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Date : 17th December, 2018 **Larinpuia Vangchhia**
Place : Aizawl

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Abbreviation Used

ASHA	: Accredited Social Health Activist
BA	: Bachelor of Arts
BCG	: Bacillus Calmette–Guérin
BP	: Blood Pressure
DNA	: Deoxyribonucleic Acid
DPT	: Diphtheria, Pertussis, Tetanus
EBCOG	: European Board and College of Obstetrics and Gynecology
ENAP	: Every Newborn Action Plan
EPI	: Expanded Program on Immunization
FA	: Factor Analysis
FAO	: Food and Agriculture Organization
FAS	: Fetal Alcohol Syndrome
FPS	: Fair Price Shop
GIS	: Geographical Information System
Hib	: Haemophilus influenza type b
HIV	: Human Immunodeficiency Virus
HSLC	: High School Leaving Certificate
HSSLC	: Higher Secondary School Leaving Certificate
ICDS	: Integrated Child Development Services
ICPDPA	: International Conference on Population and Development Program of Action
ICIMOD	: International Centre for Integrated Mountain Development
ICMR	: Indian Council of Medical Research
IDA	: Iron Deficient Anemia
IDD	: Iodine Deficiency Disorder
IFA	: Iron Folic Acid
IM	: Infant Mortality
IMR	: Infant Mortality Rate
KM	: Kilometer
KMO	: Kaiser-Meyer-Olkin

LPG	: Liquefied Petroleum Gas
MA	: Master of Arts
MMR	: Measles, Mumps, and Rubella
NCCWCH	: National Collaborating Centre for Women's and Children's Health
NFHS	: National Family Health Survey
NGO	: Non-Government Organization
NHM	: National Health Mission
NHS	: National Health Survey
NNMB	: National Nutrition Monitoring Bureau
NS	: Nutritional Status
NV	: Nutritional Value
OECD	: Organization for Economic Co-operation and Development
OPV	: Oral Polio Vaccine
PAF	: Principal Axis Factor
PCA	: Principal Component Analysis
PDS	: Public Distribution System
PEM	: Protein Energy Malnutrition
PFi	: Per-capita per day Food Intake
PHC	: Primary Health Center
PNI	: Per-capita per day Nutritional Intake
SPSS	: Statistical Package for Social Science
SRI	: System Rice Intensification
STD	: Sexually Transmitted Disease
TV	: Television
UN	: United Nation
UNDP	: United Nations Development Program
UNICEF	: United Nations International Children's Education Fund
VAD	: Vitamin A Deficiency
VC	: Village Council
WHO	: World Health Organization

FOOD SECURITY, NUTRITIONAL STATUS AND INFANT MORTALITY RATE IN DISTRICT SAIHA, MIZORAM

A THESIS SUBMITTED FOR THE AWARD OF DOCTOR OF PHILOSOPHY TO THE DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

Submitted by

LALRINPUIA VANGCHHIA

Under the supervision of

PROF. VISHWAMBHAR PRASAD SATI

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

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Supervisor

Prof. Vishwambhar Prasad Sati

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

MIZORAM UNIVERSITY

AIZAWL: MIZORAM

2018

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

Mizoram University

December, 2018

DECLARATION

I, Lalrinpuia Vangchhia hereby declare that the thesis entitled ***"Food Security, Nutritional Status and Infant Mortality Rate in District Saiha, Mizoram"***, submitted by me is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the degree of Doctor of Philosophy in Geography and Resource Management.

Date : 12.12.2018

Place : Aizawl, Mizoram

(Lalrinpuia Vangchhia)
Candidate

(Prof. Vishwambhar Prasad Sati)
Head

Department of Geography & R.M
Mizoram University

(Prof. Vishwambhar Prasad Sati)
Supervisor

Department of Geography & R.M
Mizoram University

MIZORAM UNIVERSITY

(**A Central University**)

Department of Geography and Resource Management

School of Earth Sciences

Tanhril, Aizawl, Mizoram- 796 004, India

Vishwambhar Prasad Sati, ***D.Litt. Ph.D.*** Phone: (M) +91 94257 10429

090899 04889

Professor E-mail: vpsati@mzu.edu.in

CERTIFICATE

This is to certify that the thesis entitled **"Food Security, Nutritional Status and Infant Mortality Rate in District Saiha, Mizoram"** by Mr. Lalrinpuia Vangchhia for the award of Doctor of Philosophy to the Department of Geography and Resource Management has been written under my guidance.

He has fulfilled all the requirements laid down in the Ph. D. regulations of the Mizoram University. The thesis is the result of his investigation into the subject. Neither the thesis as a whole nor any part of it was ever submitted to any other University for any research degree.

Dated : Aizawl

The : 14th December, 2018

(Prof. Vishwambhar Prasad Sati)

Head

MIZORAM UNIVERSITY

(A Central University)

Department of Geography and Resource Management

School of Earth Sciences

Tanhril, Aizawl, Mizoram- 796 004, India

Vishwambhar Prasad Sati, ***D.Litt. Ph.D.***

Professor

Phone: (M) +91 94257 10429
090899 04889
E-mail: vpsati@mzu.edu.in

Ref. No......

Date 13th December, 2018

TO WHOMEVER IT MAY CONCERN

This is to certify that Mr. Lalrinpuia Vangchhia, a Ph. D. scholar, Registration No. MZU /Ph.D./683 of 02.05.2014 has worked on the thesis entitled **"Food Security, Nutritional Status and Infant Mortality Rate in District Saiha, Mizoram"**. He has fulfilled all criteria prescribed by the UGC (Minimum Standard and Procedure governing Ph.D. Regulation). He has fulfilled the mandatory publication (see enclosed). It is also certified that the scholar has been admitted in the department through an entrance test followed by an interview as per Clause 9 (i) & (ii) of UGC Regulation, 2009.

(PROF. VISHWAMBHAR PRASAD SATI)
Head

Visiting Fellow: Chinese Academy of Sciences, Beijing; **Scientific Editor:** Journal of Mountain Science, A Springer Publication; **Member Editorial Board:** (1) SAR, A Journal of Canadian Centre for Education and Research; (2) International Journal of Agricultural and Food Research (3) International General of Geosciences; **Expert Member:** ENVIS on Himalayan Ecology; **Corresponding Member:** International Geographical Union (IGU)
Ex-Fellow: TWAS-CAS, INSA, ICSSR, GBPIHED; **Ex-Chairman:** Board of Studies in Geography, Jiwaji University, Gwalior

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CHAPTER - I

INTRODUCTION

1.1 Theoretical and Conceptual Framework

The infant mortality rate (IMR) is an indicator of child health as well as of population health (Gray, 2009). This reflects the apparent association between the causes of infant mortality and other factors that are likely to influence the health status of whole populations such as their economic development, general living conditions, social well-being, rates of illness, and the quality of the environment. Food security and nutritional status have an important role on the infant mortality rate (IMR). It does not only have impact on IMR but also on the health quality, nutritional status and living standard of the people. In worldwide, wherever the food security is high, living standard of the people and health quality is consequently high while IMR is low. On the other word, in the developing and underdeveloped world, the condition is vice-versa. There are various factors that affect food security and nutritional status and subsequently IMR.

The term ‘Food Security’ was first coined in 1974 by the Food and Agricultural Organization (FAO, 1996). The World Bank (1996) has defined it as “ensuring food to all people at all times has both physical and economic access to basic food they need”. Mathew (2002) described three main components of food security viz. availability, distribution and access. Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security depends on availability of food that is nutritionally adequate and safe, especially food that is produced by the new cutting edge from technology (Singh, 2011).

There are many steps raised worldwide to achieve food security. The global attention on food security revolves around the pledges and commitments at the world food summit in (1996). As a quantifiable target was set for 2015 to reduce the number of hungry from 800 million to 400 million, an assessment against this figure has tried and various projections have emerged. The quantifiable target of reducing the number of hungry and malnutrition to half remain the target, which could bring prosperity to the world.

Nutritional status is an effective measurement of the levels of the people and IMR. Further, nutritional deficiency diseases are related to the deficiency of the nutrients in the body, which enormously affect IMR. The daily food, which we consume always serves many purposes. The failure of food to sub-serve the functions may be brought about in a number of ways: firstly, it may be the result of inadequate intake of essential nutrients due to lack of food. Secondly, it may be developed as a result of failure to absorb normally the essential nutrient supplied by the diet in adequate quantity (Ali, 1977). The problems of the protein-energy malnutrition affect millions of children in the world today.

IMR is defined as the death of a child less than one year of age per 1000 live birth in a year, while childhood mortality is the death of a child before the child's fifth birthday. National statistics, India grouped these two mortality rates together. Globally, IMR is different in different countries of the world. About ten million infants and children die each year before their fifth birthday; 99 per cent of these deaths occur in developing nations. Infant mortality takes away society's potential physical, social, and human capital.

In India, IMR is very high. Every year, about 20 million children are born in India, but only 70 per cent survive up to the age of five. In developed countries, this survival percentage is around 95. It may be interesting to examine that why IMR is high in India and what the factors responsible for it. The studies indicate that the factors associated with the IMR are many and intermixed. In India the highest IMR is in Madhya Pradesh (56) followed by Assam (55), Orissa (53) and Uttar Pradesh (53). During the last 50 years, the North Eastern Region has experienced a high population growth rate along with high literacy rate. Mizoram and Tripura have achieved more than 75 percent of literacy rate while Mizoram has seen a dramatic rise in IMR at the same time (IMR has increased from 16 in 2003 to 37 in 2014).

Poverty, food and nutritional status are taken as the important factor affecting the IMR in Mizoram. About 822 infants below one year old died in Mizoram during 2014 while, 21 mothers died during pregnancy and delivery over the same period. The Sample Registration System Survey (2012) revealed that the national IMR for a year was 42 in every 1,000 and the rate in Mizoram was 35 in every 1,000 pregnant women. The Centre has set a target to reduce IMR to 25 by 2017. In 2014, the total number of child birth in the district was 1398 and 158 were dead before attaining one year. IMR was 113 and it was 3.05 times higher than the state average and 2.9 times of national average (NHM, 2017).

1.2 Scope of the Study

The study mainly focuses on infant mortality rate (IMR) in relation with food security and nutritional status of a pregnant women including socio-economy of a family and reproductive healthcare of a pregnant women in district Saiha, Mizoram. IMR in the whole state during the last 5 years shows moderate at national levels (16^{th} position, 2014) but at the same time Saiha district has attained 1^{st} position among the district, every year. According to the National Health Mission (2017), the district has witnessed increasing trend from 75 in 2010 to 113 in 2014 (i.e. 20.21%). There is no research done in the subject and area, most of the people belief that IMR is very high in the district due to God sentence, poor medical facilities, low income and cleanliness. No one thinking about poverty, food, malnutrition and reproductive healthcare of a pregnant woman are related with child survival which is mainly concern in the present study.

Socio-economy, food security, nutritional status are inseparable components, affecting each other. Reproductive healthcare of pregnant women is also related with socio economic components, especially education and income. Similarly poverty, malnutrition, health and healthcare of a pregnant woman are closely related with infant death. People in remote area like the district Saiha could not access proper medical facilities due to poor socio-economic condition. They are not able to attain food security status, because of poor accessibility and unavailability of different variety of foods further result imbalance intake of foods. Consequently, it causes imbalance on nutritional intake in which peoples are under nutrition to some vitamins as well as over nutrition in other vitamins. The situation is very harmful for mankind and danger for pregnant women. Further, malnutrition, poor health and healthcare of a pregnant woman affect infant mortality. Thus, a deep study on IMR and identification of the affecting factors is necessary. This work will be first and foremost. It will be useful to all stakeholders- researchers, academicians, policy makers, general public and the students.

1.3 Statement of the Problems

IMR is one of the most imperative measurements and negative indicator for the level of livelihood in an area. It is closely related with food security and nutritional status of the family, especially mother, during her pregnancy as well as socio economy of a family. The food intake and nutritional status of a pregnant mother is resulted in the survival of her new born baby. A number of studies have shown a comparatively higher IMR for children born to poor maternal food and nutritional status, because, they are not able to supply an enough and healthy nutrients for their child survival. The economy and literacy levels of a family may also be closely related with food and nutrition intake of a pregnant mother, which affect child health before attaining one year.

National Health Mission (2017) reveals that Saiha district has the highest IMR among the districts (113), compared to the whole state of Mizoram (37) as discussed earlier. The literacy rate is 90.01 per cent (2011 census) and it ranks fifth amongst of the districts of Mizoram. The medical facilities are also quite averaged as compared to another districts while, food availability, food accessibility and food stability is very low. So, it is believed that the food and nutritional status may be the factor affecting IMR in Saiha district. Poverty is believed to be the factor affecting food insecurity, malnutrition and infant mortality. Thus, it is intended that the problems of IMR is related to socio economy, food security, nutritional status and reproductive healthcare as stated above, have been study.

1.4 Research Questions

Followings are the research questions for the present study

a) Is IMR affected by socio economic status of a family?

b) Is IMR related with food security of a family?

c) Is IMR related with nutritional status of pregnant women?

d) Is IMR related with reproductive health and healthcare of pregnant women?

1.5 Objectives of the study

Based on the above questions, the present study was conducted with the following objectives:

1) To examine food security and nutritional status in Saiha district
2) To study the factors affecting food security and nutritional status
3) To examine IMR in relation to food security and nutritional status
4) To suggest a model for food security and nutritional status

1.6 Review of Literature

Food security and nutritional status are the comprehensive terms, have greater impact on health qualities and IMR. There are numbers of study carried out on food security and nutritional status in the world, in general and in India, in particular. In terms of food security, Khadka (2002) described that food security, at the individual, household, national, regional and global level-exist when all people, at all times, have physical and economic access to adequate, save and nutritious food to meet their dietary need and food preferences for an active and healthy life.

The Food and Agriculture Organization in the fourth (1977**)** and fifth (1985) world food surveys puts the proportion of the third world population living below a minimum survival level of energy consumption at about 15 per cent, where as world bank (1986) assesses the number of living on diets in less than optimum energy content at between 14 & 15 per cent. Sukhatme (1977) estimates that in India the numbers of people whose energy intake are below the lower limit of adaptation comprise 20 per cent of the population, whereas Dandekar and Rath (1971) estimated about twice that proportion to be unable to purchase a minimum adequate diet.

The food insecurity is a worldwide common problem. The Food and Agriculture Organization of the United Nations (2013) estimates around 800 million people worldwide to be food insecure and they are not limited to the developing world. FAO (1996) consider measuring food insecurity at the individual/Household level rather than the national level defers from the more traditional approach of identifying food insecurity as the inadequacy of aggregate supply and accessibility to food. Sen (1981) has been also argued strongly that aggregate measures of food deprivation should take in to account aspect of inequality within food insecure households.

Food security has mainly three components i.e. food availability, food accessibility and food stability (Nayak and Narayankar 2009). Food availability is an important component of food security. The food accessibility is one of the most important components in food security. Narasaiah (2006) describes yet more than 700 million people in the developing world do not have access to sufficient food to lead healthy and productive lives. More than 180 million children are underweight. Diseases of hunger and malnutrition are widespread for people to be food secure that is to have access at all times to the food required for a healthy and productive life- there must be both availability of food and access to food. Access to food by households (and individuals) is conditioned by poverty, the poor usually lack adequate means to secure access to food. Food security is related with the issues of availability, accessibility and affordability of food to all the people round the year. It implies sufficient stocks of food grains either through domestic production or import, purchasing power of the people especially the marginalized people so that they can afford to purchase food in terms of adequate quantity and nutrition.

Singh (2002) highlights in India, the warehouses of the national food agency are brimming with 60 million tons of grains, food security is a core issue for about 200 million people-one fourth of the world undernourished population. The battle against food insecurity is therefore far from over. It is obvious that while adequate production of food is an essential condition, it is not sufficient to ensure comprehensive food security. Access to food especially on the part of vulnerable people is thus now a major concern. The hungry child can't wait. A former novelist said, "His name is today".

An evaluation conducted by National Council of Applied Economic Research (2002) reveals that approximately 67 per cent of the centers across the country report irregular supply of food. Patel *et al.* (2012) discusses food security is the fundamental requirement for the development of any country. The most specific nutritional inventions in India are the Integrated Child Development Services (ICDS) and the Mid-Day Meal Scheme while the main problems of this scheme is that very low quality of food supply due to local institutional corruption and insufficient stocks of food at state level.

Food security is a matter, which has been receiving attention of every one and has resulted in World food Summit five years ago. Kumar (2011) explained that as far as India is concerned we have achieved the food self-sufficiency and have a large buffer stock of almost 60 million tons of food grains. However, at the same time we have about 26 per cent of the population Below Poverty Line. In terms of absolute numbers, this means that almost 260 million persons are below the poverty line in the country. A large proportion of this population lives in rural areas. It is estimated that almost 193 million persons out of the 260 million persons below the poverty line live in rural areas.

The crisis in food security dominated our efforts of development planning in India after the achievement of independence. Gopalan (2002) discusses famines and scarcity in the previous decades resulted in hunger and death of the country. The reliance on heavy imports to augment supply of food grains emptied our coffers. Self-sufficiency on food production became an urgent goal of our five year plans. Our national food security effectively remains illusory, food crisis a haunting reality accompanied by malnutrition, morbidity and death.

The availability of food according to Singh (2002) implies nearly one-fourth of India’s population, 251 million out of nearly one billion, is below the poverty line. 170 million of the poor, 68 per cent are rural and the remaining 32 per cent are urban. Number at the national level in rural areas has decreased after 1983; the number of poor in the cities has been increasing. There are serious implications of these trends on feeding the cities and food security of urban people, urban poverty and environment. A question may be asked as to whether the rural settings and opportunities could be improved for securing livelihood security and consequently rationalizing the migration to the cities. As per report "commonwealth or common Hunger" released by NGO (save the Children) around 45 per cent of Indian kids are underweight and 7 million under five are severely malnourished. The report reveals 64 per cent of the world underweight kids live in 54 commonwealth countries and India has both highest number and highest proportion of underweight Children.

The food security and nutritional status of the people affect the physical as well as mental health; it also affects the IMR of a region. Pant (2012**)** described that the Tribal people particularly Tharus are the lowest income group people living in absolute poverty and are also surviving in shadow of severe under nutritional conditions inviting several diseases including deficiency-related diseases. An unhealthy person cannot perform the physical as well as mental responsibilities properly.

Annual income of family is the basis of determining poverty line in North East India. Sahu (2002) discussed in case of settled cultivation it might be possible to determine approximately the quantity of rice produced but it is difficult to get the approximate quantity from shifting cultivation. We may perhaps infer that in North East India no tribal family could be regarded lying below the poverty line since from the point of view of food nutrients a tribal family in the north-east which supplements its food with wild roots, Tubers, Fruits, Leafy vegetables, Fish meat and so on.

Mizoram has facing food scarcity, Kabra (2008) discusses owing to scarcity of food, and hunting played a vital role in Mizo life. Scarcity of cultivable land and food coupled with lust of wealth made Mizo riding the enemies of villages in the neighboring territories to carry off slaves or captives and loot as much as possible. With the increase in number of marts, Mizo became dependent more and more on the plains for their necessities of life. Mizoram is chronically a food deficit area. It appears that the deficit is on the increase. The state has to import more than half of its requirement from outside the state. This of course does not take in to account the part of the production that does not reach the consumer. Low productivity and demographic pressure has put the state in a vulnerable position. Availability and accessibility of food stock at affordable exchange rate are important issue; it will depend on household's ability to buy. The other aspect relevant on the measurement or poverty is the nutritional value of food consumed.

Nutrition is a significant factor in determining the health status of youth. Naidu & Parasuraman (1982) discussed the youth's nutritional status is the condition of the body resulting from the food intake, its absorption and utilization over a period of time. Diseases can affect any of these biological processes as well as person's food requirements. Food intake is the critical nutrition input. Poor nutrition of the youth and the general population results from low income, low productivity and low purchasing power.

Jelliffe (1966) has been defines Malnutrition as pathological state resulting from a relative or absolute deficiency or excess of one or more essentials nutrients, this state being clinically manifested or detected only by biochemical, anthropometric or psychological tests. Chatterjee, (1999) also highlight the income of the parents also plays a significant role in controlling IMR. The facilities available in the community can be bought by those who belong to higher socio-economic strata of society. Malnutrition is the underlying or an associated cause of death due to infectious diseases. The surveys conducted by the National Nutritional Monitoring Bureau (NNMB), Hyderabad sponsored by the pan American health organization in 18 widely separated areas found that, in 7 per cent of all the death of young children, malnutrition was the underlying cause and 46 per cent an associated cause, i.e. it was directly responsible for 53 per cent of the death of children below 5 years of age. Accordingly, the prevalence of malnutrition as a causative factor in child mortality is discussed on the basis of the result of diet surveys on nutritional intake, nutritional deficiency signs and anthropometric measurements.

Nutrition is a vital component of the complex concept of health. Devadas (1974) describe the nutritional status of an individual is fairly well influenced by the choice of foods in family apart from various other social and economic dimensions. Chen *et al* (1980) has been further demonstrated that the nutritional status of mother has an impact on birth weight of the babies and the incidence of infant and child mortality. Chandra (1971) has also observed that the IMR was the highest when the maternal weight was lighter (40.5 kg).

The poor nutritional status affects the IMR of an area. Maeyer (1976) described the child who is undernourished or malnourished and retarded in growth is more prone to infections, which produce higher mortality rate in such children, particularly toddlers (1-4 years), than in well-nourished children. Underlying the high mortalities caused by many childhood diseases and the almost universal growth retardation are both energy and protein deficiencies. Program designed to maintain the nutritional status should be started when the child is still in utero, almost from the time of conception. A poor state of nutrition of the mother during pregnancy will definitely affect the offspring.

No other diseases compares in importance with protein-energy malnutrition (PEM) in the field of nutrition or public health in general. Maeyer (1976) explained this form of malnutrition is highly prevalent in young children in almost all the developing countries. Few children survive the most severe forms of PEM unless they receive medical attention; even then, mortality may still be high.

It is necessary to distinguish between factors that condition malnutrition and those that precipitate acute malnutrition and death. Beaten &Bengoa (1976) highlighted the precipitating, rather than the conditioning, factors are undoubtedly responsible for much of the high mortality, and perhaps of the savior forms of the malnutrition, among children under five years of age. Based on considerations of the effect of malnutrition and under nutrition on work output and productivity, the nutritional status of the total population, not just the groups susceptible to acute malnutrition, is a matter of concern.

Srinivasan (1992) stated that the problems of hunger and under nutrition (primarily meant to describe inadequate long-term energy intake in some sense) in developing countries has rightly attract the attention of scholars. The world bank (1986) estimates that in 1980, 34 per cent of the population of developing countries, or 73 million people did not have sufficient energy intakes through their diets to enable them to live an active working life and that the diets of nearly half of them (340 million) were so deficient in energy that they ran the risk of stunted growth and serious health problems.

Healthy nutrition takes many forms and is understood differently in different countries and cultures. Arora (2009) discussed in general, healthy nutrition should be an integral part of daily life that contributes to the psychological, mental and social well-being of individuals. It is the combined effect of the food we consumed, our health status, and the care we take in meeting the health needs of ourselves and others. Well-being is established by consuming safe foods as part of a balanced diet that contains adequate amount of nutrients in relation to bodily requirements. Malnutrition can be related to various factors, such as poverty, infections which lead to poor appetite, and lack of access to food, sanitation and or health services. Malnutrition negatively affects quality of life and learning and can cause death and diseases. Household food security, health services, a healthy environment, and care for women and children are considered the underlying determinants of child survival and development.

Children in poor communities suffer not merely from calorie deficiency but from other nutrient deficiencies as well. Thus Gopalan (1992) indicated that Indian children in poor rural communities often suffer from moderate and severe iron deficiency, anemia 963 per cent of children below three years belonging to poor rural communities were found to suffer from such anemia.

In India the question of defining poverty line was first raised by Indian Labour Conference in 1957. Gedam (1995) suggested that based on the recommendation of Nutritional Advisory Committee a minimum consumption expenditure of 100 rupees at

1960-61 prices of family of 5 persons will be needed to meet nutritional diet. This consumption expenditure depends upon prevailing prices and these prices vary in rural and urban areas. Therefore the consumption expenditure per capita income was suggested to be Rs. 25 for urban areas and Rs. 18.9 in rural areas at 1960-61. According to the study conducted by Dandekar & Rath (1971) the average calorie norms 2,250 per capita per day was recommended as adequate diet in Indian condition.

In India's concern for nutrition is as old as its civilization. Rasul (2002) explained nutrition and health are not synonymous, but without good nutrition, health cannot be maintained. Food has always played an extraordinarily vital role in the rise and growth or the fall and decline of a nation because of its effect on the health efficiency of its population. Despite spectacular increase in the food grains production in recent years, the problems of chronic malnutrition continue to exist extensively: especially among children and women because they are caught in the relentless sequence of ignorance, poverty, inadequate food intake, disease and early death. The nutritional status of a nation is closely related to food adequacy and its distribution. The nutritional status is, thus, as outcome of complex and inter-related set of factors.

Nutrition is a primary requirement for human development. Indeed, it is vital for the development of healthy and productive human resources. Gopalan (2002) described that today, the nutritional profile of the people of India is marked by high incidence of nutrition disorders in various dimensions- Protein Energy Malnutrition (PEM), Iodine Deficiency Disorder (IDD), Vitamin 'A' Deficiency (VAD), Anaemia, Flurosis, and Lathirism etc. One-fifth of the world's blind, six million, are in India. More than 70 million people suffer from IDD. It has been found that 235 districts of the country are endemic to IDD, that is, where the incidence of the disorder is more than 10 per cent. Individual households need to have purchasing power to access available food supplies. Under nutrition is especially devastating in its impact amongst children below 5 years of age. According to the survey of nutritional status of rural population conducted (1996) by the National Nutrition Board in selected villages of seven states, 91.1 per cent of children below five years of age, suffer malnutrition of various degree.

Health and nutrition are very intimately related aspects of an individual's biological status. Sharma (2011) described food contains various substances that are required for growth, development and maintenance of the body. These substances are called nutrients which are proteins, carbohydrates, fats, vitamins and minerals. Infant and young children required relatively more nutrients (2-3 times) per kg body weight than the adult. In special psychological conditions like pregnancy and lactation, adult women need additional nutrients to meet the extra demand for foetal growth and maternal tissue expansion in pregnancy and milk secretion during lactation.

Raj (2003) discussed usually due to social or other causes there are many death in many countries within a period of one year of a child, in some cases whereas newly born baby dies, in some cases both the babies as well as mother leave for heaven. This increase death rate as well. The study of Child death is of course very important. In every society, infant are the most victim of death. Death rate in many countries is quite high and data available about real and direct causes of death very defective and undependable. The high IMR is caused by outside factor like ill-nourishment and nutrition etc.

Chakraborthyet al., (1978) has conducted several studies at the micro level confirm that the influence of infant and child mortality on completed family size. It is expected that all communities with high rate of infant and child mortality have high fertility to ensure the survival of at least some of the children born to them. For instance, Majumdar (2004) observed that high fertility among tribal is offset by high IMR and the number of children reared by tribal's mother at any times does not exceed those reared by other caste mother.

The poor nutritional status has more effect on the IMR among the tribal people. The study of Food availability and nutritional Status of Tharu Scheduled Tribe Population in the District U.S Nagar of Uttarakhand State by Pant (2012) showed that maximum 81 per cent deaths occurred before the age of five i.e., IMR among Tharu still more due to early marriage of girls in one hand and poor nutritional intake to the other.

Rao *et al.* (2004) in their paper on 'nutritional status of children in north-east India' have examined the nutritional status of children in the north-east states of Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and Tripura. The study highlights the problem of underweight, anemia, morbidity, malnutrition among the children.

Kailiana (1980) discussed the deficiency in food supply in Mizoram is a chronic feature. There are conventional famines known as 'Mautam' and 'Thingtam' which may invariably cause a great damage to people in view of the scarcity of food of all kind and the poor condition of the people.

Reddy and Mamatha (1992) studied the IMR in terms of time birth of children. Among all infant deaths, neonatal mortality (0-28 days) is higher than post-neonatal mortality (29 days and after). Probably the reason for experiencing the first infant deaths, mothers might have been more careful in preventing infant deaths in neonatal period. The infant deaths that occur in the post-neonatal period can also be prevented by effective health services, good nutrition intake, and health education to mother.

Hunger and food insecurity have a sufficient effects on health and nutrition of both adults and children. Narasaiah (2006) described that they can lead to growth failure in children. About 184 million pre-school children in developing countries were underweight in 1994. In addition to energy deficiencies, micronutrients deficiencies are also widespread in the developing world. About 14 million pre-school children (under the age of 5 years) have Eye damage as a result of vitamin-A deficiency. Between 250, 000 and 500,000 pre-school children go blind each year due to Vitamin-A deficiency, two third of these children die within months of going blind. Many more children are mildly affected. Iron deficiency leads to anemia, which if not checked can diminish learning capacity and increase morbidity and mortality.

Gupta (1980) highlighted many of the factors that determine IMR like low birth weight, women’s literacy, poor hygiene, poor sanitation, poverty etc. meant IMR among Indian tribe was calculated to be 120.3 which is alarming higher than 77 of Indian national population.

There is a general agreement that the health status of the tribal population in India is very poor. Basu *et al*. (1996) have tried to establish the IMR of India is due to widespread malnutrition. IMR among tribal population are found to vary from a minimum of 36 in Kerala to 168 in U.P. In general, states like Andhra Pradesh (144), Gujarat (145), Haryana (112), Madhya Pradesh (140) Tamil Nadu (119) and U.P (168) show very high IMR.

A study of fertility and mortality differentials among the war Khasi of Meghalaya by Khongsdier (2002) highlighted that female education has a significant impact on maternal and child health as it enhanced the knowledge and skills of mothers in health care practices concerning nutrition. The IMR is closely related with maternal health and nutritional status. The IMR is significantly associated with maternal age and birth order. IMR and juvenile mortality rate are higher in males than in Females, the rate is increase with the increasing birth order in the present population. The IMR tends to increase with the increasing age group of the mothers. IMR is decrease with the increasing educational levels. Schultz (1984) also determine the higher infant and child mortality rate among the poorly educated mother are due to their poor hygienic practices and lack of access to food and modern medical facilities in north-east India.

According to Government record (2013), one may note that the IMR for the north eastern Indian States works out to be around 49, whereas for the North Eastern states excluding Assam State it comes out as 31 for the year 2012.

The NHS Bulletin (2011) highlight the IMR and Maternal Mortality Rate of Mizoram appears to have been increasing, IMR was mainly in the rural areas and occurrence of famine during 2006 – 2008 due to bamboo flowering. As a result, nutrition supply to mothers and children were greatly emphasized by Health Department and deeply involved in monitoring and helping the State Nutritional Programme due to famine this year. Moreover, acute shortage of area utilization for Jhum Cultivation was so high and decrease of Jhum Cultivation so resulted decrease of food production which further resulted low nutritional status amongst mother and infant.

The IMR in Mizoram is very high. NHM (2013) highlighted about 600 infants died while 12 maternal deaths were recorded in Mizoram during 2012-2013. The Centre set a target to reduce IMR to 25 by 2017 while the IMR in Mizoram is still 30. A survey by economics and statistics department of Mizoram (2012) has revealed that IMR has increased alarmingly in Mizoram according to a latest survey, 38 IMR is 38 in 2008 as compared to 16 in 2003. The IMR has increased at an alarming rate in Mizoram during the last five years, from 2003 (16), 2004 (19), 2005 (26), 2006 (26), 2007 (29.73) and 2008 (38.34). According to the NFHS-III, Mizoram is the sixth state in terms of low IMR at 34. Among the eight districts, IMR is highest in Saiha district with 113.64 and lowest in Lawngtlai district with 19.08 during the same time .The IMR in Saiha district is much higher than national average which is 57, as per 2005-06 NFHS III survey.

The nutritional status of a population is a crucial indicator in determining the health status of individuals in a community. Poor nutritional status leads to functional impairment, inability to cope with environment al hazards, decreased productivity, disability and less resistance to infections (Reddy and Mahatha, 1992). The primary factors having a direct bearing on the nutritional status include education, mass media, economic resources, social roles, food distribution patterns, quality and quantity of food. Health and nutrition education is an important tool to enhance the level of awareness of individual to bring about a change in their behavior patterns to prevent malnutrition and enhance the child survival rate. The primary aim of nutrition education is the establishment of good habits through the acquisition of knowledge and changes in eating habits, attitude and values with regard to food.

1.7 Study Area

Saiha District is located in the southernmost part of Mizoram between $21^{0}\,5^{|}$ – $22^{0}\,60^{|}$ N latitude and $92^{0}\,30^{|}$ – $93^{0}\,15^{|}$ E longitudes. It falls in the survey of India Topo sheets No. $84\frac{B}{15}$, $84\frac{B}{16}$, $84\frac{F}{3}$, $84\frac{F}{4}$, $84\frac{G}{1}$ and $84\frac{G}{5}$. It is bounded by Myanmar in the southeast, Serchhip in the North and Lawngtlai in the West. The total area of the district is 1,409 sq km. According to 2011 census, the population was 56,366 with 40 persons per sq km, of which, rural population constituted 31,301 (55.5 per cent) and urban population was 25,065 (44.46 per cent). Male and female population was 28,594 and 27,980, respectively. The child sex ratio was 932. The literacy rate was 88.46 per cent. There are two rural development blocks i.e., Saiha and Tuipang, which have 76 villages including 12,374 households. The 3,216 households were jhum cultivators and 618 families have been practicing wet rice cultivation (Agriculture Statistical Abstract, 2012). In 2014 among the districts of Mizoram, Saiha district has the highest IMR (113) which is 3.05 times higher than the whole state i.e. 37 (NHM, 2017). During the last 5 years IMR was increased by 20.21 per cent.

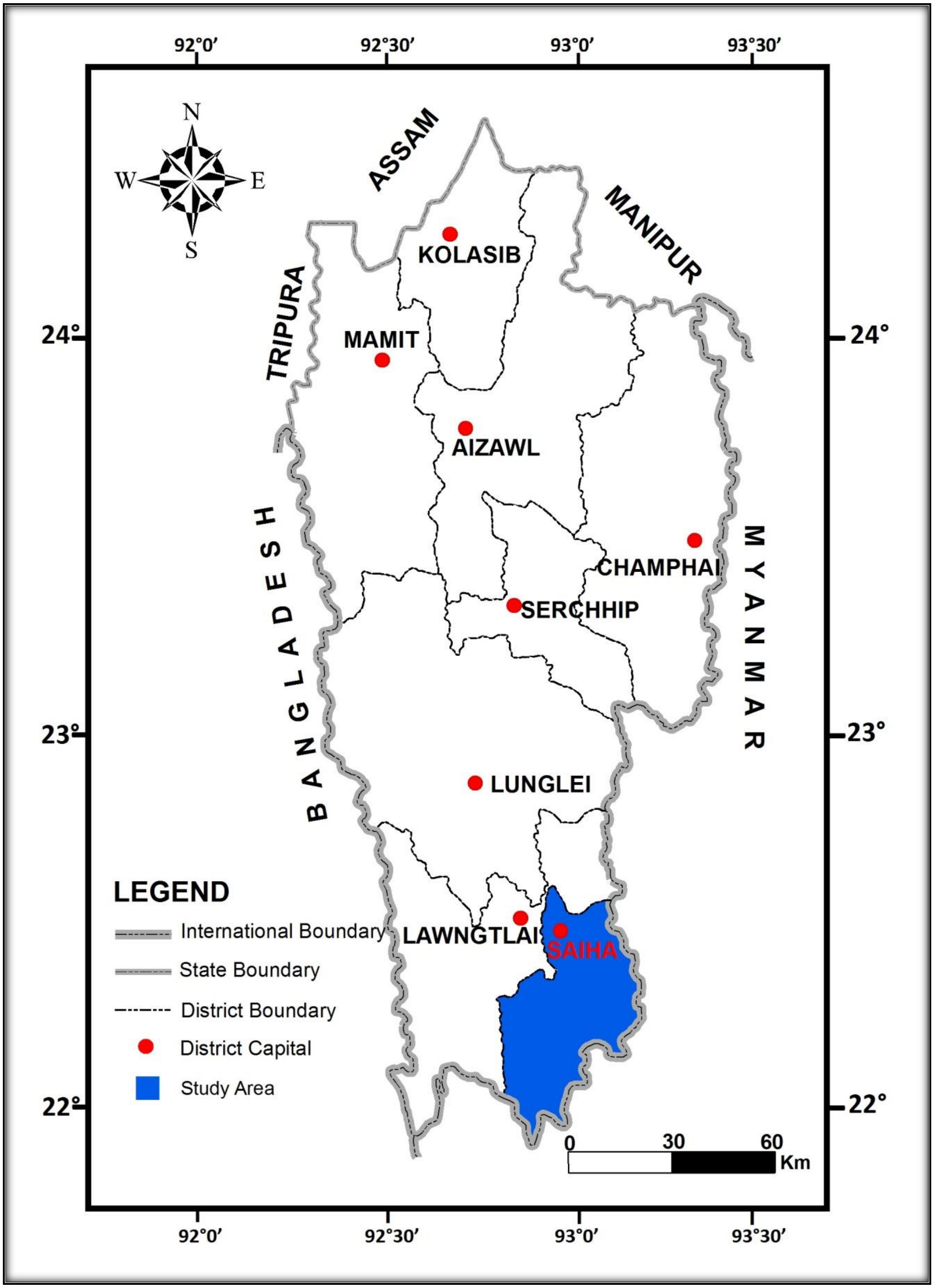

Fig.1.1 Mizoram Map Showing District Saiha

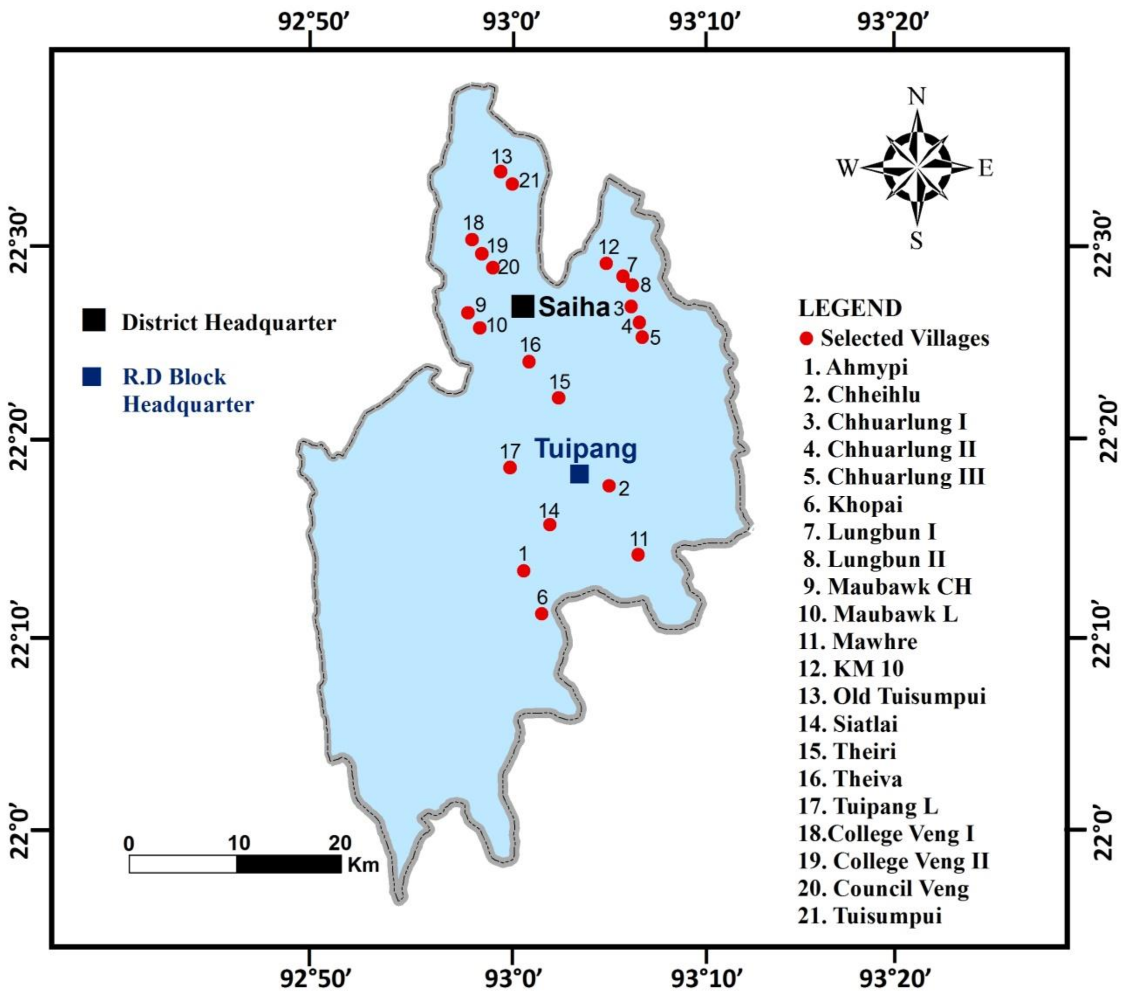

Figure 1.2 Saiha District Map Showing Selected Villages

1.8 Organization of the Chapters

The present study has been organized into eight chapters,

The first chapter is an introduction of the study. It deals with scope of the study, statement of the problems, objectives of the study, review of literature, and study area.

The second chapter is devoted for methodology of the study including selection of the study area, sampling and sample size and technique of analysis.

The third chapter deals with socio-economic background of the study area. Village wise demographic composition and socio-economic status were discussed.

The fourth chapter is food security. It includes the three major components like food availability, food accessibility and food stability. Village wise level of food security status has been work out and discussed.

The fifth chapter is divided into dietary patterns and nutritional status. It pertains to the food consumption patterns. Efficiency and deficiency on vitamins and minerals components were discussed.

The sixth chapter is reproductive healthcare. It deals with patterns of health and healthcare of a pregnant woman during pregnancy including antenatal care, tobacco consumption, delivery, women’s health, bread feedings and postnatal care.

The seventh chapter deals with infant mortality rate (IMR). General discussions have been made on district wise IMR of Mizoram and village wise IMR of the study area. The relationship between IMR and socio-economy, food security, nutritional status and reproductive healthcare was discussed. A comparison between women having infant death and does not have was also made in the same. Extreme infant disaster was also discussed.

The eighth chapter is conclusion. It provides conclusion summery of the findings, major factors causing IMR and suggestions.

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CHAPTER - II

METHODOLOGY

Methodology of the present study includes selection of the study area, preparation of scheduled, sampling design and sample size, collection of data, data processing viz., data entry, tabulation, analyze and interpretation with application of statistical techniques and graphical works. The study was mainly based on primary data collected by author during the year 2014 and 2015. The study comprises five major components such as socio economic, food security, nutritional status, reproductive healthcare and infant mortality rate (IMR) in Saiha district Mizoram. Socio economic status of a family was measured through 19 indicators. Food security status was studied by dividing it into three sub-components like food availability (3), food accessibility (5) and food stability (8) including the 16 indicators (Figure 2.1). Nutritional status of a pregnant woman was measured by two ways viz., vitamin (16) and minerals (10) components comprising 26 indicators (Appendix-III). Reproductive health and healthcare of a pregnant woman was also study by adopting 39 related indices. Infant mortality rate (IMR) of every village councils was also collected and calculated

2.1 Selection of Study Area

Since the main intention of the present study infant mortality rate in relation with socio-economic, food security, nutritional status and reproductive healthcare, the district Saiha has been selected for case study because infant mortality rate is highest among the district of the state at all times (Table 7.1) . The district has recorded highest infant mortality rate among Indian district in 2014 (113). At the same time the district have extremely high IMR every year as shown in the table 7.1. Therefore, the district was selected for case study.

2.2 Sampling and Sample Size

Both qualitative and quantitative data were collected to conduct the study. Data was obtained mainly from the primary sources. Selection of villages was mainly based on infant mortality rate as on pilot survey, beside the location such as river valleys and structured hills; distance from the urban centers and roads; population size, the level of infrastructural facilities are also considered for selection. Primary data was collected from 21 village councils (18 village councils from rural and 3 village councils from urban area) covering 40 per cent of the total household by purposive random sampling technique. In this case firstly all the women who have infant death for their lifetime were purposively selected and secondly the other women who have no infant death for their lifetime were randomly selected to meet 40 per cent of the total household. Household level survey was conducted during 2014 and 2015. Out of total 2518 households of 21 villages, 1023 households (40 %) were surveyed (Appendix-II). Secondary data were also collected in relation with general discussion of the district as well as the state.

Before conducting case study, a pilot survey was undertaken first to select the villages and appropriate variables to be included in the study. Those variables which have no relationship were excluded from further analysis. Thereafter a structured scheduled was framed and face to face interviewed have been conducted on all the components of socio-economic condition of a family, food security of a family, nutritional status of a pregnant woman, nutrient intake and reproductive healthcare status of a pregnant woman.

Socio-economic status of the study area has been measured by selecting 19 indicators (Table 3.1) under the components of demographic characteristics, house types, educational attainment, annual income, occupation patterns, number of rooms, cleanliness and household assets.

To measure food security status the main three components of food security viz., food availability, food accessibility and food stability were studied (Nayak and Narayankar 2009). Food availability is an important component of food security. The major indicators of food availability selected are food production/ha/annum (kg), per capita/day availability of rice (gram) and per capita availability of livestock (number). Food accessibility includes road condition, distance from nearest urban center (km), population FPS ratio, regularity of FPS, No. of main workers, annual income, productivity of land and irrigation facilities. Subsequently, the different indicators of food stability like self-sufficiency in rice, independency and self-sufficiency on others food staff, food stock and education were selected.

To obtain nutritional status of a pregnant woman daily food consumption has been collected by daily intake recall method. Nutrient content of each food item was calculated from food tables and summed up for all food items per gram for the corresponding year. Then, foods data were converted into different nutritive values such as energy, vitamins and minerals based on food composite tables and nutritive value of the Indian food (Gopalan et al., 1989). From the gathered data on per day per family food consumption (kg), per capita per day nutrition and calorie values was work out using the following formula (Vangchia, 2017).

PNI = (PFi X NV)/100

Where PNI = Per Capita per Day Nutritional Intake

PFi = per capita per day food intake in gram

NV = Nutritional Value of foods intake

100 = All nutritional value are given in per 100 gram

After calculating per capita per day consumption of food staffs in gram, the nutritive value of every food staff were calculated on the basis of the nutritive value given by ICMR (Gopalan, 1989) as under.

NS = PPCfs x nv

Where;

NS= Nutritional status of a person

nv = Nutritive value of food staff

Then all the nutritive value of consumed food staff was added and the nutritional intakes of a person were calculated in to 26 different vitamins, minerals and trace elements (Appendix-III). Further the nutritional intake of a person was compared with the dietary recommended requirement for all kinds of nutrition (Gopalan, 1989 and WHO) to find out the nutritional efficiency of a person. Percentages of the nutritional efficiency against the recommended value were also calculated to find out the composite score of every indicator.

IMR of each village was calculated by the following formula:

$$\text{IMR} = \frac{\text{No.of Infant death}}{\text{No.of live birth}} \times 1000$$

2.3 Techniques of Analysis

To analyze the collected data statistical techniques like Z score standardize techniques, Principal Component Analysis (PCA), Factor Analysis (FA) and Pearson's coefficient of correlation statistics have been applied. Principal Component Analysis and Factor Analysis are dominant multivariate statistical techniques. The main ideas of using PCA or FA are to reduce a large number of variables in to a smaller number of factors, to clearly describe the relationships among observed variables. They are the techniques of data reduction methods that drive a composite, smaller set of variables. Then each of the factors or components may be thought as 'supervariable' (Tabachnick and Fidell, 2013).

According to Knox and Pinch (2010), the most chosen statistical techniques for measuring spatial differentiation are PCA and FA. At one side PCA is preferred method for data reduction and FA is appropriate method for detecting structure on other (Krishnan, 2010). Use of FA is very helpful in a theoretical solution without error variability or without a unique mathematical solution (Tabanick and Fidell, 2013)

2.3.1 Z-Score Standardized Techniques

A Z-score standardized technique was used for normalization of the raw data and to find out the composite index. Data collected from primary and secondary sources were transformed into variables to be used as indicators. To transform data matrix into scale free matrix, indicators were standardized by subtracting the mean from each individual variables and divided by their standard deviation, as the following frmula

$Zi = (Xij - Xj)/SDj$

Where,

Zi is the Z-score for the i^{th} unit

Xij is the X variable in the i^{th} unit and j^{th} variable

Xj is the mean of j^{th} variable and,

SDj is the standard deviation of the j^{th} variable

After obtaining Z-score for every indicator, composite score was obtained by adding up of all individual Z-score or standard data as-

$Ci = \sum Z$

Where, Ci is the composite scores and $\sum Z$ is the summation of Z-scores

2.3.2 Principal Component Analysis (PCA)

In principal component analysis (PCA), an original set of variables is transformed into a smaller new set of orthogonal (uncorrelated) variable called principal components. The components are linear combinations of variables with weights in terms of their eigenvectors. These eigenvectors are derived from the correlation matrix of the variables. Thus each principal component is a linear combination of Z's obtained as

$Z_1 = \alpha_{11}\varkappa_1 + \alpha_{12}\varkappa_2 + ... + \alpha_{1q}\varkappa_q$

$$Z_2 = \alpha_{21}\varkappa_1 + \alpha_{22}\varkappa_2 + ... + \alpha_{2q}\varkappa_q$$

…

$$Zq = \alpha_{q1}\varkappa_1 + \alpha_{q\,2}\varkappa_2 + ... + \alpha_{2\,qq}\varkappa_{qm}$$

Where $\varkappa_{1,}\ \varkappa_{2,\ldots..}\ \varkappa_q$ are the variables or indicators, q the number of variables and Z_i (i= 1,…., q) represents the principal components. a_{ij} are the component loadings which are chosen as weights applied to the variables x_j in the above equation so that the principal component Z_i satisfies the following conditions:

i. They are uncorrelated also called as orthogonal

ii. The first component is accounting for maximum possible proportion of the variance of the set of $x_{s,}$ while the second component includes maximum of the remaining variance, and so on until the last of the principal components absorbs all the remaining variance not accounted for by the preceding components, as-

$$a^2_{i1} + a^2_{i2} \ldots + a^2_{iq} = 1$$

where i = 1,2,….q.

PCA involves finding of the eigenvalues λj, where j=1, 2,…. q.of the sample covariance matrix (CM) as-

$$CM = \begin{matrix} cm_{11} & cm_{12} \ldots cm\ 1_q \\ cm_{21} & cm_{22} \ldots cm\ 2_q \\ \ldots & \\ Cm_{q1} & cm_{q\,2} \ldots cm_{qq} \end{matrix}$$

Where,

The diagonal element cm_{ij} is the variance of x_i and cm_{ij} is the covariance of variables xi and x_{ij}. The eigenvalues of the matrix CM are the variances of the principal components and can be found by solving the characteristics equations where I is the identity matrix and λ is the vectors of eigenvalues.

One of the important properties of the eigenvalues is that they add up to the sum of the diagonal elements of CM. that is, the sum of the variances of the principal components is equal to the sum of the variances of the original variables. Such as-

$$\lambda_1 + \lambda_2 + \ldots + \lambda_q = cm_{11} + cm_{22} \ldots cm_{qq}$$

All the variables are standardized first to have zero means and unit variances at the start of the analysis to prevent some variables having undue influences on the principal components. Then covariance matrix CM takes the form of the correlation matrix. The correlation matrix rather than the covariance matrix is used in PCA that all individual indicators are given equal weights in forming the principal components (Chatfield and Collins, 1980).

2.3.3 Factor Analysis

Factor analysis (FA) and PCA are similar in terms of procedure and constructions. However, PCA is based on linear data combinations, while FA model assumes that the data are based on the underlying factors of the model and that the data variance can be decomposed into that accounted for by common and unique factors.

The mathematical equation for calculation in FA is given as (OECD, 2008)

$$X_1 = \alpha_{11} F_1 + \alpha_{12} F_2 + ... + \alpha_{1m} F_m + e_1$$

$$X_2 = \alpha_{21} F_1 + \alpha_{22} F_2 + ... + \alpha_{2m} F_m + e_2$$

…

$$X_q = \alpha_{q1} F_1 + \alpha_{q2} F_2 + ... + \alpha_{qm} F_m + e_q$$

Where X_i (i=1,…q) represents the original variables but standardized with zero mean and unit variance; α_{i1}, α_{i2},…, α_{im} are the factor loadings related to the variable X_i; F_1, F_2,…,F_m are m uncorrelated common factors, each with zero mean and unit variance; and e_i are the q factors supposed independently and identically distributed with zero mean.

2.3.4 Steps in Factor Analysis

There are three basic steps in FA including PCA (Ho, 2014) such as computation of the correlation matrix for all variables, extraction of initial factors, and rotation of the extracted factors to terminal solution.

1. **Computation of correlation matrix**

   Factor analysis (FA) is based on correlation between measured variables. Extreme multicollinearity is not permitted to conduct FA because this would result problems in determining the unique contribution of the variables to a factor (Field, 2000). According to Hutcheson and Sofroniou (1999) Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is a statistics for comparing the magnitudes of the observed correlation coefficients.

The KMO statistic is computed for every individual indicator, and their total is the KMO overall statistic. The range of KMO value varies from 0 to 1 and overall should be 0.60 or higher to proceed with factor analysis (Kaiser and Rice, 1974). Malticollinearity can also be identified via the determinant of the correlation matrix. If the determinant is greater than 0.00001, then there is no multicollinearity (Field, 2000).

The Kaiser-Mayer-Olkin measure of sample adequacy is

$$KMO_j = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} a_{ij}^{2*}} \quad KMO = \frac{\sum_{i \neq j} \Sigma r_{ij}^2}{\sum_{i \neq j} \Sigma r_{ij}^2 + \sum_{i \neq j} \Sigma a_{ij}^{2*}}$$

where a_{ij}^* is the anti-image correlation coefficient.

r_{ij} is the correlation coefficient of variable i and variable j, Then presumably r_{ij} must be the original correlations between i and j.

Saitluanga (2017) discussed about Barlett's test of sphericity is used to test the null hypothesis that the individual indicators in a correlation matrix are uncorrelated, i.e., that the correlation matrix is an identity matrix. The statistic is based on a chi-squared transformation of the determinant of the correlation matrix

2. Extraction of factors

Extraction of factors (or components in case of PCA) is the second step in FA which is simply aggregates of correlated variables. Tabachnick and Fidell (2013) mentioned that to be labeled something as a factor it should have minimum 3 variables. A factor with 2 variables is only considered dependable when there is a high correlation between variables (R =0.70) but fairly uncorrelated with other variables (Young and Pearce, 2013). These factor loadings were coefficients of correlation which indicate the relationship between the original variables and the newly derived factors. We can also say that they measure the degree of contribution to the meaning of each new factor by each original variable in the data set. In this case, a factor loading of 0.812 could be interpreted as being 82.1 per cent correlated positively with the factor.

There are different methods for extraction of the factors or components. Selection of extraction methods depends on nature of research undertaken. There are two basic methods for obtaining factor solution in Principal Component Analysis (PCA). There are six methods of extraction under common factor analysis model such as principal axis factoring, un-weighted least squares, generalized least squares, maximum likelihood, alpha factoring and image factoring. However principal axis solution (or Principal axis factoring) and PCA are the two most common extraction methods in geography (Clark et al., 1974).

For the present study, PCA was used to determine composite index of socio economic, food security, nutritional status and reproductive healthcare status. As Ho (2014) mentioned that PCA is suggested when the purpose of the study is no more than to reduce data in order to obtain the minimum number of factors needed to represent the original set of data. This method is chosen to other methods for construction of composite index of various dimensions of indicators components as all the variances in the observed variables are analyzed.

On the other hand, factor analysis, particularly Principal Axis Factor (PAF) method was also employed in the present study. As Tucker and Mac Callum (1997) mentioned PAF method was based on the notion that all variables belong to the first group and when the factor is extracted, a residual matrix is calculated. Factors are then extracted continuously until there is a large enough of variance accounted for in the correlation matrix

3. Determination of number of factors

The eigenvalue criterion and scree test criterion are the two conventional criteria for determining the number of initial un-rotated factors which is to be extracted. The eigenvalue criterion also called Kaiser's criterion suggest retaining all factors which are above the eigenvalue of 1 (Kaiser, 1970). Then this scree test rule is based on a visual plot of the eigenvalue against the number of factors in their order of extraction. In this scree test, factors located above the break (i.e., point of infection) are retained. Parallel analysis is also recommended to extract reliable number of factors (Zwick and Velicer 1986, Streiner, 1998 & O'Connor, 2000). The eigenvalues derived from the actual data are compared to the eigenvalues derived from the random data sets in parallel analysis. Factors are retained as long as the i^{th} eigenvalues from the actual data is greater than the *i*th eigenvalue from the random data. Hence Kaiser's rule was followed for the present analysis.

4. Methods of Rotation

Since un-rotated factors are ambiguous factors are rotated for better interpretation. The main used of rotation is to attain a simple optimal structure which attempts to have each variable load on as factors as possible, but maximizes the number of high loadings on each variable (Rummel, 1970).

According to Rummel (1970) the most commonly used methods in factorial ecology as orthogonal rotation is when the factors are rotated 90^0 from each other, and it is assumed that the factors are uncorrelated. On the other hand, Giggs and Mather (1975), Constello and Osborne (2005) explained that oblique rotation is when the factors are not rotated 90^0 from each other, and the factors are considered is however, inconclusive.

The selection between orthogonal and oblique rotations depends on the purpose the study. ‘If the goal of the research is no more than to ‘reduce the data’ to more manageability proportions, regardless of how meaningful the resulting factors may be, and if there is reason to assume that the factors are uncorrelated, then orthogonal rotation must be used. Conversely, oblique rotation is appropriate’ if the goal of the research is to discover theoretically meaningful factors, and if there are theoretical reasons to assume that the factors will be correlated (Ho, 2014), Hence, one orthogonal rotation method ‘varimax’ was used in PCA, and ‘direct oblimin’ which is an oblique rotation method was adopted in factor analysis in the present study.

2.3.5 Construction of Weights Using principal Component Analysis

To obtain the weight and aggregate variables in a composite index PCA and FA can be used. These methods are useful because they require no a priori assumptions on the weights of the different dimensions.

In the present case one of the main objectives was to construct a composite index of the socio-economics, food security, nutritional status, reproductive healthcare and infant mortality rate. PCA was useful as it is weighting technique in the development of composite indices as it has the virtue of simplicity and allows for weights representing the information content of individual indicators (OECD, 2008). Thus PCA and FA are the most commonly used multivariate statistical techniques used in the weighting of composite indices (Booysen, 2002)

By the way of Greyling (2013) and OCED (2008), a novel method developed by Nicoletti et al., (2000) has been applied here as it is a weighting technique. This technique considers the factor loadings of the entire extracted components to weigh a composite index. One of the significance of this method is that higher proportion of the variance in the data set is explained (Greyling, 2013).

In this case Nicoletti et al., (2000) discuss the approach as follows:

1. Firstly, make a group of the individual indicators with the highest factor loadings into intermediate composite indicators.
2. Secondly, the weight of each variable in the intermediate composite is derived by squaring the factor loadings of the variables and scaling it to unity sum within each intermediate composite index. The squared factor loadings signify the proportion of the total variance of the indicator which is explained by the component.
3. Thirdly, aggregated by assigning a weight to each of them equal to the proportion of the explained variance divided by total variance of each factor once the

intermediate composite indices have been constructed. Then, weight score (W_i) is found by multiplying the variables weight is obtained which is rescaled again to sum up to one to preserve comparability.

4. Lastly, after obtaining the final weights, rank of each village council was obtained by the product of normalized variable and the final weight.

2.3.6 Correlation

Pearson coefficient of correlation was used to measure the relationship between selected variables. This technique is one of the most common methods in quantitative geography. It measures the degree and direction of relationship between two or more variables. The formula of correlation for *x* and *y* variable as follows

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2]\,[n(\sum y^2) - (\sum y)^2]}}$$

The value of correlation coefficient ranges between -1 and +1. A value of -1 refers to perfect negative correlation while a value of +1 refers to perfect positive correlation. If the value is 0, it implies no relationship.

2.3.7 Calculation of Composite Index

After obtaining weights of every indicator, the index value of all village councils have been worked out by the following formula is used to determine the Composite index score.

$$I = \sum_{j=1} Xi \left(\sum_{j=1} /Lij/.Ej \right) / \sum_{i} \left(\sum_{j=1} /Lij/.Ej \right)$$

Where *I* is the index, Xi is the i-th Indicator; Lij is the factor loading of the i-th variable on the j-th factor; E is the Eigen Value of the J-th factor.

2.3.8 Classification of the Village Councils

Natural break data classification developed by Jenks called Jenks natural break method or Jenks optimization method was adopted. The method partitions statistical data into classes using an algorithm which calculates groupings of data value based on the data distribution (Jenks 1967). The Jenks method is calculated using Arc GIS 10.1 software that automatically figures the natural breaks.

2.4 Limitations of the Study

1. There is no proper data records of village wise Infant Mortality Rate, so, only the current year (2014) could be rightly collected
2. Some variables are difficult to interpret because they may load onto more than one factor which is known as split loadings. These variables may correlate with each other to produce a factor despite having little underlying meaning for the factor.
3. There was no proper village boundary in the study area. Since the study was village level, maps could not be prepared to show the result.

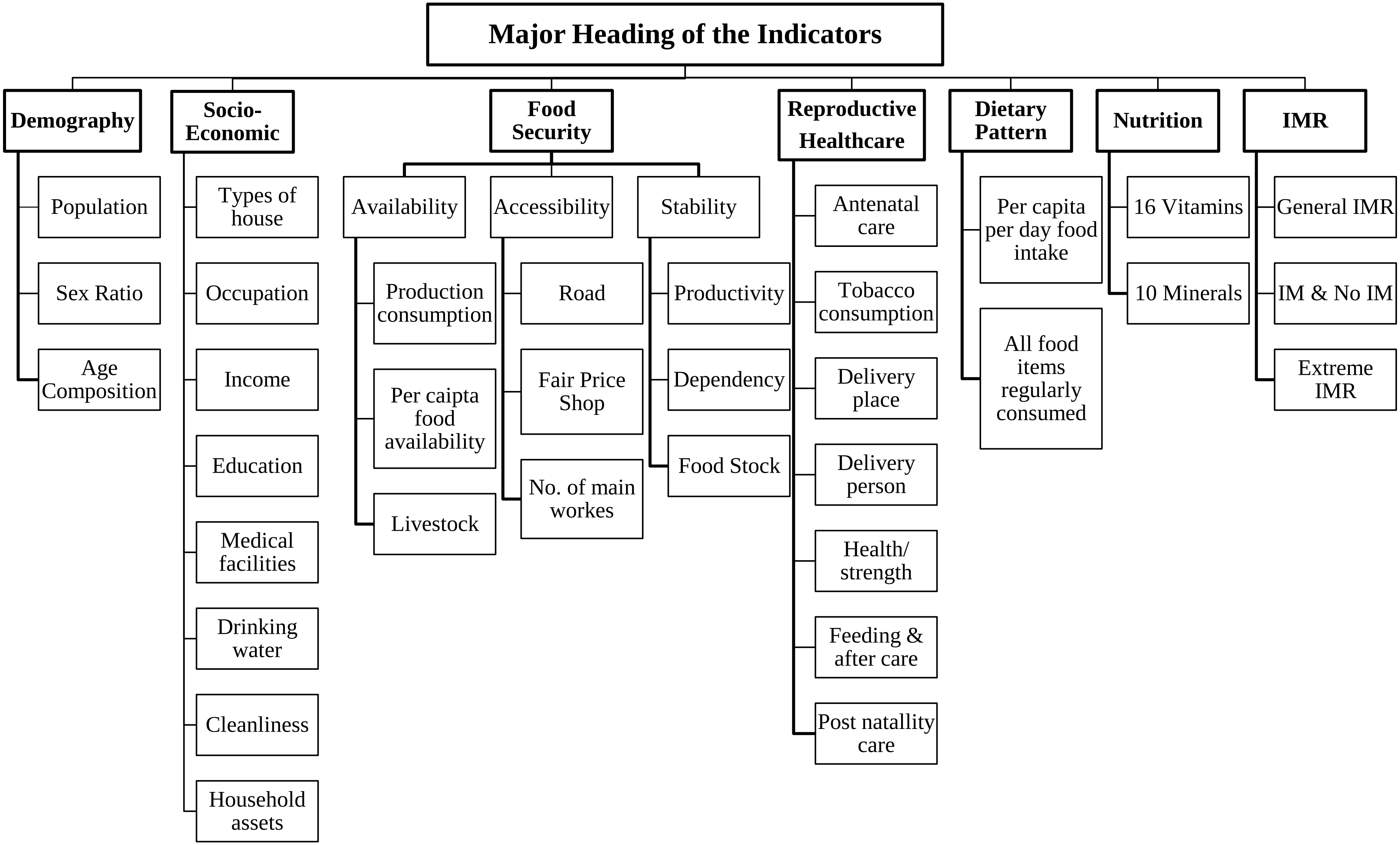

Figure 2.1 Major Heading of the Indicators

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CHAPTER - III

SOCIO-ECONOMIC BACKGROUND

3.1 Introduction

In demographic geography, the relationship between women's socio-economic roles and child survival is always discussed. Most of the researches in India suggest that women's employment may have at least one drawback that survival of young children appears to be negatively affected if the woman is work hard (Basu and Basu1991, Sunitha Kishor 1992). In this case 20 women's employment is seen as affecting the family through changes in care received by children. If a woman is regularly working she is less likely to devote time on feeding to her children, nursing them, breast feeding and playing with them. In the past, older siblings or grandparents were usually available to take care of young infants during the mother was employed and working. However the extended family has now become less common because of social change and modernization. All these factors produce a result of poor child health. The ways in which women's working behavior impacts child bearing widely vary and depend on different factors like socio-economic status of the family, biological factors, cultural practices etc. (Binitha V Thampi, 1996).The characteristics of mother's work determines the amount of time and care a mother can give to her child, and it may determine the amount of resources/income available to the mother and thus her access to various goods and services.

Although a number of studies have shown that there is a strong relationship between socio-economic characteristics of populations and infant mortality that exist in in cities and in subareas of cities particularly to post neonatal mortality (Bedger et al., 1966; Donabedian et al., 1965; Hunt, 1967; Hunt and Huyck, 1966; Schlesinger et al., 1959; Stockwell, 1962; Willie, 1959; Yankauer, 1950; Yankauer and Allaway, 1958), but there is a few study which analyzed the cause and affects relationship. Alten derfer and Crowther (1949) study 973 cities in which association between per capita income and infant mortality was analyzed.

The infant mortality rate (IMR) is one of the best indicator of child health (Gray at al., 2009) as well as of population health. Socio-economic factors affecting health of the population such as economic development, general living conditions and social wellbeing further have an impact on IMR (Reidpath & Allotey, 2003 and Kurinczuk et al., 2009). According Mosley and Chen (1984), infant or child deaths are seen as attributable to a range of hierarchical determinants that may be proximal (e.g., maternal factors, nutrition deficiency, infections, injuries, health services utilization), intermediate (e.g., access to food, safe water, health services, vaccinations), or distal (e.g., education, unemployment, national income, income distribution, public health spending).

There is a high relationship between income inequality and infant mortality (IM) (Regidor et al, 1012 and Olson, 2010). According to the income inequality hypothesis by Wilkinson and Pickett (2009), once a society progresses beyond the point of absolute deprivation, then it is the distribution of income within the society that affects health outcomes. There is a significant association between IM and income distribution in wealthy nations, but not with absolute income were found in two recent cross-sectional studies of OECD (Organization for Economic Co-operation and Development) countries

(Pickett &Wilkinson, 2007 and Lindstrom and Lindstrom, 2006) and in a systematic review (Spencer, 2004). Conversely, Schell (2007) conducted a study of 152 high, middle and low income countries, and did not find a significant association between income inequality and IMR in high income countries. But recent study by Olson found that both income and income inequality affect IM in the USA (Olson, 2010). Moreover, Regidor showed that the relationship between IM and income inequality in 21 high-income countries (Regidor et al., 2012).

One of the remarkable progresses during 20th century is lowering of infant mortality. In which all the available evidence makes it abundantly clear the results of this progress are not being equally shared by all of the population. The lower socio-economic groups in cities have been and continue to be characterized by an extremely pronounced shortcoming when it comes to the probability that born infant will survive its first year of life (Stockwell and Goza, 1994). But it can be noted that there is an inverse association tween infant mortality and various indicators of socioeconomic (Gortmaker, 1979; Schoendorf et al., 1992; Shapiro et al., 1965; Wise et al., 1985), as well as by applying an ecological approach (Adamchak and Stockwell, 1979; 1980; Markides and Barnes, 1977; Markides and McFarland, 1982; well et al., 1988a; Wicks and Stockwell, 1984). However, although it has clearly documented that the general association between infant mortality and socioeconomic status that the precise nature of this association is not stable but can vary over time (tonovsky, 1967; Kitagawa and Hauser, 1973; Stockwell, 1962; et al., 1988b; Willie, 1959).

3.2. Demography

The total population in the study area was 5081 from 1037 household. The average concentration of family member during the period was 4.84 members per family. In Tuisumpui village, there were more than 9 members in every family in an average and it was the highest position in household density. The average sex ratio in the study area was 950.60, where eight villages had more female population than male, the highest sex ratio village was Chheihlu with 1231.79 female per 1000 male. At the same time, the very low sex ratio had been found in Maubawk L in which 745.76 female were there in every 1000 males. The juvenile population i.e., below 14 years was 42.47, the highest was found in KM 10 in which the peoples below 14 years were 59.13 per cent of the total population while the lowest was Council veng which had only 26.05 per cent. The percentage of senile population was only 3.21 per cent in the study area. It was highest in Ahmypi village where the number of peoples across 60 years of age was 9.91 per cent of the total population while it was absent in Chhuarlung I, Chhuarlung III, Khopai and KM 10. The average working population (i.e. the age between 15 and 60) is the study area was 54.30 per cent of the total population. It was highest in Council veng in which the working age percentage was 73.29, which was followed by College Veng II (65.47%), Colleg veng I (60.81%) Chhuarlung I (60.10%), Maubawk L (59.71%), Old Tuisumpui (57.45%), Maubawk Ch (57.38%),Chhuarlung II (57.05 %), Tuipang L (55.38%), Khopai (54.73%), Chhuarlung III (54.55 %), Siatlai (53.70%), Mawhre (52.48 %), Lungbun II (50.45%), Chheihlu (50.30%), Theiva (50.28 %), Tuisumpui (48.53 %), Ahmypi (46.85%), Theiri (46.40 %), Lungbun I (44.71 %) and KM 10 with 40.87 per cent (Appendix-II, C).

Table 3.1 Ages and Sex Composition

Village Councils	Total Population	14 and below	15-60	Above 60	Sex Ratio
Ahmypi	111	43.24	46.85	9.91	881.36
Chheihlu	338	45.27	50.30	4.44	1231.79
Chhuarlung I	198	39.90	60.10	0.00	932.04
Chhuarlung II	149	42.28	57.05	0.67	1114.29
Chhuarlung III	121	45.45	54.55	0.00	951.61
Khopai	296	45.27	54.73	0.00	1027.40
Lungbun I	85	45.88	44.71	9.41	770.83
Lungbun II	111	44.14	50.45	5.41	790.32
Maubawk CH	61	37.70	57.38	4.92	848.48
Maubawk L	206	36.89	59.71	3.40	745.76
Mawhre	242	46.69	52.48	0.83	792.59
KM 10	115	59.13	40.87	0.00	1053.57
Old Tuisumpui	141	33.33	57.45	9.22	1104.48
Siatlai	162	40.74	53.70	5.56	862.07
Theiri	222	50.45	46.40	3.15	1018.18
Theiva	179	48.60	50.28	1.12	988.89
Tuipang L	186	40.86	55.38	3.76	1089.89
College veng I	689	38.17	60.81	1.02	924.16
College veng II	889	34.20	65.47	0.34	1011.36
Council veng	453	26.05	73.29	0.66	948.50
Tuisumpui	136	47.79	48.53	3.68	875.00
Total	5090				
Average		42.48	54.31	3.21	950.60

Source: field survey

Since the social and economic quality affects the dietary behavior as well as women's babies longevity. Housing condition such as the types of house, number of rooms, educational attainment, income, occupational patterns, cleanliness, household assets and household materials of a family were taken as important indices.

3.3 Types of House

The study found mainly four types of house such as bamboo house (15.39%), Assam type (70.74%), Semi-Permanent (9.85%) and Reinforce Cement Concrete (4.02

%) from the total number of the surveyed household 1037. Bamboo type of house was very common in some villages like KM 10 where 52.92 per cent were living in bamboo type of house. Theiri (32.5%), Khopai (30.61%) and Theiva (30.56%) also had a high number of bamboo houses. The very high concentration of Assam type of house in the villages such as Chhuarlung III (89.47%), Mawhre (87.1%), Siatlai (86.96%), Old Tuisumpui (85.71%), Ahmypi (82.35%), Chhuarlung I (81.48%) and Maubawk CH (80%). A high percentage was also found in all villages in Assam type of house. The lowest percentage was still very high as compare to other type of house where 41. 18 per cent found in KM 10. Semi-Permanent type of house was not found in five villages like Maubawk CH, Mawhre, Siatlai, Theiri and Theiva. The percentage was quite high in urban areas like College veng II (34.75%), College veng I (27.19%) and Council veng (26.74%). Concrete house was not found in more than half of the villages that 52.38 per cent of the total villages do not have this type of house. Ahmypi, Chhuarlung II, Chhuarlung III, Khopai, Lungbun II, Mawhre, KM 10, Theiri, Theiva, Tuipang L and Tuisumpui. The highest percentage of concrete house was Council veng wherein 19.77 per cent of the total family was living in concrete house. The two other urban areas such as College veng II (12.77%), College veng I (10.53%) have a high percentage other than the other village but it was still very low. Among the rural area only Maubawk CH had attained 10 per cent household of the total household.

Table 3.2.Types of House

Village Councils	Bamboo	Assam type	Semi-permanent	Concrete	Total
Ahmypi	5.88	82.35	11.76	0.00	100.00
Chheihlu	28.57	48.98	20.41	2.04	100.00
Chhuarlung I	0.00	81.48	11.11	7.41	100.00

Chhuarlung II	22.73	72.73	4.55	0.00	100.00
Chhuarlung III	5.26	89.47	5.26	0.00	100.00
Khopai	30.61	63.27	6.12	0.00	100.00
Lungbun I	18.75	68.75	6.25	6.25	100.00
Lungbun II	15.79	78.95	5.26	0.00	100.00
Maubawk CH	10.00	80.00	0.00	10.00	100.00
Maubawk L	12.90	70.97	9.68	6.45	100.00
Mawhre	12.90	87.10	0.00	0.00	100.00
KM 10	52.94	41.18	5.88	0.00	100.00
Old Tuisumpui	4.76	85.71	4.76	4.76	100.00
Siatlai	8.70	86.96	0.00	4.35	100.00
Theiri	32.50	67.50	0.00	0.00	100.00
Theiva	30.56	69.44	0.00	0.00	100.00
Tuipang L	16.13	70.97	12.90	0.00	100.00
College veng I	0.00	62.28	27.19	10.53	100.00
College veng II	0.00	52.48	34.75	12.77	100.00
Council veng	0.00	53.49	26.74	19.77	100.00
Tuisumpui	14.29	71.43	14.29	0.00	100.00
Average	**15.39**	**70.74**	**9.85**	**4.02**	**100.00**

Source: Field Survey

Figure 3.1 Types of House

3.4 Educational Attainment

Educational attainment was very low. 76.28 per cent of the total population could not attained high school leaving certificate (HSLC). Only 10.40 per cent of the total population have completed HSLC, 6.37 per cent are under HSSLC, BA were 4.62 per cent, percentage of peoples completed Master degree were only 0.51 and 1.8 per cent of the total population attained above MA. Educational attainment was very low in KM 10 village wherein 93.04 per cent of the total respondents do not attained HSLC. The high number of people could not completed HSLC was also high in all village especially in rural villages like Lungbun I (87.06%), Lungbun II (84.68%), Chhuarlung II (84.56%0, Tuisumpui (82.35%), Chhuarlung III (81.82%), Khopai (81.42%), Ahmypi (81.08%), Theiva (80.45%), Theiri (80.18%) and Mawhre (80.17%). The number of person who completed HSLC was low in the study area. Maubawk L 16.02, College veng II15.52, Council veng 14.13, Tuisumpui 13.97, Chheihlu 12.43, College veng I (11.76%), Mawhre (11.57%), Old Tuisumpui (11.35%), Lungbun II (10.81%), Theiva (10.61%) and Tuipang L (10.22%). In the other villages the percentage of uncompleted HSLC was less than 10. HSSLC attainment is nil in KM 10 villages. It is found very low as the percentage was less than 5 in some 7 villages such as Lungbun I 4.71, Chhuarlung II (4.7%), Theiri (4.5%), Khopai (4.05%), Siatlai (3.09%), Lungbun II (1.8%) and Tuisumpui (1.47%). Maubawk L attained the highest percentage in completion of HSSLC wherein 13.11 per cent of the respondents has completed HSSLC. The other high village/ local councils were Council veng (13.02%), Old Tuisumpui (10.64%), College veng II (10.35%) and College veng I (10.01%). College veng II (18.79%) and College veng I (12.34%) were the two highest attainments on Bachelor level education. In

Lungbun I there was no person who completed Bachelor degree level education. It was also found very low in other villages such as Old Tuisumpui (4.96%), Chhuarlung III (4.13%), Khopai (3.38%), Chheihlu (3.25%), Siatlai (3.09%), Ahmypi (2.7%), Lungbun II (2.7%), Theiri (2.7%), Tuipang L (2.69%), Mawhre (2.48%), Tuisumpui (2.21%), KM 10 (1.74%), Theiva (1.68%) and Chhuarlung II (0.67%). There were no person who completed master level education in the villages like Chheihlu, Chhuarlung II, Chhuarlung III, Khopai, Lungbun I, Lungbun II, Maubawk L, Mawhre, Niawhtlang III, Old Tuisumpui, Theiri, Theiva and Tuisumpui. Maubawk CH attained the highest position in educational level of master degree education where 3.28 per cent of the total respondents had completed master degree level education. It was followed by College veng II (2.02%), College veng I (1.89%), Chhuarlung I (1.01%), Ahmypi (0.9%), Siatlai (0.62%), Tuipang L (0.54%), and Council veng (0.44%). The other kind of studies like technical education or vocational studies were highest in College veng I wherein 6.82 per cent of the total respondents have done technical education followed by Tuipang L (5.91%), Siatlai (5.56%), Theiri (4.5%), Maubawk L (4.37%), Khopai (4.05%), Council veng (3.31%), Chhuarlung II (1.34%), Chheihlu(1.1 8%) and Lungbun I (1.18%). This kind of education was not found in Ahmypi, Chhuarlung I, Chhuarlung III, Lungbun II, Maubawk CH, Mawhre, KM 10, Old Tuisumpui, Theiva, College veng II and Tuisumpui village.

Table 3.3 Educational attainment of the study area (%)

Village Councils	**below HSLC**	**HSLC**	**HSSLC**	**BA**	**MA**	**above MA/ others**	**Total**
Ahmypi	81.08	9.91	5.41	2.70	0.90	0.00	100.00
Chheihlu	76.04	12.43	7.10	3.25	0.00	1.18	100.00
Chhuarlung I	78.28	9.60	6.06	5.05	1.01	0.00	100.00
Chhuarlung II	84.56	8.72	4.70	0.67	0.00	1.34	100.00

Chhuarlung III	81.82	7.44	6.61	4.13	0.00	0.00	100.00
Khopai	81.42	7.09	4.05	3.38	0.00	4.05	100.00
Lungbun I	87.06	7.06	4.71	0.00	0.00	1.18	100.00
Lungbun II	84.68	10.81	1.80	2.70	0.00	0.00	100.00
Maubawk CH	73.77	8.20	8.20	6.56	3.28	0.00	100.00
Maubawk L	59.22	16.02	13.11	7.28	0.00	4.37	100.00
Mawhre	80.17	11.57	5.79	2.48	0.00	0.00	100.00
KM 10	93.04	5.22	0.00	1.74	0.00	0.00	100.00
Old Tuisumpui	73.05	11.35	10.64	4.96	0.00	0.00	100.00
Siatlai	79.01	8.64	3.09	3.09	0.62	5.56	100.00
Theiri	80.18	8.11	4.50	2.70	0.00	4.50	100.00
Theiva	80.45	10.61	7.26	1.68	0.00	0.00	100.00
Tuipang L	74.73	10.22	5.91	2.69	0.54	5.91	100.00
College veng I	57.18	11.76	10.01	12.34	1.89	6.82	100.00
College veng II	53.32	15.52	10.35	18.79	2.02	0.00	100.00
Council veng	60.49	14.13	13.02	8.61	0.44	3.31	100.00
Tuisumpui	82.35	13.97	1.47	2.21	0.00	0.00	100.00

Source: Field survey, 2014

3.5 Monthly Income

The village councils were classified into 6 levels of income group according to the monthly income of a family such as below Rs. 5000, Rs 5,000 to 10,000, Rs. 10,000 to 15,000, Rs. 15,000 to 20,000, Rs. 20,000 to 30,000 and above Rs. 30, 0000. The income between Rs.5000 to 10,000 was highest among the income group which comprised 32.87 per cent of the total family. Under this category Mawhre village got the first position wherein 62.5 per cent of the total households have Rs. 5000 to 10,000 monthly income. The village was followed by Tuisumpui (50%), Lungbun II (43.75%), Theiri (41.51%), Chhuarlung I (40%), Khopai (40%), Chhuarlung III (37.5%), Lungbun I (36.84%), KM 10 (33.33%), Siatlai (33.33%), Chheihlu (32.65%), Old Tuisumpui (32.14%), Chhuarlung II (28.21%), Maubawk CH (26.09%), College veng I (23.68%), Ahmypi (23.53%), College veng II (22.54%), Maubawk L (22.45%), Council veng

(22%), Theiva (20.37%) and Tuipang L (17.86%). The highest income group i.e., Rs. 30,000 above counts only 9.03 per cent of the total household. College veng II 25.35 per cent of the total household followed by Council veng (21%), College veng I (20.18%), Tuipang L (17.86%), Maubawk L (14.29%), Tuisumpui (14.29%), Ahmypi (11.76%), Old Tuisumpui (10.71%), Lungbun I (10.53%), Maubawk CH (8.7%), Chheihlu (8.16%), Khopai (5.45%), Chhuarlung I (5%), Chhuarlung III (5%), Theiva (3.7%), Lungbun II (3.13%), Chhuarlung II (2.56%) and Theiri (1.89%). The income group under this category was nil in 3 villages like Mawhre, KM 10 and Siatlai. The lowest income group i.e., below Rs.5000 comprises 17.44 per cent of the total respondents. Khopai (36.36%) got the highest percentage in this category. A high percentage was also found in KM 10 (33.33%), Theiva (33.33%), Theiri (32.08%), Chhuarlung III (25%), Lungbun II (25%), Mawhre (25%), Maubawk L (24.49%), Siatlai (23.33%), Old Tuisumpui (17.86%), Ahmypi (17.65%), Maubawk CH (17.39%), Chhuarlung I (12.5%) and Chhuarlung II (10.26%). Tuisumpui (7.14%), Chheihlu (6.12%), Council veng (6%), Tuipang L (5.36%), College veng II (2.82%), Lungbun I (2.63%) and College veng I (2.63%) had less than 10 percent of the total household surveyed during the study.

Table 3.4 Income Level (%)

Village Councils	5000 and below	5000-10000	10000-15000	15000-20000	20000-30000	above 30000	Total
Ahmypi	17.65	23.53	23.53	11.76	11.76	11.76	100.00
Chheihlu	6.12	32.65	26.53	20.41	6.12	8.16	100.00
Chhuarlung I	12.50	40.00	25.00	10.00	7.50	5.00	100.00
Chhuarlung II	10.26	28.21	38.46	15.38	5.13	2.56	100.00
Chhuarlung III	25.00	37.50	15.00	10.00	7.50	5.00	100.00
Khopai	36.36	40.00	10.91	3.64	3.64	5.45	100.00
Lungbun I	2.63	36.84	26.32	13.16	10.53	10.53	100.00
Lungbun II	25.00	43.75	12.50	3.13	12.50	3.13	100.00
Maubawk CH	17.39	26.09	39.13	4.35	4.35	8.70	100.00
Maubawk L	24.49	22.45	18.37	16.33	4.08	14.29	100.00

Mawhre	25.00	62.50	5.00	5.00	2.50	0.00	100.00
KM 10	33.33	33.33	16.67	12.50	4.17	0.00	100.00
Old Tuisumpui	17.86	32.14	14.29	17.86	7.14	10.71	100.00
Siatlai	23.33	33.33	26.67	13.33	3.33	0.00	100.00
Theiri	32.08	41.51	16.98	3.77	3.77	1.89	100.00
Theiva	33.33	20.37	22.22	12.96	7.41	3.70	100.00
Tuipang L	5.36	17.86	21.43	26.79	10.71	17.86	100.00
College veng I	2.63	23.68	17.54	14.04	21.93	20.18	100.00
College veng II	2.82	22.54	19.72	7.75	21.83	25.35	100.00
Council veng	6.00	22.00	14.00	13.00	24.00	21.00	100.00
Tuisumpui	7.14	50.00	14.29	14.29	0.00	14.29	100.00
Average	**17.44**	**32.87**	**20.22**	**11.88**	**8.57**	**9.03**	**100.00**

Source: Field Survey

3.6 Occupational Patterns

There were nine types of common occupation in the study area such as agriculture, lumbering, driver/ operator, farming, daily workers, students, others and peoples who have no occupation. 25.74 per cent of the total population in the study area was students. More than half of the population was student in Lungbun I where 50.59 per cent were students under different institution. Lungbun I was followed by Khopai (43.58%), Maubawk CH (39.34%), Lungbun II (38.74%), Mawhre (38.24 %), Chhuarlung III (38.02%), Maubawk L (36.89%), KM 10 (27.83%), Council veng (27.59%), Tuipang L (26.34%), Siatlai (25.93%), Tuisumpui (25.74%), Theiri (25.68%), Old Tuisumpui (24.11%), Chhuarlung I (22.73%), Theiva (21.23%), Chhuarlung II (20.13%), Chheihlu (19.82%), College veng I (19.45%), College veng II (17.1%) and Ahmypi (10.81%). Other occupations like no regular workers account 24.26 per cent of the total population. Peoples who have no proper job or work comprised 16.91 per cent of the total population. The percentage of people do not have any kinds of works was highest in Mawhre village where 49.26 per cent of the total population had no proper work. The village was followed by Theiva (37.43%), College veng I (36.72%), Theiri (34.68%), Khopai (29.05%), Siatlai (26.54%),College veng II (25.87%), Tuipang L (22.58%), Council veng (22.52%), Old Tuisumpui (21.28%), KM 10 (20.87%), Maubawk CH (19.67%), Chhuarlung II (17.45%), Tuisumpui (16.91%), Maubawk L (14.56%), Lungbun II (10.81%), Chhuarlung III (8.26%), Chhuarlung I (6.57%), Lungbun I (5.88%), Ahmypi (3.6%) and Chheihlu (3.55%). Agriculture was also very common that 14.71 per cent of the total population were involved. The highest number of agriculture practice was found in Chheihlu village where in 59.17 per cent of the total population practicing agriculture. It was also high in Ahmypi (54.05%) and Chhuarlung I (50.51%) in which more than half of the population depends on agriculture. The villages was followed by Chhuarlung II (20.13), Maubawk CH (19.67%), Theiri (19.37%), Theiva (16.76%), Chhuarlung III (16.53%), Lungbun II (16.22%), KM 10 (14.78%), Tuisumpui (14.71%), Lungbun I (14.12%), Maubawk L (11.65%), Old Tuisumpui (11.35%), Tuipang L(11.29%),Siatlai (10.49%), Khopai (6.76%), College veng II (3.6%), Mawhre (3.31%), Council veng (3.31%) and College veng I (3.19%). The other occupations like farming (8.82 %), daily worker (4.41 %), government workers (2.21 %), lumbering (1.47 %) and driver or operator (1.47 %) were also practiced in the study area. Figure 3.2 shows some types of occupation in the study area.

Table 3.5 Patterns of Occupation

Village Councils	Agriculture	Lumbering	Driver/operator	Farming	Daily worker	Govt. Worker	Students	Other	Have not	Total
Ahmypi	54.05	3.60	0.90	9.01	14.41	3.60	10.81	0.00	3.60	100.00
Chheihlu	59.17	0.00	0.00	5.03	0.30	2.07	19.82	10.06	3.55	100.00
Chhuarlung I	50.51	0.00	0.51	2.53	2.02	3.03	22.73	12.12	6.57	100.00

Chhuarlung II	20.13	1.34	1.34	6.71	3.36	2.68	20.13	26.85	17.45	100.00
Chhuarlung III	16.53	2.48	0.83	10.74	10.74	2.48	38.02	9.92	8.26	100.00
Khopai	6.76	1.35	0.00	2.70	2.03	1.35	43.58	13.18	29.05	100.00
Lungbun I	14.12	2.35	0.00	9.41	5.88	4.71	50.59	7.06	5.88	100.00
Lungbun II	16.22	1.80	0.00	7.21	5.41	7.21	38.74	12.61	10.81	100.00
Maubawk CH	19.67	1.64	0.00	3.28	8.20	6.56	39.34	1.64	19.67	100.00
Maubawk L	11.65	0.49	0.00	7.28	4.37	4.85	36.89	19.90	14.56	100.00
Mawhre	3.31	0.00	0.74	2.57	3.68	2.21	38.24	0.00	49.26	100.00
KM 10	14.78	1.74	0.87	3.48	3.48	0.87	27.83	26.09	20.87	100.00
Old Tuisumpui	11.35	1.42	0.71	9.22	2.13	6.38	24.11	23.40	21.28	100.00
Siatlai	10.49	1.23	1.23	4.94	1.23	2.47	25.93	25.93	26.54	100.00
Theiri	19.37	0.00	0.45	9.01	4.05	0.90	25.68	5.86	34.68	100.00
Theiva	16.76	0.56	0.56	9.50	3.35	1.12	21.23	9.50	37.43	100.00
Tuipang L	11.29	0.54	0.00	8.06	5.91	3.76	26.34	21.51	22.58	100.00
College veng I	3.19	0.00	2.47	0.58	6.53	6.39	19.45	24.67	36.72	100.00
College veng II	3.60	0.00	1.57	0.56	10.01	6.52	17.10	34.76	25.87	100.00
Council veng	3.31	0.00	1.10	1.10	19.65	12.14	27.59	12.58	22.52	100.00
Tuisumpui	14.71	1.47	1.47	8.82	4.41	2.21	25.74	24.26	16.91	100.00
Average	**14.71**	**1.47**	**1.47**	**8.82**	**4.41**	**2.21**	**25.74**	**24.26**	**16.91**	**100.00**

Source: Field Survey

A. Agriculture B. Cattle Rearing
C. Poultry D. Carpenrey

Figure 3.2 Occupational Patterns

3.7 Number of Rooms per Household

Number of rooms in a house could be one indicator for socio-economic status of a family. A better number of rooms signifies the better economy and vice versa. It also shows the personality and behavior of the family, family environment etc. The study area was divided into three classes such as household having 3 or more rooms, household having 2 rooms and household having 1 room or lesser. The household having more than 3 rooms were highest which covers 45.38 per cent of the total household surveyed followed by 1 room or lesser (31.38 %) and household having 2 rooms which comprised 23.24 per cent. The highest percentage of household having 3 rooms or more was found in Council veng where 85 per cent of the total households surveyed have 3 rooms or more. The villages like Chhuarlung I (75%), Old Tuisumpui (67.86%), Maubawk L (65.31%), Chhuarlung III (62.5%), Chhuarlung II (61.54%), Theiri (54.72%), Theiva (51.85%), Lungbun I (50%), Siatlai (50%) were good under this indicator. The other villages where a low percentage of household having 3 rooms or more were Tuipang L (46.43%), Maubawk CH (39.13%), College veng I (38.6%), Mawhre (32.5%), College veng II (30.99%), KM 10 (29.17%), Chheihlu (26.53%), Lungbun II (25%), Khopai (21.82%), Tuisumpui (21.43%) and Ahmypi (17.65%). On the other hand the household having 1 or lesser room were common in KM 10 (54.17%), Lungbun II (53.13%), Khopai (52.73%), Chheihlu (42.86%), Ahmypi (41.18%), Lungbun I (39.47%), Mawhre (37.5%), Theiva (37.04%), Tuisumpui (35.71%), College veng I (30.7%), Maubawk CH (30.43%) and Chhuarlung III (30%).

Table 3.6 No. of Rooms per Household (in %)

Village Councils	>1	2	< 3	Total
Ahmypi	41.18	41.18	17.65	100.00
Chheihlu	42.86	30.61	26.53	100.00
Chhuarlung I	17.50	7.50	75.00	100.00
Chhuarlung II	28.21	10.26	61.54	100.00
Chhuarlung III	30.00	7.50	62.50	100.00
Khopai	52.73	25.45	21.82	100.00
Lungbun I	39.47	10.53	50.00	100.00
Lungbun II	53.13	21.88	25.00	100.00
Maubawk CH	30.43	30.43	39.13	100.00
Maubawk L	20.41	14.29	65.31	100.00
Mawhre	37.50	30.00	32.50	100.00
KM 10	54.17	16.67	29.17	100.00
Old Tuisumpui	21.43	10.71	67.86	100.00
Siatlai	26.67	23.33	50.00	100.00
Theiri	16.98	28.30	54.72	100.00
Theiva	37.04	11.11	51.85	100.00
Tuipang L	21.43	32.14	46.43	100.00
College veng I	30.70	30.70	38.60	100.00
College veng II	20.42	48.59	30.99	100.00
Council veng	1.00	14.00	85.00	100.00
Tuisumpui	35.71	42.86	21.43	100.00
Average	31.38	23.24	45.38	100

Source: Field Survey

3.8 Cleanliness

Cleanliness is one of the important components for the determination of health condition of a people. The pattern of waste disposal is important so the number and types of toilet had been taken as an indicator. In Lungbun I village, 15.79 per cent had no toilet and also there was no septic tank type of toilet. Similarly in Theiri village, 7.55 per cent of the total households surveyed were living without a proper toilet. It was followed by Lungbun I (7.27 %), Chhurlung III (5.0 %), Niawhtlang III (4.17 %), Siatlai (3.33 %), Chhuarlung II (2.56 %) and Council Veng (2.0 %). As shown in Table 3.7 pit latrine was still more common which comprise 67.01 per cent of the total household surveyed. Septic tank type of toilets accounts only 30.48 per cent and 2.51 per cent of the total household do not have any kind of toilets. Percentage of pit latrine type of toilets was very high in Tuipang L (98.21%), Siatlai (96.67%), Theiva (96.3%), Mawhre (90%), Maubawk CH (86.96%), Theiri (84.91%), Lungbun II (84.38%), Lungbun I (84.21%), Khopai (83.64%), Ahmypi (82.35%), KM 10 (79.17%), Maubawk L (75.51%), Chhuarlung I (75%), OldTuisumpui (64.29%), Chhuarlung III (57.5%), Chheihlu (57.14%), Tuisumpui (57.14%) and Chhuarlung II (53.85%). But it was not found in College veng I, College veng II and Council veng. On the other hand all household have septic tank type of toilets in College veng I and College veng II. 98 per cent of the total households had this type of toilets in Council veng which was followed by Chhuarlung II (43.59%), Chheihlu (42.86%), Tuisumpui (42.86%), Chhuarlung III (37.5%), Old Tuisumpui (35.71%), Chhuarlung I (25%), Maubawk L (24.49%), Ahmypi (17.65%), KM 10 (16.67%), Lungbun II (15.63%), Maubawk CH (13.04%), Khopai (9.09%), Theiri (7.55%), Mawhre (5%), Theiva (3.7%) and Tuipang L (1.79%). Figure 3.3 shows types of latrines and toilets in the study area.

Table 3.7 No. and Types of Latrine

Village Councils	Pit latrine	Septic tank	Do not have	Total
Ahmypi	82.35	17.65	0.00	100.00
Chheihlu	57.14	42.86	0.00	100.00
Chhuarlung I	75.00	25.00	0.00	100.00
Chhuarlung II	53.85	43.59	2.56	100.00
Chhuarlung III	57.50	37.50	5.00	100.00
Khopai	83.64	9.09	7.27	100.00
Lungbun I	84.21	0.00	15.79	100.00
Lungbun II	84.38	15.63	0.00	100.00
Maubawk CH	86.96	13.04	0.00	100.00
Maubawk L	75.51	24.49	0.00	100.00
Mawhre	90.00	5.00	5.00	100.00
KM 10	79.17	16.67	4.17	100.00

Old Tuisumpui	64.29	35.71	0.00	100.00
Siatlai	96.67	0.00	3.33	100.00
Theiri	84.91	7.55	7.55	100.00
Theiva	96.30	3.70	0.00	100.00
Tuipang L	98.21	1.79	0.00	100.00
College veng I	0.00	100.00	0.00	100.00
College veng II	0.00	100.00	0.00	100.00
Council veng	0.00	98.00	2.00	100.00
Tuisumpui	57.14	42.86	0.00	100.00
Average	**67.01**	**30.48**	**2.51**	**100.00**

Source: Field Survey

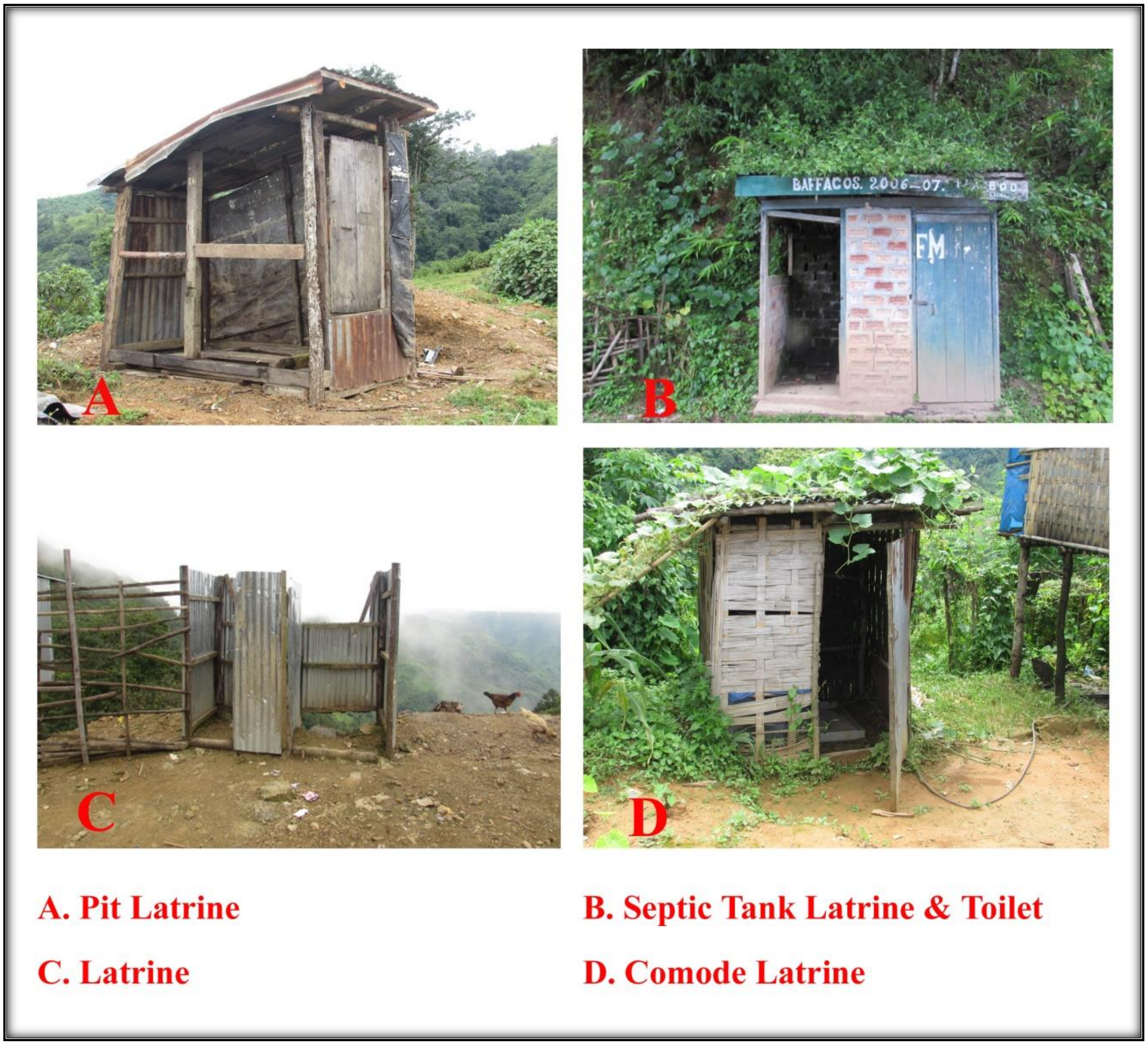

Figure 3.3 Types of Latrines/ Toilets

3.9 Household Assets I

A household asset is one of the important components which depict socio economic condition of a people. It shows standard of living of a family. Table 3.8 shows the household assets including Television (TV), Radio, Refrigerator, Washing machine and Long chair / sofa. Television was not found very common that 46.48 per cent of the total household surveyed have TV but it was very common in urban areas like Council veng (98%), College veng I (90.35%) and College veng II (89.44%). More than half of the household had Television in the villages like Ahmypi (52.94%) and Maubawk L (51.02%). While the other villages without TV were very high percentage such as Chhuarlung II (48.72%), Old Tuisumpui (46.43%), Siatlai (43.33%), Tuisumpui (42.86%), Chhuarlung I (42.5%), Khopai (41.82%), Mawhre (40%), Tuipang L (39.29%), Lungbun II (37.5%), KM 10 (37.5%), Theiri (35.85%), Maubawk CH (34.78%), Theiva (31.48%), Chhuarlung III (27.5%), Lungbun I (26.32%) and Chheihlu (18.37%). Radio was found very rare that only 5.10 per cent of the total household still living with Radio. It was still practice common in some villages like Tuisumpui (28.57%), Chheihlu (22.45%) and Ahmypi (17.65%) while it was not available in the villages like Chhuarlung I, Chhuarlung III, Lungbun I, Maubawk CH, Maubawk L, KM 10, Old Tuisumpui, Theiva and Tuipang L. 24.35 per cent of the total households surveyed have Refrigerator. It was more popular in urban areas like College veng I (71.93%), Council veng (71%) and College veng II (66.2%). The villages like Tuisumpui (57.14%), Ahmypi (41.18%), Old Tuisumpui (39.29%), Maubawk L (22.45%), Maubawk CH (21.74%) also largely used Refrigerator. But it was not very common in Lungbun II (18.75%), Siatlai (16.67%), Khopai (12.73%), Chhuarlung III (12.5%), Mawhre (12.5%), Chheihlu (10.2%), Theiva (9.26%), Tuipang L (7.14%), Chhuarlung II (5.13%), Chhuarlung I (5%), KM 10 (4.17%), Theiri (3.77%) and Lungbun I (2.63%). Only 21.77 per cent of the total household surveyed have washing machine. The highest number of washing machine found in College veng II where in 68.31 per cent of the total household had washing machine. It was followed by Council veng (63%), College veng I (62.28%), Tuisumpui (57.14%), Old Tuisumpui (32.14%), Maubawk L (20.41%), Ahmypi (17.65%), Maubawk CH (17.39%), KM 10 (16.67%), Siatlai (16.67%), Lungbun II (15.63%), Mawhre (12.5%), Chheihlu (10.2%), Chhuarlung III (10%), Theiva(9.26%), Chhuarlung II (7.69%), Chhuarlung I (7.5%), Tuipang L (7.14%), Theiri (3.77%) and Khopai (1.82%) while there was no washing machine in Lungbun I. Almost all the family have Log chair more than 2 numbers in the study area (93.05%). All the family had 2 or more Longchair/ Sofa in the villages like Ahmypi, Chhuarlung III, Khopai, Lungbun I, Maubawk CH, College veng I, College veng II, Council veng and Tuisumpui. The other villages also had a good number like Lungbun II (96.88%),Chhuarlung I (95%), Mawhre (95%), Theiri (94.34%), Old Tuisumpui(92.86%),ChhuarlungII(89.74%), Tuipang L (87.5%), Maubawk L (85.71%), Siatlai (83.33%), Theiva (83.33%), Chheihlu (79.59%) and KM 10 (70.83%).

Table 3.8 Household Assets I (in %)

Village Councils	Television	Radio	Refrigerator	Washing Machine	Long chair/ Sofa 2 or more
Ahmypi	52.94	17.65	41.18	17.65	100.00
Chheihlu	18.37	22.45	10.20	10.20	79.59
Chhuarlung I	42.50	0.00	5.00	7.50	95.00
Chhuarlung II	48.72	7.69	5.13	7.69	89.74
Chhuarlung III	27.50	0.00	12.50	10.00	100.00
Khopai	41.82	5.45	12.73	1.82	100.00
Lungbun I	26.32	0.00	2.63	0.00	100.00
Lungbun II	37.50	3.13	18.75	15.63	96.88

Maubawk CH	34.78	0.00	21.74	17.39	100.00
Maubawk L	51.02	0.00	22.45	20.41	85.71
Mawhre	40.00	2.50	12.50	12.50	95.00
KM 10	37.50	0.00	4.17	16.67	70.83
Old Tuisumpui	46.43	0.00	39.29	32.14	92.86
Siatlai	43.33	10.00	16.67	16.67	83.33
Theiri	35.85	1.89	3.77	3.77	94.34
Theiva	31.48	0.00	9.26	9.26	83.33
Tuipang L	39.29	0.00	7.14	7.14	87.50
College veng I	90.35	0.88	71.93	62.28	100.00
College veng II	89.44	4.93	66.20	68.31	100.00
Council veng	98.00	2.00	71.00	63.00	100.00
Tuisumpui	42.86	28.57	57.14	57.14	100.00
Average	**46.48**	**5.10**	**24.35**	**21.77**	**93.05**

Source: Field Survey, 2014

3.10 Household Assets II

Table 3.9 shows the status of household assets II in the study area including bank account, motor vehicles, cars, two wheeler, mobile phones, internet connections, computer, newspaper, water connections and Liquefied Petroleum Gas (LPG) connections. Percentage of households' materials like mobile phone and bank account were high in the study area which was 85.57 and 75.78 per cent respectively. The other household materials like Motor vehicles (6.07%), Cars (2.54%), two wheelers (6.62%), internet connections (3.72%), Computers (7.61%), Newspaper (6.54) water connections (10.52%) and LPG connections (36.48%) were very low. Except Khopai (45.45%) and Chheihlu (42.86%) villages all the villages had a good number of bank account that more than half of the total household had bank account. Percentage of motor vehicles was highest in Theiri village wherein 71.7 per cent of the total households had motor vehicles. But it was low in College veng II (13.38%), College veng I (9.65%), Council veng (8%), Old Tuisumpui (7.14%), Maubawk CH (4.35%), Tuipang L (3.57%), Siatlai (3.33%), Mawhre (2.5%), Chheihlu (2.04%), and Khopai (1.82%). No vehicles was found in Ahmypi, Chhuarlung I, Chhuarlung II, Chhuarlung III, Lungbun I, LungbunII, Maubawk L, KM 10, Theiva and Tuisumpui villages. Cars had been found only in seven villages such as Maubawk L (14.29%), College veng II (14.08%), College veng I (7.89%), Council veng (5%), KM 10 (4.17%), Tuipang L (3.57%), Chhuarlung II (2.56%), and Khopai (1.82%) whereas the other 14 villages had no cars. Percentage of family having two wheelers in the study area was very low, it was found as College veng II (31.69%), Council veng (28%), College veng I (19.3%), Maubawk CH (17.39%), Old Tuisumpui (10.71%), KM 10 (8.33%), Chhuarlung I (7.5%),Tuisumpui (7.14%), Siatlai (3.33%), Maubawk L (2.04%), Theiva (1.85%) and Tuipang L (1.79%). Two wheeler was not found in the villages like Ahmypi, Chheihlu, Chhuarlung II, Chhuarlung III, Khopai,Lungbun I, Lungbun II, Mawhre and Theiri. All the family had mobile phone in some villages like Maubawk L, Niawhtlang III, Old Tuisumpui, Siatlai, Theiri, Tuipang L and Tuisumpui. It was also very high in other villages such as College veng II (97.89%), College veng I (96.49%), Maubawk CH (95.65%), Lungbun II (93.75%), Ahmypi (88.24%), Chhuarlung II (87.18%),LungbunI (86.84%), Chhuarlung I (85%), Chhuarlung III (80%), Theiva (79.63%), Chheihlu (75.51%), Khopai (67.27%), Mawhre (57.5%) and Council veng (6%). Internet connections was available only in 6 villages such as College veng II (31.69%), College veng I (28.95%), Council veng (9%), Maubawk CH (4.35%), Chheihlu (2.04%) and Maubawk L (2.04%) whereas it was not available in other 15 villages. Computer connections was found in Council veng (35%), College veng I (32.46%), Collegeveng II (30.28%), Tuisumpui (17.43%), Maubawk L (12.24%), Siatlai (10%), Maubawk CH (8.7%), KM 10 (4.17%), Chheihlu (4.08%), Old

Tuisumpui (3.57%) and Theiva (1.85%). But it was not found in some villages like Ahmypi, Chhuarlung I, Chhuarlung II, Chhuarlung III, Khopai, Lungbun I, Lungbun II, Mawhre, Theiri and Tuipang L. Newspaper subscriber was very low in the study area that only found in three urban areas and one village such as College veng II (55.63%), College veng I (47.37%), Council veng (18%) and Chheihlu (16.33%) while the other 17 villages do not subscribe newspaper. Water connection was also found only in three local councils and two village councils in the study area like College veng I (77.19%), College veng II (70.42%), Council veng (55%), Chheihlu (16.33%), Maubawk L (2.04%). LPG was becoming the major used for cooking purposes. The percentage of household having LPG connection was highest in Council veng where 96 per cent of the total household having LPG connections. It was followed by College veng II (95.07%), College veng I (87.72%), Tuisumpui (71.43%), Maubawk L (48.98%), Ahmypi (47.06%), Theiva (46.3%), Siatlai (43.33%), Old Tuisumpui (42.86%), Maubawk CH (30.43%), Tuipang L (30.36%), Theiri (28.3%), Chhuarlung I (22.5%), Khopai (16.36%), Mawhre (15%), Chhuarlung II (10.26%), KM 10 (8.33%), Lungbun I (7.89%), Chhuarlung III (7.5%), Lungbun II (6.25%) and Chheihlu (4.08%). Figure 3.4 shows household assets of some villages

Table 3.9 Household Assets II (in %)

Village Councils	Bank account holder	Motor Vehicles	Car	Two wheeler	Mobile phone	Internet connections	Computer	Newspaper	Water connections	LPG connection
Ahmypi	100.00	0.00	0.00	0.00	88.24	0.00	0.00	0.00	0.00	47.06

Chheihlu	42.86	2.04	0.00	0.00	75.51	2.04	4.08	16.33	16.33	4.08
Chhuarlung I	50.00	0.00	0.00	7.50	85.00	0.00	0.00	0.00	0.00	22.50
Chhuarlung II	51.28	0.00	2.56	0.00	87.18	0.00	0.00	0.00	0.00	10.26
Chhuarlung III	57.50	0.00	0.00	0.00	80.00	0.00	0.00	0.00	0.00	7.50
Khopai	45.45	1.82	1.82	0.00	67.27	0.00	0.00	0.00	0.00	16.36
Lungbun I	57.89	0.00	0.00	0.00	86.84	0.00	0.00	0.00	0.00	7.89
Lungbun II	65.63	0.00	0.00	0.00	93.75	0.00	0.00	0.00	0.00	6.25
Maubawk CH	86.96	4.35	0.00	17.39	95.65	4.35	8.70	0.00	0.00	30.43
Maubawk L	91.84	0.00	14.29	2.04	100.00	2.04	12.24	0.00	2.04	48.98
Mawhre	60.00	2.50	0.00	0.00	57.50	0.00	0.00	0.00	0.00	15.00
KM 10	100.00	0.00	4.17	8.33	100.00	0.00	4.17	0.00	0.00	8.33
Old Tuisumpui	100.00	7.14	0.00	10.71	100.00	0.00	3.57	0.00	0.00	42.86
Siatlai	100.00	3.33	0.00	3.33	100.00	0.00	10.00	0.00	0.00	43.33
Theiri	52.83	71.70	0.00	0.00	100.00	0.00	0.00	0.00	0.00	28.30
Theiva	68.52	0.00	0.00	1.85	79.63	0.00	1.85	0.00	0.00	46.30
Tuipang L	100.00	3.57	3.57	1.79	100.00	0.00	0.00	0.00	0.00	30.36
College veng I	99.12	9.65	7.89	19.30	96.49	28.95	32.46	47.37	77.19	87.72
College veng II	92.96	13.38	14.08	31.69	97.89	31.69	30.28	55.63	70.42	95.07
Council veng	90.00	8.00	5.00	28.00	6.00	9.00	35.00	18.00	55.00	96.00
Tuisumpui	78.57	0.00	0.00	7.14	100.00	0.00	17.43	0.00	0.00	71.43
Average	**75.78**	**6.07**	**2.54**	**6.62**	**85.57**	**3.72**	**7.61**	**6.54**	**10.52**	**36.48**

Source: Field Survey

Figure 3.4 Household Assets

3.11 Data Analyze

Socio-Economics data from 19 indicators were first normalized by Z Score Standardized techniques. Descriptive statistics were also formulated to explained minimum, maximum, average and standard deviation of the value (Table 3.10). It prevents undue influence of variables on analysis.

Table 3.10 Descriptive Statistics of the Indices

Descriptive Statistics					
Indicators	**N**	**Min**	**Max**	**Mean**	**S.D**
X_1 (% of persons attain Bachelor & above)	21	1.18	21.04	6.94	5.76
X_2 (% of houses_ Semi-permanent + RCC)	21	.00	47.52	13.86	14.02
X_3 (% of family having Monthly income of 30000 & above)	21	.00	25.35	9.02	7.50
X_4 (% of peoples having regular jobs)	21	.87	12.14	3.97	2.77
X_5 (% of family with 3 no. rooms or more)	21	17.65	85.00	45.38	19.32
X_6 (% of family having Septic Tank)	21	.00	100.0	30.48	32.21
X_7 (% of family having Television)	21	18.37	98.00	46.47	21.02
X_8 (% of family having Radio)	21	.00	28.57	5.10	8.13
X_9 (% of family having Fridges)	21	2.63	71.93	24.35	23.51
X_{10} (% of family having Washing Machines)	21	.00	68.31	21.77	21.58
X_{11} (% of family having long chair/Sofa 3 or more)	21	14.81	85.71	35.98	19.17
X_{12} (% of family having saving bank accounts)	21	42.86	100.0	75.78	21.47
X_{13} (% of family having motor vehicles)	21	.00	71.70	15.23	20.35
X_{14} (% of family having phone_ Mobile + others)	21	57.50	100.0	89.75	12.04
X_{15} (% of family having internet connections)	21	.00	31.69	3.71	9.11
X_{16} (% of family having computers)	21	.00	35.00	6.77	11.41
X_{17} (% of family having newspapers subscribe)	21	.00	55.63	6.53	15.86
X_{18} (% of family having water connections)	21	.00	77.19	10.52	24.38
X_{19} (% of family having LPG connections)	21	4.08	96.00	36.47	29.64
Valid N (listwise)	21				

After completion of normalization, Principal Component Analysis (PCA) was run to obtain the result. PCA requires computation of correlation analysis and test statistics like Kaiser-Meyer-Olkin (KMO) and Bartlett's test Sphericity to assess the appropriateness of using the techniques. The correlation coefficient matrix shows that most of the variables were inter-correlated and there was no extreme multi- colinearity. The value of KMO for the selected data is 0.520 which is acceptable to run PCA. Then PCA was run in the computer software SPSS to extract communalities and components. Using Kaiser's criterion of taking Eigen values more than 1, five components were extracted which together explained 52.0 percent of the total variation in the data set. It was considered as good enough to process the analysis. The Barlett's Test of Sphericity also showed a significant level of 0.000 and we can reject hypothesis since the probability is less than 0.5

Table 3.11 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.520
Bartlett's Test of Sphericity	Approx. Chi-Square	511.636
	df	171
	Sig.	.000

Running the PCA in SPSS, I had identified the initial Eigen Values (Total) which is more than one. In the present case, it was 11.472, 2.132, 1.607 and 1.053. The number of Eigen values above one varies from data to data. The four components explain 85.56percent variance of the variables includes in the analysis. Component 1 includes socio-economic indicators like internet, newspaper, water connection, education, computer, house types, septic tank, television, washing machine, refrigerator, income, LPG connection and vehicle. Component 2 includes radio and long chair/ sofa. Component 3 explain mobile phone and bank Account. Number of rooms and occupation were under component 4. This shown in the rotational component matrix presented in table 3.12.

Table 3.12 Rotated Component Index

Rotated Component Matrix[a]					
Indicators	**Component**				**Communalities**
	1	2	3	4	
Internet	**.965**	.059	.137	-.072	.868
Newspaper	**.965**	.131	.030	-.095	.890
Water connection	**.964**	.153	.061	.124	.723
Education	**.873**	-.073	.314	.050	.753
Computer	**.868**	.117	.247	.300	.805
House Type	**.836**	.302	.095	.301	.896
Septic Tank	**.832**	.347	.015	.288	.861
Television	**.799**	.196	.274	.331	.880
Washing Machine	**.708**	.530	.348	.186	.930
Fridge	**.678**	.568	.323	.208	.937
Income	**.675**	.330	.316	.244	.804
Gas connection	**.674**	.394	.452	.222	.809
Vehicle	**.669**	-.225	.356	.018	.625
Radio	-.140	**.841**	-.090	-.381	.811
Long chair/ Sofa	.441	**.751**	.212	-.013	.959
Phone	.114	.009	**.886**	.109	.919
Bank account	.213	.145	**.859**	.071	.958
No. of Room	-.013	-.316	.053	**.838**	.971
Occupation	.472	.158	.248	**.666**	.863
% of explained variance	60.337	11.220	8.458	5.540	
Expl.Var. (Eigen value)	11.472	2.132	1.607	1.053	
Expl./Total	0.13	0.02	0.02	0.01	
Total Var.	85.56				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 8 iterations.
Expl. Var. is the variance explained by the component, and Expl./Total is the explained variance divided by the total variance of the five components

To obtained weight of the indicators, I had multiplied 1st Eigen value (11.472) with 1st extracted component column (0.965, 0.965, 0.964, 0.873, 0.868, 0.836, 0.832, 0.799, 0.708, 0.678, 0.675, 0.674, 0.669, -0.140, 0.441, 0.114, 0.213, -0.013 and 0.472), 2nd Eigen Value (2.132) with 2nd column, 3rd Eigen value (1.607) with 3rd column and

4th Eigen value (1.053) with 4th column Finally, I had summed up the values obtained in case of each variable. For example, for the first variable (internet), I have

11.472x 0.965 + 2.132x0.059 + 1.607x0.137 + 1.053x-0.072 = 11.34

In the same way, the weights of the other variables were calculated. This is produced as

Table 3.13 Weight of the Indicators

Indicators	Weight
X_{18} (% of family having water connections)	11.61
X_{15} (% of family having internet connections)	11.34
X_{17} (% of family having newspapers subscribe)	11.30
X_{16} (% of family having computers)	10.92
X_{2} (% of houses_ Semi-permanent + RCC)	10.71
X_{6} (% of family having Septic Tank Latrine)	10.61
X_{1} (% of persons attain Bachelor & above)	10.41
X_{7} (% of family having Television)	10.37
X_{10} (% of family having Washing Machines)	10.00
X_{9} (% of family having Fridges)	9.73
X_{19} (% of family having LPG connections)	9.53
X_{3} (% of family having Monthly income of 30000 & above)	9.21
X_{13} (% of family having motor vehicles)	7.79
X_{11} (% of family having long chair/Sofa 3 or more)	6.99
X_{4} (% of peoples having regular jobs)	6.85
X_{12} (% of family having saving bank accounts)	4.21
X_{14} (% of family having phone_ Mobile + others)	2.87
X_{5} (% of family with 3 no. rooms or more)	0.15
X_{8} (% of family having Radio)	-0.36
Total	**154.24**

After obtaining weights of every indicators, the index value of all Villages/ Local council have been worked out by the following formula was used to determine the Composite index score.

$$I = \sum_{j=1} Xi \left(\sum_{j=1} /Lij/.Ej \right) / \sum_{i} \left(\sum_{j=1} /Lij/.Ej \right)$$

Where, I is the index, Xi is the i-th Indicator; Lij is the factor loading of the i-th variable on the j-th factor; E is the Eigen Value of the J-th factor. The following is as an example for Ahmypi. The total weight of the indicators is 154.24

Table 3.14 Calculation of Weigh Indicators Village council wise

X	**X_1**	**X_2**	**X_3**	**X_4**	**X_5**	**X_6**	**X_7**	**X_8**	**X_9**	**X_{10}**	**X_{11}**	**X_{12}**	**X_{13}**	**X_{14}**	**X_{15}**	**X_{16}**	**X_{17}**	**X_{18}**	**X_{19}**
j **i**	-0.58 X 10.41	-0.15 X 10.71	0.36 X 9.21	-0.14 X 6.85	-1.44 X 0.15	-0.40 X 10.61	0.31 X 10.37	1.54 X -0.36	0.72 X 9.73	-0.19 X 10.0	-0.34 X 6.99	1.13 X 4.21	-0.75 X 7.79	-0.13 X 2.87	-0.41 X 11.34	-0.59 X 10.92	-0.41 X 11.30	-0.43 X 11.61	0.36 X 9.53
X_i	-8.56	0.32	6.46	-4.36	-0.18	4.08	-1.78	-1.03	13.56	16.39	18.12	0.55	-3.10	2.44	-4.63	-6.49	-4.66	-5.01	11.24
C.I	$\sum X_i$ = -23.0 / $\sum_i$ = 154.24 C.I = -0.15																		

Table 3.15 Composite Index of Village Councils

Village Councils	Composite Index	Village Councils	Composite Index
Ahmypi	-0.15	KM 10	-0.52
Chheihlu	-0.27	Old Tuisumpui	0.06
Chhualung I	-0.39	Siatlai	-0.21
Chhuarlung II	-0.52	Theiri	-0.42
Chhuarlung III	-0.53	Theiva	-0.61
Khopai	-0.58	Tuipang L	-0.23
Lungbun I	-0.60	College veng I	1.95
Lungbun II	-0.46	College veng II	2.16
Maubawk CH	-0.07	Council veng	1.67
Maubawk L	0.13	Tuisumpui	0.22
Mawhre	-0.62		

Natural Break data classification developed by Jenks called Jenks natural break method or Jenks optimization method was adopted. The method partitions statistical data into classes using an algorithm which calculates groupings of data value based on the data distribution (Jenks 1967). The Jenks method was calculated using Arc GIS 10.1 software that automatically figures the natural breaks.

3.12 Discussions

Factor analysis explains the majority of the indices by giving their weigh. 7.3 per cent of the socio-economic conditions were influenced by the availability of drinking water facilities which attain the highest weight indicator. Internet connectivity (7.35 per cent), newspaper facilities (7.33 per cent), computer availabilities (7.08 per cent) and education (6.75 per cent) also large affects the social status because its controls peoples thinking and knowledge. Family having good house (6.94 per cent), good and proper toilet (6.88 per cent) were effective to attain a good condition. Availability of household's assets like television (6.72 per cent), washing machine (6.48 per cent), refrigerators (6.31 per cent) and LPG connections (6.18 per cent) also got the high factors influenced. Monthly income of a family (5.97 per cent) might be treated as one of the deciding factor but not the major factors for socio- economic status in the study area. It says the availability of money only is not enough to attain socio-economic security. The indices like availability of vehicles (5.05 per cent), access of chairs or sofa in household (4.53 per cent), mobile phone users (2.73 per cent), number of persons having regular job (4.44 per cent), number of rooms (0.10 per cent), number of bank account holder (1.86 per cent), had more importance for socio-economic condition as compared to the others.

Using of radio (-0.23 per cent) does not have now any impact for socio-economic status in the present study area as shown in table 3.13.

3.13 Overall Socio-Economic Status

Table 3.16 explains the overall socio-economic status of the study area. After calculation of all the indicators (19) the whole study area was divided into five classes such as very high, high, moderate, low and very low socio-economic status. College veng II got the highest position wherein the composite score was 2.16. The urban areas like College veng II (2.16), College veng I (1.95) and Council veng (1.67) were the very high socio-economic status comprising 14.29 per cent of the total villages in the study area. The other 14.29 per cent were high level including Tuisumpui (0.22), Maubawk L (0.13) and Old Tuisumpui (0.06). Maubawk CH (-0.07), Ahmypi (-0.15), Siatlai (-0.21), Tuipang L (-0.23), Chheihlu (-0.27) were moderate status which covered 23.81 per cent of the total villages. Low status accounts 28.57 per cent of the total villages such as Chhualung I (-0.39), Theiri (-0.42), Lungbun II (-0.46), Chhuarlung (II-0.52), KM 10 (-0.52) and Chhuarlung III (-0.53). The four villages which was 19.05 per cent of the total villages like Khopai (-0.58), Lungbun I (-0.6), Theiva (-0.61) and Mawhre (-0.62) were under very low status.

Table 3.16 Socio-Economic Status

Index	Classes	Village Councils
0.221 to 2.160	Very high	College veng I, College veng II & Council veng (14.29%)
-0.069 to -0.220	High	Maubawk L, Tuisumpui & Old Tuisumpui (14.29%)
-0.389 to -0.070	Moderate	Ahmypi, Chheihlu, Maubawk CH, Siatlai & Tuipang L (23.81%)
-0.579 to -0.390	Low	Chhuralung I, Chhuarlung II, Chhuarlung III, KM 10, Lungbun II & Theiri (28.57%)
-0.620 to -0.580	Very Low	Khopai, Lungbun I, Mawhre & Theiva (19.05%)

Source: Field Survey

3.14 Conclusion

Due to economic pressures and the aids of their economic contributions are likely to be mediated by the socio-cultural context majority of women in India take the labor force (Bardhan 1985, Desai and Jain 1994, Kabeer 1999).With an increase participation in the labor force, the dual role of women in developing countries both income earner and family care provider has arose as an important factor. This increasing women's participation in economic activities outside home may impact the family and particularly the child because mother typically is the primary care provider for children (Sivakami, 2000).

The study finds the better socio-economic condition was only found in urban areas like College veng I, College veng II and Council veng which accounts 14.29 per cent of the total selected villages. While it was very poor in the rural areas comprising 85.71 per cent of the total selected villages. Thus majority of the population in the study area could be considering as a poor socio-economic condition.

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CHAPER - IV

FOOD SECURITY

4.1 Introduction

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (World Food Summit 1996). Food insecurity is defined as, "the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain" (Anderson, 1990). Feeding the future population of 10 billion by 2050 is increasingly challenging due to complex interplay of social and economic drivers (Hanjraetal. 2017). Global drivers including climate change, energy, financial crises, carbon economy, land use change and climate change pose further challenges (Hanjra and Qureshi 2010; Thenkabail et al. 2011; Qureshi et al. 2013). Local drivers which impact food security include floods and droughts, access to irrigation, salinity and land degradation, croplands, rural infrastructure, markets and credit, water supply and sanitation systems, gender issues, and public investment and subsidy policies (Narayanamoorthy and Hanjra 2006; Mu et al. 2009; Narayanamoorthy and Hanjra 2010; Thenkabail et al. 2010; Ward 2010; Kumar et al. 2012; Karimov et al. 2014; Pavelic et al. 2015; Drechsel and Hanjra 2016). The challenges to food security are complex and require renewed analysis and focus on food systems at global, regional and local levels, to sustainably deliver safe and nutritious food to all people at all times (Brown et al. 2012).

Local food security depends on production, procurement and distribution of food grains. It also depends on physical access, landscape vulnerability such as landslides, flash floods and road blocks and socio-economic factors – price hike, transportation to food supply and fuel. Availability, access, stability and utilization of food are believed as the four pillars and important dimensions that regulate food security. Access to food is another major factor which includes physical access of rural areas, market access, market price and institutional support. Access to food means that it is well distributed according to the demand. It further stabilizes economic, social and environmental sustainability. Both food availability and its proper distribution may achieve food security.

Von Braun et al. (2003) observed that global food production would be sufficient to provide everyone with his minimum calorie needs if available food was distributed according to the need. Further, price volatility, higher commodity prices and an increasingly inelastic demand in the rich world expose the poor to food insecurity and malnutrition risks (OECD - FAO 2011). Cline (2008) predicts that an average decline in global food production between 3 per cent and 16 per cent by 2080 is due to global warming. Tiwari and Joshi (2012) studied natural and social factors affecting food security in the Himalaya. According to them, food security situation has been deteriorating largely in developing and underdeveloped countries during the last decades mainly due to increasing population that lead the gap between demand and supply for food.

Fullbrook (2010) states that economic recession which started in 2008 and large fluctuations in food prices have also adversely affected food security in developing and poor countries. Further, due to climate change, developing and underdeveloped countries, which practice subsistence agriculture and occupy large population, are likely to face more severe food crises than the developed countries (Aase et al. 2009). Food crises have more deepened in the mountainous areas (Huddleston et al. 2003) as they are highly critical to food security. This is because of the presence of many factors such as subsistence economies, undulating terrain, harsh climate, low yield of crops, high vulnerability to natural risks and limited infrastructure and access to markets (Tiwari and Joshi 2012).

Barrett (2010) observed that more than one billion people in the world do not have access to sufficient dietary and about two billion people are suffering from micronutrient deficiencies. FAO (2015) estimated that about 795 million people in the world were undernourished in 2014. At the same time, Sub-Saharan Africa has the highest prevalence of undernourishment where about 220 million people are hungry. South Asia has about 15.7 per cent people unnourished. However, the drivers of food insecurity and undernourishment are quite different in Sub-Saharan Africa than Asia (Hanjra et al. 2009). In the Hindu Kush Himalaya, out of the total 200 million people, 31 per cent live below poverty line (excluding China and Myanmar) (Hunzai et al. 2011).

Food security is a complex field of analysis developed within the disciplines of food, nutrition and economics. It is a multi-disciplinary and multi-dimensional, combining natural and social sciences in one integrated approach. Food security can be addressed at national, regional, community, households and individual levels. Ultimately, however, food security refers to individual in a household (WFP, 1998) to be search again

A report of C. Rangarajan Committee estimated poverty line in India as Rs. 471/person/day for urban poverty and Rs. 32/person/day for rural poverty. According to this estimation, 29.5 per cent people live below poverty line in India (Planning Commission in India 2014). India ranks 63 among the 78 countries who alarmingly suffer in food insecurity. Further, the changes in the climatic conditions are expected to cause a decrease of 30 per cent agricultural productivity in India (Cline 2008; IPCC 2007; UNDP 2006). The Government of India adopted National Food Security Act (Right to Food Act) in 2013. The main objective of the Act is to subsidize food grain to reach out to 75 per cent of rural population and 50 per cent of urban area. However, its results have yet to come. National Rural Employment Guarantee Act of India (2005) also aims at increasing food security level. Under the scheme, every unemployed adult is given a token money of Rs. 150/day and in lieu of it, he/she works for a village level development work. However, in the rural areas, its implementation is not proper. Livestock-forest (biomass) based subsistence agriculture in the Himalaya constitutes the main source of rural livelihoods (Tiwari and Joshi 2011) as about 70 per cent of the total population depends on farming activities. Little access to productive agricultural lands (19.6 %) (Tscharntke et al. 2012) and undulating terrain limit the scale of productive activity (Tiwari 2008). However, economic viability of crop farming is comparatively less due to geo-environmental constrains. In the Himalaya, a major portion of farming land is un-irrigated (88 %). Increasing needs as well as pressure of population on the arable land, the traditional farming has become unsustainable both economically and ecologically (ICIMOD 1996; Sati 2009).

The present study finds only 4.76 per cent of the total villages have attained the real food security status in Saiha district. The other 14.29 per cent were under severely insecure conditions due lacks of production, access and instability of productivity.

4.2 Data Analysis

To obtain food security status, 21 food security indicators were analyzed under three components of food security viz. food availability, food accessibility and food stability. Firstly, all the data were normalized by Z score standardize technique (Appendix IV, B). Descriptive statistics were also formulated to explained minimum, maximum, average and Standard deviation of the value (Table 4.1). It prevents undue influence of variables on analysis. Secondly, after completion of normalization, Principal Component Analysis (PCA) was run to obtain the result. Thirdly, composite indices for the three food security components was calculated (Table 4.6) and grouped into indices/ levels (five) from very low to very high according to food security status in the study villages (Table 4.7). The following paragraphs discuss a detailed note on food security status.

Table 4.1: Descriptive Statistics of the selected indices (21)

Security Components	Indicators	N	Minimum	Maximum	Mean	Std. Deviation
Food Availability	Per Capita availability of Rice	21	.00	178.68	44.07	40.27
	No. of Livestock/head	21	.62	3.22	1.93	.72
	Productions Consumption - differences (in Qtls)	21	-97.59	-6.48	-29.91	27.75
Food Accessibility	Road all season	21	.00	1.00	.76	.43
	Distance from nearest urban center (km)	21	-125.00	.00	-50.14	40.23
	Population FPS ratio	21	.00	.02	.00	.00
	Regularity of FPS	21	.00	1.00	.85	.35
	No. of main workers %	21	40.87	73.29	54.30	7.39
Food Stability	Annual income >30000 %	21	.00	25.35	9.02	7.50
	Productivity of Land (Kg/Ha)	21	.00	2456.14	881.80	537.92
	Family having Irrigation %	21	.00	75.51	3.89	16.42
	Self Sufficiency ion Rice %	21	.00	91.84	6.87	20.77
	Independency	21	.00	53.06	11.74	14.50
	Self Sufficiency on others foods %	21	.00	6.12	.42	1.37
	Food stock %	21	.00	15.00	5.31	5.50
	Education above Bachelor	21	1.18	21.05	6.94	5.76
	Valid N (listwise)	21				

Source: Field survey

Principal Component Analysis (PCA) requires computation of correlation analysis and test statistics like Kaiser-Meyer-Olkin (KMO) and Bartlett's test Sphericity to assess the appropriateness of using the techniques. The correlation coefficient matrix shows that most of the variables were inter-correlated and there was no extreme multi- colinearity.

The value of KMO for the selected data is 0.469 which is acceptable to run PCA. The Barlett's Test of Sphericity also showed a significant level of 0.000 and we can reject hypothesis since the probability is less than 0.5. Then PCA was run in the computer software SPSS to extract communalities and components. Using Kaiser's criterion of taking Eigen values more than 1, five components were extracted which together explained 46.9 per cent of the total variation in the data set. It is considered as good enough to process the analysis.

After component loadings were estimated, the individual indicators with the highest component loadings are grouped into intermediate composite indicators. Since we extracted five components, there are also five intermediate composites as shown in table 4.2. The factor score for every indicator in a component were shorted by their size of value. Thus, the first component shows food security indicators like availability of irrigation facilities, Self-sufficiency on other food crops, Self- sufficiency in Rice, dependency on others sources and type of road. The second components includes educational attainment, food surplus, annual family income, availability of main workers and distance from urban center, the third component indicates only per capita availability of Rice, the fourth component are productivity of land, regularity of FPS and availability of FPS. Availability of livestock and family food stock are under the fifth component.

Running the PCA in SPSS, we have identified the initial Eigen Values (Total) which is more than one. In our present case, it is 4.33 and 0.95. The number of Eigen values above one varies from data to data. The two components explain 43.35 percent variance of the variables includes in the analysis (table 4.2).

Table 4.2 Rotated Component Matrix[a]

Indicators	Components				
	1	2	3	4	5
Irrigation	**.958**	-.005	-.005	.085	-.022
Self-Sufficiency on others crops	**.949**	.036	.222	.054	-.037
Self- sufficiency Rice	**.939**	-.007	.118	.098	.041
Dependency	**.682**	.017	.636	.150	-.241
Road type	**-.546**	.114	.479	.216	.344
Education	-.106	**.909**	.137	.048	-.143
Food surplus	-.272	**-.864**	-.197	.042	.081
Income more than 30000	.033	**.834**	-.173	-.148	.136
Percentage of Main workers	-.080	**.802**	-.045	-.029	.020
Distance from urban center	-.348	**.545**	-.447	.111	.472
Per capita availability Rice	.210	.011	**.899**	-.124	.139
Productivity of land	-.133	.142	.168	**-.841**	.113
Regularity of FPS	.011	.170	.278	**.796**	.254
Availability of FPS	.107	-.481	-.249	**.663**	.356
Availability of Livestock	.134	.140	.167	.235	**.781**
Food Stock	.294	.341	.034	.076	**-.672**
% of explained variance	27.092	23.214	14.763	10.587	6.888
Expl.Var. (Eigen value)	4.335	3.714	2.362	1.694	1.102
Expl./Total	0.33	0.28	0.18	0.13	0.08
Total Var.	13.207				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 6 iterations.
Expl. Var. is the variance explained by the component, and Expl./Total is the explained variance divided by the total variance of the five components

To obtained weight of the indicators, I had multiplied 1st Eigen value (4.335) with 1st extracted component column (0.958, 0.945, 0.939, 0.682, -0.546, -0.106, -0.272, 0.033, -0.080, -0.348, 0.210, -0.133, 0.011, 0.107, 0.134 and 0.294), 2nd Eigen Value (3.714) with 2nd column, 3rd Eigen value (2.362) with 3rd column, 4th Eigen value (1.694) with 4th column and fifth Eigen value (1.102) with the fifth column. Finally, we have summed up the values obtained in case of each variable. For example, for the first variable (irrigation), I have 4.335x 0.958+ 3.714x -0.005 + 2.362x-0.005 + 1.694x0.85 + 1.102x-0.022 = 4.24

In the same way, the weights of the other variables were calculated. This is produced as

Table 4.3 Weight of the indicators

Indicators	Weight
X_{11} (Availability of irrigation facilities)	4.24
X_{12} (Self-sufficiency in Rice)	4.82
X_{14} (Self-Sufficiency on other foods)	4.53
X_{13} (Dependency on other sources, market)	4.51
X_{16} (Education attainment)	3.16
X_1 (Per capita per day availability of Rice)	3.02
X_7 (Regularity of FPS)	2.96
X_2 (No. of Livestock per head)	2.75
X_9 (Annual Income more than Rs. 30000)	2.73
X_8 (Availability of Main workers)	2.50
X_{15} (Household Food Stock)	2.01
X_5 (Distance from urban center in Km)	0.17
X_4 (Road type, all seasons, all vehicles)	-0.07
X_6 (Populations FPS ratio)	-0.40
X_{10} (Productivity of land)	-0.95
X_3 (Food surplus)	-4.69
Total	**31.31**

Source: Field survey

After obtaining weights of every indicators, the index value of all village council have been worked out by the following formula is used to determine the Composite index score.

$$I = \sum_{j=1} Xi \left(\sum_{j=1} /Lij/.Ej \right) / \sum_{i} \left(\sum_{j=1} /Lij/.Ej \right)$$

Where *I*is the index, Xi is the i-th Indicator; Lij is the factor loading of the i-th variable on the j-th factor; E is the Eigen Value of the J-th factor. The following is as an example for Ahmypi.

The total weight of the indicators is 31.31

Table 4.4 Calculation of Composite Score

VC	X_{11}	X_{12}	X_{14}	X_{13}	X_{4}	X_{16}	X_{3}	X_{9}	X_{8}	X_{5}	X_{1}	X_{10}	X_{7}	X_{6}	X_{2}	X_{15}	C.I
Ahmypi	-0.24 x	-0.33 x	-0.31 x	0.41 x	0.55 x	-0.58 x	0.53x	0.36 x	-1.01 x	-1.74 x	-0.01 x	0.07 x	0.40 x	0.65 x	-1.01 x	-0.97 x	12.21 /
	4.24	4.82	4.53	4.51	-0.07	3.16	-4.69	2.73	2.50	0.17	3.02	-0.95	2.96	-0.40	2.75	2.01	31.31 = **-0.39**

In the same way, the major food security index for the rest of the village councils had been calculated as shown in table 4.5

Table 4.5 Village wise Z-Score and Composite Score of food Security

Village Councils	Food availability	Food accessibility	Food stability	Composite Score
Ahmypi	-1.03	0.44	-0.24	-0.39
Chheihlu	1.16	-0.14	2.82	2.49
Chhuarlung I	-0.09	0.45	-0.13	-0.04
Chhuarlung II	-0.45	0.49	-0.54	-0.47
Chhuarlung III	-0.82	-1.18	-0.51	-0.85
Khopai	3.26	-0.29	0.52	0.93
Lungbun I	1.64	0.72	-0.43	-0.29
Lungbun II	1.88	0.63	-0.37	-0.15
MaubawkCh	-0.52	1.15	-0.36	-0.30
Maubawk L	-1.00	-0.08	0.09	-0.04
Mawhre	-0.61	-1.93	-0.10	-0.50
KM 10	-1.28	0.85	-0.59	-0.77
Old Tuisumpui	0.20	-0.06	-0.06	-0.01
Siatlai	-1.38	0.39	0.10	-0.12
Theiri	-1.08	0.03	-0.25	-0.42
Theiva	-1.10	0.59	-0.33	-0.52
Tuipang L	-2.05	-1.78	-0.26	-0.63
College veng I	1.44	-0.03	0.59	0.99
College veng II	2.57	-0.10	0.36	1.04
Council veng	0.40	-0.23	-0.05	0.51
Tuisumpui	-1.14	0.08	-0.27	-0.46

Source: Field survey

Further Composite Score of all village councils had been analyzed by PCA and grouped into five classes by Jenks natural breaks methods (table 4.6).

4.3 Food Availability

Food availability is a function of both domestic and net imports and this process attains the human needs. It includes per capita per day availability of rice, number of livestock per head and food surplus. Agriculture is the prime sector which provides food requirement of the peoples and livestock is another food resources sector that provides meat and dietary products.

Number of livestock available per head (1.9376), food surplus (production minus consumption i.e., -29911.5476) and food availability status have been measured. Per capita per day availability of rice is found very low in the study area which is 44.07 gram. Khopai village obtained the highest rank this case (178.68 grams) whereas the lowest were found in Maubawk Ch and KM 10 village councils where there was no rice production during the study period. Livestock is one of the major sources which provides flesh food, milks etc. Chickens, Pigs, Cows, Dogs and Buffalos were the common livestock found in the study area. Lungbun II ranks first in terms of availability of livestock wherein 3.22 numbers of livestock were available per every person. While Tuipang L was very poor in source of the products that two peoples need to share one number of livestock (0.62 per head). Food surplus is one of the important food security indicators. It is the subtraction of the total consumption from the total production of rice. If the consumption is less than production, it could be consider as food insecure or deficiency. After consideration of these factors food insecurity have been found in all village councils.

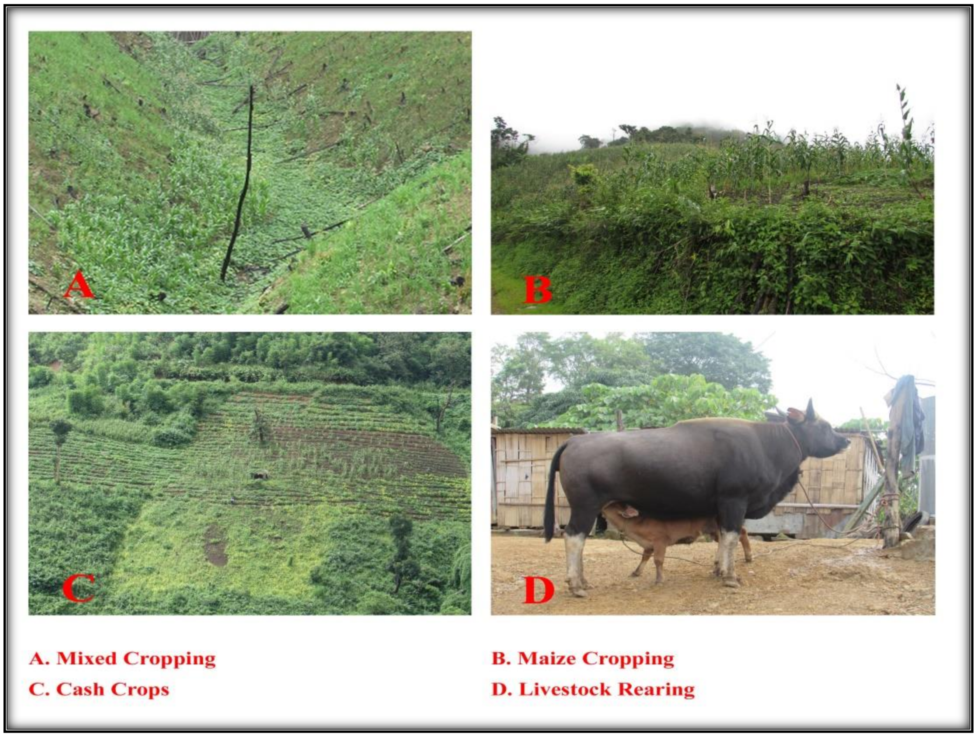

Figure 4.1 Some Sources of Foods Production

Figure 4.2 Types of Road

4.4 Food Accessibility

Food accessibility is another important component that determines the food security in an area (Swaminathan, 2010). Majority of the malnourished population cannot produce or afford to buy enough food. They have inadequate access to natural resources, jobs, income or social scores etc. (Chaturvedi, 1997). To obtained food accessibility status, five major indicators were selected such as type of road (i.e. all weathered as well as all types of vehicles throughout the year), distance from the urban center, availability of Fair Price Shop (FPS), regularity of food supply through FPS and percentage of main workers.

Road condition plays an important role in food gathering as well as food supply. All season's road was initiated at 0.76 percent of the total villages (figure 4.2). Chheihlu, Mawhre, Old Tuisumpui and Tuisumpui have dry seasons and jeep-able roads, while all season road/ metaled road was available in other village councils. Urban center virtually served all the foods and basic needs to the surrounding areas, so the distance of the villages from the nearest urban center effects the food accessibility. In the present study the distance of villages from the nearest urban center was taken in km, then while measuring the standardized value the distance were minus from 0, so it can produced data for measuring the status. The average distance between villages and urban center was 50.14 kilometers. Khopai was considered as the remotest among all the villages (i.e., 125 km from the nearest urban center, Saiha) while College veng I, College veng II and Council veng are urban center.

Fair Price Shop (FPS) is the major key for public distribution system (PDS) in the state. The availability of FPS to the population was measured as the populations FPS ratio (0.0062). It indicates one FPS supplies foods for 620 peoples in the present situation. The eight village councils such as Chhuarlung III, Khopai, Mawhre, Theiri, Tuipang L, College veng I, College veng II and Council veng accounts 38.09 per cent of the total villages which do not have FPS. Regularity of food supply is another important factor in public distribution systems (PDS). Chhuarlung III, Mawhre and Tuipang L (14.28 per cent) do not receive food supplies on time or regular interval. The uncertainty or irregularity of public distribution system cause condition of severe food shortage situation that there is no possibilities to buy food though the peoples have enough money.

Availability of main workers in a family is one of the determining factors for gathering of foods and furthers food security. Percentage of the people between the ages of 15 to 60 of the total population was taken as the main workers (54.309 per cent). 73.29 per cent of the total population was main workers in Council veng while it was only 40.87 per cent in Km 10.

4.5 Food Stability

Family annual income, land productivity, irrigational facilities, self-sufficiency on rice and others crops, dependency on others/ market, family food stock and educational attainment were selected to measured food stability status. Number of household having rupees 30,000 or more annual income was used to know the purchasing power (9.02 averages). The 25.35 per cent of the total household in College veng II attained the condition while it was nil in Mawhre, KM 10 and Siatlai villages. Productivity of agricultural land is the supporting factors which determine food stability. The average productivity of land in the study area was very low (881.80 kg per hectare). Chhuarlung

III (2456.14per cent) attained the highest position while Maubawk CH and KM 10 do not produce rice during the study year. The number of household having permanent irrigation facilities in their farm land were study because irrigation is one of the most important elements for food stability. Only 3.89 per cent of the total households were facilitated with proper irrigation. Chheihlu village was quite good in this component while the other 80.9 per cent of the total villages were very poor. Hence it might be consider as one of the most determining factors for the backwardness of the villages in food security. As it is the staple food, self-sufficiency in rice was a significant indicator for food security. Percentage of family numbers who are self -sufficient in rice (average 6.87per cent) was found as severely under self- sufficient. Sufficiency was found only at 5 villages (23.81 per cent). In chheihlu village 91.84 per cent of the families were self -sufficient while it was zero in other 16 villages. Dependency of a family on other sources including market or others state product was observed. 11.74 per cent of the family were not fully depend on other sources of food while the remaining 88.26 per cent were fully relies on others. More than half of the families were not fully dependent on other in Chheihlu village (53.06 per cent) while all families were fully dependent in Chhuarlung II, Chhuarlung III, Maubawk CH, KM 10 and Tuisumpui villages. Similarly self-sufficiency on others food stuff were also observed. Almost all the villages could not attain self-sufficiency in others foods staff (0.42 per cent) except the three villages like Chheihlu, Khopai and College veng II. In terms of family food stock, only 5.31 per cent of the total households had been found. Mawhre village obtained the highest position wherein 15 per cent of the total households have rice stock. The other 9 villages (42.86 per cent) do not have rice stock for 2 months or more.

4.6 Over all Food Security Status

After calculation of all three components viz. food availability, food accessibility and food stability, food security status was measured as KM 10, Tuipang L, Chhuarlung III (14.29 %) were under very low category. Ahmypi, Mawhre, Maubawk CH, Theiva, Chhuarlung II, Theiri, Tuisumpui and Lungbun I (38.10 %) were under low status. Moderate status comprises 23.81 per cent of the total village councils such as Chhuarlung I, Maubawk L, Old Tuisumpui, Lungbun II and Siatlai. College veng I, College veng II, Council veng and Khopai accounting 19.05 per cent were high status and Chheihlu (4.76 %) was very high food security status.

Based on the composite scores of food security components and their overall composite score, the villages were categorized into five food security levels such as very low (-0.85 to -0.630), Low (-0.629 to -0.290), Moderate (-0.289 to -0.010), High (-0.009 to 1.040) and very high (1.040 to 2.490). It was observed that the highest number of villages lie under low food security level (38.10 %) while 14.29 per cent villages came under very high foods security level. Villages that obtain high to very high level of food security was only 4.76 per cent while only 23.81 per cent villages lie in moderate level of food security.

4.7 Discussions

The Himalaya is one amongst the most fragile ecosystems of the world and both natural and anthropogenic hazards are quite active in this region. Depletion of natural resources base has led to a significant disruption of ecosystem services and as a result, food productivity has decreased during the recent past. A loss of agro-biodiversity in terms of reduction in staple food-crops mainly due to changes in the food habits further accentuates food insecurity (Palni et al. 1998). Changing of food habits, bio-fuel production and encroachment on productive agricultural land for construction activities etc. have manifested food insecurity. Due to huge depletion of natural resources with the consequent ecosystem services and the potential impact of climate change, agricultural production is facing serious challenges (Robert 2009). Global climate changes have also adversely affected food and livelihood security in the Himalaya region (ICIMOD 2007). Climate change was observed in northeast India as rainfall received by it in 2006 monsoon season stands to be the scantiest for a period of 25 years since 1982 (Das et al. 2006). ICIMOD (2008) noted that the year 2005 had prolonged dry period with many springs drying up accompanied by large landslides.

In the selected district rice cultivation accounts only 0.01 per cent the total geographical area. The total production was 14.5 metric tons and productivity was 725 kilogram per hectare (GOM, 2014). However food security status in the selected villages was found as severely inadequate as well as all food security components was very poor. The study revealed that food availability is limited as its composite score stands for 0.00. About 70 per cent villages obtained medium, low and very low status. Food availability depends on the output from agricultural land. It account only 4 per cent of total geographical area and hence it was not sufficient to attain food security. Again traditional practices and shifting cultivation dominates the study area. Innovation in traditionally practiced shifting cultivation is limited due to undulating and fragile terrain and it had led to low production and productivity. Thus, per capita/day availability of rice was very less (44.07 gram). Low composite score of food availability was also due to less food production, which is 29.91gram less than consumption. Although, mean value of per capita availability of livestock was 1.93, its economic value was not enough to attained food security.

In terms of food accessibility, about 40 per cent villages had high to very high status and it was higher than food availability. Road condition was very poor as the mean value for all season's road was 0.76 only. The average distance from nearest urban center was 50.14 kilometers which is not enough to attain food security. Public Distribution System (PDS) was functioning very poor because population's fair price shop ratio was found very low as the mean value of it was zero. It shows some villages do not have fair price shop. On the other regularity of food supply through fair price shop was not very bad as the means value was 85 and hence food is comparatively accessible. Other food accessibility indicators which is percentage working population (agriculture) had high scores i.e. 54.30 per cent and composite score of food accessibility was zero.

Food stability depends on income, land productivity, irrigation facilities, dependency and sufficiency on market, educations and food stock of a family. As food availability status was found very low, it had severe repercussions on food stability. Therefore, composite score was calculated as -0.01. Because of very low food production, food stock availability was limited as only 5.31 per cent households had food stock for more than five months. Though rice as the staple food of the people, only 6.68 per cent households have self-sufficiency in rice production because of less agriculture land and low productivity. Irrigation facility was also very poor (3.89 per cent of the total area) mainly because of undulating and fragile terrain of hills, and valleys had provide less arable land and thus, agriculture was rain fed etc. Income of a family serves financial support for food gathering, collecting and access. Only 9.02 per cent of the total household attained enough money power for family requirement in the study area. Dependency on others food products through market was extremely high. Only 11.74 per cent of the total household were independent on rice and 0.42 per cent on others food stuff. Knowledge is also one of the determinant factors for family food management system. The people who have a good knowledge about food security of a family account only 6.94 per cent of the total population.

Physical access is one of the constrain factors to food access. Natural hazards both terrestrial and atmospheric are very active in Mizoram, mainly landslides and flash floods. These factors often lead to food inaccessibility and thus, food instability prevails. Inadequacy in infrastructural facilities such as road connectivity, food storages and proper food distribution systems also poised serious threat to food security. One of the reasons of food insecurity in the state was its farming system that characterizes shifting cultivation with very low yield of crops and low economic viability. Infrastructural facilities in Mizoram were lagging behind. About 50% rural areas are lacking in road connectivity. Further, only 33.4% roads are in good conditions. Except small single track railways, there is no railway line. Landslides were very common and flash floods were active during July-August in the valleys and small flood plains. Crops grow in the jhumland and output from it was insufficient. Due to growing population (2.3% annual growth rate), food demand is increasing and further public distribution system was not properly managed. Thus, food scarcity problem exists. All these drivers/ components together influence food security status. Overall composite score of all components of food security is 0.00 which was extremely low to attain food security.

However food insecurity found prevalent in the present study area. Only Chheihlu village (4.76 per cent) had attained the real secure status where availability and stability founds good though the accessibility was poor. With good accessibility the four village councils like College veng I, College veng II, Council veng and Khopai (19.05 per cent) had attained high level (more or less secure) food security status. Under this category, peoples were not fully secure because availability was very poor further affects food stability. In case if there was road connectivity blockage or disaster the areas possibly come to food shortage. Status on availability, accessibility and stability on foods were correspondingly poor called as moderate level status. Generally those villages located near in terms of independent feeling from urban center (Saiha) but far in terms of interconnections come under this classification. 23.81 per cent of the total villages attained this condition such as Chhuarlung I, Maubawk L, Old Tuisumpui, Lungbun II and Siatlai. The villages which were insecure in foods was observed as 38.10 per cent of the total village councils under which Ahmypi, Mawhre, MaubawkCh, Theiva, Chhuarlung II, Theiri, Tuisumpui and Lungbun I falls. The severely food insecure condition was found in three villages such as KM 10, Tuipang L, Chhuarlung III covering 14.29 per cent of the total village councils.

Table 4.6 Indices and Food Security Status

Food availability		
Index	**Class**	**Villages/ Local Councils**
1.881 to 3.260	Very high	Khopai& College veng II (9.52 per cent)
0.401 to 1.880	High	Chheihlu, Lungbun I, Lungbun II & College veng I (19.05 per cent)
-0.819 to 0.400	Moderate	Maubawk CH, Chhuarlung I, Chhuarlung II, Old Tuisumpui, Mawhre& Council veng (28.57 per cent)
-2.049 to -0.820	Low	Chhuarlung III, Theiri, Theiva, Tuisumpui, Maubawk L, Siatlai, KM 10 &Ahmypi (38.10)
-2.050 & Below	Very Low	Tuipang L (4.76 per cent)
Food Accessibility		
0.721 to 1.150	Very high	Maubawk CH & KM 10 (9.52 per cent)
0.081 to 0.720	High	Chhuralung I, Chhuarlung II, Theiva, Siatlai, Lungbun I, Lungbun II &Ahmypi (33.33 per cent)
-0.139 to 0.080	Moderate	Theiri, Tuisumpui, Maubawk L, Old Tuisumpui, Mawhre& College veng I (28.57 per cent)
-1.179 to – 0.140	Low	Chheihlu, Khopai& College veng II (14.29 per cent)
-1.193 to -1.180	Very Low	Chhuarlung III, Mawhre &Tuipang L (14.29 per cent)
Food Stability		
0.591 to 2.820	Very high	Chheihlu (4.76 per cent)
0.101 to 0.590	High	College veng I, College veng II &Khopai (14.29 per cent)
-0.429 to -0.240	Low	Maubawk CH, Theiri, Theiva, Tuisumpui, Lungbun II, Tuipang L and Ahmypi (33.33 per cent)
-0.590 to -0.430	Very Low	Chhuarlung II, Chhuarlung III, KM 10 &Lungbun I (19.05 per cent)
Over all Food Security Status		
1.040 to 2.490	Very high	Chheihlu (4.76 per cent)
-0.009 to 1.040	High	College veng I, College veng II, Council veng and Khopai (19.05 per cent)
-0.289 to -0.010	Moderate	Chhuarlung I, Maubawk L, Old Tuisumpui, Lungbun II and Siatlai (23.81 per cent)
-0.629 to -0.290	Low	Ahmypi, Mawhre, MaubawkCh, Theiva, Chhuarlung II, Theiri, Tuisumpui and Lungbun I (38.10 per cent)
-0.85 to -0.630	Very Low	KM 10, Tuipang L, Chhuarlung III (14.29 per cent)

4.8 Conclusion

Saiha district had been facing the threat of food insecurity, agriculture stagnation and high market dependency. Thus, large populations were living under chronic poverty line in rural areas on the one hand and foods dependency on the other hand. At the meantime, the district was bestowed with plenty of natural resources in terms of fertile soils, irrigational sources from the big rivers and suitable climatic conditions. The study reveals that a sustainable use of natural resources and suitable climatic conditions along with development of infrastructural facilities and proper institutional support may lead to enhanced food security. For instance, agricultural production could be increased by using modern agricultural technique like System Rice Intensification (SRI) in the potential food producing areas. SRI is a modern cultivation technique to increase rice production and productivity and it has already been started in few areas, particularly in suburb areas of Mizoram. Further, irrigation facilities might be developed in the river valleys and flood plains for substantial rice production. More importantly, climate is feasible to cultivate a number of vegetables and fruits. Value additions in crop products, construction of cold storage and access to market will enhance food security. PDS can be made smooth through opening a number of fair price shops. Infrastructural facilities such as proper road connection to the remote villages, electrification and establishment of government institutions should be developed. Awareness programs to increase food stock at household levels can be launched locally to secure food for the adverse conditions such as heavy rain triggered landslide that causes to road block. The study also observed a vast potential of horticulture crop in the district. For instance, Mango near the river valley of Chhimtuipui produced the best quality not only in the state but also in India. The district has now producing the best quality of others horticulture crops like Banana, Pineapple, Papaya, Lemon, Strawberry etc. the only requirement is to increase crops land, production and productivity in a sustainable way to achieved food security.

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CHAPTER - V

DIETARY PATTERNS AND NUTRITIONAL STATUS

5.1 Introduction

Man needs a wide range of nutrients to perform various functions in the body and to lead a healthy life. The nutrients include proteins, fat, carbohydrate, vitamins and minerals. These nutrients are chemical substances which are present in the food we eat daily. The foods containing these nutrients which we consumed daily are classified as cereals, legumes (pulses), nuts, oilseeds, vegetables, fruits, milk and milk products and flesh foods (fish, meat and poultry). Most foods contain almost all the nutrients in various proportions, some foods being rich in certain nutrients. Some foods provide only a single nutrient as in the case of sugars which are source of only carbohydrates while oils, ghee etc., provide only fats (Gopalan, 2011).

Nutritional status is an effective measurement of the levels of the people and Infant Mortality Rate (IMR). Nutritional deficiency diseases are related to the deficiency of the nutrients in the body affects IMR. The daily food which we consume always serves many purposes. The failure of food to sub-serve the functions may be brought about in a number of ways: firstly, it may be the result of inadequate intake of essential nutrients due to lack of food. Secondly, it may be developed as a result of failure to absorb normally the essential nutrient supplied by the diet in adequate quantity (Ali, 1977). The problems of the protein-energy malnutrition affect millions of children in the world today.

Nutrition is a primary requirement for human development. Indeed, it is vital for the development of healthy and productive human resources. Today, the nutritional profile of the people of India is marked by high incidence of nutrition disorders in various dimensions- Protein Energy Malnutrition (PEM), Iodine Deficiency Disorder (IDD), Vitamin 'A' deficiency (VAD), Anaemia, Flurosis, and Lathirism etc. One-fifth of the world's blind (six million) are in India. More than 70 million people suffer from IDD. It has been found that 235 districts of the country are endemic to IDD, that is, where the incidence of the disorder is more than 10 per cent. Individual households need to have purchasing power to access available food supplies. Under nutrition is especially devastating to children below 5 years of age. According to the survey of nutritional status of rural population conducted (1996) by the national nutrition board in selected villages of seven states, 91.1 per cent of children below five years of age, suffer malnutrition of various degree (Gopalan, 2002).

Nutrition is a vital component of the complex concept of health. Nutritional status of an individual is fairly well influenced by the choice of foods in family apart from various other social and economic dimensions (Devadas, 1974). It was a significant factor in determining the health status of youth. Youth's nutritional status is the condition of the body resulting from the food intake, its absorption and utilization over a period of time. Diseases can affect any of these biological processes as well as person's food requirements. Food intake is the critical nutrition input. Poor nutrition of the youth and the general population results from low income, low productivity and low purchasing power (Naidu & Parasuraman, 1982).

The problems of hunger and under nutrition (primarily meant to describe inadequate long-term energy intake in some sense) in developing countries has rightly attract the attention of scholars (Srinivasan, 1992). World bank (1986) estimates that in 1980, 34 per cent of the population of developing countries, or 73 million people did not have sufficient energy intakes through their diets to enable them to live an active working life and that the diets of nearly half of them (340 million) were so deficient in energy that they ran the risk of stunted growth and serious health problems.

In India's concern for nutrition is as old as its civilization. Nutrition and health are not synonymous, but without good nutrition, health cannot be maintained. Food has always played an extraordinarily vital role in the rise and growth or the fall and decline of a nation because of its effect on the health efficiency of its population. Despite spectacular increase in the food grains production in recent years, the problems of chronic malnutrition continue to exist extensively: especially among children and women because they are caught in the relentless sequence of ignorance, poverty, inadequate food intake, disease and early death. The nutritional status of a nation is closely related to food adequacy and its distribution. The nutritional status is, thus, as outcome of complex and inter-related set of factors (Rasul, 2002).

Nutrition includes protein, carbohydrates, fat, vitamins and minerals, essential for a healthy body. Adult mother needs additional nutrients during pregnancy and lactation (Sharma, 2004). India's concern on nutrition is age-old. Although it has achieved a remarkable status in the production of food grains, chronic poverty still exists. In 1960–61, the Nutritional Advisory Committee of India recommended 2250 kcal intake as adequate diet12, which is now 2400 kcal. The per capita per day calorie intake in India has decreased from 2221 (kcal) in 1983 to 2058 (kcal) in 2012. However, change in per day per capita availability of cereals and pulses has increased to 16.9% and 48.1% respectively (GOI, 2012).

North east India is mainly characterizes by tribal population, where people living below poverty line are more compared to other states of the country. In terms of nutrition, tribal people receive them from roots of wild plants, tubers, fruits, leafy vegetables, fish and meat (Sahu, 2002). Low income, low production and yield of crops, and low purchasing power cause nutrition deficiency that results in several repercussions in the human body (Naidu and Parasuraman, 1982).

Under-nutrition and the associated widespread prevalence infectious diseases are one of the major health problems in many of the developing countries (WHO, 1990). Inadequate nutritional intake, or under-nutrition, can be considered as the major source of many adverse effects on individuals growth and health (Gordon el al., 1968; Chandra and Newberne, 1977; Chen et at., 1981; Chandra, 1981, 1983; Martorell and Ho, 1984; Mitra, 1985; 16 Mascie Taylor, 1991; Edmundson et al., 1992). Eveleth and Tanner (1990) have presented that populations living under chronic low dietary intakes have a pattern of growth characterized by slow growth during childhood and adolescence, late adolescence growth spurt and a prolonged period of growth. Adequate nutritional intakes are generally considered to be necessary for normal growth and development as well as for prevention of deficiency diseases (Mitchell et al., 1976; WHO, 1968). Deficiency of protein and other nutrients during the preschool age period had an adverse effect on the child, leading to retardation in both physical growth and mental development (Jelliffe, 1966; Galler et al., 1990;

Stinson, 1998). Ongeri (1975) mentioned that malnutrition particularly protein and calories are a common cause of deprived growth in preschool children. Hertzig el al., (1972) also stated that under nutrition's children were shorter in height, lower intelligence and smaller head circumference than normal children in the same school or their sibs. In reality small underweight or size body of children in developing countries is largely due to effects of poor diet and frequent infection (Martorell and Ho, 1984). Greulich's (1957) compare physical growth and development of the American born and the native Japanese children. It has revealed that children brought up in the United States were taller and heavier than their counterparts in Japan due to improved standard of nutrition and physical environment. Study from Malaysia by Chong et al., (1984) have also shows that the positive effect of protein energy malnutrition on growth pattern of the pre-school and primary school children. Also in Nigeria, Antinmo and Hart (1980), Nnanyelugo (1983) have identified that malnutrition in primary school children could be attributed to low nutrient intake, low socio economic conditions and unfavorable environmental conditions. Based on the report made by Lampl et al. (1978) among the New Guinean school children, protein supplement has contributed largely to a faster growth and prevention of malnutrition. Similar result has been also found by Addo et al., (1988) during the study among the school children of Nigeria. In the condition of India, Rao (1961) mentioned that the growth pattern was strongly influenced by dietary intakes. Boys and girls in the 'better fed' groups were more heavy and taller than those in 'poorly fed' ones (Easwaran et al., 1972, 1974). The major 12 causes of growth retardation among the pre-school boys in rural areas of Hyderabad is nutritional deficiencies (Satyanarayana et al., 1980). However, in a vast and diverse ethnic nation like India, the extent and type of malnutrition among children varies from region to region, depending upon the geography, socio economic factors, food habits, level of literacy, climate, and religious cultural practices etc., (ICM, 1972; Gopalan, 1988 & WHO, 1989).

In the last 20 years, there have been no significant changes in patterns of dietary intake of Mizoram. Wheat, maize and millets are the substantial cereals, which are prepared for consumption in various ways. Large quantities of cooked rice, meat, and vegetables are consumed with various kinds of ginger, garlic, chilies, and spices. Beer of rice or ZU was openly served before they became Christians, especially during successful hunting expeditions, harvest festivals, and return of a good friend from a long journey. Among the Christians, tea is served in place of rice beer. They smoke indigenous cigarette called as meizial and other non-local cigarettes. They sip nicotine water or 'tuibur frequently and chew betel leaves and areca nut (Pudaite, 1963).

5.2 Functions of Food

The primary function of food is to satisfy hunger, to give nutrition to the body, to maintain health of the body, to enrich the physical and mental function of the body etc. along with it provides energy for all types of activities, help growth of the body and protect from the diseases. To performed these, daily diet should be not only a single foods but a mixture of variety of foods like cereals, pulses, vegetables, roots and tubers, flesh foots, milk etc. because different foods contain different nutrients which is required by our body (Gopalan, 2012).

5.3 Dietary Patterns

Dietary patterns indicate the whole complexity of diet into consideration when compared to investigations of single food items and thus can be used to account for interactions between foods and nutrients in assessing the association between diet and disease risk (Hu, 2002). The habitual decisions of a peoples called as dietary habits is very important regarding consumptions of vitamins and minerals which further effect health status of a people. In the present study, since the nutritional status has been measured from the foods intake of a people, the dietary patterns is taken as an important determinant. There is a close relationship between quality and quantity of foods and health of the people. Usually rural peoples consumes as the foods they produced. Major produces and foods which are regularly consumed by the peoples in the study area were classify by 9 major types i.e., (i) Food grains including Rice and maize, (ii) Pulses includes Small Pea, Peas, Big Beans and Dal, (iii) Green leafy vegetables like Mustard leave, Pumpkin leave and small beans leave; (iv) others vegetables such as Small Beans, Pumpkin, Brinjal, Mock Tomato, Tomato, Bean, Cauliflower, Cabbage and Bamboo shoot, (v) Roots and Tubers like Carrot, Potato, Turnip, White Radish, Onion, others types of onion; (vi) Nuts and Oilseeds like Soybean and Ginger Seeds; (vii) Fruits like Orange, Banana, Pineapple, Papaya and Lemon; (viii) for Flesh foot Flesh Food Pork, Beef, Chicken and Egg; (ix) others like Oil, Milk and Sugar were the foods that regularly consumed by the peoples in the study area.

5.3.1 Food Grains

The major cereals or food grains consumed in the study area were rice (1287.20 K cal) and maize (6.36 K cal). These are the main source of energy that they contribute a lot of our daily intake of energy to the total population. Rice was the staple food as 100 per cent of the respondents used rice as the main foods. The main reasons for this was the major production, easy to cultivate, easy for cooking process, its availability and accessibility as compared to other food staff. Generally rice had been eaten after cooking and per capita per day intake of rice for a pregnant mother was very high as compare with all other food stuff. Rice is the main sources of energy, carbohydrates and magnesium (Appendix-III, A). The intake of rice per day for a pregnant woman was 373.10 gram (table 5.3.1). Maize contain high amount energy, carbohydrates and phosphorous (Appendix-III, A). The average per capita per day intake of maize was 5.09 gram only. It was very less as compared with rice it was only a supplementary foods for breakfast. Tuisumpui was the top position for maize intake i.e., 30 gram per day while the lowest intakes of only 0.15 grams per day have been found in Tuipang L (table 5.1).

Table 5.1 Per Capita per day Food Intake (in gram)

Village Councils	Rice	Maize
Ahmypi	456.46	0.44
Chheihlu	545.54	7.50
Chhuarlung I	320.88	2.04
Chhuarlung II	377.00	1.70
Chhuarlung III	360.88	1.93
Khopai	484.00	2.90
Lungbun I	333.00	2.00
Lungbun II	425.89	2.47
Maubawk CH	290.32	1.56
Maubawk L	251.00	1.00
Mawhre	329.00	1.80
KM 10	311.78	1.12
Old Tuisumpui	342.00	0.18
Siatlai	295.00	20.00
Theiri	400.15	0.43
Theiva	313.99	2.50
Tuipang L	377.00	0.15
College veng I	418.58	11.90
College veng II	367.87	7.42
Council veng	507.87	7.81

Tuisumpui	326.90	30.00
Average	**373.10**	**5.09**

Source: Field survey

5.3.2 Pulses

Pulses has come to occupy a special place in human nutrition, small beans, peas, big beans and dal were the only pulses food found in the study area. Small peas were normally collected from local products not from outside state. It is eaten by boiled and sometimes curry after boiled. It contains very high proportion of phosphorous, energy, potassium, choline, magnesium and selenium minerals (Appendix-III, B). The average per capita per day intake was 2.64 grams in which the highest was College veng (11.61 gram) and Lungbun I was lowest (0.1 gram/day). Peas found in the study area were generally dry peas because green peas were not produce much locally and it is costly to buy for the normal peoples. So the main peas consumed were imported from the other states. It was eaten by boiled with water and sometimes with oil. This was the common foods habits in restaurant and generally taken sportsman and children. The pregnant mothers have not taken much as it is required. Peas are the main source of phosphorous, carbohydrates, energy and calcium. The mean per capita per day intake was 2.21 gram. The highest was College veng II (6.86 gram) while the lowest was Chhuarlung I (0.50). Big beans are called as 'Bepui' in local name was only local products, and there was no import from the other states. The food was taken by boiled and curry. It was not used for restaurant and others like purposes because the production is less and it is not available enough at all times. Sometimes they make it dry for stock and it was used to eat for off seasons. Vitamins like choline, phosphorous, energy and calcium were normally found in this food, magnesium and sodium minerals were also found. The average per capita per day intake was 2.66 grams. College veng I got the highest position in consumption (10.69 gram) while it was not found in Maubawk L. The type of dal which had been found was red dal imported from the other states and eaten in both boiled and curry. It was used prosperously for mead day meal foods and it was also regularly used for household, hostels etc. The average intake of the foods was 20.9 gram per head per day. It was very high as compare to another pulses food items. Pulse (Dal) is very rich in vitamins like energy, phosphorous, carotene and carbohydrates (Appendix-III, B). It is also very rich in potassium and sodium minerals. Council veng has attained the highest intake in which all the pregnant mother have consumed 35.03 gram per day while only 8 grams in Lungbun I.

Table 5.2 Per Capita per day Food Intake of Pulses (in gram)

Village Councils	Small Peas	Peas	Big Beans	Dal
Ahmypi	1.50	1.33	2.19	10.21
Chheihlu	2.45	1.62	5.01	20.54
Chhuarlung I	1.10	0.50	1.40	12.61
Chhuarlung II	1.40	1.80	1.40	10.00
Chhuarlung III	1.00	2.31	1.35	9.94
Khopai	2.80	2.80	2.00	13.00
Lungbun I	1.00	4.00	3.00	8.00
Lungbun II	0.54	2.38	3.34	30.39
Maubawk CH	1.62	1.51	1.56	24.19
Maubawk L	0.10	1.00	0.00	24.00
Mawhre	2.69	3.57	1.76	17.30
KM 10	1.50	0.60	1.98	77.15
Old Tuisumpui	5.00	2.00	1.59	14.00
Siatlai	0.40	0.85	0.49	18.00
Theiri	1.24	0.98	0.16	17.28
Theiva	2.11	1.05	1.47	24.35
Tuipang L	0.38	0.75	1.00	9.10
College veng I	11.61	3.08	10.69	30.67
College veng II	6.17	6.86	7.03	13.99
Council veng	9.32	5.94	7.56	35.03
Tuisumpui	1.40	1.50	0.96	19.80
Average	**2.64**	**2.21**	**2.66**	**20.93**

Source: Field survey

5.3.3 Vegetables

Vegetables are essential ingredients of meals as they provide the require nutrients to human. They are very rich sources of antioxidants inhibit the free radicals in the body tissues and reduce the risk of chronic degenerative diseases. In the study area, vegetables were used as salad and others foods. The regular intakes of vegetables in the study could be divided into three such as:

i) Green leafy Vegetables including Mustard leaves, Pumkin leaves and Small beans leaves

ii) Others vegetables like Small Beans, Pumpkin, Brinjal, Mock Tomato, Tomato, Beans, Cauliflowers, Cabbage, and Bamboo Shoots

iii) Roots and Tubers includes Carrot, Potato, Turnip, Radish, Red Onion and local Onion

Green leafy vegetables include mustard leaves, pumpkin leaves and small beans leaves. A mustard leaf was one of the popular foods in the study area as well as the state. It was usually boiled and mixed with pork meat. It is very rich in carotene, iron and calcium, it also provides energy phosphorous, protein etc. (Appendix-III, C). Per capita per day intake was 17.70 gram. Council veng attained highest where the intake was 71.01 gram per capita per day while it was very low in KM 10 (1.86 gam). Like mustard leave, pumpkin leave is one of the most common foods in the available seasons. The mean intake (18.48 gram) was higher than all other leafy vegetables. It is very rich in calcium and phosphorous, it also contains energy, carbohydrate, fiber, protein etc. The per capita per day intake was highest in Council veng (71.38 gram) and lowest in KM 10 (2.18

gram). Small bean leaves was one of the rich sources of phosphorous, calcium, sodium, selenium, carbohydrates etc. The mea intake was 12.71 gram per day per capita highest in Council veng (91.76) and lowest in Tuipang L (1.40) as shown in table 5.3.

Table 5.3 Per Capita per day Food Intake of Leafy Vegetables (in gram)

Village Councils	Mustard Leave	Pumpkins Leave	Small Beans Leave
Ahmypi	16.67	15.62	9.01
Chheihlu	17.88	18.08	7.56
Chhuarlung I	10.61	8.92	8.92
Chhuarlung II	2.00	17.00	1.46
Chhuarlung III	9.28	9.61	7.25
Khopai	20.00	29.00	13.00
Lungbun I	21.00	19.00	17.00
Lungbun II	28.57	32.14	28.57
Maubawk CH	20.97	22.04	1.51
Maubawk L	10.00	7.00	5.00
Mawhre	24.30	27.86	3.11
KM 10	1.86	2.18	2.29
Old Tuisumpui	5.79	6.70	5.00
Siatlai	5.00	5.00	5.30
Theiri	5.98	4.40	4.22
Theiva	10.13	7.18	6.45
Tuipang L	30.00	23.80	1.40
College veng I	26.37	25.69	19.45
College veng II	28.28	29.55	22.65
Council veng	71.01	71.38	91.76
Tuisumpui	6.10	6.10	6.10
Average	**17.70**	**18.49**	**12.71**

Source: Field survey

Other vegetables include small beans, pumpkin, brinjal, mock tomato, tomato, beans, cauliflower and cabbage. Small beans was only collected from local products, usually boiled with water and sometime eaten by raw. It is very rich in vitamins like phosphorous, calcium, energy, folic acid, choline, magnesium, sodium and selenium etc. (Appendix). The mean intake per capita per day was only 6.39 highest in Council veng (50.77 gram) and lowest in Tuisumpui (0.50gram). Pumpkin is one of the sources of choline, energy, calcium, phosphorous etc. (Appendix-III, D). It was also only the local production usually eaten by curry. Beside this it is one of the important sources of animal's foods like pig and cattle etc. The per capita intake was very low (4.15gram) and was highest in College veng I (16.50 gram) and lowest in Siatlai (0.50 gram). Brinjal was one of the important foods in the study area because it is available in all seasons and can be mixed with others vegetables in mizo called as 'Bai'. Brinjal provide selenium, chloride, phosphorous, energy, calcium etc. (Appendix-III, D). The mean intake was 5.36 gram per day per capita. The highest intake was found in College veng I (18.34gram) and lowest in Old Tuisumpui (0.30 gram). Usually it was eaten by mixed with vegetation's boiled as well as fry. Mock tomato contains only the major vitamins like phosphorous, calcium, energy, carbohydrates etc. (Appendix) but not provides minor vitamins and trace minerals. So that is why the people think that is not energy gaining foods, it minus the energy as well as blood pressure. It was the popular foods as mixed vegetables and boiled throughout the years and also common for mass fooding in festivals etc. The mean intake was very high (38.92 grams) as compared with the other vegetables because it is available throughout the year with cheap prices. The highest per capita per day intake was found in Tuisumpui (7.6 grams) while lowest was KM 10 (0.88 grams). Tomato was one of the most popular vegetables collected from market or others products. It was also one of the regular food in the peoples but the mean intake (5.47 grams) was not very high because it is not much produced local as well as the price is too high for the villagers. The highest intake had found in Council veng (35.62 grams) while the lowest was Ahmypi (0.16 grams). The people think that tomato as one of the most healthy foods among the vegetables, it is very rich in potassium, carotene, sodium, phosphorous, calcium, energy, iron etc. (Appendix-III, D). The people generally eat tomato as a salad and sometime curry with eggs. Bean is one of the important sources for major vitamins like iron, phosphorous, calcium, energy, protein, carbohydrates and trace minerals like potassium and selenium etc. (Appendix-III, D). It could be eaten usually by boiled with water and also used to ear as mixed vegetables. The mean per capita per intake (6.39 grams) was not very high as compared with the favors foods it is because the price is little bit high than the purchasing power of the villagers. The intake was highest in Council veng (45.56 grams) and lowest was Lungbun II (0.21gram). Cauliflowers were generally imported from the other states, it is the common foods throughout the year but the per capita per day intake (3.21grams) was very low because of its cost. The highest intake was found in college veng II (14.14 grams) and the lowest was Theiva (0.42 gram). It is the leading sources of iron among the vegetables it contains 40 gram per 100 gram of edibles portion, so it must be noticed like it is the pregnant foods because all pregnant women need more iron. Beside this, it is very rich in all others major vitamins like calcium, phosphorous, energy, carbohydrate, proteins, crude fiber. It also contains a large amount of trace minerals like potassium, sodium, selenium, chloride etc. Cabbage was collected from the local products, it was available in market throughout the year but the price is highly fluctuating. During the seasons the price was very low as Rs. 10 per kilogram while in the off seasons the price reaches 60 Rs. Per kilogram. The mean intake (4.98 grams) was also not very much, the highest intake found in Chhuarlung II (15 gram) and the lowest was Chhuarlung I (1 grams). It is not very rich as compared to the similar products like Cauliflower. But it is very rich in carotene, vitamin c and choline, it also contain phosphorous, carbohydrates, energy, calcium, iron, protein etc. (Appendix-III, D).

Table 5.4 Per Capita per day Food Intake of Other Vegetables (in gram)

Village Councils	Small beans	Pumpkin	Brnjal	Mock tomato	Tomato	Bean	Cauliflower	Cabbage
Ahmypi	3.48	1.20	1.84	1.53	0.16	0.52	0.93	3.03
Chheihlu	4.36	11.82	13.76	8.33	5.77	4.56	2.36	3.70
Chhuarlung I	1.09	1.16	1.14	1.63	0.98	0.71	1.00	1.00
Chhuarlung II	1.80	1.50	1.00	1.28	3.70	1.57	2.40	15.00
Chhuarlung III	5.15	2.00	7.22	2.84	0.72	5.05	4.82	3.61
Khopai	6.00	3.00	5.00	5.00	4.00	5.79	1.80	3.69
Lungbun I	5.00	1.00	8.00	6.00	2.00	20.00	2.00	3.00
Lungbun II	10.33	9.23	7.71	4.17	3.28	0.21	5.95	4.05
Maubawk CH	1.40	1.72	1.24	1.34	2.31	2.42	1.99	3.66
Maubawk L	0.60	2.00	2.00	2.00	5.00	3.00	2.00	3.00
Mawhre	4.80	3.11	2.12	2.09	2.67	2.54	2.54	7.37
KM 10	0.67	1.44	1.76	0.88	1.49	1.54	1.87	4.62
Old Tuisumpui	6.00	1.00	0.30	22.00	0.50	1.30	1.70	2.00
Siatlai	1.90	0.50	1.20	1.20	0.50	2.60	3.00	3.00
Theiri	2.25	0.98	0.98	1.28	0.66	1.15	0.85	1.89
Theiva	0.77	2.04	3.49	2.86	5.98	4.14	0.42	1.92
Tuipang L	3.00	2.00	2.68	2.90	1.39	1.00	0.70	1.30
College veng I	14.42	16.50	18.34	19.74	19.30	14.37	13.11	10.60
College veng II	9.97	10.30	13.07	10.87	10.67	11.29	14.14	11.92
Council veng	50.77	13.98	14.79	13.47	35.62	45.56	3.58	14.13
Tuisumpui	0.50	0.76	5.00	706.00	8.10	4.83	0.18	2.20
Average	**6.39**	**4.15**	**5.36**	**38.92**	**5.47**	**6.39**	**3.21**	**4.98**

Source: Field survey

5.3.4 Roots and Tubers

The popular food stuff were carrot, potato, turnip, radish, red onion and other types of onion called as Zo onion. All the roots and tubers foods were imported from the other states except Zo onion. All these food items had been taken as salad and raw eat except potato. They are the important sources of phosphorous, carbohydrates, calcium, energy, protein etc. The mean intake was very less because they are one of the costly food items in the area. The average intake was carrot (5.39 grams), Turnip (2.45 grams), Radish (1.84 grams), Red onion (7.74 grams) and Zo onion (3.73 grams) respectively (table 5.5). Potato was one of the most common foods in the area, the average intake (31.79 grams) was also very high among all others food items. It is eat by fry and also boiled, it is also the common food for hostel and restaurant in different type of preparation. Potato is very rich in potassium (247 grams / 100 grams) and energy (97 Kcal/100 grams), Protein (1.6 grams/100 grams) also rich in carbohydrates, phosphorous, calcium etc. (Appendix-III, E).

Table 5.5 Per Capita per day Food Intake of Roots and Tubers (in gram)

Village Councils	Carrot	Potato	Turnip	Radish	Red onion	Zo Onion
Ahmypi	2.60	17.12	0.59	0.34	1.44	1.56
Chheihlu	8.33	41.86	3.47	2.34	7.51	5.82
Chhuarlung I	0.21	27.44	0.93	1.30	2.04	0.80
Chhuarlung II	1.00	30.00	0.90	0.58	1.60	1.00
Chhuarlung III	2.95	21.27	0.52	0.91	5.65	1.98
Khopai	0.19	20.00	0.90	0.40	4.00	3.90
Lungbun I	0.00	16.00	1.00	1.00	4.00	2.00
Lungbun II	0.36	32.44	0.19	0.66	11.01	3.18
Maubawk CH	1.29	42.47	1.24	0.91	1.99	1.51
Maubawk L	30.00	36.00	0.80	1.00	6.00	1.00
Mawhre	2.42	29.16	1.09	0.46	3.90	1.34
KM 10	0.11	34.48	2.01	0.85	0.94	1.09
Old Tuisumpui	0.60	29.00	1.20	0.27	2.00	0.03
Siatlai	0.70	2.80	10.00	10.00	5.00	2.60
Theiri	0.24	22.20	0.54	0.31	3.95	1.19
Theiva	3.85	29.09	0.68	0.66	2.49	1.51
Tuipang L	0.79	31.00	0.06	0.35	0.53	1.70
College veng I	19.55	64.59	10.26	5.72	16.55	16.55
College veng II	10.95	41.51	6.01	5.11	7.93	17.71
Council veng	20.13	65.19	7.01	5.39	13.10	9.27
Tuisumpui	6.87	34.00	2.00	0.06	61.00	2.60
Average	**5.39**	**31.79**	**2.45**	**1.84**	**7.74**	**3.73**

Source: Field survey

5.3.5 Nuts and Oilseeds

Soya beans and ginger seeds were only regularly consumed in the study area. Both of them are different for preparation of eating. Soya beans were first cooked by water and after that it is prepared for eating as one type of salad. Most of this food were the local product and sometime collected from other sources. It is the leading sources of energy, 100 gram its edible portion can produced 432 kilo calorie, it is also very rich in protein (43.2 grams / 100 grams), calcium (690 grams), iron (10.4 grams), phosphorous, carbohydrates, carotene etc. (Appendix-III, F). The mean intake (1.98) was very low because it is not like the major foods and only a type of salad. The highest village was College veng I (11.61grams) and lowest was Lungbun I (nil). The other nuts and seeds found eat regular is ginger seeds. It is only the local products and used as a salad not as a major food staff. The mean per capita intake (3.97 gram) was not very less because it is locally produced in every village and also the price is not very high. Ginger seeds are an important source for Magnesium, 100 gram of its edible portion can produce 405 milligram. It also provide major vitamins and some trace minerals but not much as shown in Appendix. It was highly consumed in Chheihlu (11.73) while very low in Tuipang L (0.40). Table 5.6 shows the village wise intake patterns during the study period.

Table 5.6 Per Capita per day Food Intake of Nuts and Oil Seeds (in gram)

Village Councils	Soya beans	Ginger Seeds
Ahmypi	0.38	1.29
Chheihlu	2.13	11.73
Chhuarlung I	0.96	1.46
Chhuarlung II	0.56	1.40
Chhuarlung III	0.33	2.87
Khopai	1.90	1.80
Lungbun I	0.00	3.00
Lungbun II	1.09	2.45
Maubawk CH	3.76	1.40
Maubawk L	0.30	4.00
Mawhre	0.97	2.14
KM 10	0.88	3.41
Old Tuisumpui	0.20	10.00
Siatlai	1.90	3.00
Theiri	0.24	0.55

Theiva	0.47	0.64
Tuipang L	0.30	0.40
College veng I	11.61	10.84
College veng II	5.76	6.69
Council veng	7.30	9.36
Tuisumpui	0.56	5.00
Average	**1.98**	**3.97**

Source: Field Survey

5.3.6 Fruits

Fruits which are regularly eaten were very few in the area, the five types of fruits like orange, banana, pineapple, papaya and lemon were the only found. The intake per capita per day was also very less but they contributed some amount of vitamins and minerals for health of the people. The mean intake of these foods orange (2.94 grams), banana (3.37 grams), pineapple (3.01 grams), papaya (2.11 grams) and lemon (2.70 grams) were very less because they are not the major food items, they were not produced sufficient from local and the price is also very high except lemon. They are one of the most important sources of energy. They produced orange (48), banana (116), pineapple (52), papaya (37) and lemon (57) kilo calorie per 100 gram respectively. There contributions for vitamins and minerals were not very high, orange (1104 gram), banana (78 gram) and pineapple (18 gram) are an important sources for carotene (Appendix-III, G).

Table 5.7 Per Capita per day Food Intake of Fruits (in gram)

Village Councils	Orange	Banana	Pineapple	Papaya	Lemon
Ahmypi	0.50	1.24	0.75	0.78	1.20
Chheihlu	1.09	2.01	1.52	0.71	2.73
Chhuarlung I	2.41	1.31	2.86	3.35	0.98
Chhuarlung II	2.50	1.60	0.90	0.60	0.70
Chhuarlung III	1.68	1.10	0.33	0.30	0.22
Khopai	1.80	1.38	1.50	1.00	1.00
Lungbun I	10.00	5.00	0.00	1.00	0.90
Lungbun II	2.47	3.10	2.11	2.02	1.10

Maubawk CH	2.63	2.74	1.40	1.29	1.29
Maubawk L	1.90	2.20	7.10	3.50	2.70
Mawhre	1.62	1.56	4.39	1.15	1.28
KM 10	1.60	6.80	2.98	1.61	1.61
Old Tuisumpui	1.80	3.00	4.60	2.00	27.00
Siatlai	4.00	5.00	4.00	2.60	1.49
Theiri	0.78	1.14	0.91	0.82	0.24
Theiva	2.06	3.01	1.69	0.83	0.93
Tuipang L	0.40	1.68	0.48	0.45	0.10
College veng I	9.58	8.27	10.50	10.11	4.57
College veng II	7.57	12.60	10.80	6.75	5.17
Council veng	4.12	3.41	2.88	2.58	1.40
Tuisumpui	1.29	2.64	1.60	0.80	0.10
Average	**2.94**	**3.37**	**3.01**	**2.11**	**2.70**

Source: Field Survey

5.3.7 Flesh Food

Flesh food including pork, beef, chicken and eggs were found as regular foodstuff throughout the year. The mean per capita per day intake was very high as pork (14.79 grams), Chicken (12.64 grams), Beef (6.32 grams) and eggs (26.91 grams). Flesh foods are the major sources of protein, energy, phosphorous, calcium etc. Among the animal flesh pork was the popular foods taken by the people both in rural and urban area, it is very rich in protein (18.7 grams), energy (114 kilo calorie), calcium (30 grams) phosphorous (200 grams), fat (4.4 grams) etc. per 100 grams. Chicken is very rich in protein (25.9 grams), energy (109 kilo calorie), Calcium (25 grams) and phosphorous (245 grams), Beef is one of the most important sources for major vitamin as 100 grams of its edible portions produced 79.2 gram of protein, 10.3 grams of fat, 410 kilo calorie of energy, 68 grams of calcium, 324 grams of phosphorous, 18.8 grams of iron, 52 grams of sodium and 214 grams of potassium etc. An egg was the most common foods taken as it can be prepared easily. The total number of eggs consumed was collected and transformed into gram (19 no. of eggs = 1 kg). It is an important source of protein (13.3

grams), fat (13.3 grams), energy (173 kilo calorie), Calcium (60 grams), phosphorous (220 grams), folic acid (78.3 micro grams) etc. Appendix-III, H shows nutritive value of flesh foods.

Table 5.8 Per Capita per day Food Intake of Flesh Food (in gram)

Village Councils	Pork	Chicken	Beef	Egg
Ahmypi	1.72	5.14	0.62	9.24
Chheihlu	12.84	14.63	3.00	0.52
Chhuarlung I	3.15	4.82	0.95	12.09
Chhuarlung II	1.80	3.60	1.48	8.00
Chhuarlung III	6.14	7.11	3.45	210.74
Khopai	13.00	2.90	0.80	1.00
Lungbun I	8.00	1.00	1.00	5.00
Lungbun II	10.48	15.60	5.06	19.61
Maubawk CH	8.98	7.63	3.33	13.44
Maubawk L	11.00	10.00	7.00	13.00
Mawhre	18.89	2.77	0.82	5.85
KM 10	6.99	11.36	1.24	9.39
Old Tuisumpui	23.70	20.00	10.00	10.94
Siatlai	14.00	15.00	6.00	14.90
Theiri	3.89	7.02	1.60	10.22
Theiva	12.34	10.31	7.00	12.89
Tuipang L	16.00	13.00	2.60	0.49
College veng I	28.74	22.25	18.82	19.11
College veng II	38.36	26.63	21.69	167.98
Council veng	57.17	47.90	31.35	7.80
Tuisumpui	13.48	16.79	5.00	13.00
Average	**14.79**	**12.64**	**6.32**	**26.91**

Source: Field Survey

5.3.8 Cooking oil, Milk and Sugar

These are important foodstuff that the people regularly need and consumed. Cooking oil and sugar were totally collected from other sources while some amounts of milk were collected from local. As shown in table 5.9 the average per capita per day consumption of cooking oil was 18.27 grams, milk (22.84 grams) and sugar (6.47 grams). The cooking oil produces two types of vitamins such as fat (100 %) and calorie (i.e., 900 kilo calorie per 100 grams). Milk is an important source of all major vitamins as it contain protein (3.2 grams), fat (4.1 grams), energy (117 grams), calcium (210 grams), phosphorous (130 gram), carotene (53 gram), sodium 973 gram), potassium (140 gram) etc. per 100 grams. Sugar is also an important source of nutrition as 100 grams produces vitamins like energy (394 kilo calorie) and carbohydrates (99.4 grams) as shown in Appendix-III, I.

Table 5.9 Per Capita per day Food Intake of Cooking Oil, Milk & Sugar (in gram)

Village Councils	Cooking Oil	Milk	Sugar
Ahmypi	10.30	0.03	3.48
Chheihlu	18.22	0.00	6.15
Chhuarlung I	14.39	0.00	4.71
Chhuarlung II	20.00	2.00	6.70
Chhuarlung III	9.01	1.53	5.51
Khopai	10.00	0.00	5.60
Lungbun I	11.00	0.00	4.00
Lungbun II	36.16	0.00	7.30
Maubawk CH	22.85	0.00	5.00
Maubawk L	18.00	0.60	4.50
Mawhre	13.11	1.62	5.05
KM 10	19.68	0.00	4.00
Old Tuisumpui	19.00	2.80	3.50
Siatlai	17.90	0.35	6.00
Theiri	11.46	0.56	7.68
Theiva	18.90	0.28	8.29
Tuipang L	9.00	30.00	7.10
College veng I	28.06	22.84	10.91
College veng II	32.28	58.23	11.81
Council veng	24.38	19.59	10.89
Tuisumpui	20.00	0.14	7.63
Average	18.27	6.69	6.47

Source: Field Survey

Table 5.10 Descriptive Statistics of Dietary Patterns for Selected Indices

Foods Components	Food items	N	Min	Max	Mean	S.D	Intake in %
Cereals	Rice	21	251.00	545.54	373.10	76.62	53.65
	Maize	21	.15	30.00	5.08	7.46	0.73
Pulses	Small Peas	21	.10	11.61	2.63	3.00	0.38
	Peas	21	.50	6.86	2.21	1.70	0.32
	Big Beans	21	.00	10.69	2.66	2.71	0.38
	Dal	21	8.00	77.15	20.93	15.00	3.01
Leafy vegetables	Mustard leave	21	1.86	71.01	17.70	15.29	2.55
	Pumpkin leave	21	2.18	71.38	18.48	15.45	2.66
	Small beans leave	21	1.40	91.76	12.71	19.56	1.83
Vegetables	Small Beans	21	.50	50.77	6.39	10.80	0.92
	Pumpkin	21	.50	16.50	4.15	4.92	0.60
	Brinjal	21	.30	18.34	5.36	5.37	0.77
	Mock Tomato	21	.88	706.00	38.92	152.96	5.60
	Tomato	21	.16	35.62	5.46	8.21	0.79
	Beans	21	.21	45.56	6.38	10.27	0.92
	Cauliflower	21	.18	14.14	3.20	3.73	0.46
	Cabbage	21	1.00	15.00	4.98	4.23	0.72
Roots and Tubers	Carrot	21	.00	30.00	5.38	8.23	0.77
	Potato	21	2.80	65.19	31.79	14.53	4.57
	Turnip	21	.06	10.26	2.44	3.11	0.35
	Radish	21	.06	10.00	1.83	2.55	0.26
	Red Onion	21	.53	61.00	7.74	12.89	1.11
	Others Onion	21	.03	17.71	3.73	4.89	0.54
	Soya beans	21	.00	11.61	1.98	2.91	0.28

Nuts and Oil seeds	Ginger seeds	21	.40	11.73	3.97	3.58	0.57
Fruits	Orange	21	.40	10.00	2.94	2.75	0.42
	Banana	21	1.10	12.60	3.37	2.85	0.48
	Pineapple	21	.00	10.80	3.01	3.05	0.43
	Papaya	21	.30	10.11	2.10	2.35	0.30
	Lemon	21	.10	27.00	2.70	5.72	0.39
Flesh foods	Pork	21	1.72	57.17	14.79	13.23	2.13
	Chicken	21	1.00	47.90	12.64	10.60	1.82
	Beef	21	.62	31.35	6.32	8.06	0.91
	Egg	21	.49	210.74	26.91	54.68	3.87
Others	Cooking Oil	21	9.00	36.16	18.27	7.49	2.63
	Milk	21	.00	58.23	6.69	14.61	0.96
	Sugar	21	3.48	11.81	6.46	2.43	0.93
	Valid N (listwise)	21					

Source: Field Survey

5.4 Nutritional Status

One of the main health problems in many developing countries is the widespread prevalence of under-nutrition or nutritional deficiency and infectious diseases (WHO, 1990). Usually it is described that the basic causes of under-nutrition and infections in developing countries are poverty, poor hygienic conditions and poor access to preventive and health care (Mitra, 1985 & WHO, 1990). Thus, assessment and measure of nutritional status of population has attracted the attention not only the nutritionists and other biological scientists, but also the economists and other social scientists with a view to understanding the health and socioeconomic status of the population (Osmani, 1992).

According to Brown (1984) nutritional status can be defined as, “the physical expression of the relationship between the nutrient intakes, or bio-availability of nutrients, and the physiological requirements of an individual”. This physical expression of the relationship between nutrient intakes and physiological requirements of a person can be measured by different methods. Among them anthropometry and dietary intake are generally used for measuring the magnitude of under nutrition at both individual and population levels. Anthropometric measurements and indices like weight, height, mid upper arm circumference, skinfold thickness, weight-for-age, height-for-age, weight-for-height, body mass index, indices of upper arm circumference, etc., (WHO, 1963; Jelliffe, 1966; Frisancho, 1990.

In the present study nutritional status was measured by studying intake of 26 kinds of nutrients including both vitamins and minerals components. After taking the entire regular foods intake by pregnant women, it was transformed into nutritive value. Pregnancy is an exceptional condition of enhanced demand for various nutrients. Physiological changes proceeding in the body of a pregnant woman caused, for example, by a high concentration of progesterone, include a reduced bioavailability of some dietary components and an increased demand for them owing to a developing fetus. Deficiencies of mineral elements and vitamins in this period may contribute to the occurrence of perinatal complications, fetus necrobiosis, congenital organ defects in the child and impairment of the immune system functioning in a fetus (Black, 2001, Godfrey et al., 1996, Maggini, 2007).

5.4.1 Data Analysis

To measure nutritional status, the daily food intake of every pregnant woman had been collected from all the foods items they regularly consumed. 37 food items were selected as they consumed regularly as discussed earlier. The actual food intake was transformed into nutritional value on the basis of the value given by National Institute of Nutrition, Indian Council of Medical Science, Hyderabad (Gopalan, 2011). Per capita per day nutritional value has been calculated by using the following formula (Rinpuia et al., 2017)

$$\text{PNI} = \frac{\boldsymbol{PFi\ X\ NV}}{\mathbf{100}}$$

Where PNI = Per Capita per Day Nutritional Intake

PFi = Per capita per day food intake in gram

NV = Nutritional Value of foods intake

100 = All nutritional value are given in per 100 gram

Nutritional efficiency was calculated based on the recommended value given by Indian Council of Medical Research (Gopalan, 2011). To measure the levels of nutritional efficiency attainment, Z-score standardized technique has been used for normalization and standardization, principal component analysis has been adopted to find out the composite index of nutritional efficiency attainment, factor analysis is used to find out the important factors effecting nutritional attainment among the data (weight of the indicators).

The nutritional intakes of pregnant women had been classified into two components such as vitamins and minerals. Vitamin component include proteins, fat, crude fiber, carbohydrates, energy, calcium, phosphorous, iron, carotene, thiamine, riboflavin, niachin, vitamin B6, folic acid, vitamin C and choline. Magnesium, sodium, potassium, copper, manganese, molybdenum, zink, chromium, selenium and chloride were minerals component. Then, the status of deficiency and efficiency from those kinds of vitamins and minerals were studies as per the recommended dietary requirement (Gopalan, 2011), if the intake of a people is more than the recommended value it was treated as nutritional efficient on the other hand deficiency have been found if the intake is less than the recommended value.

5.4.2 Components of Nutritional Measurement

The present study examined the major vitamins components and trace minerals elements covering 26 types of nutrients components to measured nutritional status. The component includes protein, fat, crude fiber, carbohydrates, energy, calcium, phosphorous, iron, carotene, thiamine, riboflavin, niacin, vitamin B6, folic acid, vitamin C and choline. The result shows that majority of the pregnant women have deficiency in vitamins components.

Minerals play an important roles in the body by the way of participation in the construction of the body and regulation of its function especially in bone construction, transport of oxygen, to regulate blood sugar, as a cofactor for the enzyme activity, regulation of chemical reactions, to protect of cells from oxidative damage and regulation of immune system function (Blumfield et al., 2013). According to King (2000) minerals constitute about 4 per cent to 5 per cent of body weight out of which, 50 per cent is calcium and 25 per cent is phosphorus. During the time of pregnancy, the increased physiological changes to support body metabolism in the mother and growing foetus lead to an increased need for micronutrients (Blumfield et al., 2013, King, 2000). Hence it is require to ensure that whether women receive sufficient nutrients both macro and micro especially during pregnancy (King, 2000, Berti et al., 2011). Deficiency of macro and micronutrient both during fertilization and pregnancy cause some increased risks which include anemia, pregnancy-induced hypertension and pre-eclampsia, foetal growth restriction, increased labor complications, and maternal and foetal mortality (King, 2000, Berti et al., 2011 and Cetin et al., 2010). So by taking the word of Cetin et al., (2010) nutritional status of a pregnant women or mother affects embryonic genome expression and is associated with development of diseases in later life stages such as coronary artery disease, stroke, and conditions such as hypertension and non-insulin dependent diabetes. The 10 kinds of trace minerals were found in the present studies such as magnesium, sodium, potassium, copper, manganese (Mn), molybdenum (Mo), zinc, chromium (Cr), selenium and chloride (Cl).

5.4.3 Protein Deficiency

Proteins are a vital to any living organism. It is the most important constituents of tissues and cells of the body. They form the important component of muscle and other tissues and vital body fluids like blood (Gopalan, 2011). Protein is critical for ensuring the proper growth of fetal tissue, including the brain. It also helps with breast and uterine tissue growth during pregnancy. It even plays a role in your increasing blood supply, allowing more blood to be sent to your baby. Good sources include lean beef and pork, beans, chicken, salmon, nuts, peanut butter and cottage cheese etc.

The daily recommended requirement of a pregnant mother is 65 grams according to ICMR (Gopalan, 2011). The study finds out protein deficiency in the study area was quite high. As per the recommendations, the average daily proteins intake in the study area was 48.44 grams which is 23.51 per cent less than the requirement value (65 grams/ day). Thus, the study area could not meet the standard recommended requirement by 23.51 percent. The study finds the only 9.25 per cent of the pregnant women had attained protein efficiency. The other 90.48 per cent were malnutrition. Only the two urban localities such as College veng I (88.36 grams) which is 28.24 per cent higher than the recommended dietary requirement and College veng II (98.11 grams) 50.93 per cent higher than the recommended dietary requirement attained the efficiency status. Highest deficiency was found in Tuisumpui village where all women could not attained the recommended value by 68.03 per cent. The village was followed by Chhuarlung I (50.79 %), Lungbun I (47.17 %), Chhuarlung II (42.62 %), Mawhre (41.72 %), Theiri (40.76 %), Maubawk CH (39.88 %), Ahmypi (37.57 %), Siatlai (36.72 %), Tuipang L (36.61%), Maubawk L (36.13 %), Theiva (35.17 %), KM 10 (31.17 %), Khopai (28.58 %), Lungbun II (16.62 %), Chheihlu (11.69 %), Old Tuisumpui (10.52 %), Council veng (1.43 %) and Chhuarlung III (0.9 %).

Table 5.11 Attainment of Protein Vitamin

Village Councils	Intake (per capita per day in gram)	Attainment	Attainment (%)	Status
Ahmypi	40.58	-24.42	-37.57	Deficient
Chheihlu	57.40	-7.6	-11.69	Deficient
Chhuarlung I	31.99	-33.01	-50.79	Deficient
Chhuarlung II	37.30	-27.7	-42.62	Deficient
Chhuarlung III	64.42	-0.58	-0.90	Deficient
Khopai	46.42	-18.58	-28.58	Deficient
Lungbun I	34.34	-30.66	-47.17	Deficient
Lungbun II	54.19	-10.81	-16.62	Deficient
Maubawk CH	39.08	-25.92	-39.88	Deficient
Maubawk L	41.52	-23.48	-36.13	Deficient
Mawhre	37.88	-27.12	-41.72	Deficient
KM 10	44.74	-20.26	-31.17	Deficient
Old Tuisumpui	58.16	-6.84	-10.52	Deficient
Siatlai	41.13	-23.87	-36.72	Deficient
Theiri	38.51	-26.49	-40.76	Deficient
Theiva	42.14	-22.86	-35.17	Deficient
Tuipang L	41.21	-23.79	-36.61	Deficient
College veng I	83.36	18.36	28.24	Efficient
College veng II	98.11	33.11	50.93	Efficient
Council veng	64.07	-0.93	-1.43	Deficient
Tuisumpui	20.78	-44.22	-68.03	Deficient

Source: Field Survey

5.4.4 Fat Deficiency

Fat is an important component of diet and serves a number of functions in the body. Fat is a concentrated source of energy and it supplies per unit weight more than twice the energy furnished by either protein or carbohydrates. It also imparts palatability to a diet and retards stomach emptying time. Presence of fat in the diet is important for the absorption of fat soluble vitamins like vitamin A and carotene present in the diet. Apart from these functions, some facts, particularly those derived from vegetable sources provide what is known as "essential fatty acids" which have vitamins like functions in body. These essential fatty acids are also important for the structure and functions of cells (Gopalan, 2011).

According to ICMR s pregnant woman needs to take fat minimum at 30 gram per day (Gopalan, 2011). During the studies, the average daily intake of pregnant women in the study area was 26.92 grams which is 10.27 percent less than the recommended dietary requirement (30 grams/ day). The 23.81 per cent of the total pregnant women had attained the fat nutritionals requirement while the other 76.19 per cent were under nutrition. The villages like Chhuarlung III (40.64 grams), Lungbun II (44.28 grams), College veng I (42.55 grams), Tuisumpui (49.22 grams) and College veng II (66.27 grams) meet the requirement. On the other hand deficiency had been found in the villages like Maubawk CH (2.03 %), Niawhtlang III (7.84 %), Theiva (15.58 %), Siatlai (18.25 %), Council veng (18.42 %), Chheihlu (18.77 %), Old Tuisumpui (18.9 %), Chhuarlung II (18.95 %), Chhuarlung I (36.37 %), Mawhre (38.79 %), Theiri (44.33 %), Ahmypi (49.8 %), Lungbun I (49.88 %), Khopai (50.24 %), Tuipang L (53.36 %) and Maubawk L (84.05 %) could not attained the recommended dietary requirement. However fat deficiency was comparatively low to the others vitamins because the intake of cooking oil was quite high (2.63 % of the total food intake). At the same time the whole study area were under recommended level due to low intake of vegetables, seeds and animals oil.

Table 5.12 Attainment of Fats Vitamin

Village Councils	Intake (per capita per day in gram)	Attainment	Attainment (%)	Status
Ahmypi	15.06	-14.94	-49.80	Deficient
Chheihlu	24.37	-5.63	-18.77	Deficient
Chhuarlung I	19.09	-10.91	-36.37	Deficient
Chhuarlung II	24.31	-5.69	-18.95	Deficient
Chhuarlung III	40.64	10.64	35.45	Efficient
Khopai	14.93	-15.07	-50.24	Deficient
Lungbun I	15.04	-14.96	-49.88	Deficient
Lungbun II	44.28	14.28	47.59	Efficient

Maubawk CH	29.39	-0.61	-2.03	Deficient
Maubawk L	4.79	-25.21	-84.05	Deficient
Mawhre	18.36	-11.64	-38.79	Deficient
KM 10	27.65	-2.35	-7.84	Deficient
Old Tuisumpui	24.33	-5.67	-18.90	Deficient
Siatlai	24.53	-5.47	-18.25	Deficient
Theiri	16.70	-13.3	-44.33	Deficient
Theiva	25.33	-4.67	-15.58	Deficient
Tuipang L	13.99	-16.01	-53.36	Deficient
College veng I	42.55	12.55	41.84	Efficient
College veng II	66.27	36.27	120.90	Efficient
Council veng	24.47	-5.53	-18.42	Deficient
Tuisumpui	49.22	19.22	64.08	Efficient

Source: Field Survey

5.4.5 Crude Fiber Deficiency

ICMR recommend pregnant women to consume 21 grams of crude fiber for every day. DHC (2014) mentioned that dietary fiber binds water in the intestine in the form of a gel and ensures that the stool is bulky and its passage through the intestine is not delayed. Dietary-fibers in high fiber diet decrease absorption of bile acids and cholesterol from the bowel, by getting attached to them. Deficiency in fiber result gastrointestinal disorders (i.e., constipation, appendicitis, colon cancer), degenerative disorders (i.e., prostate and breast cancer), metabolic disorders (i.e., diabetes, obesity, gallstones) and cardiovascular disorders including i.e., varicose veins, strokes and high blood pressure (B.P). Common complaints of pregnancy include heartburn, constipation and indigestion also related with fiber deficiency. Studies have shown that eating plenty of fiber during pregnancy reduces the risk and severity of hemorrhoids, which become more common as the baby grows. A higher intake of soluble fiber can help prevent the glucose intolerance that can lead to gestational diabetes. According to report of the American Journal of Hypertension, increasing the amount of fiber intake during early pregnancy has reduced the risk of preeclampsia (a dangerous condition caused by elevated blood pressure). The study, further discuss that pregnant women who consumed 21.2 grams or more of fiber a day were 72 percent likely to develop preeclampsia than those who ate less than 11.9 grams per day (Barndad (2015).

There was a severe deficiency of crude fiber nutrients to all pregnant women in the study area. The average per capita per day intake (3.06 grams) was 85.45 per cent less than the recommended requirement (21 gram per day). This may affects the physical fitness of a pregnant mother. The study found that deficiency was very high in all villages. The highest malnutrition was found at Theiri where the average per capita per day fiber intake was 91.82 lesser (or-91.82 %) than the recommended value. The village was followed by Chhuarlung I (-90.95 %), Chhuarlung II (-90.9 %), Siatlai (-90.1 %), Tuipang L (-90.1 %), Theiva (-89.76 %), Maubawk L (-89.46 %), KM 10 (-89.41 %), Chhuarlung III (-88.96 %), Ahmypi (-88.72 %), Maubawk CH (-88.71 %), Mawhre (-86.88 %), Tuisumpui (-85.9 %), Lungbun I (-84.58 %), Khopai (-84.05 %), Lungbun II (-83.76 %), Old Tuisumpui (-82.86 %), Chheihlu (-81.49 %), Council veng (-77.2 %), College veng II (-72.21 %) and College veng I (-66.54 %).

Table 5.13 Attainment of Crude Fiber Vitamin

Village Councils	Intake (per capita per day in gram)	Attainment	Attainment (%)	Status
Ahmypi	2.37	-18.63	-88.72	Deficient
Chheihlu	3.89	-17.11	-81.49	Deficient
Chhuarlung I	1.90	-19.1	-90.95	Deficient
Chhuarlung II	1.91	-19.09	-90.90	Deficient
Chhuarlung III	2.32	-18.68	-88.96	Deficient
Khopai	3.35	-17.65	-84.05	Deficient
Lungbun I	3.24	-17.76	-84.58	Deficient
Lungbun II	3.41	-17.59	-83.76	Deficient
Maubawk CH	2.37	-18.63	-88.71	Deficient
Maubawk L	2.21	-18.79	-89.46	Deficient

Mawhre	2.75	-18.25	-86.88	Deficient
KM 10	2.22	-18.78	-89.41	Deficient
Old Tuisumpui	3.60	-17.4	-82.86	Deficient
Siatlai	2.08	-18.92	-90.10	Deficient
Theiri	1.72	-19.28	-91.82	Deficient
Theiva	2.15	-18.85	-89.76	Deficient
Tuipang L	2.08	-18.92	-90.10	Deficient
College veng I	7.03	-13.97	-66.54	Deficient
College veng II	5.84	-15.16	-72.21	Deficient
Council veng	4.79	-16.21	-77.20	Deficient
Tuisumpui	2.96	-18.04	-85.90	Deficient

Source: Field survey

5.4.6 Efficiency of Carbohydrate Nutrition

The primary function of carbohydrates is to provide energy (calories) to the human body (Laveilli, 1975). Carbohydrates are a class of energy yielding substances which includes starch, glucose, cane, sugar, milk, sugar etc. grains foods, roots and tubers are largely composed of starch, a complex carbohydrate. Food ingredients like simple sugars, namely cane sugar and glucose are pure carbohydrates (Gopalan, 2011).

The study founds all the respondents could attained nutritional requirement as well as exceeds the recommended value in carbohydrate. The average per capita per day intake was 338.65 grams which is 160.50 per cent higher than the recommended value (130 grams/day). The highest exceeding was found at Chheihlu village where per capita per day intake was 263.6 per cent higher than the recommended value, while the lowest was Maubawk L where the average intake exceeds the recommended value by 74.64 per cent. Majority of carbohydrates come from cereals (Rice and maize) and pulses (Peas and Dal) foodstuff etc. which account 58.47 per cent of the total food items consumed. The intake of these foodstuffs was sufficient enough in the daily diets of the pregnant women. The high intake of carbohydrates was an indication of sufficient nutrition in the study area (Table 5.15). Chheihlu village was followed by Council veng (234.55 %), College veng I (220.32 %), Khopai (213.05 %), Tuipang L (208.86 %), Lungbun II (193.08 %), Ahmypi (191.04 %), Tuisumpui (187.33 %), College veng II (174.76 %), Theiri (162.88 %), Chhuarlung II (148.04 %), KM 10 (138.23 %), Chhuarlung III (137.71 %), Old Tuisumpui (130.42 %), Lungbun I (125.05 %), Mawhre (124.65 %), Theiva (118.13 %), Chhuarlung I (112.65 %), Maubawk CH (111.17 %), Siatlai (100.6 %) and Maubawk L (74.64 %).

Table 5.14 Attainment of Carbohydrate Vitamin

Village Councils	Intake (per capita per day in gram)	Attainment	Attainment (%)	Status
Ahmypi	378.36	248.36	191.04	Efficient
Chheihlu	472.37	342.37	263.36	Efficient
Chhuarlung I	276.45	146.45	112.65	Efficient
Chhuarlung II	322.46	192.46	148.04	Efficient
Chhuarlung III	309.02	179.02	137.71	Efficient
Khopai	406.97	276.97	213.05	Efficient
Lungbun I	292.56	162.56	125.05	Efficient
Lungbun II	381.01	251.01	193.08	Efficient
Maubawk CH	274.52	144.52	111.17	Efficient
Maubawk L	227.04	97.04	74.64	Efficient
Mawhre	292.05	162.05	124.65	Efficient
KM 10	309.69	179.69	138.23	Efficient
Old Tuisumpui	299.54	169.54	130.42	Efficient
Siatlai	260.78	130.78	100.60	Efficient
Theiri	341.75	211.75	162.88	Efficient
Theiva	283.57	153.57	118.13	Efficient
Tuipang L	401.52	271.52	208.86	Efficient
College veng I	416.41	286.41	220.32	Efficient
College veng II	357.19	227.19	174.76	Efficient
Council veng	434.92	304.92	234.55	Efficient
Tuisumpui	373.52	243.52	187.33	Efficient

Source: Field survey

5.4.7 Energy Malnutrition

Energy is one of the most determining factor controlling health and mortality of a people. It is measured by kilo calorie per day. A calorie is a unit of heat energy, technically defined as "the energy needed to raise the temperature of one gram of water by one degree centigrade". In the human body, the process of metabolism converts the calories contained in food into the energy that we need to live. It has become standard practice to express food energy in terms of kilocalories because even small amount of food can contain thousands of calories of energy (Kirsten, 2004).

According to recent study on the association of maternal weight gain and body composition with the newborn birth weight on the influence of birth weight to infant mortality as well as related metabolic demands of pregnancy (WHO, 1995a; Kelly et al., 1996; Butte and King, 2002), in order to accomplish extra energy required during this period. It was suggested that estimates of energy requirements and recommendations for energy intake of pregnant women must be population-specific, because they are differences in body size, lifestyle and underlying nutritional status. The energy requirement is different in economically developed societies and low-income developing societies. Pregnancy energy requirements of stunted or undernourished women may differ from those of overweight and obese women; and physical activity patterns may change during pregnancy to an extent that is determined by socio-economic and cultural factors.

A high risk of low birth weight and pre-term delivery and of obstetric complications during labor and delivery was usually found at women with short stature, especially in developing countries with inadequate health care systems and high prevalence of impaired growth during the childhood (WHO, 1995 & Martorell et al., 1981). A work done by Picket, Abrams and Selvin (2000) exposed healthy women with uncomplicated pregnancies in the developed country like United States showed a positive association between maternal height and birth weight among white, black and Asian women, but not Hispanic women.

Energy deficiency was found at all village councils in the study area. The average daily energy intake of a pregnant woman was 1783.70 kilo calorie which is 29.36 per cent lower than the recommended value of 2525. It is an indication of under nutrition and malnutrition in the district. The highest deficiency was found in Maubawk L village (i.e 48.50 %) which was followed by Chhuarlung I (44.33 %), Siatlai (43.14 %), Lungbun I (42.85 %), Mawhre (41.14 %), KM 10 (39.61 %), Theiva (39.34 %), Maubawk Ch (39.25 %), Chhuarlung II (35.83 %), Old Tuisumpui (35.77 %), Theiri (33.87 %), Ahmypi (28.25 %), Khopai (26.79 %), Chhuarlung III (26.31 %), Tuipang L (25. 68 %), Tuisumpui (26.80 %), Lungbun II (15.38 %), Council veng (12.01 %), Chheihlu (7.35 %), College veng I (5.19 %) and College veng II (3.12 %). The result clearly shows that urban areas attained almost the recommended requirement while high energy malnutrition was found at all rural areas.

Table 5.15 Attainment of Energy

Village Councils	Vitamin intake (Kilo Calorie per day)	Attainment	Attainment (%)	Status
Ahmypi	1812.05	-712.95	-28.24	Deficient
Chheihlu	2339.36	-185.64	-7.35	Deficient
Chhuarlung I	1405.64	-1119.36	-44.33	Deficient
Chhuarlung II	1620.26	-904.74	-35.83	Deficient
Chhuarlung III	1860.66	-664.34	-26.31	Deficient
Khopai	1848.48	-676.52	-26.79	Deficient
Lungbun I	1442.99	-1082.01	-42.85	Deficient

Lungbun II	2136.73	-388.27	-15.38	Deficient
Maubawk CH	1533.84	-991.16	-39.25	Deficient
Maubawk L	1300.37	-1224.63	-48.50	Deficient
Mawhre	1486.20	-1038.80	-41.14	Deficient
KM 10	1524.82	-1000.18	-39.61	Deficient
Old Tuisumpui	1621.81	-903.19	-35.77	Deficient
Siatlai	1435.77	-1089.23	-43.14	Deficient
Theiri	1669.71	-855.29	-33.87	Deficient
Theiva	1531.60	-993.40	-39.34	Deficient
Tuipang L	1876.48	-648.52	-25.68	Deficient
College veng I	2393.93	-131.07	-5.19	Deficient
College veng II	2446.12	-78.88	-3.12	Deficient
Council veng	2221.66	-303.34	-12.01	Deficient
Tuisumpui	1949.21	-575.79	-22.80	Deficient

Source: Field survey

5.4.8 Calcium Deficiency

Calcium is an essential element required for several life processes. As the structural component, it is required for the formation and maintenance of skeleton and teeth. It is also required for a number of essential processes. It is required for normal contraction of heart for its normal function, nervous activity and blood clothing. These later functions are carried out by ionized calcium present in the cells. The calcium levels in cells and plasma are well maintained (Gopalan, 2011). Pregnant women need minimum three servings of calcium at one day because it helps build baby's bones and regulates body's use of fluids (Natali Butler, Rd, LD, 2017). Among young and pregnant teens, the recommendation is five servings. Calcium is vital for making your baby's bones and teeth. It is found in both animal and plant foods. Dairy products and fish with edible bones such as sardines are rich in calcium. Breakfast cereals, dried fruit such as figs and apricots bread, almonds, tofu (a vegetable protein made from soya beans) and green leafy vegetables such as watercress, broccoli and curly kale are other good sources of calcium (DoH, 2016).

All the pregnant women in the study areas were suffered from calcium deficiency. The average daily intake was 242.44 milligram which is 75.76 per cent lower than the recommended value (1000 milligram). The highest deficiency in Calcium found in the village of Theiri (88.67 %) which was followed by Chhuarlung I (86.70 %), KM 10 (86.60 %), Theiva (85.82 %), Siatlai (85.73 %), Chhuarlung II (83.97 %), Old Tuisumpui (83.91 %), maubawk L (83.52 %), Tuisumpui (82.40 %), Ahmypi (82.00 %), Lungbun I (78.06 %), Maubawk CH (77.29 per cent), Chheihlu (75.10 per cent), Mawhre 74.90 %), Lungbun II (74.43 %), Khopai (73.88 %), Chhuaalung III (70.73 %), Council Veng (68.42 %), Tuipang l (67.79 %), College veng I (47.55 %) and College veng II (33.39 %).

Table 5.16 Calcium Nutritional Status

Village Councils	Calcium intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	179.97	-820.03	-82.00	Deficient
Chheihlu	249.03	-750.97	-75.10	Deficient
Chhuarlung I	132.96	-867.04	-86.70	Deficient
Chhuarlung II	160.32	-839.68	-83.97	Deficient
Chhuarlung III	292.68	-707.32	-70.73	Deficient
Khopai	261.25	-738.75	-73.88	Deficient
Lungbun I	219.39	-780.61	-78.06	Deficient
Lungbun II	255.69	-744.31	-74.43	Deficient
Maubawk CH	227.08	-772.92	-77.29	Deficient
Maubawk L	164.83	-835.17	-83.52	Deficient
Mawhre	251.04	-748.96	-74.90	Deficient
KM 10	133.95	-866.05	-86.60	Deficient
Old Tuisumpui	160.89	-839.11	-83.91	Deficient
Siatlai	142.66	-857.34	-85.73	Deficient
Theiri	113.26	-886.74	-88.67	Deficient
Theiva	141.83	-858.17	-85.82	Deficient
Tuipang L	322.09	-677.91	-67.79	Deficient
College veng I	524.54	-475.46	-47.55	Deficient
College veng II	666.12	-333.88	-33.39	Deficient
Council veng	315.75	-684.25	-68.42	Deficient
Tuisumpui	175.98	-824.02	-82.40	Deficient

Source: Field survey

5.4.9 Nutritional Status on Phosphorous

Phosphorus is a mineral that helps build strong bones to the baby as well as adult (About 85 % of all the phosphorus in the body is found in your bones.)It is also vital for muscle contractions, blood clotting, kidney function, nerve conduction, tissue and cell repair, and normal heart rhythm. It helps the body to generate and use energy (BCMAB, 2016). The major work of phosphorus is to regulate metabolism and conversion of food into energy. It is also involved in most physiological processes like supports acid-alkaline balance in the stomach, a positive effect on the heart, improves liver, kidney and biliary tract, provides the growth and division of cells, protects the parathyroid glands and prevents the immune deficiency etc. Thus it is required for the assimilation of the child's body of nutrients. It contributes in the formation of the digestive system, increases gastric secretion and excretion. We can also say that phosphorus help the internal organs of the baby and prepares them to work independently after birth (Nutrition and Vitamin Therapy, 2016).

The study finds that there was exceeding of the recommended allowances in phosphorous nutrients. The average daily recommended value for pregnant women was 550 milligram. But at the same time, all the pregnant women exceeded the daily allowance by 95.59 per cent. The highest exceeding dietary requirement was found in College veng II, here the daily phosphorous intake exceeds the recommended value by 220.93 per cent. College veng II was followed by College veng I (198.96 %), Chheihlu (152.60 %), Council veng (151.30 %), Chhuarlung III (142.14 %), Lungbun II (112.89 %), Tuipang L (105.36 %), Khopai (97.01 %), Tuisumpui (92.10 %), Ahmypi (87.81 %), KM 10 (78.98 %), Theiri (68.90 %), Old Tuisumpui (68.48 %), Maubawk L (61.58 %), Mawhre (59.41 %),Theiva (58.61 %), Siatlai (55.39 %), Chhuarlung II (54.36 %), Lungbun I (53.05 %), Maubawk Ch (46.47 %) and Chhuarlung I (41.01 %).

Table 5.17 Nutritional Status on Phosphorous

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	1032.97	482.97	87.81	Efficient
Chheihlu	1389.32	839.32	152.60	Efficient
Chhuarlung I	775.54	225.54	41.01	Efficient
Chhuarlung II	849.00	299.00	54.36	Efficient
Chhuarlung III	1331.78	781.78	142.14	Efficient
Khopai	1083.58	533.58	97.01	Efficient
Lungbun I	841.76	291.76	53.05	Efficient
Lungbun II	1170.89	620.89	112.89	Efficient
Maubawk CH	805.58	255.58	46.47	Efficient
Maubawk L	888.70	338.70	61.58	Efficient
Mawhre	876.74	326.74	59.41	Efficient
KM 10	984.37	434.37	78.98	Efficient
Old Tuisumpui	926.64	376.64	68.48	Efficient
Siatlai	854.64	304.64	55.39	Efficient
Theiri	928.95	378.95	68.90	Efficient
Theiva	872.33	322.33	58.61	Efficient
Tuipang L	1129.48	579.48	105.36	Efficient
College veng I	1644.27	1094.27	198.96	Efficient
College veng II	1765.12	1215.12	220.93	Efficient
Council veng	1382.12	832.12	151.30	Efficient
Tuisumpui	1056.56	506.56	92.10	Efficient

Source: Field survey

5.4.10 Iron Deficiency

During pregnancy iron stores could be depleted. That is why appropriate intake of iron is necessary to build and regulate these stores. If the iron level in early pregnancy is low it can cause premature birth and low birth weight of baby. Intake of animal and plant foods can help to have iron. The absorption is better as compared to plant sources. Red meat is the best source of iron. It is also found in other meats like chicken and fish. Leafy green vegetables, legumes and iron-enriched breakfast cereals are also other sources (DoH, 2016).

The recommended daily iron requirement is 38 milligram per day according to ICMR (Gopalan, 2011). The average intake in the present study was 20.90 milligrams per day which is 45.01 per cent lesser than the recommended dietary requirement. It indicates that there was iron malnutrition among pregnant women in the study areas. The deficiency was found in all villages except College veng I and II. In College veng I and II Iron intake exceed the recommended requirement value by 0.36 and 0.48 per cent respectively. The highest deficiency was found in Chhuarlung I where iron intake was 62.34 per cent less than the requirement, which was followed by Theiva (61.18 %), Siatlai (60.63 %), Chhuarlung II (60.05 %), Maubawk L (59.30 %), Theiri (57.17 %), Tuisumpui (56.56 %), KM 10 (55.49 %), Old Tuisumpui (54.42 %), Maubawk Ch (51.62 %), Tuipang L (51.15 %), Mawhre (49.94 %), Ahmypi (48.90 %), Lungbun I (41.88 %), Khopai (41.77 %), Lungbun II (40.22 %), Chhuarlung III (40.10 %), Chheihlu (30.42 per cent) and Council veng (20.02 %).

Table 5.18 Nutritional Status on Iron

Village Councils	Intake (Milligrams per day)	Attainment	Attainment (%)	Status
Ahmypi	19.42	-18.58	-48.90	Deficient
Chheihlu	26.44	-11.56	-30.42	Deficient
Chhuarlung I	14.31	-23.69	-62.34	Deficient
Chhuarlung II	15.18	-22.82	-60.05	Deficient
Chhuarlung III	22.76	-15.24	-40.10	Deficient
Khopai	22.15	-15.86	-41.72	Deficient
Lungbun I	22.09	-15.91	-41.88	Deficient
Lungbun II	22.72	-15.29	-40.22	Deficient
Maubawk CH	18.39	-19.62	-51.62	Deficient
Maubawk L	15.47	-22.53	-59.30	Deficient
Mawhre	19.02	-18.98	-49.94	Deficient
KM 10	16.91	-21.09	-55.49	Deficient
Old Tuisumpui	17.32	-20.68	-54.42	Deficient
Siatlai	14.96	-23.04	-60.63	Deficient
Theiri	16.28	-21.72	-57.17	Deficient
Theiva	14.75	-23.25	-61.18	Deficient

Tuipang L	18.56	-19.44	-51.15	Deficient
College veng I	38.14	0.14	0.36	Efficiency
College veng II	37.82	-0.18	-0.48	Efficiency
Council veng	29.63	-8.37	-22.03	Deficient
Tuisumpui	16.51	-21.49	-56.56	Deficient

Source: Field survey

5.4.11 Nutritional Status on Carotene (Vitamin A)

Carotene plays different important roles in the human body. It improves immunity, keeps vision healthy, good for the skin and helps fight free radicals etc. (Chhandita Chakravarty, 2015). Carotene is a fat-soluble vitamin. It is stored in the liver and fat cells of the body (NHS, 2012). A good intake of vitamin A during pregnancy builds up baby's natural stores in preparation for the first few months of life (Azais Braesco V and Pascal G, 2000). Taking the required amount of vitamin A in pregnancy must be proportion because too much can harm baby development and lead to birth defects on the one hand (NHS, 2012), while too little carries certain risks to the baby's development on the other (WHO). A healthy intake help baby to nutritional support they need for normal development. Deficiency can affect baby's immune function after birth, leaving them more susceptible to infection and illness (Azais Braesco V and Pascal G, 2000). Vitamin A also helps normal growth of bones and teeth to children and young people furthur supporting role in the immune system throughout pregnancy. The risk of deficiency is higher during the third trimester when requirements increase due to baby's development and increased blood volume. So pregnant body naturally prioritizes the baby's needs and hence vitamin A requirement is more (Van den Broek, N et al, 2010).

All the pregnant women could not attain the recommended dietary requirement in this vitamin. The average daily intake (749.08 micrograms) was lesser than the recommended value of 3300 micrograms per day by 77.30 per cent. The extreme malnutrition was found in Chhuarlung II where the per capita per day intake was 93.20 per cent less than the recommended requirement value. The village was followed by Old Tuisumpui (92.07 %), Theiri (93.31 %), KM 10 (91.41 %), Siatlai (89.61 %), Chhuarlung I (87.13 %), Tuisumpui (85.45 %), Theiva (84.45 %), Ahmypi (81.82 %), Khopai (80.13 %), Lungbun I (77.08 %), Chheihlu (76.28 %), Maubawk Ch (76.99 %), Mawhre (75.36 %), Tuipang L (73.08 %), Council veng (71.58 %), Lungbun II (70.20 %), Maubawk L (69.68 %), Chhuarlung III (61,08 %), College vneg I (54.21 %) and College veng II (41.25 %).

Table 5.19 Nutritional Status on Vitamin A (Carotene)

Village Councils	Intake (Micro gram per day)	Attainment	Attainment (%)	Status
Ahmypi	599.91	-2700.09	-81.82	Deficient
Chheihlu	783.96	-2516.04	-76.24	Deficient
Chhuarlung I	424.82	-2875.18	-87.13	Deficient
Chhuarlung II	224.46	-3075.54	-93.20	Deficient
Chhuarlung III	1284.39	-2015.61	-61.08	Deficient
Khopai	655.83	-2644.17	-80.13	Deficient
Lungbun I	756.41	-2543.59	-77.08	Deficient
Lungbun II	983.43	-2316.57	-70.20	Deficient
Maubawk CH	759.28	-2540.72	-76.99	Deficient
Maubawk L	1000.51	-2299.49	-69.68	Deficient
Mawhre	813.25	-2486.75	-75.36	Deficient
KM 10	283.35	-3016.65	-91.41	Deficient
Old Tuisumpui	261.85	-3038.15	-92.07	Deficient
Siatlai	342.98	-2957.02	-89.61	Deficient
Theiri	286.88	-3013.12	-91.31	Deficient
Theiva	513.04	-2786.96	-84.45	Deficient
Tuipang L	888.48	-2411.52	-73.08	Deficient
College veng I	1510.92	-1789.08	-54.21	Deficient
College veng II	1938.72	-1361.28	-41.25	Deficient
Council veng	938.02	-2361.98	-71.58	Deficient
Tuisumpui	480.27	-2819.73	-85.45	Deficient

Source: Field Survey

5.4.12 Nutritional Status on Thiamine (Vitamin B_1)

Human cells cannot utilize oxygen for energy and also the nervous system cannot function properly without Thiamine vitamin. Deficiency of this can leads to a disease in the form of neuritis and general weakness popularly called as beriberi. Abnormal growth and poor appetite in children are because of this vitamin deficiency. For adults also deficiency of Thiamine is responsible for the constipation. It further cause occurrence go headache, lack of stamina and chronic fatigue (Borsook, 1941). On the other it also performs several important functions during pregnancy. It helps both pregnant women and the baby to convert carbohydrates into energy. It plays an important role to baby's brain development. It also helps muscles, nervous system and heart function of a pregnant woman (Rebecca, 2017).

The average per capita per day intake of this vitamin was 1.38 milligrams during the study period which is 4.46 per cent higher than the recommended value (1.3 milligrams). Pregnant women from the 10 village (47.62 per cent) councils had attained the recommended daily requirement. The highest efficiency in this nutrition was found in College veng I where the daily vitamins intake of pregnant women exceeded the recommended value by 56.15 per cent. The village was followed by Chheihlu (44.00 %), College veng II (42.84 %), Council veng (37.86 %), Khopai (22.81 %), Lungbun II (20.04 %), Ahmypi (7.51 %), Chhuarlung III (7.08 %), KM 10 (4.93 %) and Tuisumpui (4.83 %). On the other hand the remaining 11 villages (52.38 %) are malnutrition. Deficiency were found in the villages like Maubawk L (23.21 %), Chhuarlung I (18.68 %), Maubawk Ch (14.30 %), Lungbun I (13.25 %), Theiva (12.72 %), Siatlai (10.53 %), Chhuarlung II (7.71 %), Mawhre (6.08 %), Tuipang L (2.47 %), Theiri (2,18 %) and Old Tuisumpui (1.32 %).

Table 5.20 Nutritional Status on Vitamin B_1 (Thiamine)

Village Councils	Intake (Milligrams per day)	Attainment	Attainment (%)	Status
Ahmypi	1.40	0.10	7.51	Efficient
Chheihlu	1.87	0.57	44.00	Efficient
Chhuarlung I	1.06	-0.24	-18.68	Deficient
Chhuarlung II	1.20	-0.10	-7.71	Deficient
Chhuarlung III	1.39	0.09	7.08	Efficient
Khopai	1.60	0.30	22.81	Efficient
Lungbun I	1.13	-0.17	-13.25	Deficient
Lungbun II	1.56	0.26	20.04	Efficient
Maubawk CH	1.11	-0.19	-14.30	Deficient
Maubawk L	1.00	-0.30	-23.21	Deficient
Mawhre	1.22	-0.08	-6.08	Deficient
KM 10	1.36	0.06	4.93	Efficient
Old Tuisumpui	1.28	-0.02	-1.32	Deficient
Siatlai	1.16	-0.14	-10.53	Deficient
Theiri	1.27	-0.03	-2.18	Deficient
Theiva	1.13	-0.17	-12.72	Deficient
Tuipang L	1.27	-0.03	-2.47	Deficient
College veng I	2.03	0.73	56.15	Efficient
College veng II	1.86	0.56	42.84	Efficient
Council veng	1.79	0.49	37.86	Efficient
Tuisumpui	1.36	0.06	4.83	Efficient

Source: Field survey

5.4.13 Nutritional Status on Riboflavin (Vitamin B_2)

Riboflavin is a water soluble vitamin that is flushed out of the body daily, so it must be restored every day. It is found in eggs, nuts, dairy products, meats, broccoli, brewer's yeast, Brussel sprouts, wheat germ, wild rice, mushrooms, soybeans, green leafy vegetables and whole grain and enriched cereals and bread. Riboflavin provides growth and overall good health. Riboflavin deficiency is link with anemia, sore throat, mouth or lip sores, and swelling of soft tissue in the mouth and inflammation of the skin according to the American Journal of Clinical Nutrition (Alina, 2015).

Deficiency of this vitamin founds at all pregnant women in the study area. The average daily intake during the study was 0.69 milligram which is 54.04 per cent lesser than the daily recommended requirement (1.5 milligram). The highest deficiency found in Maubawk L (68.82 %) followed by Lungbun I (66.79 %), Chhuarlung I (66.72 %), Maubawk Ch (65.52 %), Theiva (65.36 %), Old Tuisumpui (64.67 %), Mawhre (64.54 %), Siatlai (64.15 %), Chhuarlung II (62.52 %), Tuisumpui (61.37 %), Tuipang L (61.34 %), Theiri (60.56 %), KM 10 (57.99 %), Ahmypi (56.88 %), Khopai (54.29 %), Lungbun II (50.50 %), Council veng (47.55 %), Chheihlu (46.41 %), College veng I (36.65 %), Chhuarlung III (9.29 %) and College veng II (2.82 %).

Table 5.21 Nutritional Status on Vitamin B_2 (Riboflavin)

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	0.65	-0.85	-56.88	Deficient
Chheihlu	0.80	-0.70	-46.41	Deficient
Chhuarlung I	0.50	-1.00	-66.72	Deficient
Chhuarlung II	0.56	-0.94	-62.54	Deficient
Chhuarlung III	1.36	-0.14	-9.29	Deficient
Khopai	0.69	-0.81	-54.29	Deficient
Lungbun I	0.50	-1.00	-66.79	Deficient
Lungbun II	0.74	-0.76	-50.50	Deficient
Maubawk CH	0.52	-0.98	-65.52	Deficient
Maubawk L	0.47	-1.03	-68.82	Deficient
Mawhre	0.53	-0.97	-64.54	Deficient
KM 10	0.63	-0.87	-57.99	Deficient
Old Tuisumpui	0.53	-0.97	-64.67	Deficient
Siatlai	0.54	-0.96	-64.15	Deficient
Theiri	0.59	-0.91	-60.56	Deficient
Theiva	0.52	-0.98	-65.36	Deficient
Tuipang L	0.58	-0.92	-61.34	Deficient
College veng I	0.95	-0.55	-36.65	Deficient
College veng II	1.46	-0.04	-2.82	Deficient
Council veng	0.79	-0.71	-47.55	Deficient
Tuisumpui	0.58	-0.92	-61.37	Deficient

Source: Filed survey

5.4.14 Nutritional Status on Niacin (Vitamin B_3)

In this vitamin, except Maubawk L and Maubawk Ch, all the village councils attained the requirement. In these two villages the deficiency was not very high i.e., 10.01 per cent in Maubawk L and 0.51 in Maubawk Ch. The highest efficiency had been found in Chhehlu village where the Niachin intakes exceed the requirement by 76.063 per cent. The village was followed by Council veng (66.66 %), College veng I (64.96 %), Khopai (50.98 %), College veng II (43.35 %), Lungbun II (42.49 %), Ahnypi (37.84 %), Theiri (24.05 %), Tuipang L (19.68 %), Chhuarlung II (16.73 %), KM 10 (16.49 %), Old Tuisumpui (16.45 %), Chhuarlung III (15.73 %), Tuisumpui (15.15 %), Mawhre (8.81 %), Theiva (6.11 %), Lungbun I (5.85 %), Siatlai (1.01 %) and Chhuarlung I (0.49 %).

Table 5.22 Nutritional Status on Vitamin B_3 (Niacin)

Village councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	19.30	5.30	37.84	Efficient
Chheihlu	24.65	10.65	76.06	Efficient
Chhuarlung I	14.07	0.07	0.49	Efficient
Chhuarlung II	16.34	2.34	16.73	Efficient
Chhuarlung III	16.20	2.20	15.73	Efficient
Khopai	21.14	7.14	50.98	Efficient
Lungbun I	14.82	0.82	5.85	Efficient
Lungbun II	19.95	5.95	42.49	Efficient
Maubawk CH	13.93	-0.07	-0.51	Efficient
Maubawk L	12.60	-1.40	-10.01	Efficient
Mawhre	15.23	1.23	8.81	Efficient
KM 10	16.31	2.31	16.49	Efficient
Old Tuisumpui	16.30	2.30	16.45	Efficient
Siatlai	14.14	0.14	1.01	Efficient
Theiri	17.37	3.37	24.05	Efficient
Theiva	14.85	0.85	6.11	Efficient
Tuipang L	16.76	2.76	19.68	Efficient
College veng I	23.09	9.09	64.96	Efficient
College veng II	20.07	6.07	43.35	Efficient
Council veng	23.33	9.33	66.66	Efficient
Tuisumpui	16.12	2.12	15.15	Efficient

Source: Field survey

5.4.15 Nutritional Status on Pyridoxine (Vitamin B_6)

Even it has some beneficial side effects for a pregnant woman Pyridoxine is vital for the development of baby's nervous system and brain throughout each week of pregnancy. It could prevent low birth weight, provide requirement to the development of baby's brain and nervous system. This vitamin is found in beans, bananas, papayas, whole grain cereals etc. Garlic, beans, sweet potatoes, chickpeas, avocados, hazelnuts, sunflower seeds, brown rice, prune juice, spinach, bananas, papayas, chicken, pork loin, wild salmon, turkey, grass-fed beef, safe-catch elite tuna etc. are another source of this vitamin.

All the pregnant women in the study were under nutrition in this vitamin. The average intake (0.02 milligram/ day) was 98.60 per cent lower than the recommended dietary allowance i.e., 1.3 milligram per day. The highest deficiency was found in Chhuarlung I in which the deficiency was 99.69 per cent by comparing to the recommended value. The village was followed by Tuipang L (99.60 %), Old Tuisumpui (99.38 %), Theiri (99.38 %), Theiva (99.38 %), Tuisumpui (99.38 %), Ahmypi (99.07 %), Lungbun I (99.07 %), Maubawk L (99.07 %), Siatlai (99.07 %), Chheihlu (98.86 %), Chhuarlung III (98.86 %), Khopai (98.86 %), Lungbun II (98.86 %), Maubawk Ch (98.86 %), KM 10 (98.58 %), Council veng (98.53 %), Mawhre (97.73 %), College veng I (96.74 %), College veng II (96.33 %) and Chhuarlung II (95.38 %).

Table 5.23 Nutritional Status Vitamin B_6 (Pyridoxine)

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	0.01	-1.29	-99.07	Deficient
Chheihlu	0.01	-1.29	-98.86	Deficient
Chhuarlung I	0.00	-1.30	-99.69	Deficient
Chhuarlung II	0.06	-1.24	-95.38	Deficient
Chhuarlung III	0.01	-1.29	-98.86	Deficient
Khopai	0.01	-1.29	-98.86	Deficient
Lungbun I	0.01	-1.29	-99.07	Deficient
Lungbun II	0.01	-1.29	-98.86	Deficient
Maubawk CH	0.01	-1.29	-98.86	Deficient
Maubawk L	0.01	-1.29	-99.07	Deficient
Mawhre	0.03	-1.27	-97.73	Deficient
KM 10	0.02	-1.28	-98.58	Deficient
Old Tuisumpui	0.01	-1.29	-99.38	Deficient
Siatlai	0.01	-1.29	-99.07	Deficient
Theiri	0.01	-1.29	-99.38	Deficient
Theiva	0.01	-1.29	-99.38	Deficient
Tuipang L	0.01	-1.29	-99.60	Deficient
College veng I	0.04	-1.26	-96.74	Deficient
College veng II	0.05	-1.25	-96.33	Deficient
Council veng	0.02	-1.28	-98.53	Deficient
Tuisumpui	0.01	-1.29	-99.38	Deficient

Source: Field survey

5.4.16 Nutritional Status in Folic Acid

Folic acid also called as vitamin B9 provides "folate" is essential for baby's growth and development, particularly in the earliest weeks of pregnancy and the first trimester. It helps the body break down, use and create protein, the building block of human cells and DNA creation as well as formation of red blood cells. During the early pregnancy, folic acid helps the embryonic neural tube, the precursor to baby's brain and spinal cord, to properly close. It help in the formation of the fetus' heart and circulatory system and helps lower the chance your baby will have birth defects. Some of the food sources of folic acid are dark leafy green vegetables(263 mcg in 1 cup cooked spinach), avocado (120 mcg in 1 cup sliced), legumes (250 to 350 mcg in 1 cup beans, lentils or peas), broccoli (168 mcg in 1 cup chopped and cooked), asparagus (134 mcg in 1/2 cup), beets (80 mcg in two small), orange (35 mcg in 3/4 cup), foods fortified with folic acid, including whole grain cereal, bread, pasta and rice etc. (Heidi, 2017)

Folic acid malnutrition was found at all pregnant women except in College veng II. In College veng II, the pregnant women have attained the recommended value as they exceed the value by 66.32 per cent. All of the other villages, the deficiency has been found out at 65.83 per cent to the recommended requirement of 100 microgram per day. 91.55 per cent deficiency have found as the highest that is Tuipang L which is followed by 88.02 per cent deficiency in Old Tuisumpui, Lungbun I (87.71 per cent), Khopai (87.24 per cent), Chhuarlung II (87.14 per cent), Theiri (86.90 per cent), Ahmypi (86.58 per cent), Niawhtlang III (85.94 per cent), Mawhre (84.88 per cent), Chhuarlung I (84.69 per cent), Theiva (82.54 per cent), Chheihlu (81.55 per cent), Maubawk L (80.27 per cent), Siatlai (79.73 per cent), Maubawk Ch (79.19 per cent), Chhuarlung III (74.20 per cent), Council veng (73.76 per cent), Tuisumpui (72.30 per cent), Lungbun II (71.22 per cent), College veng I (31.65 per cent).

Table 5.24 Nutritional Status on Folic Acid

Village Councils	Intake (Micro gram per day)	Attainment	Attainment (%)	Status
Ahmypi	13.42	-86.58	-86.58	Deficient
Chheihlu	18.45	-81.55	-81.55	Deficient
Chhuarlung I	15.31	-84.69	-84.69	Deficient
Chhuarlung II	12.86	-87.14	-87.14	Deficient
Chhuarlung III	174.20	74.20	74.20	Deficient
Khopai	12.76	-87.24	-87.24	Deficient
Lungbun I	12.29	-87.71	-87.71	Deficient
Lungbun II	28.78	-71.22	-71.22	Deficient
Maubawk CH	20.81	-79.19	-79.19	Deficient
Maubawk L	19.73	-80.27	-80.27	Deficient
Mawhre	15.12	-84.88	-84.88	Deficient
KM 10	14.06	-85.94	-85.94	Deficient

Old Tuisumpui	11.98	-88.02	-88.02	Deficient
Siatlai	20.27	-79.73	-79.73	Deficient
Theiri	13.10	-86.90	-86.90	Deficient
Theiva	17.46	-82.54	-82.54	Deficient
Tuipang L	8.45	-91.55	-91.55	Deficient
College veng I	68.35	-31.65	-31.65	Deficient
College veng II	166.32	66.32	66.32	Efficient
Council veng	26.24	-73.76	-73.76	Deficient
Tuisumpui	27.70	-72.30	-72.30	Deficient

Source: Field survey

5.4.17 Nutritional Status on Vitamin C

Vitamin C is vital to the human body as it helps build the immune system and the connective tissues. Pregnant women are at risk as parts of their immune system are suppressed by hormones and need collagen for the baby's growth. Vitamin C then comes as a saving grace that can help boost the immunity of pregnant women. The main source of this vitamin are tomato, pepper (red, yellow and green), cabbage, kale, broccoli, sweet potato, cauliflower, orange, lemon, and tangerine, berries, apples, grapes, apricots, persimmons, peaches, strawberries, meat, fish, milk, parsley etc. (Aliya khan, 2018). Vitamin C deficiency is still very high in many developing countries also in pregnant women. In the developing countries pregnant women are frequently hospitalized for several preventable reasons such as anemia in pregnancy, mostly iron-deficient anemia (IDA) and the upper/lower respiratory tract infections (WHO, 1992). It is estimated that 33 to 75 per cent of women in developing countries are affected by anemia during pregnancy and its predisposing factors include multi-parity, low socio-economic status, malaria infestation, HIV infection and others (Ajaii, 1988 & Fleing et al., 1986).

Malnutrition in vitamin C in the study area was quite good as compared to other minor vitamins. The average vitamin C intake (27.24 milligram/day) was lower than the recommended value (30 milligram per day) by 9.20 per cent. Some villages had attained the recommended requirement, the urban area like college veng I had exceeded the recommended value by 139.16 per cent, College veng II (112.27 %), Chhuarlung II (1.80 %), Chheihlu (0.78 %) and Mawhre (0.27 %). On the other hand, the remaining villages had deficiency in this nutrients like 61.33 per cent deficient in Theiri village followed by Chhuarlung I (50.74 %), Ahmypi (48.16 %), Theiva (42.97 %), Chhuarlung III (36.50 %), Siatlai (33.77 %), KM 10 (32.75 %), Tuipang L (31.74 %), Khopai (25.50 %), maubawk Ch (17.28 %), Tuisumpui (17.20 %), Lungbun II (17.18 %), Maubawk L (16.39 %), Old Tuisumpui (11.40 %), Council veng (4.54 %) and Lungbun II (0.01 %).

Table 5.25 Nutritional Status on Vitamin C

Village Councils	Intake (Milligrams per day)	Attainment	Attainment (%)	Status
Ahmypi	15.55	-14.45	-48.16	Deficient
Chheihlu	30.23	0.23	0.78	Efficient
Chhuarlung I	14.78	-15.22	-50.74	Deficient
Chhuarlung II	30.54	0.54	1.80	Efficient
Chhuarlung III	19.05	-10.95	-36.50	Deficient
Khopai	22.35	-7.65	-25.50	Deficient
Lungbun I	24.85	-5.15	-17.18	Deficient
Lungbun II	30.00	0.00	-0.01	Deficient
Maubawk CH	24.82	-5.18	-17.28	Deficient
Maubawk L	25.08	-4.92	-16.39	Deficient
Mawhre	30.08	0.08	0.27	Efficient
KM 10	20.17	-9.83	-32.75	Deficient
Old Tuisumpui	26.58	-3.42	-11.40	Deficient
Siatlai	19.87	-10.13	-33.77	Deficient
Theiri	11.60	-18.40	-61.33	Deficient
Theiva	17.11	-12.89	-42.97	Deficient
Tuipang L	20.48	-9.52	-31.74	Deficient
College veng I	71.75	41.75	139.16	Efficient
College veng II	63.68	33.68	112.27	Efficient
Council veng	28.64	-1.36	-4.54	Deficient
Tuisumpui	24.84	-5.16	-17.20	Deficient

Source: Field survey

5.4.18 Malnutrition on Choline

Choline is one of the most essential for normal function of all cells because its metabolites, assures the structural integrity and signaling functions of cell membranes. So it is the major source of methyl groups in the diet. It directly affects cholinergic neurotransmission and lipid transport from liver (Zeisel et al., 1994). During pregnancy and lactation the demand of choline is very high because transport of choline from mother to fetus depletes maternal plasma choline in humans (Sweiry et al., 1986, Sweiry & Yudilevich, 1985, Mc Mahon & Farrell, 1985).

In this vitamin, all the pregnant women were under nutrition. The average per capita per day intake (87.24 milligram) was 79.47 per cent less than the recommended dietary allowances (425 milligram/day). The highest deficiency was found at 90.84 per cent in Theiri village which was followed by Siatlai (90.25 %), Chhuarlung I (89.49 %), Ahmypi (87.96 %), Tuipang L (87.40 %), Theiva (87.00 %), Lungbun I (85.70 %), KM 10 (85.26 %), Tuisumpui (84.79 %), Chhuarlung III (84.24 %), Khopai (84.18 %), Maubawk Ch (83.70 %), Chhuarlung II (84.63 %), Old Tuisumpui (82.47 %), Mawhre (81.44 %), Maubawk L (76.21 %), Lungbun II (74.69 %), Council veng (71.32 %), Chheihlu (70.15 %), College veng II (54.62 %) and College veng I (33.61 %).

Table 5.26 Nutritional Status on Choline

Village Councils	Intake (Milligrams per day)	Attainment	Attainment (%)	Status
Ahmypi	51.17	-373.83	-87.96	Deficient
Chheihlu	126.84	-298.16	-70.15	Deficient
Chhuarlung I	44.67	-380.33	-89.49	Deficient
Chhuarlung II	69.59	-355.41	-83.63	Deficient
Chhuarlung III	66.98	-358.02	-84.24	Deficient
Khopai	67.22	-357.78	-84.18	Deficient
Lungbun I	60.78	-364.22	-85.70	Deficient
Lungbun II	107.55	-317.45	-74.69	Deficient

Maubawk CH	69.27	-355.73	-83.70	Deficient
Maubawk L	101.13	-323.87	-76.21	Deficient
Mawhre	78.87	-346.13	-81.44	Deficient
KM 10	62.63	-362.37	-85.26	Deficient
Old Tuisumpui	74.52	-350.48	-82.47	Deficient
Siatlai	41.43	-383.57	-90.25	Deficient
Theiri	38.95	-386.05	-90.84	Deficient
Theiva	55.24	-369.76	-87.00	Deficient
Tuipang L	53.55	-371.45	-87.40	Deficient
College veng I	282.17	-142.83	-33.61	Deficient
College veng II	192.86	-232.14	-54.62	Deficient
Council veng	121.87	-303.13	-71.32	Deficient
Tuisumpui	64.65	-360.35	-84.79	Deficient

Source: Field survey

5.4.19 Nutritional Status on Magnesium

Magnesium (Mg) is one of the essential minerals required by humans. It work with many enzymes to regulate body temperature, synthesis nucleic acids, and proteins as well as maintaining electrical potentials in nerves and muscle membranes (Makrides et al., 2014, McNamara et al., 2015). Magnesium is found in Dairy products, breads and cereals, legumes, vegetables, and meats (Zaloga, 1989). The common causes of magnesium deficiency include inadequate dietary intake or gastrointestinal absorption, increased losses through the gastrointestinal or renal systems, and increased the requirement for magnesium, such as in pregnancy (Seelig, 1980 & Hurley, 1981).

Magnesium intake was very high in the study area. All the pregnant women had exceeds the recommended dietary requirement. The average intake (652.78 milligram/day) exceeds the recommended value (200 milligram per day) by 226.39 per cent. The highest intake had been found in Chheihlu village in which the intake exceeds the recommended value by 380.66 per cent. The village was followed by Council veng (342.95 %), College veng I (321.24 %), Khopai (306.51 %), Lungbun II (278.05 %), Ahmypi (275.84 %), College veng II (248.24 %), Theiri (233.18 %), Chhuarlung II (215.52 %), Tuipang L (211.20 %), Chhuarlung III (207.18 %), Old Tuisumpui (197.28 %), KM 10 (197.08 %), Tuisumpui (190.93 %), Mawhre (186.40 %), Lungbun I (185.56 %), Theiva (169.74 %), Chhuarlung I (169.68 %), Maubawk Ch (155.55 %), Siatlai (154.51 %) and Maubawk L (126.93 %). Thus all the pregnant women in the study area attained the recommended daily requirement as shown in the table 5.27.

Table 5.27 Nutritional status on Magnesium

Village Councils	Intake (per capita per day in Milligram)	Attainment	Attainment (%)	Status
Ahmypi	751.68	551.68	275.84	Efficient
Chheihlu	961.32	761.32	380.66	Efficient
Chhuarlung I	539.36	339.36	169.68	Efficient
Chhuarlung II	631.05	431.05	215.52	Efficient
Chhuarlung III	614.37	414.37	207.18	Efficient
Khopai	813.02	613.02	306.51	Efficient
Lungbun I	571.12	371.12	185.56	Efficient
Lungbun II	756.09	556.09	278.05	Efficient
Maubawk CH	511.10	311.1	155.55	Efficient
Maubawk L	453.87	253.87	126.93	Efficient
Mawhre	572.79	372.79	186.40	Efficient
KM 10	594.16	394.16	197.08	Efficient
Old Tuisumpui	594.57	394.57	197.28	Efficient
Siatlai	509.01	309.01	154.51	Efficient
Theiri	666.35	466.35	233.18	Efficient
Theiva	539.48	339.48	169.74	Efficient
Tuipang L	622.40	422.4	211.20	Efficient
College veng I	842.48	642.48	321.24	Efficient
College veng II	696.47	496.47	248.24	Efficient
Council veng	885.89	685.89	342.95	Efficient
Tuisumpui	581.86	381.86	190.93	Efficient

Source: Field survey

5.4.20 Malnutrition on Sodium

For the present day the role of excessive dietary salt (sodium chloride, NaCl) in causing hypertension, cardiovascular disease and stroke is very common (Claas & Arnet, 2016). So sodium essential for healthy physiological function since it is required for the regulation of fluid levels, temperature and pH. During pregnancy salt intake is likely to enable the numerous physiological changes that must occur to support the growth and development of the placenta and foetus because these changes affect every organ system in the human body and begin shortly after conception (Soma et al., 2016).

All the pregnant women could not attain the daily requirement (3900 milligrams per day). The average intake was 99.14 per cent less than the recommended requirement. Very high deficiency was found in all villages as shown in the table 5.29 The highest deficiency had been found in Ahmypi and Theiri village where the deficiency exceeds the recommended value by 99.63 per cent which was followed by Chhuarlung II (99.60 %), Chhuarlung I (99.56 %), Mawhre (99.48 %), Maubawk Ch (99.47 %), Chhuarlung III (99.47 %), Siatlai (99.42 %), Khopai (99.41 %), Theiva (99.35 %), Old Tuisumpui (99.32 %), Tuisumpui (99.32 %), Maubawk L (99.30 %), Chheihlu (99.27 %), Lungbun I (99.26 %), Tuipang L (99.12 %), KM 10 (99.08 %), Lungbun II (99.88 %), Council veng (98.63 %), College veng I (97.51 %) and College veng II (97.16 %).

Table 5.28 Nutrition Status on Sodium

Village Councils	Intake (per capita per day in Milligram)	Attainment	Attainment (%)	Status
Ahmypi	14.30	-3885.7	-99.63	Deficient
Chheihlu	28.35	-3871.65	-99.27	Deficient
Chhuarlung I	17.08	-3882.92	-99.56	Deficient
Chhuarlung II	15.45	-3884.55	-99.60	Deficient
Chhuarlung III	20.76	-3879.24	-99.47	Deficient
Khopai	23.14	-3876.86	-99.41	Deficient
Lungbun I	29.01	-3870.99	-99.26	Deficient
Lungbun II	43.49	-3856.51	-98.88	Deficient
Maubawk CH	20.62	-3879.38	-99.47	Deficient
Maubawk L	27.33	-3872.67	-99.30	Deficient
Mawhre	20.38	-3879.62	-99.48	Deficient
KM 10	35.90	-3864.1	-99.08	Deficient

Old Tuisumpui	26.33	-3873.67	-99.32	Deficient
Siatlai	22.50	-3877.5	-99.42	Deficient
Theiri	14.25	-3885.75	-99.63	Deficient
Theiva	25.44	-3874.56	-99.35	Deficient
Tuipang L	34.15	-3865.85	-99.12	Deficient
College veng I	97.29	-3802.71	-97.51	Deficient
College veng II	110.80	-3789.2	-97.16	Deficient
Council veng	53.29	-3846.71	-98.63	Deficient
Tuisumpui	26.44	-3873.56	-99.32	Deficient

Source: Field survey

5.4.21 Potassium Deficiency

For maintaining of electrolytic balance in human body, potassium plays an important role. It is also important for foetal growth. A right amount of potassium mineral is required because low potassium intake can cause edema during the 7-9 months of pregnancy on the one hand and very high levels of potassium can cause hyperkalemia on the other hand. This mineral also plays a role in muscle contractions, transmission of signals across nerves etc. It also works for optimum blood pressure levels. The amount of blood in the body increases during pregnancy. Due to this potassium is required to maintain optimum chemical balance. It can also reduce cramps in the legs during pregnancy (Kumar, 2016). Potassium mineral is found in different kind of foodstuff like potato with skin, plums, raisins, prune juice, lima beans, acorn squash, cubed, banana, spinach, tomato , orange raisin bran cereal, , artichoke, molasses,, tomato,, sunflower seeds, orange, almonds etc.

The recommended requirement of potassium for pregnant women is 2000 milligram per day that a high deficiency was found in all the pregnant women in the study area. The average intake (442.65 milligram/day) was 77.87 per cent less than the recommended dietary requirement. Ahmypi village got the highest deficiency where the potassium nutrient is deficient by 88.63 per cent of the recommended value. The village was followed by Chhuarlung II (87.83 %), Chhuarlung I (87.10 %), Lungbun I (86.52 %), Tuipang L (86.17 %), Chhuarlung III (85.79 %), Siatlai (85.17 %), Theiri (85.01 %), Khopai (83.84 %), Mawhre (81.47 %), Theiva (78.98 %), Maubawk Ch (78.91 %), Maubawk L (78.57 %),Tuisumpui (77.97 %), Old Tuisumpui (77.55 %), Chheihlu (76.51 %), Council veng (74.55 %), Lungbun II (68.75 %), College veng II (65.46 %), KM 10 (50.53 %) and College veng I (49.92 %).

Table 5.29 Nutrition Status on Potassium

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	227.41	-1772.59	-88.63	Deficient
Chheihlu	469.78	-1530.22	-76.51	Deficient
Chhuarlung I	258.04	-1741.96	-87.10	Deficient
Chhuarlung II	243.44	-1756.56	-87.83	Deficient
Chhuarlung III	284.26	-1715.74	-85.79	Deficient
Khopai	323.13	-1676.87	-83.84	Deficient
Lungbun I	269.65	-1730.35	-86.52	Deficient
Lungbun II	625.09	-1374.91	-68.75	Deficient
Maubawk CH	421.82	-1578.18	-78.91	Deficient
Maubawk L	428.66	-1571.34	-78.57	Deficient
Mawhre	370.55	-1629.45	-81.47	Deficient
KM 10	989.44	-1010.56	-50.53	Deficient
Old Tuisumpui	448.93	-1551.07	-77.55	Deficient
Siatlai	296.68	-1703.32	-85.17	Deficient
Theiri	299.79	-1700.21	-85.01	Deficient
Theiva	420.31	-1579.69	-78.98	Deficient
Tuipang L	276.67	-1723.33	-86.17	Deficient
College veng I	1001.51	-998.49	-49.92	Deficient
College veng II	690.87	-1309.13	-65.46	Deficient
Council veng	509.03	-1490.97	-74.55	Deficient
Tuisumpui	440.56	-1559.44	-77.97	Deficient

Source: Field survey

5.4.22 Nutritional Efficiency in Copper

Copper nutrition play an important role especially in building connective tissues, iron metabolism, production of melatonin, heart function, immune system function and development of the central nervous system (Cetin, 2010, Spencer et al., 2015). This mineral is vital cofactor of antioxidant enzymes (Spencer et al., 2015). It plays an important role in removing pregnancy oxidative stress. Pre-eclampsia, foetal growth restriction and abortion might be there without this protective mechanism (DLK, 2008, Spencer et al., 2015).

The study found almost all the pregnant women were sufficient in copper nutrition. The average intake (1.47 milligram/ day) was 28.19 per cent higher than the recommended dietary requirement. Only three villages could not attain the recommended value but the deficiency was not high and it may be treated as sufficient. The deficiency had been found in Chhuarlung I (6.54 %), Maubawk L (2.63 %), Tuipang L (0.15 %). The highest efficiency was found in College veng I in which the copper intake of a pregnant woman exceeds the recommended value by 112.24 per cent. College veng I is followed by Chheihlu (69.78 %), KM 10 (68.03 %), College veng II (69.18 per cent), Council veng (60.25 %), Lungbun II (52.02 %), Khopai (40.07 %), Chhuarlung II (27.89 %), Ahmypi (21.45 %), Tuisumpui (16.86 %), Mawhre (16.61 %), Theiri (14.44 %), Old Tuisumpui (10.05 %), Maubawk Ch (8.91 %), Chhuarlung III (8.20 %), Theiva (7.37 %), Lungbun I (5.18 %) and Siatlai (0.85 %).

Table 5.30 Nutrition Status on Copper

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	1.40	0.25	21.45	Efficient
Chheihlu	1.95	0.80	69.78	Efficient
Chhuarlung I	1.07	-0.08	-6.54	Deficient
Chhuarlung II	1.47	0.32	27.89	Efficient
Chhuarlung III	1.24	0.09	8.20	Efficient
Khopai	1.61	0.46	40.07	Efficient
Lungbun I	1.21	0.06	5.18	Efficient
Lungbun II	1.75	0.60	52.02	Efficient
Maubawk CH	1.25	0.10	8.91	Efficient
Maubawk L	1.12	-0.03	-2.63	Deficient
Mawhre	1.34	0.19	16.61	Efficient
KM 10	1.93	0.78	68.03	Efficient
Old Tuisumpui	1.27	0.12	10.05	Efficient
Siatlai	1.16	0.01	0.85	Efficient
Theiri	1.32	0.17	14.44	Efficient
Theiva	1.23	0.08	7.37	Efficient
Tuipang L	1.15	0.00	-0.15	Deficient
College veng I	2.44	1.29	112.24	Efficient
College veng II	1.85	0.70	61.18	Efficient
Council veng	1.84	0.69	60.25	Efficient
Tuisumpui	1.34	0.19	16.86	Efficient

Source: Field survey

5.4.23 Manganese Deficiency

Manganese is one of the essential nutrients for human as well as animal. It is needed for development and function of skeletal systems, reproductive hormones, enzymes activation and cell protection by antioxidant function. High manganese cause fetus during pregnancy (Wood, 2009). Manganese mineral is an important mineral nutrient in humans and other animals and is required for normal amino acid, lipid, protein, and carbohydrate metabolism. It can act by activating certain enzymes or through manganese-dependent metalloenzymes that are needed for proper immune function, regulation of blood sugars and cellular energy, reproduction, digestion, bone growth, and the body’s defense against free radicals. At the same time excessive intake of manganese is a potent neurotoxin (Aschner et al., 2005). Major sources of manganese minerals are seafood (Mussels, Cooked), nuts (Hazelnuts), seeds (Pumpkin), bread (Whole-Wheat), tofu (Firm, Raw), beans (Butter/Lima Beans, Cooked), fish (Bass, Cooked), spinach (Cooked), whole grains (Brown Rice), tea (Black, Brewed) etc. (Daisy, 2018).

Deficiency was found in every pregnant woman at all village councils in manganese mineral. The average intake was 4.58 milligram per day which is 54.19 per cent less than the recommended dietary requirement (10 milligram per day). The poorest manganese minerals intake was Maubawk L having 67.22 per cent deficiency of the requirement. Maubawk was followed by Maubawk Ch (63.97 %), Siatlai (63.63 %), Theiva (62.16 %), Chhuarlung I (62.11 %), Lungbun I (60.29 %), Mawhre (60.11 %), Old Tuisumpui (59.28 %), Tuisumpui (57.76 %), KM 10 (57.56 %), Chhuarlung III (57.14 %), Tuipang L (57.00 %), Chhuarlung II (56.00 %), Theiri (53.39 %), College veng II (50.90 %), Lungbun II (48.08 %), Ahmypi (47.68 %), Khopai (43.52 %), College veng I (39.97 %), Council veng (39.87 %) and Chheihlu (30.33 %).

Table 5.31 Nutrition Status on Manganese

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	5.23	-4.77	-47.68	Deficient
Chheihlu	6.97	-3.03	-30.33	Deficient
Chhuarlung I	3.79	-6.21	-62.11	Deficient
Chhuarlung II	4.40	-5.60	-56.00	Deficient
Chhuarlung III	4.29	-5.71	-57.14	Deficient
Khopai	5.65	-4.35	-43.52	Deficient
Lungbun I	3.97	-6.03	-60.29	Deficient
Lungbun II	5.19	-4.81	-48.08	Deficient
Maubawk CH	3.60	-6.40	-63.97	Deficient
Maubawk L	3.28	-6.72	-67.22	Deficient
Mawhre	3.99	-6.01	-60.11	Deficient
KM 10	4.24	-5.76	-57.56	Deficient
Old Tuisumpui	4.07	-5.93	-59.28	Deficient
Siatlai	3.64	-6.36	-63.63	Deficient

Theiri	4.66	-5.34	-53.39	Deficient
Theiva	3.78	-6.22	-62.16	Deficient
Tuipang L	4.30	-5.70	-57.00	Deficient
College veng I	6.00	-4.00	-39.97	Deficient
College veng II	4.91	-5.09	-50.90	Deficient
Council veng	6.01	-3.99	-39.87	Deficient
Tuisumpui	4.22	-5.78	-57.76	Deficient

Source: Field survey

5.4.24 Malnutrition on Molybdenum Minerals

In human beings, molybdenum is a component of two enzymes-xanthine oxidase, which is involved in the degradation of adenosine monophosphate, and sulfite oxidase. It is described only in one patient who was on prolonged total parenteral nutrition (Mills and Davis, 1987). Molybdenum supplementation during pregnancy is contraindicated. It is require for the functioning of human body include energy creation inside the human cells, normal development of nervous system and the processing of wastes in kidneys. Liver, grains, leafy vegetables, nuts, peas, lentils and beans are the main sources of molybdenum (Gideon, 2017).

All the pregnant women were severely under nutrition in this mineral. The mean intake (0.40 micro gram/ day) was deficient by 99.17 per cent of the recommended dietary allowance (50 micro grams per day). The severe deficiency had been found in Theiva in which the deficiency percentage was 99.36 to the recommended requirement. The village was followed by Maubawk L and Siatlai (99.35 %), Lungbun I (99.34 %), Chhuarlung I (99.33 %), Chhuarlung III (99.29 %), Tuipang L and Mawhre (99.28 %), Maubawk Ch (99.26 %), Chhuarlung II (99.24 %), Old Tuisumpui (99.23 %), Tuisumpui (99.22 %), Theiri (99.21 %), Ahmypi and Colle veng I (99.16 %), Council veng (99.11

%), Khopai (99.08 %), Lungbun II (99.05 %), KM 10 (98.93 %), Chheihlu (98.92 %) and College veng I (98.87 %).

Table 5.32 Nutrition Status on Molybdenum

Village Councils	Intake (Micro gram per day)	Attainment	Attainment (%)	Status
Ahmypi	0.42	-49.58	-99.16	Deficient
Chheihlu	0.54	-49.46	-98.92	Deficient
Chhuarlung I	0.33	-49.67	-99.33	Deficient
Chhuarlung II	0.38	-49.62	-99.24	Deficient
Chhuarlung III	0.36	-49.64	-99.29	Deficient
Khopai	0.46	-49.54	-99.08	Deficient
Lungbun I	0.33	-49.67	-99.34	Deficient
Lungbun II	0.47	-49.53	-99.05	Deficient
Maubawk CH	0.37	-49.63	-99.26	Deficient
Maubawk L	0.33	-49.67	-99.35	Deficient
Mawhre	0.36	-49.64	-99.28	Deficient
KM 10	0.53	-49.47	-98.93	Deficient
Old Tuisumpui	0.39	-49.61	-99.23	Deficient
Siatlai	0.32	-49.68	-99.35	Deficient
Theiri	0.40	-49.60	-99.21	Deficient
Theiva	0.32	-49.68	-99.36	Deficient
Tuipang L	0.36	-49.64	-99.28	Deficient
College veng I	0.57	-49.43	-98.87	Deficient
College veng II	0.42	-49.58	-99.16	Deficient
Council veng	0.45	-49.55	-99.11	Deficient
Tuisumpui	0.39	-49.61	-99.22	Deficient

Source: Field survey

5.4.25 Zink Malnutrition

Zinc minerals played the fundamental processes of cell differentiation and replication in term of an extensively in nucleic acid and protein metabolism and, hence, in the (Hambidge et al., 1986). Deficiency of this mineral during pregnancy caused from inadequately treated acrodermatitis enteropathica- a hereditary condition in which zinc absorption is impaired (Hambidge et al., 1975). Zinc minerals are mainly found in cereals like bran, whole grain and multigrain cereals, wheat germ, pumpkin seeds, sesame seeds, meat like beef, lamb, pork, chicken and turkey, shellfish like crabs, clams, lobsters and mussels, squash seeds, fruits, vegetables, dark chocolate, spinach, mushroom and nuts are etc. (Vineetha, 2014).

Deficiency was found at all pregnant women in the study area. The average zink intake (6.05 milligram/ day) was 35.66 per cent lower than the recommended allowance of 9.4 milligram per day. The severe malnutrition of zinc intake had been found in Maubawk L, the inatke in the village was less than 54.08 per cent to the recommended value. The village was followed by Siatlai (49.34 %), Theiva (47.88 %), Maubawk Ch (47.13 %), Chuarlung I (45.93 %), Lungbun I (44.11 %), Mawhre (43.83 %), Old Tuisumpui (41.32 %), Tuisumpui (40.13 %), Chhuarlung III (39.89 %), KM 10 (39.51 %), Tuipang L (38.50 %), Chhuarlung II (37.38 %), Theiri (34.43 %), College veng I (31.80 %), Ahmypi (26.53 %), Lungbun II (26.10 %), Khopai (20.40 %), Council veng (17.20 %), College veng I (16.26 %) and Chheihlu (7.11 %).

Table 5.33 Nutrition Status on Zink

Village Councils	Intake (Milligram per day)	Attainment	Attainment (%)	Status
Ahmypi	6.91	-2.49	-26.53	Deficient
Chheihlu	8.73	-0.67	-7.11	Deficient
Chhuarlung I	5.08	-4.32	-45.93	Deficient
Chhuarlung II	5.89	-3.51	-37.38	Deficient
Chhuarlung III	5.65	-3.75	-39.89	Deficient
Khopai	7.48	-1.92	-20.40	Deficient
Lungbun I	5.25	-4.15	-44.11	Deficient
Lungbun II	6.95	-2.45	-26.10	Deficient
Maubawk CH	4.97	-4.43	-47.13	Deficient
Maubawk L	4.32	-5.08	-54.08	Deficient
Mawhre	5.28	-4.12	-43.83	Deficient
KM 10	5.69	-3.71	-39.51	Deficient
Old Tuisumpui	5.52	-3.88	-41.32	Deficient
Siatlai	4.76	-4.64	-49.34	Deficient
Theiri	6.16	-3.24	-34.43	Deficient
Theiva	4.90	-4.50	-47.88	Deficient

Tuipang L	5.78	-3.62	-38.50	Deficient
College veng I	7.87	-1.53	-16.26	Deficient
College veng II	6.41	-2.99	-31.80	Deficient
Council veng	7.78	-1.62	-17.20	Deficient
Tuisumpui	5.63	-3.77	-40.13	Deficient

Source: Field Survey

5.4.26 Malnutrition on Chromium Mineral

Chromium mineral is functions for maintain of blood sugar levels. Intake of Chromium is helpful for people who have diabetes. It is essential for balance chromium consumption. Chromium minerals are commonly found in broccoli, tomatoes, green beans, potatoes, lettuce, barley, oats, chicken, beef, bananas, apples, eggs, cow's milk, brown rice, black pepper etc. (Debolina, 2015)

An extreme malnutrition had been found at all pregnant women in the study area in chromium mineral. The mean intake was only 0.04 micro grams per day per pregnant women which is 99.86 per cent less than the recommended dietary requirement (30 micro gram/ day). The extreme deficiency in this mineral was found in Maubawk L and Siatlai village where all pregnant women deficient at 99.90 per cent of the requirement value. It was followed by Chhuarlung I, Maubawk Ch and Theiva (99.98 %), Lungbun I, Mawhre, KM 10 and Tuipang L (99.88 %), Chhuarlung II, Chhuarlung III, Old Tuisumpui and Theiri (99.87 %), Tuisumpui (99.86 %), Ahmypi (99.85 %), Lungbun II and College veng II (99.84 %), Khopai (99.83 %), Council veng (99.82 %) and College veng I (99.80 %).

Table 5.34 Nutritional Status on Chromium Mineral

Village Councils	Intake (Micro gram per day)	Attainment	Attainment (%)	Status
Ahmypi	0.04	-29.96	-99.85	Deficient
Chheihlu	0.06	-29.94	-99.79	Deficient
Chhuarlung I	0.03	-29.97	-99.89	Deficient
Chhuarlung II	0.04	-29.96	-99.87	Deficient
Chhuarlung III	0.04	-29.96	-99.87	Deficient
Khopai	0.05	-29.95	-99.83	Deficient
Lungbun I	0.04	-29.96	-99.88	Deficient
Lungbun II	0.05	-29.95	-99.84	Deficient
Maubawk CH	0.03	-29.97	-99.89	Deficient
Maubawk L	0.03	-29.97	-99.90	Deficient
Mawhre	0.04	-29.96	-99.88	Deficient
KM 10	0.03	-29.97	-99.88	Deficient
Old Tuisumpui	0.04	-29.96	-99.87	Deficient
Siatlai	0.03	-29.97	-99.90	Deficient
Theiri	0.04	-29.96	-99.87	Deficient
Theiva	0.03	-29.97	-99.89	Deficient
Tuipang L	0.04	-29.96	-99.88	Deficient
College veng I	0.06	-29.94	-99.80	Deficient
College veng II	0.05	-29.95	-99.84	Deficient
Council veng	0.05	-29.95	-99.82	Deficient
Tuisumpui	0.04	-29.96	-99.86	Deficient

Source: Field survey

5.4.27 Nutritional Status on Selenium Mineral

Selenium minerals work for conversion of hydrogen peroxide to water. It is an important component of the body's defense against free radical damage (Hoekstra, 1975). Cell functions, restoring and maintaining muscles, fertility and cancer prevention are related with intake of selenium mineral. It regulates the growth and development as well as fights against infection (Dorosti, 2004, Smolin & Grosvenor, 2011). According to Berti et al., 2011, Lippincott & Wilkins (2008) human body absorbs 55 per cent to 70 per cent of selenium from foods. Generally, selenium deficiency is not found in human body (Smolin, 2011). Selenium deficiency can cause recurrent pregnancy loss, pre-eclampsia and intrauterine growth restriction (Vigeh et al., 2008). Selenium concentration is lower among low-weight newborns umbilical cord serum than that in newborns with normal weight (LPI, 2017). Thus selenium concentration is directly correlated with the infant head circumference (King, 2000, LPI, 2017). Selenium minerals are found in seafood, poultry, eggs, kidney, liver and plant foods (including cereals, nuts, garlic, and radish) (Dorosti, 2004, Mahan et al., 2008, IZiNCG, 2004).

All the pregnant women exceed the recommended dietary requirement in selenium minerals intake except Tuipang L village. In Tuipang l village, the deficiency percent was also very low i.e., 0.54 per cent lowers than the recommended value. The average intake (63.64 micro gram/ day) had crossed the recommended requirement (40 micro gram/ day) by 58.5 per cent. The highest exceeding intake was found in College veng I where the intake exceeds the recommended level by 430.04 per cent. It was followed by KM 10 (318.90 %), College veng II (268.96 %), Lungbun II (196 %), Council veng (190 %), Chheihlu (124.6 %), Lungbun I (117.41 %), Maubawk Ch (89.34 %), Maubawk L (85.69 %), Theiva (84.96 %), Khopai (79.55 %), Mawhre (76.18 %), Tuisumpui (70.70 %), Old Tuisumpui (67.67 %), Chhuarlung III (60.21 %), Siatlai (31.38 %), Theiri (27.06 %), Chhuarlung II (14.96 %), Chhuarlung I (13.81 %) and Ahmypi (6.24 %).

Table 5.34 Nutritional Status on Selenium Mineral

Village Councils	Intake (Micro gram per day)	Attainment	Attainment (%)	Status
Ahmypi	31.88	1.88	6.27	Efficient
Chheihlu	67.46	37.46	124.86	Efficient
Chhuarlung I	34.14	4.14	13.81	Efficient
Chhuarlung II	34.49	4.49	14.96	Efficient
Chhuarlung III	48.06	18.06	60.21	Efficient
Khopai	53.86	23.86	79.55	Efficient
Lungbun I	65.22	35.22	117.41	Efficient
Lungbun II	89.08	59.08	196.93	Efficient

Maubawk CH	56.80	26.80	89.34	Efficient
Maubawk L	55.71	25.71	85.69	Efficient
Mawhre	52.85	22.85	76.18	Efficient
KM 10	125.67	95.67	318.90	Efficient
Old Tuisumpui	50.30	20.30	67.67	Efficient
Siatlai	39.42	9.42	31.38	Efficient
Theiri	38.12	8.12	27.06	Efficient
Theiva	55.49	25.49	84.96	Efficient
Tuipang L	29.84	-0.16	-0.54	Deficient
College veng I	159.01	129.01	430.04	Efficient
College veng II	110.69	80.69	268.96	Efficient
Council veng	87.14	57.14	190.47	Efficient
Tuisumpui	51.21	21.21	70.70	Efficient

Source: Field survey

5.4.28 Nutritional Status on Chloride Minerals

Chloride mineral is working to control fluid balance between the interior and exterior of cells. Further electrolytes affect blood pressure, blood volume and the acid/base of bodily fluids (Leah, 2012). Chloride mineral is a major mineral that works with sodium and potassium to keep the body fluid levels balanced. It also helps by maintaining the fluid volume outside of the cells. Celery, tomatoes, lettuce, and seaweeds are good sources of chloride (Sheeren, 2017). According to Wiegman (2018) the recommended daily dosage for women who are pregnant or nursing is often higher than that of women who have neither condition.

Chloride intake of all pregnant women the study area exceeds the recommended dietary requirement. The average intake (348.63 gram/ day) of this mineral was 771.57 per cent higher than the recommended allowances i.e., 2.3 gram per day. The highest exceeding village was College veng I (2562.10 %) which is followed by College veng II (1885.67 %), Council veng (1352.22 %), Lungbun I (1067.07 %), Lungbun II (1059.68 %), chheihlu (1039.72 %), Khopai (723.67 %), Tuisumpui (691.50 %), KM 10 (607.74

%), Theiva (603.91 %), Chhuarlung III (597.45 %), Maubawk L (551.24 %), Mawhre (527.14 %), Old Tuisumpui (504.03 %), Maubawk Ch (514.29 %), Chhuarlung I (390.53 %), Chhuarlung II (382.54 %), Ahmypi (334.25 %), Tuipang L (313.39 %), Theiri (269.49 %) and Siatlai (229.47 %).

Table 5.35 Nutritional Status on Chloride Mineral

Village Councils	Intake (Gram per day)	Attainment	Attainment (%)	Status
Ahmypi	173.70	133.70	334.25	Efficient
Chheihlu	455.89	415.89	1039.72	Efficient
Chhuarlung I	196.21	156.21	390.53	Efficient
Chhuarlung II	193.01	153.01	382.54	Efficient
Chhuarlung III	278.98	238.98	597.45	Efficient
Khopai	329.45	289.45	723.63	Efficient
Lungbun I	466.83	426.83	1067.07	Efficient
Lungbun II	463.87	423.87	1059.68	Efficient
Maubawk CH	245.71	205.71	514.29	Efficient
Maubawk L	260.50	220.50	551.24	Efficient
Mawhre	250.86	210.86	527.14	Efficient
KM 10	283.10	243.10	607.74	Efficient
Old Tuisumpui	241.61	201.61	504.03	Efficient
Siatlai	131.79	91.79	229.47	Efficient
Theiri	146.19	106.19	265.49	Efficient
Theiva	281.56	241.56	603.91	Efficient
Tuipang L	165.36	125.36	313.39	Efficient
College veng I	1064.84	1024.84	2562.10	Efficient
College veng II	794.27	754.27	1885.67	Efficient
Council veng	580.89	540.89	1352.22	Efficient
Tuisumpui	316.60	276.60	691.50	Efficient

Source: Field survey

5.5 Overall Nutritional Status

Nutritional status is measured using the combination of vitamins (16) and trace minerals (10) nutrients components. To measure the overall nutritional status, the two nutrients components were first analyzed separately by PCA through SPSS software. Then overall nutritional status has been calculated applying the same techniques. After component loadings were estimated, the individual indicators with the highest components loadings are group into intermediate composite indicators. Three components were extracted. The first component consists of the nutrients variables such as magnesium, zink, manganese, carbohydrate, niacin, chromium, thiamine, energy and molybdenum. It explains 34.62 per cent of the total variable. The second component explains 30.77 per cent of the total variables. It includes 8 nutrients variables like folic acid, riboflavin, carotene, calcium, phosphorous, fat, iron and protein. This component may be one of the most important components for pregnant women and their new born babies. The third component includes the nutrients variables such as potassium, sulphur, choline, vitamin C, copper, chloride, sodium and crude fiber. It explains again 34.62 per cent of the total variables. The first and second component may be labeled as major vitamin nutrients variable and the third component may be minerals nutrients variables.

Running the PCA in SPSS, it was identified the initial Eigen Values (Total) which is more than one. In our present case, it is 16.944, 4.036 and 1.930. The number of Eigen values above one varies from data to data. The three components explain 88.11 per cent variance of the variables includes in the analysis. This shown in the Rotational Component Matrix presented in table 5.37.

A. Food taking

B. Nutrition distribution through PDS

C. Malnutirion female 2 Years

D. Under weight baby 6 months old

Figure 5.1 Nutrition Distribution and Malnutrition on new born Babies

Table 5.36 Intermediate Composite Indices of Nutritional Status

Variables	Rotated Component Matrix[a]			Communality
	Component			
	1	2	3	
Magnesium	**.972**	.138	.142	.984
Zink	**.971**	.126	.178	.991
Manganese	**.970**	.134	.167	.987
Carbohydrate	**.949**	.132	.063	.923
Niacin	**.941**	.221	.237	.990
Chromium	**.899**	.269	.302	.972
Thiamine	**.790**	.439	.411	.985
Energy	**.754**	.549	.259	.937
Molybdenum	**.742**	-.032	.567	.874
Folic Acid	-.041	**.936**	.037	.879
Riboflavin	.280	**.892**	.097	.883
Carotene	.149	**.846**	.300	.829
Calcium	.273	**.811**	.411	.900
Phosphorous	.567	**.723**	.343	.962
Fat	.085	**.683**	.348	.595
Iron	.509	**.668**	.488	.943
Protein	.267	**.653**	.409	.664
Potassium	.163	.124	**.900**	.853
Sulphur	.234	.260	**.894**	.922
Choline	.349	.506	**.725**	.904
Vitamin C	.201	.578	**.720**	.892
Copper	.646	.186	**.710**	.955
Chloride	.380	.517	**.702**	.905
Sodium	.208	.645	**.677**	.918
Crude Fiber	.460	.514	**.637**	.882
B6	.074	.382	**.477**	.380
% of explained varianced	65.168	15.521	7.422	
Expl. Vr. (Eigen value)	16.944	4.036	1.930	
Expl./ Total	9.069	7.395	6.446	
Total Variance	22.91			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Expl. Var. Is the variance explained by the components and Expl/Total is the explained variance divided by the total variance of the three components

To obtained weight of the indicators, we have multiplied 1st Eigen value (16.944) with 1st extracted component column (0.972, 0.971, 0.970, 0. 949, 0.941, 0.899, 0.790, 0.754 and 0.742), 2nd Eigen Value (4.036) with 2nd column (0.936, 0.892, 0.846, 0.811, 0.723, 0.683, 0.668 and 0.653) and 3rd Eigen Value (1.930) with 3rd column (0.900, 0.894, 0.725, 0.720, 0.710, 0.702, 0. 677, 0.637 and 0.477). Finally, we have summed up the values obtained in case of each variable. For example, for the first variable (Magnesium), we have 16.944 x 0.972+ 4.036 x 0.138 + 1.930 x 0.142 = 17.30

Factor analysis produced the weight of the indicators. As shown in table no5.38. The most impact factor which determines nutritional attainment among in the study area are Magnesium, Zink, Manganese and Niacin contributing 6.04 per cent each of all kind of nutrition. On the other hand protein, sodium, vitamin C, sulphur, carotene, potassium, fat, vitamin B_6 and folic acid contribute scaled below 3 per cent. Carbohydrate, chromium, thiamine, energy, molybdenum, phosphorous, copper and iron are ranged from 4 to 5 per cent each as shown in the table.

Table 5.37 Weight of the Indicators

Vitamins	Weight	Weight in %		Vitamins	Weight	Weight in %
Magnesium	17.30	6.04		Chloride	9.88	3.45
Zink	17.30	6.04		Choline	9.35	3.26
Manganese	17.30	6.04		Calcium	8.69	3.03
Niacin	17.29	6.04		Riboflavin	8.53	2.98
Carbohydrate	16.73	5.84		Protein	7.95	2.78
Chromium	16.90	5.90		Sodium	7.43	2.59
Thiamine	15.95	5.57		Vitamin C	7.13	2.49
Energy	15.49	5.41		Sulphur	6.74	2.35
Molybdenum	13.54	4.73		Carotene	6.52	2.28
Phosphorous	13.19	4.61		Potassium	5.00	1.75
Copper	13.07	4.56		Fat	4.87	1.70
Iron	12.26	4.28		Vitamin B6	3.72	1.30
Crude Fiber	11.10	3.88		Folic Acid	3.15	1.10
Total					**286.39**	**100.00**

After obtaining weights of every indicators, the index value of all Villages/ Local council have been worked out again by the following formula is used to determine the Composite index score. (Discussed in chapter 3).

$$\boldsymbol{I = \sum_{j=1} Xi \left(\sum_{j=1} /Lij/.Ej \right) / \sum_{i} \left(\sum_{j=1} /Lij/.Ej \right)}$$

Where *I* is the index, Xi is the i-th Indicator; Lij is the factor loading of the i-th variable on the j-th factor; E is the Eigen Value of the J-th factor. Table 5.39 shows the composite score of every nutrient indicator.

Table 5.38 Composite Index of the Village Councils

Village Councils	Composite Score
Ahmypi	-0.20
Chheihlu	0.87
ChhuarlungI	-0.85
ChhuarlungII	-0.41
ChhuarlungIII	0.24
Khopai	0.16
Lungbun I	-0.50
LungbunII	0.51
MaubawkCH	-0.50
MaubawkL	-0.77
Mawhre	-0.40
KM 10	-0.13
OldTuisumpui	-0.27
Siatlai	-0.77
Theiri	-0.52
Theiva	-0.63
TuipangL	-0.27
CollegevengI	1.97
CollegevengII	1.84
Councilveng	0.83
Tuisumpui	-0.18

After calculation of the two components viz. major vitamins and trace minerals, the overall nutritional status of pregnant women for all village councils had been work out. Table 3.40 explains the classification of villages into five categories on the basis of their nutritional efficiency level. College veng I was highest in overall nutritional which score 1.97 in composite index, it was followed by College veng II (1.84), Chheihlu (0.87), Council veng (0.83), Lungbun II (0.51), Chhuarlung III (0.24), Khopai (0.16), KM 10 (-0.13), Tuisumpui (-0.18), Ahmypi (-0.2), Old Tuisumpui (-0.27), Tuipang L (-0.27), Mawhre (-0.4), ChhuarlungII (-0.41), Lungbun I (-0.5), Maubawk CH (-0.5), Theiri (-0.52), Theiva (-0.63), MaubawkL (-0.77), Siatlai (-0.77) and Chhuarlung I (-0.85).

Table 5.39 Overall Nutritional Status

Major Vitamin Components (16)		
Index	**Status**	**Village Councils**
0.741 to 2.27	Very high	College veng I & College veng II (9.52 %)
0.039 to 0.74	High	Old Tuisumpui, Chheihlu, Lungbun II, Council veng & Chhuarlung III (23.81 %)
-0.48 to – 0.04	Moderate	Niawhtlang III, Ahmypi, Tuipang L & Khopai (19.05 %)
-0.729 to -0.49	Low	Mawhre, Maubawk L, Maubawk Ch, Theiva, Siatlai, Theiri, Chhuarlung II & Lungbun I (38.10 %)
-0.87 to – 0.73	Very Low	Chhuarlung I & Tuisumpui (9.25 %)
Trace Minerals (10)		
1.171 to 2.280	Very high	College veng I (4.76%)
-1.169 to 1.170	High	Chheihlu, Council veng, College veng II, Khopai, KM 10 & Lungbun II (38.57%)
-0.449 to -0.170	Moderate	Ahmypi, Theiri, Tuisumpui & Old Tuisumpui (19.05%)
-0.789 to -0.450	Low	Chhuarlung II, Chhuarlung III, Lungbun I, Maubawk CH, Mawhre, Theiva & Tuipang L (33.33%)
-0.860 to -0.790	Very low	Chhuarlung I, Maubawk L & Siatlai (14.29%)
Overall Nutritional Status		
0.8701 to 1.970	Very High	College veng I & College veng II (9.52 %)
0.5101 to 0.870	High	Chheihlu & Council veng (9.25 %)
-0.129 to 0.51	Moderate	Chhuarlung III, Khopai & Lungbun II (14.29 %)
-0.629 to -0.130	Low	Ahmypi, Chhuarlung II, Lungbun I, Maubawk CH, Maubawk L, Mawhre, Niawhtlang III, Old Tuisumpui, Theiri, Tuipang L & Tuisumpui (52.38 %)
-0.630 to -0.850	Very Low	Chhuarlung I, Siatlai & Theiva (14.29 %)

5.6 Conclusion

Vijayaraghavan and Hanumantha rao et.al. (1998) in their study on diet and nutrition situation in rural India has indicated that the diets of the rural population are inadequate and deficient in most nutrients. Almost all the nutrient intake values recorded among the respondents in the present study were below the recommended dietary allowances (RDA). This makes it clear that the quality and quantity wise the intakes of respondents are unable to meet RDA. From the table 5.41 it is evident that the sample could be able to meet the recommended requirement at 100 per cent of the sample respondents from Carbohydrates, Phosphorous Magnesium and Chloride. Nutritional efficiency also founds in some nutrient components where the percentage of respondents who attained the recommended requirement is high like Selenium (99.98 %), copper (98.47 %), Niacin (98.14 %), Thiamine (68.14 %), Fat (37.09 %) and Vitamin C (36.24 %). The other nutrient intakes and deficits are also put on view in the table. Calories are needed by the body for its healthy living the calorie intakes were found lower than RDA adequacy were found to be 100 per cent of the sample and lower than RDA, due to this body decline in to starvation mode. Proteins are essential for life as they are the basic constituents of all protoplasm and are involved in the structure of living cell and its function but the inadequacy ranged up to 90.48 per cent of the total respondents. The fat intake was also found to be comparatively lower than RDA 37.09 per cent only attained the recommended status. Calcium is very much essential for maintaining healthy bones. Deficiency of calcium leads to softening of bones leading to deformity in bones, the inadequacy of calcium ranged 100 per cent. The deficit of iron is extremely high i.e., 99.6 per cent of the total respondents. The deficit of Carotene Riboflavin, Vitamin B6, Choline, Sodium, Potassium, Manganese, Molybdenum, Zink, and Chromium ranged up to 100 per cent of the total respondents. Very low nutritional status also found in nutrients components like Thiamine (31.86 %), Niacin (1.86 %), Copper (1.53 %) and selenium (0.02 %). The low and no consumption of green leafy vegetables, yellow and orange vegetables and fruits, lacking milk and its products in their diets exhibit and indicate towards the increased deficits of all the nutrients. No respondents could attain RDA in some kinds of nutrition components such as Carbohydrates, Phosphorous, Magnesium and Chloride. Table 5.41 represents the mean intake and deficit of the respondents when compared with RDA.

Table 5.40 Nutritional Attainment

Nutrients component	Per capita intake/ day	Attainment in %	% of women sufficient	% of women deficient
Protein	48.44 g	-23.51	9.25	90.48
Fat	26.92 g	-10.27	37.09	62.91
Crude fiber	3.06 g	-85.47	0	100
Carbohydrates	338.65 g	263.6	100	0
Energy	1783.70 kl	- 29.36	0	100
Calcium	242.44 mg	-75.76	0	100
Phosphorus	550 mg	95.59	100	0
Iron	20.90 mg	-45.01	0.04	99.6
Carotene	749.08 µg	-77.30	0	100
Thiamine	1.38 mg	4.46	68.14	31.86
Riboflavin	0.69 mg	54.04	0	100
Niacin	17.46 mg	19.80	98.14	1.86
Vit B6	0.02 mg	98.60	0	100
Folic acid	34.17 mg	-65.83	8.45	91.55
Vitamin C	27.24 mg	-9.20	36.24	63.76
Choline	87.24 mg	-79.47	0	100
Magnesium	652.78 mg	226.39	100	0
Sodium	33.63 mg	-99.14	0	100
Potassium	442.65 mg	-77.87	0	100
Copper	1.47 mg	28.19	98.47	1.53
Manganese	4.58 mg	-54.19	0	100
Molybdenum	0.40 µg	-99.17	0	100
Zink	6.05 mg	-35.66	0	100
Chromium	0.04 µg	-99.86	0	100
Selenium	63.64 µg	58.5	99.98	0.02
Chloride	348.63 g	771.57	100	0

Source: Field survey

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CHAPTER - VI

REPRODUCTIVE HEALTHCARE

6.1 Introduction

Women are implications for health. (Fathalla, (1997) broadly classified women into four categories based on health needs as Firstly women have particular health needs in relation with related to sexual and reproductive function. Secondly women have an elaborate reproductive system that is vulnerable to dysfunction or disease, even before it is put to function or after it has been put out of function. Thirdly women are subject to the same diseases of other body systems that can affect men. The patterns of disease always varied from those of men due to genetic constitution, hormonal environment or gender-evolved lifestyle behavior. The reproductive system or function is interacting with diseases of women body systems or their treatments. Fourthly women are subject to social diseases which impact on their physical, mental or social health which may include female genital mutilation, sexual abuse and domestic violence etc.

ICPDPA (1994) define it as reproductive health is “a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and its functions and processes.” The reproductive system including function, dysfunction and disease, plays a vital role in women's health which is different from the case with men. The major burden of the disease in females is related to their reproductive function and reproductive system.

Apart from the absence of disease or infirmity, reproductive health implies that, people have the ability to reproduce, to regulate their fertility and to practice and enjoy sexual relationships. It further entails that reproduction is carried to a successful result through infant and child survival, growth and healthy development. So finally it implies that women perform safely through pregnancy and childbirth, that fertility regulation can be attained without any health hazards. (Fathalla,1988).

Fathalla (1996) mentioned that reproductive health is an integrated package. Women could not maintain a good health if they have only one element and miss another. Thus the various elements of reproductive health are strongly inter-related and interdependent to each other. Improvements of one element can produced a kind of result in potential improvements to other elements. Similarly, lack of improvement in one element can hinder progress in other elements.

Worldwide Pelvic infection, for example, accounts for about one-third of all cases of infertility and for a much higher percentage in sub-Saharan Africa (WHO, 1987). The resultant infertility is also the most difficult to treat. The degree of the problem in relation with infertility will not be ameliorated except by a combat of sexually transmitted diseases (STDs), by safer births that avoid postpartum infection, and by decreasing the need for or the resort to unsafe abortion practices.

Without good maternity care infant and child survival including their growth and development cannot be improved. For instance proper planning of births such as adequate child spacing, is a basic component of any child survival package. For example the diseases like STDs, and HIV infection in particular can obstruct advance progress in child survival unless adequately controlled. Thus fertility regulation is a major element in any safe motherhood strategy. It reduces the number of unwanted pregnancies, with a resultant decrease in the total exposure to the risk as well as a decrease in the number of unsafe abortions. A high risk pregnancy can also reduce through proper planning of births. WHO multinational study showed that a major factor in the female with no demonstrable cause in the male was diagnosed in only 12.8 per cent of cases, and a major factor in the male with no demonstrable cause in the female was diagnosed in only 7.5% of cases (WHO, 1987). The burden of infertility, however, for biological and social reasons, is unequally shared.

The condition of health is generally low in a developing country like India particularly that of women's health when it pertains to reproductive health. Reproductive health can be studied from various aspects and women suffer from reproductive morbidity in the multicultural setting of India. According to assessment of the country's performance in the areas of health, demographic behavior and family planning indicates there were improvements in the past five decades (Central Bureau of Health Intelligence, 2006; Registrar General, 2006).

6.2 Data Analysis

For the present study, the reproductive healthcare practices of a pregnant mother had been studied by taking the major indicators such as antenatal care, tobacco consumption patterns during pregnancy, mother's physical strength, delivery, postnatal care and baby's vaccination (Table 6.1).

Table 6.1 Explanation of Selected Indicators

Healthcare Components	Selected Indicators (39)
Antenatal care (7)	No. of pregnant women took Tetanus injection, IFA, Iron intake not less than 50 capsules, Calcium not less than 50 Capsules, others supplementary vitamins intake, Work care/ work load reduction and Regular checkup during pregnancy in %
Tobacco consumption (5)	No. of pregnant women Free from Smoking, khaini, Tuibur, Sahdah & Alcohol during pregnancy in %
Institutional delivery (3) & Expert (3)	No. of pregnant women who deliver babies at PHC. Sub-Center & Hospital in %
	No. of babies deliver by Nurse, Health Workers, & ASHA in %
Women's health/ strength (4)	No. of pregnant women having Good physical strength , Not having major diseases, Not having permanent diseases, Having good nutrition (opinion) during pregnancy in %
Post Natal care Feeding (7)	No. of mother having breast feeding immediately after birth, Feeds only mothers breast, Breast feeding till 6 months, Routine feeding of foods, Normal cleaning of babies, Regular checkup after birth and, Immediate checkup when babies sick in %
Post-Natal Care Vaccination (10)	No. of babies received BCG, DPT, OPV, Measles, MMR, Hip, Hip sag, Hepatitis B, Timely vaccination & regular vaccination in %

6.3 Antenatal Care

Labor and delivery is the end of pregnancy and beginning of new life. Antenatal care plays an important role to achieve a successful labor and delivery process. It ensures maternal foetal health wellbeing and also prepares women physically fit for labor, delivery and the postpartum period. It also helps in the physical and mental preparation of women and helps them relax during those last months.

The health of future generations is to a great extent determined by the baby's growth and development within the womb. The success of fetal life determines not only the health of the newborn, but also has a major impact on adult health and disease risk. Good perinatal health is therefore important to individuals, to society and to future generations (Barker et al., 2013). EBCOG considers that it is the public health responsibility of obstetricians, together with midwives, nurses and general practitioners, to organize appropriate care for vulnerable groups. This can only become effective when antenatal care is linked with local public health initiatives, including social services and youth care, which address lifestyle and social issues. This approach is challenging, but the benefits are considerable (Denktas et al., 2014). Furthermore because the initial phases of pregnancy have a large impact on perinatal and subsequent adult health, optimal care needs to be initiated before pregnancy. The promotion of preconception health will not only improve women's general health but has a favourable effect on the health of the next generation. Preconception care may require a change of mind set both for healthcare professionals and also for women, their partners and their families, but again the benefits to society could be great (Temel et al., 2014).

In the present studies seven indicators were selected to measured antenatal care during pregnancy such as Number of Tetanus injection taken, number of Iron Folic Acid (IFA) intake, number of pregnant women taking Iron supplement more than 50 capsules in per cent, number of pregnant women taking calcium supplement more than 50 capsules in per cent, number of any other types of supplementary vitamins taken by a pregnant women in per cent, physical health care of a pregnant mother i.e., control for working during pregnancy and regularity of checkup taken.

6.3.1 Tetanus Injection

Tetanus is a life-threatening bacterial disease that is caused by the toxin of a bacterium called clostridium tetani which is often found in soil. It can cause severe morbidity in the pregnant women of mother and mortality in the neonate. Tetanus bacteria enter the body through an open wound. It could well be a tiny prick or scratch on the skin, although tetanus infection is more common when there is a deep puncture wound such as a bite, cut, burn or an ulcer (Park K, 2014). Tetanus affects a person's nervous system and can be fatal if left untreated. Neonatal tetanus usually occurs in newborns through infection of the unhealed umbilical stump, especially when the stump is cut with a non-sterile instrument. Tetanus is prevented only through vaccination (Silveria, 1995 & Verma, 2012). Tetanus toxoids appear safe during pregnancy and are administered in many countries of the world to prevent neonatal tetanus. According to WHO report, neonatal tetanus kills over 200,000 newborns every year that almost all these deaths occur in developing countries while it is very rare in developed nations (WHO, 2015).

The study area was quite good in taking tetanus injection. 73.43 per cent of the total pregnant women took the injection during the studies. College veng I in Saiha town was highest in tetanus injection per pregnant women i.e., 95.61 per cent of pregnant women had tetanus injection. It was followed by Theiva (88.89 %), Maubawk L (87.76 %), Siatlai (86.67 %), College Veng II (86.62 %), Tuisumpui (85.71%), Council veng (84.00 %), Ahmypi (82.35 %), KM 10 (79.17 %), Maubawk CH (78.26 %), Chhuarlung I (77.50 %), Old Tuisumpui (75.00 %), Chhualung III (75.00 %), Lungbun II (68.75 %), Theiri (67.92 %), Khopai (65.45 %), Chhuarlung II (61.54 %), Lungbun I (60.53 %), Tuipang L (48.21 %), Mawhre (45.00 %) and Chheihlu (42.86 %).

6.3.2 Iron Folic Acid (IFA) Injection

Iron Folic Acid (IFA) injection is one of the effective measures for health of pregnant women. IFA is particularly important for women who are pregnant to consume enough. This helps prevent the fetus from developing major congenital deformities of the brain or spine, including neural tube defects, such as spinal bifida and anencephaly. Pregnant women should take folic acid supplements for a full year before conception to reduce the risk of these developments (Nordqvist, 2017).

The average number of pregnant women taking IFA injection during pregnancy in the study area was 16.37 per cent only. It may be the big factor which affects pregnant women's health. There were the 8 villages wherein no pregnant mother had been taking IFA injection during the time of their pregnancy such as Chhuarlung II, Chhuarlung III, Lungbun I, Lungbun II, Maubawk CH, KM 10, Old Tuisumpui and Siatlai. On the other hand 95.61 per cent had taken this injection in College Veng I, which is followed by College veng II (86.62 %), Council veng (84.00 %), Ahmypi (35.29 %), Tuipang L (21.43 %), Theiva (5.56 %), Mawhre (5.00 %), Chhualung I (2.50 %), Chheihlu (2.04 %), Maubawk L (2.04 %), Theiri (1.89 %) and Khopai (1.82 %).

6.3.3 Iron Supplementary Intake (more than 50 Capsules)

Iron makes up hemoglobin, which is a major component of blood. This is what helps the blood carry oxygen to different parts of our cells. The foetus needs iron to make blood for itself too. There are lesser chances of complications to the mother during pregnancy when there is enough iron in the mother's blood. Enough blood in the body ensures the well-being of the mother, even if there is some blood loss during delivery.

Adequate amount of iron helps the baby develop normally functioning internal organs. It also reduces the risk of pre-mature birth and other complications during delivery (Shabana, 2018). Since iron intake from food staff was always insufficient in the state supplementary intake is much recommended for the study area. The doctors recommended 100 capsules of iron supplements during pregnancy in the study area.

For the present study percentage of pregnant women taking more than 50 capsules of iron during pregnancy were counted. During the period of study, only 17.37 per cent achieved this condition. College veng I was the highest in this indicators where the 95.61 per cent of pregnant women got more than 50 capsules of Iron during pregnancy, this is followed by College veng II (86.62 %), Council veng (84.00 %), Ahmypi (35.29 %), Tuipang L (21.43 %), Theiva (5.56%), Mawhre (5.00 %), Chhualung I (2.50 %), Chheihlu (2.04 %), Maubawk L (2.04 %), Theiri (1.89 %) and Khopai (1.82 %). In the other 9 villages like Chhuarlung II, Chhuarlung III, Lungbun I, Lungbun II, Maubawk CH, KM 10, Old Tuisumpui, Siatlai and Tuisumpui, no pregnant women having more than 50 capsules of Iron.

6.3.4 Calcium Supplementary Intake (more than 50 capsules)

Role of calcium supplementation during pregnancy is reducing hypertensive disorders. The review by Hofmeyr et al., (2006 &2007) included studies from developed and developing countries and their pooled estimate had shown that calcium supplementation during pregnancy considerably reduced occurrence of gestational hypertension and pre-eclampsia. Low calcium intake has been hypothesized to cause increase in blood pressure by stimulating the release of parathyroid hormone and/or renin which leads to increased intracellular calcium concentration in vascular smooth muscle cells and causes vasoconstriction (Belizan at al., 1988). Calcium supplementation can reduce hypertensive disorders in pregnancy can possibly be explained by reduction in parathyroid calcium release and intracellular calcium concentration, thereby reducing smooth muscle contractility and promoting vasodilatation (Villar at al., 1989). It could also prevent preterm labor and delivery by reducing uterine smooth muscle contractility (Villar & Repke, 1990) directly and indirectly by increasing magnesium levels (Repke et al., 1989). The second explanation could be prevalent malnutrition in developing countries. It had been proposed that hormones involved in blood pressure control are altered during malnutrition and can lead to significant morbidity in malnourished pregnant women (Thrift et al, 2010 & Torun, 2006).

The average number of pregnant women who have taken more than 50 capsules of calcium in the study area was only 39.97 per cent. The main reason from the study was an illiterate pregnant woman could not take much of iron because iron had given some problems to their health, so that they neglected the importance of iron for pregnancy. In College veng II, 80.99 per cent pregnant women had been taking more than 50 capsules of calcium followed by College veng I (79.82 %), Tuisumpui (71.43 %), Council veng (66.00 %), Mawhre (55.00 %), Chheihlu (53.06 %), Theiri (50.94 %), Chhuarlung III (40.00 %), Ahmypi 35.29 %), Chhualung I (35.00 %), Maubawk CH (34.78 %), KM 10 (33.33 %), Old Tuisumpui (32.14 %), Tuipang L (30.36 %), Siatlai (26.67 %), Khopai (25.45 %), Theiva (22.22 %), Lungbun II (21.88 %), Lungbun I (21.05 %), Maubawk L (16.33 %) and Chhuarlung II (7.69 %).

6.3.5 Other Vitamin Supplementary Intake

Some of the pregnant women have got any types of vitamins other than iron and Calcium for supplementary antenatal care. 54.03 per cent of the pregnant women have got supplementary types of vitamins during pregnancy. In College veng I, 96.49 per cent pregnant women have taken various types of vitamins during the study period, which was followed by College veng II (92.96 %), Tuisumpui (92.86 %), Council veng 83.00 %), Ahmypi (70.59 %), Theiva (62.96 %), Theiri (58.49 %), Chhuarlung III (55.00 %), KM 10 (54.17 %), Old Tuisumpui (53.57 %), Chheihlu (51.02 %), Chhualung I (50.00 %), Mawhre (45.00 %), Maubawk CH (43.48 %), Maubawk L (42.86 %), Lungbun II (40.63 %), Siatlai (40.00 %), Lungbun I (31.58 %), Khopai (23.64 %), Tuipang L (23.21 %) and Chhuarlung II (23.08 %).

6.3.6 Control of Work Load

Physical workload factors, such as shift work, long working hours, and lifting, standing and carrying or moving heavy loads, are prevalent exposures among working women. According to the European Working Conditions Survey 2010, 16 per cent of employed women work in shifts, 13 per cent work at night, and 16 per cent usually work >40 hours a week. Fifteen percent of women report that their work involved tiring or painful positions almost all the time and 23 per cent of women were required to carry or move heavy loads at least a quarter of the time. Miscarriage is also a relatively common pregnancy outcome. (Weinberg et al., 2008). Thus, physical workload exposures may constitute an important occupational reproductive hazard for women.

In the study area only 5.54 per cent of the total women care about or reduced their work load during pregnancy, the others women do not controlled and do their works load same with un-pregnancy. Tuisumpui village attained the top position under this measurement. The 32.14 per cent of the total pregnant women had controlled their work load during pregnancy. The village was followed by Chheihlu (14.29 %), Maubawk L (14.29 %), Theiri (11.32 %), Theiva (11.11 %), Mawhre (10.00 %), Siatlai (10.00 %), Khopai (5.45 %), Chhualung I (2.50 %), Chhuarlung III (2.50 %), Council veng (2.00 %) and College veng II (0.70 %). The other remaining villages like Ahmypi, Chhuarlung II, Lungbun I, Lungbun II, Maubawk CH, KM 10, Tuipang L, College veng I and Tuisumpui does not attained this condition.

6.3.7 Regular Checkup

Regular check-up during pregnancy provide usually include a physical exam, weight checks, and providing a urine sample etc. Depending on the stage of the pregnancy, health care providers may also do blood tests and imaging tests, such as ultrasound exams. It also includes discussions about the mother's health, the fetus's health, and any questions about the pregnancy (MoD, 2011). Pregnancy is one very important phase in the life of every woman. There is some responsibility that comes with pregnancy and it has to be fulfilled well. Pregnant women must be aware of the fact that you have to undergo many important tests during pregnancy to understand the growth and development of the child. As well as to understand the condition of mother and if there are any complications in the pregnancy or not. The entire pregnancy span is divided into trimesters and there are different sets of tests and investigations which are done in each trimester (Radhakrisnan, 2017).

Only 36.03 per cent of women completed the three trimester checkup (minimum three times) during pregnancy in the study area. College veng II got the top position in this measurement wherein 85.21 per cent of the total women attained regular checkup during their pregnancy. It was followed by College veng I (80.70 %), Maubawk L (73.47 %), Tuisumpui (57.14 %), Old Tuisumpui (50.00 %), Lungbun I (44.74 %), Siatlai (43.33 %), Lungbun II (40.63 %), Chhualung I (40.00 %), Council veng (40.00 %), Theiva (35.19 %), Theiri (33.96 %), Chhuarlung III (22.50 %), KM 10 (20.83 %), Mawhre (20.00 %), Ahmypi (17.65 %), Chhuarlung II (15.38 %), Tuipang L (14.29 %), Khopai (9.09 %), Chheihlu (8.16 %) and Maubawk CH (4.35 %).

Table 6.2 Antenatal Care (in %)

Village Councils	Tetanus	IFA	Iron (<50)	Calcium (<50)	Other Vit.	Work control	Regular check up
Ahmypi	82.35	35.29	35.29	35.29	70.59	0.00	17.65
Chheihlu	42.86	2.04	2.04	53.06	51.02	14.29	8.16
Chhualung I	77.50	2.50	2.50	35.00	50.00	2.50	40.00
Chhuarlung II	61.54	0.00	0.00	7.69	23.08	0.00	15.38
Chhuarlung III	75.00	0.00	0.00	40.00	55.00	2.50	22.50
Khopai	65.45	1.82	1.82	25.45	23.64	5.45	9.09
Lungbun I	60.53	0.00	0.00	21.05	31.58	0.00	44.74
Lungbun II	68.75	0.00	0.00	21.88	40.63	0.00	40.63
Maubawk CH	78.26	0.00	0.00	34.78	43.48	0.00	4.35
Maubawk L	87.76	2.04	2.04	16.33	42.86	14.29	73.47
Mawhre	45.00	5.00	5.00	55.00	45.00	10.00	20.00
KM 10	79.17	0.00	0.00	33.33	54.17	0.00	20.83
Old Tuisumpui	75.00	0.00	0.00	32.14	53.57	32.14	50.00
Siatlai	86.67	0.00	0.00	26.67	40.00	10.00	43.33
Theiri	67.92	1.89	1.89	50.94	58.49	11.32	33.96
Theiva	88.89	5.56	5.56	22.22	62.96	11.11	35.19
Tuipang L	48.21	21.43	21.43	30.36	23.21	0.00	14.29
College veng I	95.61	95.61	95.61	79.82	96.49	0.00	80.70
College veng II	86.62	86.62	86.62	80.99	92.96	0.70	85.21
Council veng	84.00	84.00	84.00	66.00	83.00	2.00	40.00
Tuisumpui	85.71	0.00	0.00	71.43	92.86	0.00	57.14
Average	**73.47**	**16.37**	**16.37**	**39.97**	**54.03**	**5.54**	**36.03**

Source: Field survey

6.4 Tobacco Consumption during Pregnancy

Even though knowledge about the negative effects on the fetus and the newborn of smoking during pregnancy is increasingly aware widespread, this habit still remains a big problem throughout the world. The International Child Care Practices Study concluded in a survey of 21 centers in 17 countries that an average of 22 per cent of mothers and 45 per cent of fathers were smoking at the time of their child's birth (Navarro et al., 1988). Although the geographical variations are large, this most likely represents the single largest modifiable neuropharmacological exposure for the fetus. A large number of studies confirm that maternal tobacco smoking during pregnancy adversely affects pre- and postnatal growth and increases the risk of fetal mortality (Abel, 1984, Butler et al., 1972, Kleinman et al., 1988), morbidity (Habek et al., 2002, Thorngren & Herbst, 2001), cognitive development (Bauman et al., 1991, Fried et al., 1992) and behavior of children and adolescents (Wasserman et al., 1999, Weissman et al., 1999).

The possible adverse health effects of smokeless tobacco during pregnancy have received far less attention with a limited number of publications addressing this practice. Characterization of this association is however important for several reasons. Firstly, millions of pregnant women use smokeless tobacco, predominantly in Africa and Asia (Gupta, 1992) but also in Scandinavia (Idriset al., 1998). These women are not exposed to the combustion products in tobacco smoke (e.g. carbon monoxide and cyanide) that may contribute to fetal hypoxia and reduced birth weight, but as nicotine levels may be very high the fetal exposure to nicotine may be unaltered or even increased. Secondly, as the hazards of smoking during pregnancy have become more evident in recent years, pregnant women are in rapidly increasing numbers turning to other forms of nicotine. Therefore, the use of smokeless tobacco during pregnancy is an important clinical issue also for other countries than those primarily affected today. Finally, studying children exposed to smokeless tobacco, rather than tobacco smoke, facilitates comparison with the multitude of animal and cellular studies that have most often studied nicotine *per se*.

In the present studies tobacco consumption has been study by measuring the number per cent of pregnant mother free from different types of Tobacco products during their pregnancy including Tobacco Smoking, tobacco mouthing such as Khaini, Tuibur, Sahdah and Alcoholing.

6.4.1 Tobacco Smoking

It is estimated that 15 to 25 per cent of women smoke during pregnancy (Coleman et al., 2014, Olsen et al., 2002, Owen &Penn, 1999) and although pregnancy motivates a minority of women to stop smoking for at least part of their pregnancy, most start again after delivery (Owen &Penn, 1999). There is also a strong correlation between maternal smoking during pregnancy and young age, unmarried status and being from low socio-economic strata (Kvale et al., 2000). Despite current knowledge about the detrimental effects of smoking during pregnancy, the reduction in smoking among pregnant women is progressing very slowly.

In the study area 95.77 per cent of the total sample women did not smoke during pregnancy. 100 per cent women free in tobacco smoking in 10 villages like Chhuarlung II, Chhuarlung III, Lungbun I, Lungbun II, Maubawk CH, Mawhre, KM 10, Theiri and Tuipang L. The other villages also got a high percentage like College veng I (99.12 %), Council veng (98.00 %), Maubawk L (97.96 %), Chhualung I (97.50 %), College veng II (97.18 %), Siatlai (96.67 %), Khopai (94.55 %), Theiva (90.74 %), Chheihlu (85.71%), Old Tuisumpui (85.71 %), Tuisumpui (85.71 %) and Ahmypi (82.35 %). The reason why smokes women was very less in the study area is because of society where female were not always smoke in modern mizo society as well as due to their education.

6.4.2 Khaini (Smokeless tobacco)

Because of widespread knowledge about the adverse effects of maternal smoking during pregnancy has increased over the last 15 years, women in several parts of the world have turned to alternative sources of nicotine. Similarly, smoking among women in South East Asia is rare, but use of smokeless tobacco is common (Pindborg et al., 1990). Among women in India, smokeless tobacco has been demonstrated to constitute more than 95% of the total tobacco consumption, thereby by far surpassing smoking as the primary source of nicotine during gestation (Gupta, 1992). In the Mumbai Cohort study (Gupta, 1996), 58% of 59,527 lower-middle and lower-class women age 35 years and old reported current tobacco use, virtually all of which was smokeless.

A possible confounder of all studies of tobacco use during pregnancy, and in particular those emanating from developing countries, is that tobacco use tends to be associated with several other risk factors. In India, women using smoke-less tobacco had relatively lower socioeconomic status, weight, and educational status and were less likely to have had optimal antenatal care (Gupta, 2006). Similar associations are likely to occur in most countries and need to be considered when interpreting results.

Khaini was one of the popular tobacco practices (smokeless) eaten by mizo peoples especially the rural women. It has very strong nicotine which affects the women health. So the number of women free from khaini intake was important to study. The average numbers who were free from khaini in the study area was 72.42 per cent. In Lungbun I village, all the pregnant women were free from Khaini products, the other are Maubawk CH (95.65 %), Ahmypi (94.12 %), College veng I (93.86 %), College veng II (93.66 %), Siatlai (93.33 %), Khopai (90.91 %), Tuipang L (89.29 %), Council veng (86.00 %), Maubawk L (85.71 %), Chhuarlung III (80.00 %), KM 10 (70.83 %), Theiri (69.81 %), Lungbun II (62.50 %), Old Tuisumpui (60.71 %), Chhualung I (57.50 %), Theiva (53.70 %), Chheihlu (48.98 %), Mawhre (40.00 %), Tuisumpui (28.57 %) and Chhuarlung II (25.64 %).

6.4.3 Tuibur (Smokeless tobacco)

The Local name 'Tuibur' is the liquid form of tobacco produced from local. It adversely affects the health condition of a people. The number of Tuibur intake is very huge in the general peoples of mizo girls and women. It is also popular among the pregnant women. In the study area, the 87.60 per cent were free from Tuibur during pregnancy. In the villages like Chhualung I, Chhuarlung III, Lungbun I and Lungbun II, all the pregnant women were free from Tuibur products. In Tuipang L, the 96.43 per cent were free from Tuibur followed by Theiva (96.30 %), Chhuarlung II (94.87 %), Maubawk L (93.88 %), College veng I (92.98 %), Old Tuisumpui (92.86 %), Tuisumpui (92.86 %), Khopai (92.73 %), Mawhre (92.50 %), KM 10 (91.67 %), Council veng (89.00 %), College veng II (88.73 %), Maubawk CH (82.61 %), Chheihlu (75.51 %), Siatlai (63.33 %), Theiri (62.26 %) and Ahmypi (41.18 %).

6.4.4 Sahdah (Smokeless tobacco)

Local name 'Sahdah' is the local product made from tobacco through simple traditional methods. It is one kind of the popular tobacco products eaten by the mizo people particularly the female. The number of pregnant women free from Sahdah had been studied. The 58.38 per cent of the total pregnant women were free from Sahdah product. All the pregnant mothers were free from Sahdah product during pregnancy in Ahmypi village followed by Mawhre (85.00 %), Chhuarlung II (84.62 %), Old Tuisumpui (82.14 %), Chheihlu (79.59 %), Chhuarlung III (62.50 %), KM 10 (62.50 %), Chhualung I (60.00 %), Tuipang L (58.93 %), Council veng (58.00 %), Theiri (56.60 %), Maubawk L (55.10 %), College veng I (52.63 %), Siatlai (50.00 %), Lungbun II (46.88 %), College veng II (45.07 %), Tuisumpui (42.86 %), Lungbun I (42.11 %), Theiva (40.74 %), Khopai (34.55 %) and Maubawk CH (26.09 %).

6.4.5 Alcohol Drinks

While it is well known that drinking during pregnancy can lead to the development of fetal alcohol syndrome (FAS) while increasing the risk of miscarriage, birth defects, and other health complications, an occasional drink appears to have less effect during the first trimester than some might assume. As 2013 study from the University of Adelaide compared birth outcomes in five thousand six hundred and twenty-eight women in England, Ireland, Australia, and New Zealand who were pregnant for the first time between 2004 and 2011 (Helfer et al., 2014, Maier et al., 2001 & McCarthy et al., 2013).

Almost all the women the study area was free from alcohol drinking practices during pregnancy. Except Council veng Saiha where one per cent of the total respondents had practice alcohol drinking during pregnancy others 99 per cent were free. In the other villages 100 per cent women were free from alcohol drinks during the study period.

Table 6.3 Tobacco consumption (No. of women do not practice in %)

Village Councils	Smoking	Khaini	Tuibur	Sahdah	Alcohol
Ahmypi	82.35	94.12	41.18	100.00	100.00
Chheihlu	85.71	48.98	75.51	79.59	100.00
Chhualung I	97.50	57.50	100.00	60.00	100.00
Chhuarlung II	100.00	25.64	94.87	84.62	100.00
Chhuarlung III	100.00	80.00	100.00	62.50	100.00
Khopai	94.55	90.91	92.73	34.55	100.00
Lungbun I	100.00	100.00	100.00	42.11	100.00
Lungbun II	100.00	62.50	100.00	46.88	100.00
Maubawk CH	100.00	95.65	82.61	26.09	100.00
Maubawk L	97.96	85.71	93.88	55.10	100.00
Mawhre	100.00	40.00	92.50	85.00	100.00
KM 10	100.00	70.83	91.67	62.50	100.00
Old Tuisumpui	85.71	60.71	92.86	82.14	100.00
Siatlai	96.67	93.33	63.33	50.00	100.00
Theiri	100.00	69.81	62.26	56.60	100.00
Theiva	90.74	53.70	96.30	40.74	100.00
Tuipang L	100.00	89.29	96.43	58.93	100.00
College veng I	99.12	93.86	92.98	52.63	100.00
College veng II	97.18	93.66	88.73	45.07	100.00
Council veng	98.00	86.00	89.00	58.00	99.00
Tuisumpui	85.71	28.57	92.86	42.86	100.00
Average	**95.77**	**72.42**	**87.60**	**58.38**	**99.95**

Source: Field survey

Figure 6.1 Tobacco Products Consumed by Pregnant Women

6.5 Institutional Delivery

Proponents of institutional delivery point to the fact that mortality risk is concentrated around the time of birth – a quarter of all neonatal deaths occur within the first 24 hours, three-quarters within the first week (WHO, 2006). Newborn deaths have been strongly linked to time of delivery factors, and delivery complications such as prolonged or obstructed labor are consistently associated with a higher risk of mortality (Bartlett et al., 1993; Chalumeau et al., 2000; Kusiako et al., 2000).3 The main rationale for situating births in health facilities is therefore that it gives women access to skilled providers who are better able to recognize and manage delivery complications and perform essential interventions and also minimizes delays in getting help (Filippi et al., 2006).

Appropriate delivery care is crucial for both maternal and perinatal health and increasing skilled attendance at birth is a central goal of the safe motherhood and child survival movements. Skilled attendance at delivery is an important indicator in monitoring progress towards Millennium Development Goal 5 to reduce the maternal mortality ratio by three quarters between 1990 and 2015 (UN, 2015). In addition to professional attention, it is important that mothers deliver their babies in an appropriate setting, where lifesaving equipment and hygienic conditions can also help reduce the risk of complications that may cause death or illness to mother and child (Campbell & Graham, 2006). Over the past decade interest has grown in examining influences on care-seeking behavior and this study investigates the determinants of place of delivery in rural India, with a particular focus on assessing the relative importance of community access and economic status.

Table 6.4 Institutional Delivery (in %)

Village Councils	Places of delivery			Delivery personnel		
	PHC	Sub center	Hospital	Nurse	Health worker	ASHA
Ahmypi	11.76	0.00	5.88	58.82	5.88	0.00
Chheihlu	2.04	0.00	8.16	10.20	0.00	2.04
Chhualung I	45.00	0.00	5.00	42.50	0.00	30.00
Chhuarlung II	10.26	7.69	10.26	2.56	51.28	0.00
Chhuarlung III	20.00	0.00	10.00	30.00	0.00	5.00
Khopai	0.00	0.00	1.82	1.82	0.00	20.00
Lungbun I	0.00	0.00	10.53	18.42	2.63	5.26
Lungbun II	3.13	0.00	6.25	9.38	0.00	6.25
Maubawk CH	0.00	13.04	30.43	30.43	17.39	0.00
Maubawk L	4.08	8.16	34.69	34.69	24.49	14.29
Mawhre	0.00	0.00	2.50	2.50	45.00	0.00
KM 10	8.33	0.00	8.33	12.50	0.00	4.17
Old Tuisumpui	0.00	3.57	21.43	17.86	0.00	32.14
Siatlai	6.67	3.33	16.67	23.33	3.33	20.00
Theiri	11.32	1.89	24.53	33.96	1.89	3.77
Theiva	1.85	25.93	11.11	12.96	27.78	0.00
Tuipang L	1.79	0.00	7.14	8.93	0.00	0.00
College veng I	0.88	0.88	82.46	80.70	2.63	0.00
College veng II	0.00	0.70	86.62	86.62	2.11	1.41
Council veng	0.00	0.00	86.00	86.00	2.00	0.00
Tuisumpui	0.00	14.29	14.29	28.57	14.29	50.00
Average	**6.05**	**3.78**	**23.05**	**30.13**	**9.56**	**9.25**

Source: Field survey

6.5.1 Places of Delivery

Newborn deaths alone accounted for 40 percent of mortality among children under five in 2010 (Rajaratnam et al., 2010). It is well known that in developing countries, a large number of births take place outside of health facilities, usually at home and unattended by formally trained doctors or midwives, and it is widely believed that this contributes to high rates of mortality (Darmstadt et al., 2009). In sub-Saharan Africa and South Asia, the two regions that account for most newborn deaths, more than half of all births take place at home (Montagu et al., 2011). In the study area popular delivery place are Home, Primary Health Center, Sub-center, Hospital and other.

6.5.1.1 Home Delivery

The average number of women who delivered babies in home was 56.70 per cent of the total respondents in the study area. The home delivery was highest in Mawhre village i.e., 97.50 per cent of the total delivered. The village was followed by Khopai (94.55 %), Chheihlu (89.80 %), Lungbun II (81.25 %), Ahmypi (76.47 %), Tuisumpui (71.43 %), Chhuarlung II (66.67 %), Siatlai (63.33 %), KM 10 (62.50 %), Lungbun I (60.53 %), Theiri (58.49 %), Old Tuisumpui (57.14 %), Tuipang L (57.14 %), Theiva (53.70 %), Chhuarlung III (50.00 %), Maubawk L (40.82 %), Chhualung I (40.00 %), Maubawk CH (30.43 %), College veng I (15.79 %), Council veng (14.00 %) and College veng II (9.15 %).

6.5.1.2 Primary Health Center Delivery

Only 6.05 per cent of the total women in the study area delivered babies in primary health center (PHC) due to local unavailability of the institution. For instance In Chhualung I village 45.00 per cent of the total pregnant women have delivered in PHC it was the highest in among the study area because the institution is there in the village i.e., Chhuarlung PHC. Chhuarlung I was followed by Chhuarlung III (20.00 %), Ahmypi (11.76 %), Theiri (11.32 %), Chhuarlung II (10.26 %), KM 10 (8.33 %), Siatlai (6.67 %), Maubawk L (4.08 %), Lungbun II (3.13 %), Chheihlu (2.04 %), Theiva (1.85 %), Tuipang L (1.79 %) and College veng I (0.88 %). In the remaining 8 villages like Khopai, Lungbun I, Maubawk CH, Mawhre, Old Tuisumpui, College veng II, Council veng and Tuisumpui, no women have delivered in PHC.

6.5.1.3 Sub Center Delivery

Sub Center is the only accessible delivered institution particularly in rural areas. In the study area the delivery in sub center was only 3.78 per cent. This was one of the worst result found in the study area because it may depicted that no pregnant women thought that sub center was not save for delivery of their babies. Theiva (25.93 %) had attained the top position in this measurement followed by Tuisumpui (14.29 %), Maubawk CH (13.04 %), Maubawk L (8.16 %), Chhuarlung II (7.69 %), Old Tuisumpui (3.57 %), Siatlai (3.33 %), Theiri (1.89 %), College veng I (0.88 %) and College veng II (0.70 %). No Sub center delivered found in the remaining villages such as Ahmypi, Chheihlu, Chhualung I, Chhuarlung III, Khopai, Lungbun I, Lungbun II, Mawhre, KM 10, Tuipang L and Council veng.

6.5.1.4 Hospital Delivery

Hospital is the best place to delivered babies. 23.05 per cent of the total pregnant women had delivered their babies in to hospital in the study area. The 86.62 per cent of a pregnant women had delivered at hospital in College veng II, which was followed by Council veng (86.00 %), College veng I (82.46 %), Maubawk L (34.69 %), Maubawk CH (30.43 %), Theiri (24.53 %), Old Tuisumpui (21.43 %), Siatlai (16.67 %), Tuisumpui (14.29 %), Theiva(11.11 %), Lungbun I (10.53 %), Chhuarlung II (10.26 %), Chhuarlung III (10.00 %), KM 10 (8.33 %), Chheihlu (8.16 %), Tuipang L (7.14 %), Lungbun II(6.25 %), Ahmypi (5.88 %), Chhualung I (5.00 %), Mawhre (2.50 %) and Khopai (1.82 %).

6.5.1.5 Others Places

Other places include all the places except mentioned in the above. They are usually friends home, others types of places. 10.41 per cent of the total pregnant women were under this delivery. Tuipang L (33.93 %) was highest in this measurement followed by Lungbun I (28.95 %), Maubawk CH (26.09 %), KM 10 (20.83 %), Chhuarlung III (20.00 %), Old Tuisumpui (17.86 %), Maubawk L (12.24 %), Chhualung I (10.00 %), Siatlai (10.00 %), Lungbun II (9.38%), Theiva (7.41 %), Ahmypi (5.88 %), Chhuarlung II (5.13 %), Theiri (3.77 %), Khopai (3.64 %) and College veng II (3.52 %). There is no delivery in the other villages like Chheihlu, Mawhre, College veng I, Council veng and Tuisumpui.

Table 6.5 Places of Delivery (in %)

Village Councils	Home	PHC	Sub center	Hospital	Other
Ahmypi	76.47	11.76	0.00	5.88	5.88
Chheihlu	89.80	2.04	0.00	8.16	0.00
Chhualung I	40.00	45.00	0.00	5.00	10.00
Chhuarlung II	66.67	10.26	7.69	10.26	5.13
Chhuarlung III	50.00	20.00	0.00	10.00	20.00
Khopai	94.55	0.00	0.00	1.82	3.64
Lungbun I	60.53	0.00	0.00	10.53	28.95
Lungbun II	81.25	3.13	0.00	6.25	9.38
Maubawk CH	30.43	0.00	13.04	30.43	26.09
Maubawk L	40.82	4.08	8.16	34.69	12.24
Mawhre	97.50	0.00	0.00	2.50	0.00
KM 10	62.50	8.33	0.00	8.33	20.83
Old Tuisumpui	57.14	0.00	3.57	21.43	17.86
Siatlai	63.33	6.67	3.33	16.67	10.00
Theiri	58.49	11.32	1.89	24.53	3.77
Theiva	53.70	1.85	25.93	11.11	7.41
Tuipang L	57.14	1.79	0.00	7.14	33.93
College veng I	15.79	0.88	0.88	82.46	0.00
College veng II	9.15	0.00	0.70	86.62	3.52
Council veng	14.00	0.00	0.00	86.00	0.00
Tuisumpui	71.43	0.00	14.29	14.29	0.00
Average	**56.70**	**6.05**	**3.78**	**23.05**	**10.41**

Source: Field survey

6.5.2 Delivery Personnel

Proponents of institutional delivery point to the fact that mortality risk is concentrated around the time of birth – a quarter of all neonatal deaths occur within the first 24 hours, three-quarters within the first week (WHO, 2006). The main rationale for situating births in health facilities is therefore that it gives women access to skilled providers who are better able to recognize and manage delivery complications and perform essential interventions (including newborn resuscitation), and also minimizes delays in getting help (Filippi et al., 2006). The persons who delivered babies in the study area are Nurse, Nauchhar, Health Worker, ASHA and others.

6.5.2.1 Nurse Delivery

In the study area 30.13 per cent of pregnant women delivered their babies under nurse delivery. In College veng II the 86.62 per cent babies were delivered by nurse followed by Council veng (86.00 %), College veng I (80.70 %), Ahmypi (58.82 %), Chhualung I (42.50 %), Maubawk L (34.69 %), Theiri (33.96 %), Maubawk CH (30.43 %), Chhuarlung III (30.00 %), Tuisumpui (28.57 %), Siatlai (23.33 %), Lungbun I (18.42 %), Old Tuisumpui (17.86 %), Theiva (12.96 %), KM 10 (12.50 %), Chheihlu (10.20 %), Lungbun II (9.38 %), Tuipang L (8.93 %), Chhuarlung II (2.56 %), Mawhre (2.50 %) and Khopai (1.82 %).

6.5.2.2 Local Persons/ Midwife Delivery

The most common delivery in the study area was Nauchhar delivery. They are very experienced person in delivery. Many women particularly in rural areas prefer them to deliver their babies. Thus, the rate of delivery to Nauchhar was highest among the delivery persons i.e., 41.02 per cent of the total respondents. This type of delivery was highest in Tuipang L (89.29 %), which was followed by Chheihlu (85.71 %), Lungbun II (75.00 %), Khopai (74.55 %), Lungbun I (71.05 %), KM 10 (62.50 %), Theiri (56.60 %), Mawhre (52.50 %), Chhuarlung III (45.00 %), Theiva (44.44 %), Siatlai (43.33 %), Ahmypi (35.29 %), Old Tuisumpui (28.57 %), Maubawk CH (26.09 %), Chhuarlung II (20.51 %), Chhualung I (17.50 %), Maubawk L (14.29 %), Council veng (10.00 %), Tuisumpui (7.14 %) and College veng II (2.11 %). This type of delivery was not found College veng I during the studies.

6.5.2.3 Health Worker Delivery

Health worker delivered only 9.56 per cent of the total new born babies. As discussed in the delivery institution, health worker are normally in sub center, the delivery of sub center was very low as well as the health worker delivery in the study area. There was no health workers delivery in 8 villages like Chheihlu, Chhualung I, Chhuarlung III, Khopai, Lungbun II, KM 10, Old Tuisumpui and Tuipang L. It was highest in Chhuarlung II (51.28 %), followed by Mawhre (45.00 %), Theiva (27.78 %), Maubawk L (24.49 %), Maubawk CH (17.39 %), Tuisumpui (14.29 %), Ahmypi (5.88 %), Siatlai(3.33 %), Lungbun I (2.63 %), College veng I (2.63 %), College veng II (2.11 %), Council veng (2.00 %) and Theiri (1.89 %).

6.5.2.4 ASHA (Accredited Social Health Activist) Delivery

Accredited Social Health Activist (ASHA) were volunteer persons to help the pregnant women in many ways like vaccinations, vitamins, checkup and also delivery. They are almost same with like local Nauchhar. They contribution is high compared with they are very recent especially in backward rural areas as. In the present study area, 9.25 per cent of the total new born babies were delivered by ASHA. In Tuisumpui village 50.00 per cent born babies were delivered by ASHA, followed by Old Tuisumpui (32.14 %), Chhualung I (30.00 %), Khopai (20.00 %), Siatlai (20.00 %), Maubawk L (14.29 %), Lungbun II (6.25 %), Lungbun I (5.26 %), Chhuarlung III (5.00 %), KM 10 (4.17 %), Theiri (3.77 %), Chheihlu (2.04 %), and College veng II (1.41 %). Even though there is no delivery under ASHA in 8 villages such as Ahmypi, Chhuarlung II, Maubawk CH, Mawhre, Theiva, Tuipang L, College veng I and Council veng.

6.5.2.5 Other Persons Delivery

Others deliver persons includes any other persons who were not included in the above mentioned delivery account 9.99 per cent of the total women. Maubawk CH got the highest position wherein 26.09 per cent of babies were delivered under others delivery followed by Chhuarlung II (25.64 %), Old Tuisumpui (21.43 %), KM 10 (20.83 %), Chhuarlung III (20.00 %), College veng I (15.79 %), Theiva (14.81 %), Maubawk L (12.24 %), Chhualung I (10.00 %), Siatlai (10.00 %), Lungbun II (9.38 %), College veng II (7.75 %), Theiri (3.77 %), Khopai (3.64 %), Lungbun I (2.63 %), Chheihlu (2.04 %), Council veng (2.00 %) and Tuipang L (1.79 %). In the three villages like Ahmypi, Mawhre and Tuisumpui, there was no delivery for others. There was one surprising delivery that is no other helper for delivery that is only found in college veng I (0.88 %)

Table 6.6 Delivery Personnel (in %)

Village Councils	Nurse	Local/ Midwife	Health worker	ASHA	Others
Ahmypi	58.82	35.29	5.88	0.00	0.00
Chheihlu	10.20	85.71	0.00	2.04	2.04
Chhualung I	42.50	17.50	0.00	30.00	10.00

Chhuarlung II	2.56	20.51	51.28	0.00	25.64
Chhuarlung III	30.00	45.00	0.00	5.00	20.00
Khopai	1.82	74.55	0.00	20.00	3.64
Lungbun I	18.42	71.05	2.63	5.26	2.63
Lungbun II	9.38	75.00	0.00	6.25	9.38
Maubawk CH	30.43	26.09	17.39	0.00	26.09
Maubawk L	34.69	14.29	24.49	14.29	12.24
Mawhre	2.50	52.50	45.00	0.00	0.00
Niawhtlang III	12.50	62.50	0.00	4.17	20.83
Old Tuisumpui	17.86	28.57	0.00	32.14	21.43
Siatlai	23.33	43.33	3.33	20.00	10.00
Theiri	33.96	56.60	1.89	3.77	3.77
Theiva	12.96	44.44	27.78	0.00	14.81
Tuipang L	8.93	89.29	0.00	0.00	1.79
College veng I	80.70	0.00	2.63	0.00	15.79
College veng II	86.62	2.11	2.11	1.41	7.75
Council veng	86.00	10.00	2.00	0.00	2.00
Tuisumpui	28.57	7.14	14.29	50.00	0.00
Average	**30.13**	**41.02**	**9.56**	**9.25**	**9.99**

Source: Field survey

6.6 Women's Health

Health with all its dimensions is of human primary needs in such a way that health systems in the world try increasingly to promote their goals in giving health care to sustain a healthy society, and limited and insufficient indicators such as death is replaced by general health indicators such as welfare (Ahmadi et al., 2012). The most generally accepted definition of health is that by world health organization in which health is defined as the state of welfare and mental, physical and social complete easement, and merely not suffering from an illness or disability is not considered as health (Clement, 2009).

Now a day, the health of women, who build up half of the society's population, is not only recognized as a humane right, but its role in family and society is also gaining increasing importance (Ahmadi et al., 2012). Breast cancer, for example, is one of the most malignant diseases among women, especially in the developing countries, which has a bad prognosis in developed steps and has a significant effect on the family's health (Mangolian et al., 2012). Moreover, due to many reasons, women are more vulnerable than men are. Besides biological traits, they are affected by cultural, social, economic and political factors. For example, compared with men, women are in a higher level of stigma associated with HIV (Colbert et al., 2010). Although women live longer than men, they suffer more from physical illnesses, especially acute diseases and non-fatal chronic conditions. They also take more medicine (Kasle & Reed, 2002). World health organization's reports also affirm that gender differences at birth are considered in health dimensions throughout the world (Ahmadi et al., 2012).

Women's health in the study area was measured by studying the four mothers strengthens indicators like normal strength during pregnancy, free from any diseases during pregnancy, women who did not have permanent diseases and women's opinion about their nutrition. 53.95 per cent of all the respondents opined that they were good health during pregnancy. 75.15 per cent have no major diseases during pregnancy, 92.64 per cent not having chronic diseases and 22.18 per cent have thought that they received good nutrition during pregnancy.

6.6.1 Good Health during Pregnancy

Healthy weight and healthy lifestyle behaviors are considered as essential prerequisites for a successful pregnancy. The importance of maternal lifestyle including nutrition and physical activity in relation to the short- and long-term birth outcomes is increasingly featured in the literature (Barker et al., 1993, Aviram et al., 2011 & Zhang, 2011). Recently, more attention has been given to excessive gestational weight gain and obesity as they are shown to significantly increase risks of complications during pregnancy and birth as well as elevating the risk of obesity in the offspring (Lewis, 2003, Symonds et al., 2013). While many western countries are mainly facing the challenge of obesity, most developing countries suffer from a dichotomy of ill health, resulting from both undernutrition and a rising trend in obesity affecting mothers and their babies (WHO, 2016). There is a growing appreciation of interventions including elements of health psychology and behaviour change techniques (BCTs) in supporting health professionals to guide mothers in adapting a healthy lifestyle. These are also used to inform and motivate mothers to improve lifestyle during pregnancy to achieve healthier birth outcomes.

College veng I (96.49 %) was highest in percentage of healthy women during pregnancy which was followed by College veng II (96.48 %), Council veng (84%),Khopai (76.36%), Lungbun II (75 %), Mawhre (67.5%), KM 10 (62.5%), Chhuarlung II (61.54%), Old Tuisumpui (57.14%), Siatlai (53.33%), Chhuarlung III (50%), Chhualung I (47.5%), Chheihlu (46.94%), Lungbun I (44.74%), Theiri (43.4%),TuipangL (39.29%), Ahmypi (35.29%), Maubawk CH (34.78%), Theiva (25.93%), Maubawk L (20.41%) and Tuisumpui (14.29 %).

6.6.2 Free from Diseases

Before the advent of antibiotic agents, pregnancy was a recognized risk factor for severe complications of pneumococcal pneumonia, including death (Finland & Dublin, 1939). As compared with non-pregnant women, pregnant women are more severely affected by infections with some organisms, including influenza virus, hepatitis E virus (HEV), herpes simplex virus (HSV), and malaria parasites. The evidence is more limited for organisms that cause coccidioidomycosis, measles, smallpox, and varicella. The threshold for diagnostic evaluation, as well as hospitalization and treatment, may be lower for pregnant women than for other patients, and this factor may bias some of the reports of increased disease severity (Athena et al., 2015).

All the pregnant women do not have any major kinds of diseases during pregnancy in College veng II, A high percentage was also found in almost all villages like Maubawk CH (95.65%), Khopai (92.73%), Tuipang L (89.29%), Mawhre (87.5%), KM 10 (87.5%), Lungbun I (84.21%), Theiri (83.02%), College veng I (82.46%), Lungbun II (78.13%), Chhuarlung III (77.5%), Old Tuisumpui (75%), Siatlai (73.33%), Tuisumpui (71.43%), Council veng (71%), Chheihlu (69.39%), Theiva (66.67%),Ahmypi (64.71%) and Chhuarlung II (51.28%). While the in some villages more than half of the total pregnant women had any kinds of diseases during pregnancy like Maubawk L (44.9%) and Chhualung I (32.5%).

6.6.3 Free from chronic diseases

Chronic diseases can influence the course of pregnancy and may have lasting effects that manifest at and after birth. Therefore, it is not surprising that women with chronic diseases are often anxious about pregnancy. Fortunately, due to medical progress and detailed pregnancy planning in collaboration with specialists, it is rarely necessary to advice against pregnancy. For instance, 100 years ago, women with multiple sclerosis were advised against pregnancy; however, in subsequent decades, studies demonstrated that this disease may enter into temporary remission during pregnancy, and it is no longer considered a contraindication (Leibowitz et al., 1967). Another example is diabetes mellitus; prior to the introduction of insulin in 1922, patients with diabetes mellitus were considered to have a worsened pregnancy prognosis (Jovanovic & Pettitt, 2007). Epilepsy is also no longer a contraindication according to the “Deutsche Arzneimittelkommission” published in 1984. Today, pregnancy is contraindicated for some women with congenital heart failure or pulmonary hypertension (such as, Eisenmenger’s syndrome, primary pulmonary hypertension, secondary vascular pulmonary hypertension) (Siu & Colman, 2001 and Weiss & Hess, 2000).

7.36 per cent of the respondents had chronic diseases in the study area. The popular diseases are low blood pressure (18.69 %), High Blood Pressure (5.3%), Headache (6023%) , Swell (10.59%), Fever (1.87%), Physically weak (41.74%) and others (15.58%). There were no women with chronic diseases in 9 villages (42.86%) like Ahmypi, Chhuarlung III, Lungbun I, Lungbun II, KM 10, Siatlai, Theiva, College veng I, College veng II, Tuisumpui. Only chhuarlung village had a low percentage of women free from any chronic diseases (7.69 %). The other villages are ranges from 80 to 99 per cent like Council veng (99%), Tuipang L (98.21%), Khopai (98.18%), Old Tuisumpui (96.43%), Theiri (96.23%), Chhuarlung I (95%), Maubawk L (93.88%), Mawhre (92.5%), Chheihlu (85.71%) and Maubawk CH (82.61%).

6.6.4 Nutrition Satisfaction

Poor maternal nutritional intake after the periconceptional period during pregnancy can also negatively impact fetal genetic growth trajectory and can result in fetal growth restriction (Vonnahme et al., 2015). In developing countries, maternal under nutrition is a major factor contributing to adverse pregnancy outcomes. Over-nutrition, under-nutrition or unbalanced nutrition is considered a major cause of ill-health worldwide. The prevalence of overweight is high among children in most developed countries (Padhee et al., 2015). This increase in type 2 diabetes mellitus (DM) and the metabolic syndrome (MetS) in children possibly implies a combination of factors, the majority of which are related to nutrition during the life cycle (Cuervo et al., 2015). However, whether and to what extent early fetal diet influences the achievement of long-term health requires more investigation.

Perceptions on nutritional satisfaction were measured to all respondents. Only 22.18 per cent of the total women opined that they had received a good enough nutrition during their pregnancy. 92.98 per cent of the total respondents had opined that their nutrition during pregnancy was good in College veng I. Perceptions on other village councils were College veng II (92.25%), Council veng (59%), Tuipang L (33.93%), Theiri (28.3%), Chhuarlung III (25%), Mawhre (25%), Tuisumpui (21.43%),Chheihlu 20.41%), Khopai (16.36%), Ahmypi (11.76%), Maubawk CH (8.7%), Chhuarlung II (7.69%), Theiva(7.41%), KM 10 (4.17%), Old Tuisumpui (3.57%), Siatlai (3.33%), Chhualung I (2.5%) and Maubawk L (2.04%). All the respondents have answered that they did not received good nutrition during pregnancy in Lungbun I and Lungbun II.

Table 6.7 Women's Health (in %)

Village Councils	Good health	Free from diseases	Free from chronic disease	Nutrition satisfied
Ahmypi	35.29	64.71	100.00	11.76
Chheihlu	46.94	69.39	85.71	20.41
Chhualung I	47.50	32.50	95.00	2.50
Chhuarlung II	61.54	51.28	7.69	7.69
Chhuarlung III	50.00	77.50	100.00	25.00

Khopai	76.36	92.73	98.18	16.36
Lungbun I	44.74	84.21	100.00	0.00
Lungbun II	75.00	78.13	100.00	0.00
Maubawk CH	34.78	95.65	82.61	8.70
Maubawk L	20.41	44.90	93.88	2.04
Mawhre	67.50	87.50	92.50	25.00
KM 10	62.50	87.50	100.00	4.17
Old Tuisumpui	57.14	75.00	96.43	3.57
Siatlai	53.33	73.33	100.00	3.33
Theiri	43.40	83.02	96.23	28.30
Theiva	25.93	66.67	100.00	7.41
Tuipang L	39.29	89.29	98.21	33.93
College veng I	96.49	82.46	100.00	92.98
College veng II	96.48	100.00	100.00	92.25
Council veng	84.00	71.00	99.00	59.00
Tuisumpui	14.29	71.43	100.00	21.43
Average	**53.95**	**75.15**	**92.64**	**22.18**

Source: Field survey

6.7 Postnatal Care

The postnatal period is the time following delivery until six weeks after birth, and health checks during this time – especially the first two days after delivery – are essential. The WHO (2009) recommends postnatal care within 24 hours of birth, regardless of where the baby is born. Mothers and newborns should receive at least three additional postnatal care visits by a skilled provider, ideally on day 3 (48–72 hours after birth), between day 7 and day 14, and again 6 weeks after birth.

Postnatal care for the baby is an important opportunity to check for danger signs, such as insufficient feeding, fast breathing (a breathing rate of more than 60 per minute), severe chest in-drawing, lethargy, fever, low body temperature, or jaundice. At the same time, mothers can receive advice on how to identify and respond to these symptoms, as well as the benefits of exclusive breastfeeding and immunization.

Given the critical importance of essential newborn care and postnatal care for the baby, household survey programs such as DHS and MICS have recently included indicators to track the coverage of this important component of care for mothers and newborns. Globally, only 59 per cent of mothers and only one in three newborns (34 per cent) received a post-natal health check within the recommended time period.

Deaths in the first month of life, which are mostly preventable, represent 46 per cent of total deaths among children under five. As mortality among children under five declines globally, deaths among these children are more and more concentrated in the first days of life. This makes focus on newborn care more critical than ever before. In 2016, an estimated 2.6 million children died in their first month of life, which is approximately 7,000 newborns every day. Most of these newborns died in the first week of life with approximately one million dying in their first day and another one million dying in the following six days. Despite ongoing challenges, major progress has been made in improving neonatal survival. Neonatal mortality is on the decline globally with the world's neonatal mortality rate falling from 37 deaths per 1,000 live births in 1990 to 19 per 1,000 live births in 2016. The result is a drop in neonatal deaths worldwide from 5.1 million in 1990 to 2.6 million in 2016. However, this decline of 49 per cent is slower than the rate of decline among children aged 1-59 months (62 per cent). The large majority of newborn deaths (80 per cent) are due to complications related to preterm birth, intrapartum events such as birth asphyxia, or infections such as sepsis or pneumonia. Thus, targeting the time around birth with proven high impact interventions and quality care for small and sick newborns may prevent up to 80 per cent of newborn deaths. The "Every Newborn Action Plan" (ENAP) calls for an increased focus on the time around birth with targeted high impact interventions as a strategy for reducing not only newborn deaths but also maternal deaths and stillbirths, generating a triple return in investment (WHO & MCEE, 2017).

For the present studies postnatal care such as number of women who could immediate feed bread to their babies, women who feed only her own bread to their babies, women who practiced normal feeding of foods (after completion of 6 months to their babies), proper ways feeding foods (routine feeding and three times in a day), maintain proper bath of the babies (once in a day between 9 am and 2 pm.), Immediate check after birth of babies and immediate check when the baby has got sick (table 6.7).

6.7.1 Immediate Bread Feed

Breastfeeding saves lives" and "Breast is best!" are well-known slogans for physicians and women. Putting the newborn to the breast to nurse is now considered "normative" in the United States with 75% of women doing so (CDCP, 2011). Unfortunately, breastfeeding as a way to continue to feed infants is not yet normative. Women do not choose to breastfeed as long as recommended by health experts (Eidelman et al., 2012) and the government (USDH, 2020), which may result in a missed opportunity for improving infant health and, at the same time, maternal health.

Breast milk has evolved to provide the best nutrition, immune protection, and regulation of growth, development, and metabolism for the human infant (Goldman, 2012). Breast milk is critical in compensating for developmental delays in immune function in the neonate, and responsible for reducing permeability of the intestine to prepare it for extra uterine life (Goldman, 2000).

The predominant antibody in breast milk, secretory IgA (sIgA), confers its immune protection by inhibiting the adherence to or penetration of the gastrointestinal (GI) tract by pathogens and by phagocytosis or cytotoxicity of pathogens (Brandtzaeg, 2003). sIgA is higher in colostrum than mature milk, is present in a form resistant to digestion, and provides key temporal and ubiquitous immune protection (Newburg & Walker, 2007, Chirico et al., 2008). Additional, acquired secretory antibodies, such as IgM and IgG, depend on prior maternal exposure to pathogens, and provide the infant with environment-specific immune protection (Newburg & Walker, 2007).

The study area was very good in immediate breast feeding. 91.50 per cent of the total study women could feed immediately after the birth of babies. All the women have done immediate breast feeding in the villages like Ahmypi, Chhuarlung II, Lungbun II, KM 10 and Old Tuisumpui. A very high percentage had also found in Theiri (96.23 %), Chheihlu (95.92 %), Chhuarlung III (95 %), Tuipang L (94.64 %), Siatlai (93.33 %), Khopai (92.73 %), Theiva (92.59 %), Lungbun I (92.11%), Council veng (92 %), Maubawk L (89.8 %), College veng I (89.47 %), College veng II (88.73 %), Maubawk CH (82.61 %), Mawhre (80 %), Chhualung I(75 %) and Tuisumpui (71.43 %).

6.7.2 Only Mothers Breast Feed

The favorable gut micro-biome that results from breastfeeding protects the infant from pathogenic bacteria and has also been associated with reduced asthma and reduced obesity rates in children (Isolauri, 2012). This micro-biome is a function of the interaction between human milk's micro biota, such as *Bifidobacteria* and *Lactobacilli*, and the oligosaccharides which serve as fuel for these bacteria; these components resist digestion and have important antimicrobial activity (Newburg & Walker, 2007, Newburg et al., 2005). The healthy microbiome promotes integrity of the intestinal barrier and competitively inhibits pathogen binding, thereby preventing inflammatory responses (Goldman, 2000, Newburg & Walker, 2007). Additionally, the gut microbiota contributes to regulation of the expression of genes that affect fat metabolism and deposition (Kau et al., 2011).

In the study area, 91.10 per cent of the total women feed only their own milk. Mawhre, Chhuarlung I, Maubawk CH and Tuisumpui had 100 per cent feeding. The other villages were Chhuarlung II (97.44), Lungbun II (96.88%), Tuipang L (96.43%), Maubawk L (95.92%), College veng I (95.61 %), Council veng (95 %), Theiri (94.34 %), Ahmypi (94.12%), Chheihlu (93.88 %), Theiva (92.59%), Khopai (90.91%), Siatlai (90%),Lungbun I (89.47%), College veng II (84.51%), Old Tuisumpui (78.57%), Chhuarlung II (75%) and KM 10 (50 %).

6.7.3 Breast Feed up to 6 Months

Breast milk is recommended as the infant’s sole source of nutrition for the first 6 months of life. It is recommended that complementary foods be added to the infant’s diet at 6 months of age and that breastfeeding continue up to two years of age and beyond (Eidelman, 2012). Adequate nutrition during infancy and early childhood is essential to ensure the growth, health and development of children to their full potential (WHO, 2009). It has been recognized worldwide that breastfeeding is beneficial for both the mother and child, as breast milk is considered the best source of nutrition for an infant (Ku et al., 2010). Economic and social benefits are also provided to the family, the health care system and the employer.

WHO recommends that infants be exclusively breastfed for the first six months, followed by breastfeeding along with complementary foods for up to two years of age or beyond (Hanif, 2011). Exclusive breastfeeding can be defined as a practice whereby the infants receive only breast milk without mixing it with water, other liquids, tea, herbal preparations or food in the first six months of life, with the exception of vitamins, mineral supplements or medicines (Nkala, 2011). Breastfeeding an infant exclusively for the first 6 months of life carries numerous benefits such as lowered risk of gastrointestinal infection, pneumonia, otitis media and urinary tract infection in the infant while mothers return to her pre-pregnancy weight very rapidly and have a reduced risk of developing Type 2 diabetes (Kramer & Kakuma, 2009, Bai et al., 2009, WHO, 2011). Finally, breast milk contains hormones, neuropeptides and growth factors that may affect growth, development, and self-regulation of food intake, contributing to the differences observed between breastfed and formula-fed infants (Savino, 2008).

Only 58.87 per cent of the sample respondents feed up to 6 month of their babies. This was one of the worst results found in the study area. Theiri village was the highest in this indicator wherein 90.57 per cent of the respondents feed their breast up to 6 months to their babies. The village was followed by College veng I (88.6 %), Chheihlu (85.71 %), Council veng (83%), College veng II (81.69 %), Siatlai (80 %), Khopai (76.36 %), Mawhre (75 %), Old Tuisumpui (75 %), Ahmypi (70.59 %), Chhuarlung III (67.5 %), Theiva (66.67%), Chhuarlung II (61.54 %), Chhualung I (52.5 %), Tuipang L (39.29 %), Tuisumpui (35.71%), Maubawk CH (34.78%), Lungbun II (21.88 %), Lungbun I (21.05 %), Maubawk L (16.33 %) and KM 10 (12.5 %).

6.7.4 Proper Food Feed

Timing of the first introduction of solid food during infancy may have potential effects on life-long health (Kuo et al., 2011). It can be seen that very often solid foods are either given too early or too late. According to UNICEF (2012), the frequency and amounts of food that is given may be insufficient hence; hindering the normal growth of the child or their consistency or energy density may be incorrect in relation to the child's needs. Therefore WHO 72 stated that it is advisable for mothers to adopt an appropriate complementary feeding as shown in Table 6.7.

Table 6.8 Appropriate Complementary Feeding

Timely	Food should be given when exclusive and frequent breast feeding cannot provide energy and nutrients required by the infants for normal growth and development
Adequate	This signifies that the amount of food given should provide sufficient energy, protein and micronutrients to meet a growing child's nutritional needs.
Safe	This indicates that the food should be prepared and stored in a hygienic way with clean utensil and not bottles and teats; also the child should be fed with clean hands.
Properly fed	This meant that a child is given food according to the child signals of appetites and satiety. The mental frequency and feeding method should encourage the child to consume sufficient food using fingers, spoon or self-feeding according to the age of the child.

Source: United Nations Children's Fund, 2012

College veng I got the highest position wherein 93.86 per cent of the total women done this. It was followed by Siatlai (90 %), Theiva (88.89 %), Tuisumpui (85.71 %), College veng II (76.06 %), Council veng (68 %), Maubawk L (61.22 %), Khopai (60 %), KM 10 (58.33 %), Chhualung I (57.5 %), Theiri (56.6 %), Chhuarlung III (55 %), Ahmypi (52.94 %), Old Tuisumpui (50 %), Tuipang L (48.21%), Chhuarlung II (41.03%), Maubawk CH (39.13%), Lungbun II (31.25%), Chheihlu (26.53%), Lungbun I (10.53 %) and Mawhre (10 %).

6.7.5 Proper Bathing

Bathing reduces tension on overstretched muscles. It helps to heal sore muscles by relaxing them and improves flexibility or elasticity of muscles, especially when you bathe after exercising. Here are some expert tips to get rid of post-workout muscle soreness. Although your baby doesn't do the same activities as older children or adults that may warrant daily bathing, she still needs a bath two to three times a week. Babies need regular baths to clean their skin and hair more consistently than being wiped with a cloth after eating or during a diaper change. Baths control excess oil in the hair, clean your baby's skin from too much moisture and dry the areas between her skin folds (Brannagan, 2015).

During the studies, 74.16 per cent of the total respondents had taken proper regular bathing of their baby's means every day once in a day between 9 a. m to 2 p.m. In College College veng I 99.12 per cent of the total women had practiced proper bathing and other village council like College veng II (97.18 %), Council veng (95 %), Theiva (94.44 %), Tuipang L (92.86 %), Theiri (92.45%), Siatlai (90%), Ahmypi (88.24%), Tuisumpui (85.71%), Chhualung I (80%), Mawhre (72.5%), Old Tuisumpui (71.43%), Chhuarlung III (70%), Maubawk L (67.35%), Lungbun I (63.16%), Maubawk CH(60.87%), Chheihlu (59.18%), Khopai 56.36 %), KM 10 (54.17%), Lungbun II (46.88%) and Chhuarlung II (20.51 %).

6.7.6 Immediate Check after Birth

Each newborn baby must be carefully checked at birth for signs of problems or complications. The healthcare provider will do a complete physical exam that includes every body system. In the hours after he is born, your baby will have several tests and examinations to check that he is healthy and that all is well. Here's an outline of what your midwife and doctor will be looking for when they carry out the tests. Your baby will have a few checks and examinations in the first hours of his life. The first is the Apgar score, which your midwife will record at one minute, then again at five minutes after your baby's born (NCCWCH, 2007).

57.7 per cent of the total women have done immediate health checkup of their new born babies in the study area. College veng II was highest in this measurement wherein 95.07% of the total women maintain the condition. It was followed by College veng I (91.23%), Siatlai (90%), Mawhre (87.5%), Theiva (83.33%), Chhuarlung II (82.05%), Council veng (81%), Lungbun II (75%), KM 10 (62.5%), Chhuarlung III (60%), Tuisumpui (57.14%), Old Tuisumpui (50%), Lungbun I (47.37%), Tuipang L (44.64%), Maubawk CH (43.48%), Khopai (32.73%), Chhualung I (30%), Maubawk L (24.49%), Chheihlu (22.45%), Theiri (20.75%) and Ahmypi (17.65%).

6.7.7 Immediate Check when Sick

When a main symptom is present, a child could have a serious illness. Children with general danger signs and/or any condition with a red classification require urgent pre-referral treatment and referral. It is important to remember that once you have identified a general danger sign, you must conduct the IMCI assessment and determine any pre-referral treatment so that you do not delay the referral. The best possible treatment for a child with a very severe illness is usually at a hospital. Sometimes referral is not possible or not advisable. Distances to a hospital might be too far; the hospital might not have adequate equipment or staff to care for the child; transportation might not be available. Sometimes parents refuse to take a child to a hospital, in spite of the health worker's effort to explain the need for it. If referral is not possible, you should do whatever you can to help the family care for the child. If referral is not possible, continue with pre-referral treatment until the child is able to leave for the hospital (WHO, 2014).

Only 50.24 per cent of the total women do quick and immediate check for treatment when the babies have illness. It was highest in College veng II (98.59%) followed by College veng I (98.25%), Siatlai(83.33%), Council veng (75%), Theiva (66.67%), Tuipang L (64.29%), Chheihlu (57.14%), Theiri (54.72%), Chhuarlung II (48.72%), Chhuarlung III (45%), Tuisumpui (42.86%), KM 10 (41.67%), Lungbun II (40.63%), Old Tuisumpui (39.29%), Khopai (38.18%), Maubawk CH (34.78%), Maubawk L (28.57%), Lungbun I (26.32%), Chhualung I (25 %), Ahmypi (23.53%) and Mawhre (22.5%).

Table 6.9 Postnatal Care (in %)

Village Councils	Immediate Bread feed	Only Mothers Breast feed	Breast Feed up to 6 months	Proper food feed	Proper bathing	Check after birth	Check when sick
Ahmypi	100.00	94.12	70.59	52.94	88.24	17.65	23.53
Chheihlu	95.92	93.88	85.71	26.53	59.18	22.45	57.14
Chhualung I	75.00	100.00	52.50	57.50	80.00	30.00	25.00
Chhuarlung II	100.00	97.44	61.54	41.03	20.51	82.05	48.72
Chhuarlung III	95.00	75.00	67.50	55.00	70.00	60.00	45.00
Khopai	92.73	90.91	76.36	60.00	56.36	32.73	38.18
Lungbun I	92.11	89.47	21.05	10.53	63.16	47.37	26.32
Lungbun II	100.00	96.88	21.88	31.25	46.88	75.00	40.63
Maubawk CH	82.61	100.00	34.78	39.13	60.87	43.48	34.78
Maubawk L	89.80	95.92	16.33	61.22	67.35	24.49	28.57
Mawhre	80.00	102.50	75.00	10.00	72.50	87.50	22.50
Niawhtlang III	100.00	50.00	12.50	58.33	54.17	62.50	41.67
Old Tuisumpui	100.00	78.57	75.00	50.00	71.43	50.00	39.29
Siatlai	93.33	90.00	80.00	90.00	90.00	90.00	83.33

Theiri	96.23	94.34	90.57	56.60	92.45	20.75	54.72
Theiva	92.59	92.59	66.67	88.89	94.44	83.33	66.67
Tuipang L	94.64	96.43	39.29	48.21	92.86	44.64	64.29
College veng I	89.47	95.61	88.60	93.86	99.12	91.23	98.25
College veng II	88.73	84.51	81.69	76.06	97.18	95.07	98.59
Council veng	92.00	95.00	83.00	68.00	95.00	81.00	75.00
Tuisumpui	71.43	100.00	35.71	85.71	85.71	57.14	42.86
Average	**91.50**	**91.10**	**58.87**	**55.28**	**74.16**	**57.07**	**50.24**

Source: Field survey

6.8 Postnatal Immunization (Vaccination)

Immunization through vaccines is one of the most effective means of preventing disease, disability, and death from infectious disease. Both Nurses and pregnant women can play an important role in helping to prevent infectious disease during pregnancy and postpartum by better understanding which vaccinations can be used in pregnancy and during breastfeeding. The postnatal period can be defined as the first 6-8 weeks after birth. Postnatal care should be a continuation of the care the woman has received through her pregnancy, labour and birth and take into account the woman's individual needs and preferences. It should aim to create a supportive environment in which families will be guided by professionals in how to care for their baby and themselves and be able to recognize and act upon any deviation from the normal (NICE, 2006).

Newborns should receive vaccines according to national immunization guidelines. BCG should be given as soon as possible after birth; OPV0 should be given between birth and 2 weeks of age. Perinatal transmission of Hepatitis B (HB) is common, and HB vaccine, if given before infection, can prevent disease and keep nearly all individuals, including infants, from becoming carriers. The vaccine is most effectively used as a routine part of the infant immunization schedule, although it can be used at any age.

Healthy women and their newborns should stay at a health facility at least 24 hours, but after that, postnatal care (PNC) does not need to be facility-based. In many settings, properly trained health providers or CHWs can provide basic PNC at home (MCHIP, 2012). Regardless of where the birth took place, mothers and babies need at least four postnatal visits in the first 6 weeks: (1) within the first 24 hours, (2) 3 days after birth, (3) between 1 and 2 weeks (Days 3–14) after birth, and (4) 6 weeks after birth. Traditional practices often keep the mother and her baby at home for variable periods up to 6 weeks after birth. Thus, CHWs can play a role in making home visits in the postnatal period. Community mobilization and home visits by CHWs, in synergy, would increase coverage of newborn care practices and reduce neonatal deaths. Both timing of visits and treatment interventions are critical (Lancet, 2005 & Nair et al., 2010).

6.8.1 BGC Vaccination

The BCG vaccine is often derided for the lack of efficacy in preventing Mycobacterium tuberculosis infection and pulmonary disease in adults. However, BCG vaccine remains a highly effective and cost-efficient intervention to prevent tuberculous meningitis and miliary tuberculosis in infants, reducing the incidence of these life-threatening and debilitating infections by approximately 75% (Trunz, 2006, Mangtani, 2014). In addition, BCG vaccine coverage rates typically exceed those of other vaccines because it can be administered at birth as a single vaccination (Ndirangu, 2009).

53.97 per cent of the total women gave BCG vaccination at the time and regular doses. The highest was College veng II (99.3%) which was followed by College veng I (98.25%), Theiva (92.59%), Siatlai (86.67%), Lungbun II (71.88%), Ahmypi (70.59%), Chheihlu (65.31%), Chhualung I (65%), Maubawk CH(60.87%), Old Tuisumpui

(57.14%), Tuisumpui (57.14%), Tuisumpui (57.14%), Chhuarlung III (55%), Theiri (50.94%), Tuipang L (48.21%), Khopai (45.45%), Lungbun I (31.58%), KM 10(25%), Council veng (25%), Maubawk L (12.24%), Chhuarlung II (10.26%) and Mawhre(5%)

6.8.2 DPT

This is the concept behind the vaccination for diphtheria, tetanus, and pertussis (DPT). There are two forms of the DPT vaccine, DTwP and DTaP. DTwP (diphtheria, tetanus, and whole-cell pertussis) is cheaper and still used in the developing world. DTaP (diphtheria, tetanus, and a cellular pertussis) is newer, widely used in the United States, and generally regarded as safer. Both forms of the DPT vaccine protect children from three serious diseases: diphtheria, tetanus, and pertussis.

The number of women gave DPT vaccine to their babies in the study area was only 41.81 per cent. 99.3 per cent of the total respondents gave DPT vaccines to their babies at a time in College veng II. It was quite good in the other villages like College veng I (96.49%), Theiva (81.48%), Council veng (78%) and Siatlai (76.67%). Whereas a low percentage of this indicators found in Ahmypi (58.82%), Chheihlu (55.1%), Old Tuisumpui (46.43%), Chhuarlung II (46.15%), Theiri (45.28%), Lungbun II (43.75%), Chhualung I (42.5%), Chhuarlung III (42.5%), Tuipang L (37.5%), Maubawk CH (34.78%), Khopai (34.55%), Tuisumpui (28.57%), Tuisumpui (28.57%), Mawhre (27.5%), KM 10 (25%), Lungbun I (18.42%) and Maubawk L (6.12%).

6.8.3 Oral Polio Vaccine (OPV)

The effect of OPV vaccination on mortality has only been assessed in a few studies. OPV has been associated with lower infant mortality and morbidity, both in

Guinea-Bissau (Aaby et al., 2004 & Aaby et al., 2005) and elsewhere (Contreras, 1974 & Contreras, 1989). From 1985 to 2010, WHO recommended that OPV be given at birth or at first contact with the health system in low-income countries (GAG, 1985). OPV given at birth (OPV0) remains the policy in countries at high risk for polio infection, including Guinea-Bissau.

In the study area 47.36 per cent of the total women gave OPV vaccination to their new born babies. College veng II got the highest position in OPV vaccination to the new born babies i.e., 99.3 per cent which was followed by College veng I (97.37%), Council veng (79%), Chheihlu (61.22%), Ahmypi (58.82%), Chhuarlung II (53.85%), Theiva (51.85%),Old Tuisumpui (50%), Maubawk L (46.94%), Tuisumpui (42.86%), Tuisumpui 42.86 %), Chhuarlung III (42.5%), Siatlai (40%), Theiri (37.74%), Chhualung I (35%), Khopai (32.73%), Lungbun II (31.25%), Maubawk CH (30.43%), Tuipang L (30.36%), Mawhre (30%), KM 10 (25%) and Lungbun I (18.42%).

6.8.4 Measles

Measles is an acute, highly contagious illness caused by a virus in the family paramyxovirus, genus Morbillivirus. Measles presents with symptoms of fever (as high as 105°F), malaise, cough, coryza, and conjunctivitis, followed by the characteristic maculopapular rash and Koplik spots (Strebel et al., 2008). In 1978, when India adopted the Expanded Program on Immunization (EPI) promoted by WHO measles vaccine was excluded under the mistaken belief that it was not a common problem. Research reports and advocacy papers from Vellore had brought out the importance of measles vaccination even before the EPI was launched. The need to vaccinate infants at 9 months of age was identified, guiding the global EPI on measles vaccination schedule (John TJ, Jesudoss, 1973 & John et al., 1973). Measles caused death of about 3 per cent of rural and 1 per cent of urban under-five children, for which reason the highest priority was recommended for measles prevention (John et al., 1980, John and Steinhoff, 1982 & John, 1983). Annual pulse immunization, a simplified vaccine schedule, was shown to be highly effective in controlling measles in a rural community (John et al., 1984).

The study found only 31.60 per cent of the total women gave measles vaccine to their babies. It was highest in College veng II wherein 99.3 per cent of the total women took measles vaccination for their new born babies. A good percentage was also found in College veng I (96.49%), Council veng (76%) and Chhuarlung II (56.41%). On the other hand a poor vaccination had been found in the villages like Old Tuisumpui (46.43%), Tuisumpui (42.86%), Tuisumpui (42.86%), Chhuarlung III (32.5%), Mawhre (32.5%), Maubawk CH (26.09%), Theiri (24.53%), KM 10 (20.83%), Tuipang L (19.64%), Theiva (18.52%), Lungbun I (13.16%), Lungbun II (12.5%), Chheihlu (12.24%), Ahmypi (11.76%), Chhualung I (7.5%), Siatlai (6.67%), Maubawk L (4.08%) and Khopai (3.64%).

6.8.5 Measles, Mumps, and Rubella (MMR)

Measles, mumps and rubella virus vaccine live is an active immunizing agent used to prevent infection by the measles, mumps, and rubella viruses. It works by causing your body to produce its own protection (antibodies) against the virus. Measles (also known as coughing measles, hard measles, morbidity, red measles, rubella, and 10-day measles) is an infection that is easily spread from one person to another. Infection with measles can cause serious problems, such as stomachproblems, pneumonia, earinfections, sinus problems, convulsions (seizures), b rain damage, and possibly death. The risk of serious complications and death is greater for adults and infants than for children and teenagers. Mumps is an infection that can cause serious problems, such as encephalitis and meningitis, which affect the brain. In addition, adolescent boys and men are very susceptible to a condition called orchitis, which causes pain and swelling in the testicles and scrotum and, in rare cases, sterility. Also, mumps infection can cause spontaneous abortion (miscarriage) in women during the first 3 months of pregnancy. Rubella (also known as German measles) is a serious infection that causes miscarriages, stillbirths, or birth defects in unborn babies when pregnant women get the disease. If measles, mumps, and rubella vaccine is to be given to a child, the child should be at least 12 months of age. This is to make sure the measles vaccine is effective. In a younger child, antibodies from the mother may interfere with the effectiveness of the vaccine (Mee-zuls et al., 2018).

MMR vaccination was done by 21.58 per cent of the total women in the study area. No women delivered MMR vaccine to their new born babies in the villages like Chhualung I, Chhuarlung III, Khopai, Lungbun I, Theiva, Tuisumpui and Tuisumpui. It is found quite good number in College veng I (96.49%), College veng II (71.13%), Chhuarlung II (66.67%), Council veng (56%), Maubawk L (51.02%) but poor in Mawhre (35%), Maubawk CH (17.39%), Lungbun II (12.5%), Tuipang L (10.71%), Chheihlu (8.16%), Theiri (7.55 %), Old Tuisumpui (7.14%), Ahmypi (5.88%), KM 10 (4.17%), and Siatlai (3.33%),

6.8.6 Hib and Hibsag

Haemophilus influenza type b (Hib) conjugate vaccine was introduced into the United Kingdom's immunization schedule in October 1992. An initial 1-year ‘catch-up’ program offered children up to 4 years a single dose of vaccine (O'Brien, 1994). Infants were immunized at 2, 3 and 4 months of age without a ‘booster’ dose (Heathet al., 2000). Resultant relatively low post-immunization antibody concentrations were further reduced by the use of a less immunogenic Hib conjugate vaccine combined with diphtheria, tetanus and acellular pertussis (DTaP-Hib) in 2000 and 2001(McVernon et al., 2003). Despite an initial marked reduction in cases, resurgence of infections was noted 8 years after vaccine introduction (Trotter et al., 2003), necessitating a national catch-up immunization campaign (Heath & Ramsay, 2003). The United Kingdom's initial experience of high vaccine effectiveness despite low Hib antibody concentrations inspired confidence in the protective efficacy of immunological memory (Heathet al., 2000). Memory immune responses are evidenced by the rapid production of high avidity antibodies on re-exposure to antigenic challenge. Direct protection following the UK infant primary course proved lower than anticipated, however, being only 61% over the first 2 years, and 27% thereafter (Ramsay et al., 2003), possibly masked by the catch-up campaign originally employed (Ramsay et al., 2003 & Trotter et al., 2003). The demonstration of increased risk of vaccine failure in recipients of DTaP-Hib vaccine confirmed the need for higher antibody concentrations to protect against Hib disease (McVernon et al., 2003).

In the study area Hib vaccination was very low as only 22.10 per cent of the total women maintain regular vaccination to their new born babies. It was not done in the villages like Ahmypi, Chhualung I, Khopai, Lungbun I, Old Tuisumpui, Siatlai, Theiva and Tuisumpui. It was highest in Chhuarlung II where 74.36 per cent of the total respondents took the vaccination to their new born babies. Chhuarlung II was followed by College veng I (73.68%), Mawhre (70%), Maubawk L (69.39%), Council veng (65%), College veng II (54.93%), Maubawk CH (17.39%), Tuipang L (10.71%), Chheihlu (8.16%), Theiri (7.55%), Lungbun II (6.25%), KM 10 (4.17%) and Chhuarlung III (2.5%).

26 per cent of the total women had maintained Hibsag vaccination. In the 7 village councils like Ahmypi, Chhualung I, Khopai, Lungbun I, Old Tuisumpui ,Theiva and Tuisumpui no women give Hibsag vaccination. It is 99.3 per cent in College veng II, Mawhre (95%), Chhuarlung II (76.92%), Council veng (76%), Maubawk L (73.47%), College veng I (68.42%), Maubawk CH (17.39%), Tuipang L (10.71%), Chheihlu (8.16%), Theiri (7.55%), KM 10 (4.17%), Siatlai (3.33%), Lungbun II (3.13%) and Chhuarlung III (2.5%).

6.8.7 Hepatitis B

Hepatitis B vaccination was very unsatisfactory among women in the study area wherein only 30.97 per cent of the total women surveyed. It was quite good in College veng II (99.3%), Mawhre (97.5%), Council veng (79%), Chhuarlung II (76.92%), Maubawk L (69.39%) and College veng I (64.04%). While it was very poor in Tuisumpui (28.57%), Chhuarlung III (25%), Maubawk CH (17.39%), KM 10 (16.67%), Theiva (14.81%), Siatlai (10%), Tuipang L (8.93%), Chheihlu (8.16%), Theiri (7.55%), Chhualung I (7.5%), Ahmypi (5.88%), Lungbun I (5.26%), Old Tuisumpui (3.57%), Lungbun II (3.13%) and Khopai (1.82%).

6.8.8 Time Vaccination/ Normal Doses

The study finds that 54.8 per cent of the total new born babies were given double doses of vaccines due to unavailability of vaccine supply at the right time. Thus the timely vaccination with normal doses is very important. College veng I was highest in this indicator where 97.37 per cent of the respondents maintained the timely and normal doses of vaccination. College veng I was followed by College veng II (95.77%), Council veng (87%), Ahmypi(58.82%), Maubawk L (57.14%), Chheihlu (53.06%), Chhualung I (52.5%), Chhuarlung II (51.28%), Siatlai (50%), Tuisumpui (50%), Old Tuisumpui (42.86%), Mawhre (37.5%), Khopai (34.55%), Theiri (32.08%), Lungbun II (31.25%), Maubawk CH (30.43%), Theiva (29.63%), Chhuarlung III (22.5%), KM 10 (12.5%), Tuipang L (12.5%) and Lungbun I (10.53%).

Table 6.10 Immunization (in %)

Village Councils	BCG	DPT	OPV	Measles	MMR	Hib	Hibsag	Hep B	Time Vaccination/ Normal Doses
Ahmypi	70.59	58.82	58.82	11.76	5.88	0.00	0.00	5.88	58.82
Chheihlu	65.31	55.10	61.22	12.24	8.16	8.16	8.16	8.16	53.06
Chhualung I	65.00	42.50	35.00	7.50	0.00	0.00	0.00	7.50	52.50
Chhuarlung II	10.26	46.15	53.85	56.41	66.67	74.36	76.92	76.92	51.28
Chhuarlung III	55.00	42.50	42.50	32.50	0.00	2.50	2.50	25.00	22.50
Khopai	45.45	34.55	32.73	3.64	0.00	0.00	0.00	1.82	34.55
Lungbun I	31.58	18.42	18.42	13.16	0.00	0.00	0.00	5.26	10.53
Lungbun II	71.88	43.75	31.25	12.50	12.50	6.25	3.13	3.13	31.25
Maubawk CH	60.87	34.78	30.43	26.09	17.39	17.39	17.39	17.39	30.43
Maubawk L	12.24	6.12	46.94	4.08	51.02	69.39	73.47	69.39	57.14
Mawhre	5.00	27.50	30.00	32.50	35.00	70.00	95.00	97.50	37.50
KM 10	25.00	25.00	25.00	20.83	4.17	4.17	4.17	16.67	12.50
Old Tuisumpui	57.14	46.43	50.00	46.43	7.14	0.00	0.00	3.57	42.86
Siatlai	86.67	76.67	40.00	6.67	3.33	0.00	3.33	10.00	50.00
Theiri	50.94	45.28	37.74	24.53	7.55	7.55	7.55	7.55	32.08
Theiva	92.59	81.48	51.85	18.52	0.00	0.00	0.00	14.81	29.63
Tuipang L	48.21	37.50	30.36	19.64	10.71	10.71	10.71	8.93	12.50
College veng I	98.25	96.49	97.37	96.49	96.49	73.68	68.42	64.04	97.37
College veng II	99.30	99.30	99.30	99.30	71.13	54.93	99.30	99.30	95.77

Council veng	25.00	78.00	79.00	76.00	56.00	65.00	76.00	79.00	87.00
Tuisumpui	57.14	28.57	42.86	42.86	0.00	0.00	0.00	28.57	50.00
Average	**53.97**	**48.81**	**47.36**	**31.60**	**21.58**	**22.10**	**26.00**	**30.97**	**45.20**

Source: Field survey

6.9 Over all Reproductive Healthcare Status

After calculation of each of the major indicators such as antenatal care, tobacco consumption, delivery, mother's health, postnatal care and immunization including 39 indicators, the overall reproductive healthcare of the study area had been work out. To measure the overall nutritional status, all the components were first normalized by Z-Score standardized techniques and further analyzed by PCA through SPSS software. After component loadings were estimated, the individual indicators with the highest components loadings are group into intermediate composite indicators. Two components were extracted. The first component consists of the variables like Antenatal care, Delivery, Postnatal care, women's health and tobacco consumption. It explains 52.85 per cent of the total variable. The second component explains 17.87 per cent of the total variables. It only include single indicator i.e., immunization (Table 6.9)

Table 6.11 Rotated Component Matrix[a] of the Major Indicators

Indicators	Component		Communalities
	1	2	
Antenatal	**.935**	.019	.874
Delivery	**.840**	.115	.426
Postnatal	**.819**	.350	.719
Women's Health	**.707**	-.154	.524
Tobacco	**.636**	-.147	.793
Immunization	-.023	**.952**	.907
% of explained variance	52.846	17.874	
Expl.Var (Eigen value)	3.171	1.072	
Expl/Total	0.04	0.02	

Total var.	70.72		

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations
Expl. Var. is the variance explained by the component, and Expl./Total is the explained variance divided by the total variance of the five components

Factor analysis produced the weight of the indicators. As shown in table no.6.10 Antenatal care and postnatal care are the most determining factors for measurement of the overall reproductive healthcare contributing 21.92 per cent and 2.97 per cent respectively of all indicators component. Delivery accounts 20.45 per cent, women's health 14.25 per cent, tobacco consumption during pregnancy 13.64 per cent and immunization cover 0.95 per cent of all the indicators.

Table 6.12 Indicators and their Weight

Indicators	Weight
Antenatal care	2.99
Postnatal care	2.97
Delivery	2.79
Mothers Health during pregnancy	2.08
Tobacco free care during pregnancy	1.86
Immunization to the babies	0.95
Total	**13.63**

After obtaining weights of every indicators, the index value of all Villages/ Local council have been worked out by the following formula is used to determine the Composite index score.

$$I = \sum_{j=1} Xi \left(\sum_{j=1} /Lij/.Ej \right) / \sum_{i} \left(\sum_{j=1} /Lij/.Ej \right)$$

Where *I*is the index, Xi is the i-th Indicator; Lij is the factor loading of the i-th variable on the j-th factor; E is the Eigen Value of the J-th factor. (Explain detail in Chapter IV, Table 4.4).

The composite score of each major 6 indicators explaining all the 39 sub indicators components were first calculated and the overall reproductive healthcare status were measured as shown on the table no. 6.11. For example, to obtained the composite score of antenatal care during pregnancy, the sub indicators like Number of Tetanus injection taken, number of Iron Folic Acid (IFA) intake, number of pregnant women taking Iron supplement more than 50 capsules in per cent, number of pregnant women taking calcium supplement more than 50 capsules in per cent, number of any other types of supplementary vitamins taken by a pregnant women in per cent, physical health care of a pregnant mother i.e., control for working during pregnancy and regularity of checkup taken were measure and so on. After calculation of the respective result the overall reproductive healthcare was find out.

Table 6.13 Composite Score of the Villages

Village Councils	Antenatal care	Tobacco consumption	Delivery	Mothers health	Postnatal care	Vaccination	Composite index
Ahmypi	0.15	-0.16	-0.24	-0.33	-0.33	-0.24	-0.18
Chheihlu	-0.46	-0.53	-0.63	-0.15	-0.42	0.06	-0.41
Chhualung I	-0.16	0.68	-0.50	-0.80	0.05	0.05	-0.15
Chhuarlung II	-0.92	-0.79	-0.33	-0.14	-0.77	-0.1	-0.57
Chhuarlung III	-0.26	0.87	-0.57	0.00	-0.26	0	-0.11
Khopai	-0.72	2.39	-0.56	0.54	-0.31	0.03	0.07
Lungbun I	-0.57	0.87	-0.44	-0.40	-1.14	-0.01	-0.41
Lungbun II	-0.45	0.52	-0.63	0.30	-0.93	0.03	-0.31
Maubawk CH	-0.51	2.97	0.47	-1.00	-0.46	-0.01	0.14
Maubawk L	0.15	1.95	0.51	-0.96	-0.62	-0.08	0.12

Mawhre	-0.41	0.98	-0.65	0.52	-0.14	-0.12	-0.05
KM 10	-0.31	1.33	-0.65	-0.09	-1.18	-0.02	-0.29
Old Tuisumpui	0.25	-1.08	0.15	-0.20	-0.38	0.03	-0.17
Siatlai	-0.1	-0.51	-0.07	-0.12	1.12	0.07	0.12
Theiri	-0.02	-0.78	-0.17	0.10	0.29	0.01	-0.07
Theiva	0.07	0.98	0.59	-0.50	0.91	0.06	0.40
Tuipang L	-0.72	1.34	-0.68	-0.09	0.11	-0.01	-0.10
College veng I	1.75	2.3	1.10	1.66	1.60	-0.01	1.52
College veng II	1.6	11.04	1.23	1.76	1.28	-0.02	2.65
Council veng	1.08	-1.03	1.17	0.66	0.94	-0.05	0.64
Tuisumpui	0.55	1.3	0.89	-0.76	0.63	0.02	0.50

Source: Field survey

6.10 Discussions

Jenks natural break (explained in chapter 3) produced five classes like very low, low moderate, high and very high of the villages. Table no. 6.12 explains that the village wise status of reproductive healthcare in the study area.

For Antenatal care 14.29 per cent of the total selected village councils were good under very high status such as College veng I, College veng II and Council veng. Tuisumpui and Old Tuisumpui (5.92%) were high, Ahmypi, Chhuarlung I, Maubawk L, Siatlai, Theiri and Theiva (23.81) were moderate, Chheihlu, Chhuarlung III, Mawhre, Maubawk CH, KM 10, Lungbun I and Lungbun II (33.33%) were low, Chhuarlung II, Khopai and Tuipang L (14.29%) were very low.

According to percentage of pregnant women who are free from tobacco products, Maubawk CH, Maubawk L, College veng I and College veng II (19.05%) obtained very high status, College veng II, KM 10 and Tuipang L (14.29%) were high, Chhuarlung I, Chhuarlung III, Lungbun I, Lungbun II, Mawhre and Theiva (28.57%) were moderate, Ahmypi, Council veng and Tuisumpui (14.29%) were low and Chheihlu, Chhuarlung II, Lungbun I, Siatlai & Theiri (28.81%) were under very low status.

In terms of delivery 19.5 per cent of the total village councils like College veng I, College veng II, Council veng and Tuisumpui were very high status. The village councils like Maubawk Ch, Maubawk L and Theiva (14.29%) were high, Ahmypi, Old tuisumpui, Theiri and Siatlai (19.5%) were moderate, Chhuarlung I, Chhuarlung II and Lungbun I (14.29%) were low and Chheihlu, Chhuarlung III, KM 10, Khopai, Lungbun II, Mawhre and Tuipang L (33.33%) were very low.

Women's Health status was measured as only 9.52 per cent of the villages like College veng I and College veng II were counted as very high status, Council veng, Khopai, Lungbun and Mawhre (19.05 %) were high, Chheihlu, Chhuarlung II, Chhuarlung III, KM 10, Khopai, Lungbun II, Mawhre and Old Tuisumpui (38.10 %) were moderate, Ahmypi, Lungbun I & Theiva (14.29 %) were low and Chhuarlung I, Maubawk Ch, Maubawk L & Tuisumpui (19.05 %) were very low status.

Five village councils accounting 23.81 per cent of the total study village councils were very high in post natal care such as College veng I, College veng II, Council veng, Siatlai and Theiva, high were Chhuarlung I, Theiri, Tuisumpui and Tuipang L (19.05 %), Ahmypi,Chheihlu, Chhuarlung III, Maubawk CH, Khopai, Old Tuisumpui and Mawhre (33.33 %) were moderate, Chhuarlung II & Maubawk L (9.52 %) were low and the three village councils like KM 10, Lungbun I & Lungbun II (14.29 %) were very low.

Immunization of the new born babies had been found as very high village councils were College veng I, College veng II & Council veng (14.29%), high as

Chhuarlung II, Mawhre and Maubawk L (14.29 %) , moderate for Ahmypi, Chheihlu, Maubawk CH, Siatlai, Theiva, Tuisumpui & Old Tuisumpui (33.33%), low were Chhuarlung I, Chhuarlung III, Lungbun II, Theiri & Tuipang (23.81) and very low status as Khopai, KM 10 and Lungbun I (14.29%).

After finding out of all the indicators, the overall reproductive healthcare status had been calculated as only the two village councils like College veng I and College veng II comprising 9.52 per cent of the total village councils were good enough i.e., very high status, Council veng, Theiva and Tuisumpui (14.29 %) were very high, Maubawk CH, Khopai, Siatlai and Tuisumpui (19.05 %) were moderate, Ahmypi, Chhuarlung I, Chhuarlung III, Mawhre, Tuipang L, Theiri and Old Tuisumpui (33.33 %) were low and Chheihlu, Chhuarlung II, KM 10, Lungbun I and Lungbun II (23.81 %) were very low status.

Table 6.14 Overall Reproductive Health care Status

Index	Status	Village Councils
Antenatal care		
0.551 to 1.750	Very high	College veng I, College veng II & Council veng (14.29%)
0.151 to 0.550	High	Tuisumpui & Old Tuisumpui (5.92%)
-0.259 to 0.150	Moderate	Ahmypi, Chhuarlung I, Maubawk L, Siatlai, Theiri & Theiva (23.81)
-0.719 to -0.260	Low	Chheihlu, Chhuarlung III, Mawhre, Maubawk CH, KM 10, Lungbun I & Lungbun II (33.33%)
-0.920 to -0.720	Very low	Chhuarlung II, Khopai & Tuipang L (14.29%)
Tobacco Consumption		
1.341 to 2.970	Very high	Maubawk CH, Maubawk L, College veng I & College veng II (19.05%)
0.981 to 1.340	High	College veng II, KM 10 & Tuipang L (14.29%)
0.001 to 0.980	Moderate	Chhuarlung I, Chhuarlung III, Lungbun I, Lungbun II, Mawhre & Theiva (28.57%)
-0.509 to 0.000	Low	Ahmypi, Council veng & Tuisumpui (14.29%)
-1.080 to -0.510	Very low	Chheihlu, Chhuarlung II, Lungbun I, Siatlai & Theiri (28.81%)
Delivery		

0.591 to 1.230	Very high	College veng I, College veng II, Council veng & Tuisumpui (19.5%)
0.151 to 0.590	High	Maubawk Ch, Maubawk L & Theiva (14.29%)
-0.329 to 0.150	Moderate	Ahmypi, Old tuisumpui, Theiri & Siatlai (19.5%)
-0.559 to -0.330	Low	Chhuarlung I, Chhuarlung II & Lungbun I (14.29%)
-0.680 to -0.560	Very low	Chheihlu, Chhuarlung III, KM 10, Khopai, Lungbun II, Mawhre & Tuipang L (33.33%)
Women's Health		
0.661 to 1.760	Very high	College veng I & College veng II (9.52%)
0.101 to 0.660	High	Council veng, Khopai, Lungbun & Mawhre (23.81%)
-0.329 to 0.100	Moderate	Chheihlu, Chhuarlung II, Chhuarlung III, KM 10, Khopai, Lungbun II, Mawhre & Old Tuisumpui (38.10%)
-0.759 to -0.330	Low	Ahmypi, Lungbun I & Theiva (14.29%)
-1.000 to -0.760	Very low	Chhuarlung I, Maubawk Ch, Maubawk L & Tuisumpui (19.05%)
Postnatal care		
0.631 to 1.600	Very high	College veng I, College veng II, Council veng, Siatlai & Theiva (23.81%)
-0.139 to 0.630	High	Chhuarlung I, Theiri, Tuisumpui & Tuipang L (19.05%)
-0.619 to -0.140	Moderate	Ahmypi,Chheihlu, Chhuarlung III, Maubawk CH, Khopai, Old Tuisumpui & Mawhre 33.33%)
-0.929 to -0.620	Low	Chhuarlung II & Maubawk L (9.52%)
-1.180 to -0.930	Very low	KM 10, Lungbun I & Lungbun II (14.29%)
Immunization		
1.021 to 1.930	Very high	College veng I, College veng II & Council veng (14.29%)
-0.239 to 1.020	High	Chhuarlung II, Mawhre & Maubawk L (14.29%)
-0.599 to -0.240	Moderate	Ahmypi, Chheihlu, Maubawk CH, Siatlai, Theiva, Tuisumpui & Old Tuisumpui (33.33%)
-0.709 to -0.460	Low	Chhuarlung I, Chhuarlung III, Lungbun II, Theiri & Tuipang (23.81)
-0.910 to -0.071	Very low	Khopai, KM 10 & Lungbun I (14.29%)
Overall Reproductive Healthcare		
0.641 to 2.650	Very high	College veng I & College veng II
0.141 to 0.640	High	Council veng, Theiva & Tuisumpui
	Moderate	Maubawk CH, Khopai, Siatlai & Tuisumpui
-0.289 to -0.050	Low	Ahmypi, Chhuarlung I, Chhuarlung III, Mawhre, Tuipang L, Theiri & Old Tuisumpui
-0.570 to -0.290	Very low	Chheihlu, Chhuarlung II, KM 10, Lungbun I & Lungbun II

Source: field survey

6.11 Conclusion

The limited number of health care both financial and institutional available for pregnant women makes it imperative that interventions are targeted toward those at greatest risk. A very poor antenatal care was prevalent among the study women. Especially intake of supplementary vitamins like Iron (16.37 %) and Calcium (39.97 %) are very low. Important healthcare such as work reduction during pregnancy was very low that is only 5.54 per cent of the total respondents have reduced their work load and time during pregnancy. Due to poor accessibility IFA injection (16.37 %) and regular health checkup (36.03 %) among the pregnant women were very inadequate in the study area. However the percentage of pregnant women practicing tobacco consumption found not too high. Generally more than 70 per cent of pregnant women were free from any kinds of toxic intake except Sahdah (smokeless tobacco consumption) in which 41.62 per cent have regularly eaten Sahdah.

The study also found that a bad habit of poor institutional delivery wherein PHC (6.05 %), sub-center (3.78 %) and hospital (23.05 %) are unsafe for the pregnant women as well as the new born babies. While 56.70 per cent of the women delivered at their own home and delivered by local peoples. Delivery of the trained persons such as Nurse delivery was not too low as it was found as 30.13 per cent babies were delivered by nurse but at the same time due to unaware of other expert delivery as well as unavailability of medical personnel like Health worker (9.56 %) and ASHA (9.25 %), the local delivery was most common in the study area comprising 41.02 per cent of the total respondents.

According to perception only 22.18 per cent of the total pregnant women had attained a good enough nutrition during pregnancy because of financial problems, ignorance and negligence. It may further affect that only 53.95 per cent opined that they were physically strong enough during pregnancy. On the other hand most of the women were free from chronic diseases (92.64 %) as well as major diseases (75.15 %) during pregnancy period. Postnatal care was generally quite good in the study area like 91.50 per cent could immediate feed breast to their new born babies as well as only 8.9 per cent gave others types of milk other than their own breast. This may be the results of most of the women were free from any diseases during pregnancy and delivered by normal birth not by operation. Proper breast feed up to 6 months of babies (58.87 %), proper food feeds (55.28 %) and proper bathing (74.16 %) were also not very bad. Due to ignorance and remoteness postnatal health check of babies (57.07 %) and immediate health check when the babies fill sick (50.24 %) are unsafe for the new babies. It further affects the infant illness as well as infant mortality.

Immunization to the new born babies practices extremely low in the study area. This is because unawareness and negligence of the mother as well as the unavailability of door to door vaccines to the villages especially more remote part of the district. The unavailability of medical institution as well as expert also affects the irregular vaccination and double doses of vaccination (54.8 %). Vaccination like BCG (53.97 %), DPT (48.81 %), OPV (47.36%), Measles (31.60%), MMR (21.58 %), Hib (22.10 %), Hibsag (26.00 %) and hepatitis B (30.97 %) were very poor for survival of the new born babies. Hence, the study shows the overwhelming reproductive health needs of pregnant women. Because of the high rates of infant death and the costs of medical care for pregnant inmates, it is likely that providing reproductive health services will produce a substantial cost savings not only for correctional facilities but also for the municipalities that become responsible for high-risk births.

A. Baby Taking Bath

B. Breast Feeding Baby

C. Food Feeding of Baby

D. Early Pregnant Women are Working

Figure 6.2 Reproductive Healthcare of Pregnant Women

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CHAPTER - VII

INFANT MORTALITY RATE

7.1 Introduction

Infant mortality rate (IMR) is a measure of human infant deaths in a group younger than one year of age. It is an important indicator of the overall physical health of a community (Linda, 2018). IMR is possibility of dying between birth and exactly one year of age expressed per 1,000 live births (UNICEF, 2014). Liu (2015) mentioned that India contributes one-fifth of live births and more than a quarter of neonatal deaths of the world. In 2013 India was the highest for any country in the world that almost 0.75 million neonates died. The current national mortality rate (NMR) is 28 per 1000 live births according to SRS, 2013.Given the infant and under-five child mortality rates of 40 and 49 per 1000 live births, respectively, 70 per cent of total infant deaths and more than half of under-five deaths fall in the neonatal period. Indeed, with the early NMR of 22 per 1000 live births, deaths in the first week alone account for 45 per cent of total under-five deaths (SRS, 2013).

There was a significant reduction in the quantum of child deaths and neonatal during the past two decades. The annual neonatal deaths has reduced from 1.35 million in 1990 to 0.75 million in 2013 (Liu, 2015 & WHO, 2015). But at the same time the rate of decline in the neonatal and child mortality rates has accelerated only in the past decade. For example, neonatal deaths reduced by 33 per cent in the period from 2000 to 2013 compared with 17 per cent from 1990 to 2000 (WHO, 2015).

Based on a systematic analysis of world, regional and national causes of infant mortality in 2013, it was identified that preterm birth complications and infections were to be the two major causes of neonatal deaths in India (Liu, 2015 & Liu, 2012). According to review of data from the Million Death Study from India Perinatal asphyxia and malformations to be the other two significant causes of neonatal mortality in India (Bassani, 2010). These findings are very similar to the patterns of the world (Liu, 2012).

About three-fourths of total neonatal deaths occur in the first week of life. More than one-third the entire neonatal period (36.9%) of the deaths had occurs in the first 24 hour (Baqui, 2006, ICMR, 2008 & Bang, 2005).

In terms of timing of cause-specific neonatal deaths, almost all deaths (97.8%) due to asphyxia occur in the first week of life, with 70 per cent of them occurring within the first 24 hour. About three-fourth of deaths due to prematurity (74.8%) occur in the first week of life, with 30 per cent in the first 24 hour, 50 per cent of neonatal deaths secondary to sepsis occur in the first week of life. About 30 per cent of sepsis-related deaths occur in the second week, whereas around one fifth in three to four weeks. Three-fourth of the deaths due to malformations occurs in the first week of life, with 24 hour alone contributing to nearly half of these deaths (Baqui, 2006).

In India, inequalities with of caste, class, gender and geographical differences define a very large segment of the population. A high-level expert group (HLEG) appointed by the planning commission of India (PCI) witnessed that the poorest and most disadvantaged have a higher risk for diseases due to the health and social inequality interface. This could be found in urban and rural poor, women and children, especially abled persons, and traditionally marginalized and excluded communities such as adivasis, or STs, dalits, or SCs, and ethnic and religious minorities. They are a high chance of being excluded from the health services. Thus the neonates born under these populations are expected to be the most vulnerable to morbidity and mortality (HLEG, 2011). In the context of NMR there are important rural–urban and socioeconomic differences. The NMR in rural areas is twice that in urban areas (31 and 15 per 1000 live births) (SRS, 2013).

National Health Mission, Government of Mizoram monthly report (2017) shows IMR of Mizoram 2010-2017 (table 7.1). During the last 7 year the average IMR in the state was 28.29. During this period IMR of the state was highest in 2014-2015 i.e., 37 again Saiha district had the highest IMR record in the history of the district as well as the state which was 113 followed by Aizawl district (61), Serchhip (46), Kolasib (36), Champhai (34), Lunglei and Mamit (34). The data shows that IMR in the state was increased from 27 in 2010 to 37 in 2015 (10) and declined from 37 in 2015 to 22 in 2015 (15) and 22 in 2015 to 17 in 2017 (5).

Table 7.1 District wise Infant Mortality Rate in Mizoram

Districts	**Year**						
	2010-11	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Aizawl	28	26	59	75	61	35	31
Champhai	36	42	24	22	34	25	12
Kolasib	31	33	27	35	36	17	20
Lawngtlai	23	33	28	35	32	23	24
Lunglei	43	44	26	25	31	29	15
Mamit	19	26	12	21	31	13	17
Saiha	75	81	46	79	113	38	24
Serchhip	33	50	36	31	46	28	15
Mizoram	**27**	**30**	**30**	**35**	**37**	**22**	**17**

Source: NHM-HMIS Monthly reports (2017)

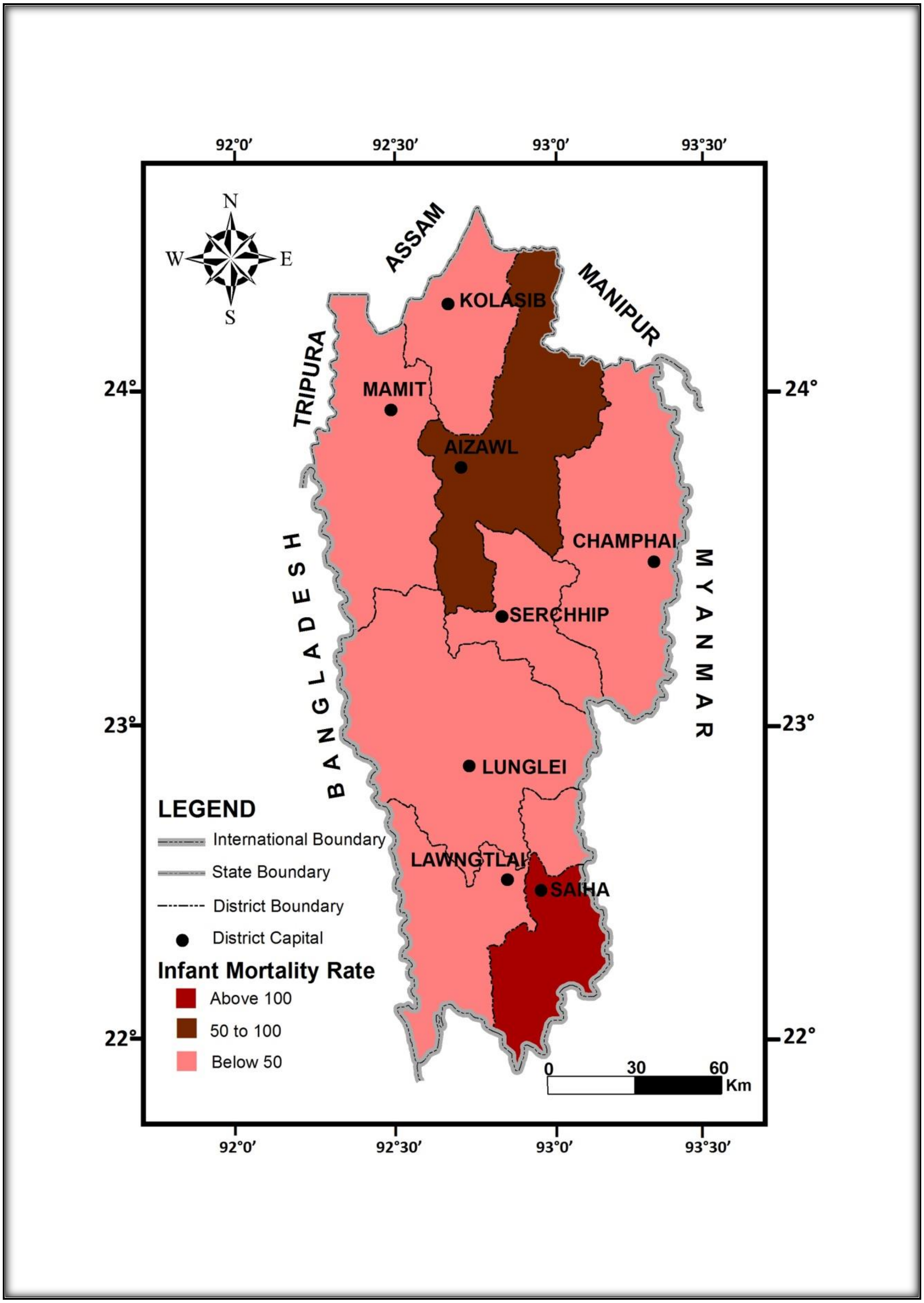

Figure 7.1 Infant Mortality Rate, Mizoram, 2014

7.2 Patterns of IMR in Mizoram, 2017

Figure 7.1 shows the district wise average IMR from 2010 to 2017 of Mizoram. The district Saiha got the highest average IMR during the last 7 years i.e., 65.14. Aizawl district is the second highest IMR district in wherein the average IMR during the 7 years was 45, followed by Serchhip (34.14), Lunglei (30.43), Kolasib (28.43), Lawngtlai (28.29), Champhai (27.86) and Mamit (19.86).

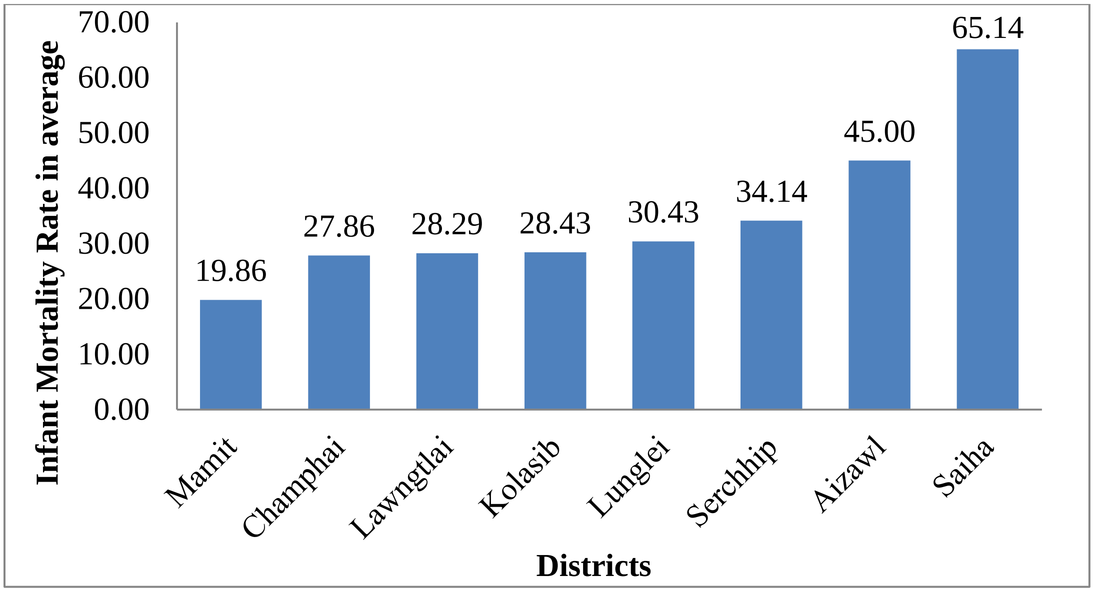

Figure 7.2 District wise Patterns of IMR in Mizoram, 2017

7.3 Infant Mortality Rate in Saiha District

In the study area, the average IMR during the study was 210.84 which were 46.40 per cent higher than whole district (113). The highest IMR found in Theiri where IMR was 636.363. Theiri was followed by Lungbun I (571.43), Chhuarlung III (363.636), Chhuarlung I (333.33), Siatlai (285.714), Theiva (272.72), Lungbun II (250), Maubawk CH (250), Khopai (214.9), KM 10 (200), Tuipang L (200), Chhuarlung II (181.818), Old Tuisumpui (166.66), Mawhre (153.85), Maubawk L (142.86), Tuisumpui (125), Council veng (28.57), College veng I (26.31), and College veng II (24.39). Zero IMR was found in Ahmypi and Chheihlu villages.

Table 7.2 Infant Mortality Rate, Village Council Wise, 2014

Village Councils	No. of Live birth	No. of Infant Death	IMR
Ahmypi	4	0	0
Chheihlu	9	0	0
Chhuarlung I	9	3	333.33
Chhuarlung II	11	2	181.818
Chhuarlung III	11	4	363.636
Khopai	14	3	214.9
Lungbun I	7	3	571.43
Lungbun II	8	2	250
Maubawk CH	4	1	250
Maubawk L	14	2	142.86
Mawhre	13	2	153.85
KM 10	5	1	200
Old Tuisumpui	6	1	166.66
Siatlai	7	2	285.714
Theiri	11	7	636.363
Theiva	11	3	272.72
Tuipang L	10	2	200
College veng I	38	1	26.31
College veng II	41	1	24.39
Council veng	35	1	28.57
Tuisumpui	8	1	125
Average			**210.84**

Source: Field Survey

The village councils were divided in to five classes of IMR such as very high having IMR of 363.635 to 636.362, high 285.713 to 363.635 IMR, moderate having 181.817 to 285.7139 IMR, Low having IMR of 28.570 to 181.817 and very Low which includes villages with zero to 28.570 IMR. Lungbun I and Theiri were very high in IMR status which comprises 9.52 per cent of the total villages studied. Under a high IMR class

9.52 per cent of the total villages were there which includes Chhuarlung I and Chhuarlung III. The highest concentration of village councils was found in Moderate status which cover 33.33 per cent of the total village councils surveyed such as KM 10, Khopai, Lungbun II, Maubawk CH, Siatlai, Theiva and Tuipang L. Low status of IMR includes Chhuarlung II, Mawhre, Maubawk L, Tuisumpui and Old Tuisumpui comprising 23.81 per cent of the total village councils surveyed and the remaining 23.81 per cent were under very low IMR status such as Ahmypi, Chheihlu, College veng I, College veng II and Council veng village councils (table 7.3).

Table 7.3 Levels of IMR Village Council Wise

Index	Status	Village Councils
363.635 to 636.362	Very high	Lungbun I & Theiri (9.52%)
285.713 to 363.635	High	Chhuarlung I & Chhuarlung III (9.52%)
181.817 to 285.7139	Moderate	KM 10, Khopai, Lungbun II, Maubawk CH, Siatlai, Theiva & Tuipang L (33.33%)
28.570 to 181.817	Low	Chhuarlung II, Mawhre, Maubawk L, Tuisumpui & Old Tuisumpui (23.81%)
0.000 to 28.570	Very low	Ahmypi, Chheihlu, College veng I, College veng II & Council veng (23.81%)

Source: Field Survey

7.4 IMR and Socio-Economic Status

There was a high negative correlation between IMR and socio-economic status in the study area. The R value of -0.535 explained the higher IMR and the lower socio-economic status. The correlation value -0.361 explained a negative correlation between Educational attainment and IMR. Type of house and IMR was related with high negative correlation i.e., -0.550. A high negative correlation was also found in income and IMR (-0.501). A low negative correlation found between occupation and IMR in which the R value was -0.344. Number of Toilets in a household is indicating the hygienic and healthy of a family. A high negative relationship was found between Toilets and IMR. Thus the result finds the low economic status of a family was associated with a high IMR and vice versa (table 7.4).

Table 7.4 Relationship between IMR and Socio-Economic Status

IMR and Socio-economic Correlations[c]					
Socio-Economics	Educational Attainment	Types of House	Income	Occupation	Toilet
IMR	-.361	-.550**	-.501*	-.344	-.578**
Sig.	.108	.010	.021	.127	.006

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
c. Listwise N=21

Source: Field Survey

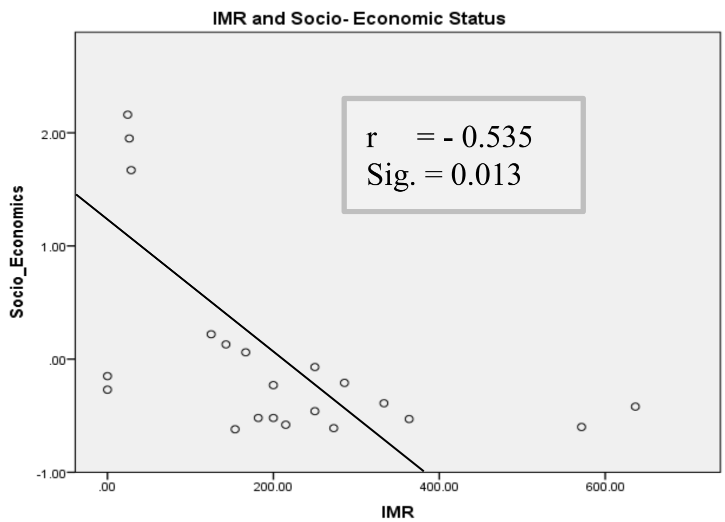

Figure 7.3 Relationship between IMR and Socio-economic Status

7.5 IMR and Food Security

The three components of food security like food availability, food accessibility and food stability and IMR were negatively correlated to each other. The R value -0.444 explained the relationship between overall food security and IMR as lower food security higher IMR. IMR was highly related with food surplus where the R value 0.525 explained a high positive correlation, Per Capita per day availability of Rice (0.44) and number of livestock per head (0.43) also had a positive correlation. Table 7.5 explained the relationship between IMR and food accessibility like types of road (0.277), distance from urban center (-0.006), Population - Fair Price Shop ratio (0.073), regularity of Fair Price Shop (-0.070) and percentage of main worker to the total population (-0.424). Almost all the indicators under food stability had a negative correlation with IMR. R value of -0.501 explained the annual income of a family was highly negative related with IMR. On the other hand land productivity had a high positive correlation i.e., 0.169. The other indicators also had a negative relationship like irrigation (0 -.297), self-sufficiency rice (0-.239), dependency (0-.291), self-sufficiency on other food stuff (0-.311), food stock of a family (0-.293) and education (0-.362) as shown in table 7.5.

Table 7.5 Relationship between IMR and Food Security

IMR and Food Availability

Food Availability	Availability Per Capita	Livestock per Head	Food Surplus
IMR	.044	.043	.525*
Sig.	.850	.855	.015

IMR and Food Accessibility

Food Accessibility	Road Types	Distance	Population FPS Ratio	Regularity of FPS	% Main workers
IMR	.277	-.006	.073	-.070	-.424
Sig.	.224	.979	.753	.763	.056

IMR and Food Stability

Food Stability	Income	Productivity	Irrigation	Self Sufficiency Rice	Dependency	Self Sufficiency other	Food Stock	Education
IMR	-.501*	.169	-.297	-.239	-.291	-.311	-.293	-.362
Sig.	.021	.464	.191	.296	.201	.170	.197	.107

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
c. Listwise N=21

Source: Field Survey

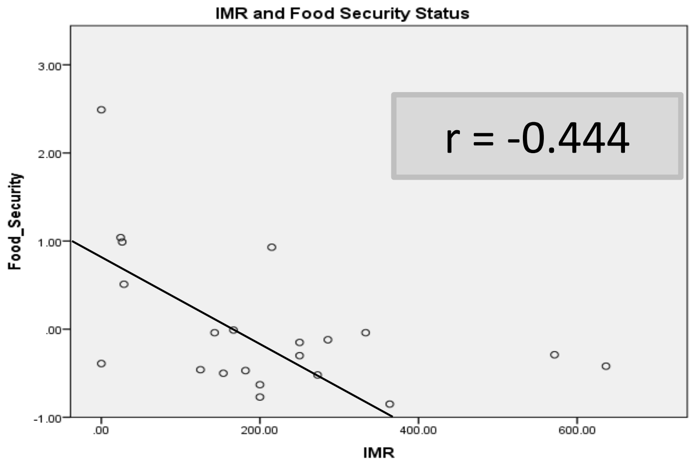

Figure 7.4 IMR and Food Security

7.6 IMR and Nutritional Status

After calculation of vitamins and minerals components, the study found overall relationship between IMR and nutritional status of a pregnant women in the study area i.e., -0.512. It explain there was a high negative correlation between IMR and nutritional status of a pregnant women explaining lower nutritional status higher IMR. There was a high negative correlation between energy intake of a pregnant women and IMR. The R value of -0.536 explained the lower energy status the higher IMR in the study area. A high negative correlation with IMR was also found in Crude fiber (-0.5), phosphorous (-0.51), Thiamine (-0.5), Niacin (-0.5), Vitamin C (-0.5) and Choline (-0.5) among the vitamin components. Intake of other vitamins like Carbohydrates (-0.457), Iron (-0.445), Calcium (-0.436) and Protein (-0.402) had also a negative relationship with IMR while a low negative correlation found between Fats intake and IMR (-0.276), Vitamin C (-0.36), Carotene (-0.35) and Folic Acid (-0.1). Among the mineral components all minerals had a negative relationship with IMR. The highest relationship found in Copper (-0.5) and Chromium (-0.5) with IMR. Molybdenum (-0.47), Manganese (-0.46), Magnesium (-0.4), Sodium (-0.4), Zink (-0.4), Potassium (-0.39), Chloride (-0.39) and Selenium (-0.3) also had a negative relationship with IMR. Thus all kind of nutritional components had a negative relationship with IMR so that the lower nutritional status of a pregnant women the higher IMR (Table 7.6).

Table 7.6 Relationship between IMR and Nutritional Status

IMR and Major Vitamin Components

Vitamins	Protein	Fat	Carb	Energy	Calcium	Iron
IMR	-.402	-.276	-.457*	-.536*	-.436*	-.445*
Sig.	.071	.226	.037	.012	.048	.043

IMR and Minor Vitamin Components

Vitamins	Cr	Ph	Car	Th	Rib	Ni	Vit B6	Fa	Vit C	Cho
IMR	-.5*	-.51*	-.35	-.5**	-.25	-.5*	-.36	-.1	-.5*	-.5*
Sig.	.01	.016	.11	.009	.25	.01	.10	.62	.02	.01

IMR and Trace Minerals

Minerals	Mg	Sod	Pot	Cu	Mn	Mo	Zn	Cr	S	Cl
IMR	-.4*	-.4*	-.39	-.5*	-.46*	-.47*	-.4*	-.5*	-.3	-.39
Sig.	.04	.04	.08	.01	.03	.03	.03	.01	.12	.07

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

c. Listwise N=21

Source: Field Survey

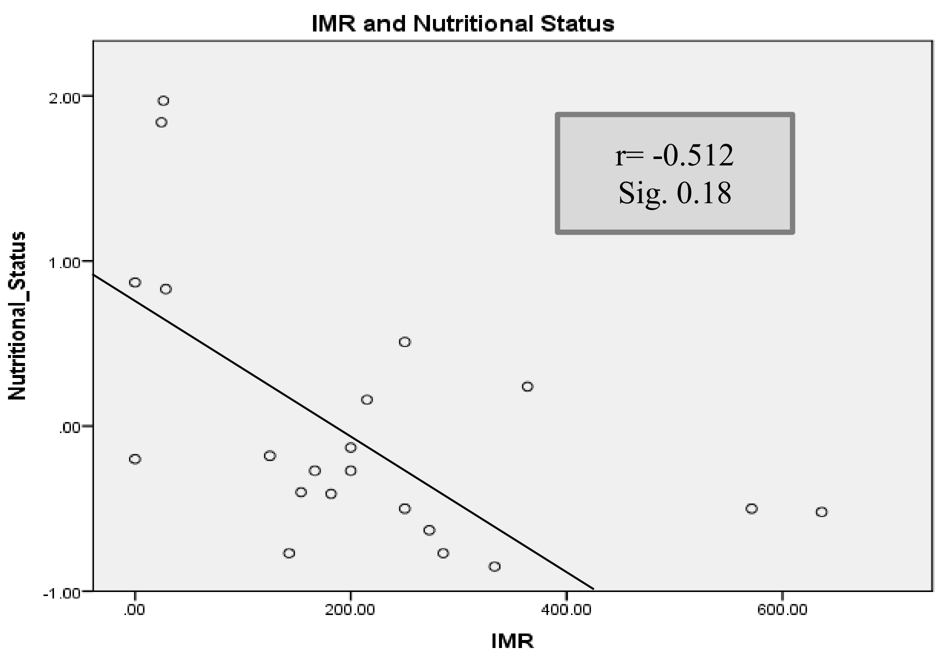

Figure 7.5 IMR and Overall Nutritional Status

7.7 IMR and Reproductive Healthcare

The study found a negative correlation between IMR and Reproductive Healthcare of pregnant women in the study area (Table 7.7). The R value of -0.47 explained that the lower reproductive healthcare of pregnant women the higher IMR and vice versa (figure 7.5). The study measured the relationship between IMR and reproductive healthcare by dividing into 6 healthcare components such as antenatal care, tobacco consumption during pregnancy, delivery, pregnant women's health and postnatal care. Under the component of antenatal care, there was a low negative correlation with IMR like tetanus injection (R= -0.16), work load (R= -0.018), regular checkup (R= -0.144). It indicated IMR was not highly affected by these three factors. On the other hand intake of Iron Folic Acid (R= -0.527) and Iron (R= -0.527) had a high negative correlations with IMR which means a lower intake of Iron Folic Acid and Iron cause higher IMR and vice versa. There was also a high negative correlations between IMR and Calcium Intake (R= -0.394) and others vitamins intake (R= -0.423).

Tobacco consumption during pregnancy and IMR were positively low correlated to each other. Smoking during pregnancy and IMR was correlated with -0.432 means smoking during pregnancy highly affected the infant mortality. The other kinds of tobacco consumption like Khaini (R= 0.071), Tuibur (R= 0.103) and Alcohol (R= 0.247) had a low positive correlation with IMR. Sahdah consumption had a negative correlation (R= -0.328). Generally tobacco consumption during pregnancy was not very high in the study area and the affects for IMR was also not very high except smoking which had a high correlation.

Delivery included both delivery place and delivery person likes institutional delivery and expert delivery. The relationship between delivery and IMR was not very high in the study area. The study found a positive correlations between PHC and Sub-Center delivery with IMR for 0.249 and 0.031 respectively while Hospital delivery had negative correlation with IMR (R= -0.383). Expert deliveries like Nurse and Health worker had low negative correlations with IMR such as -.356 and -.097 respectively while ASHA delivery had a positive relationship which is 0.050.

A subjective components like the opinion of a pregnant women about their health and nutritional status was measured. A high negative correlations (R= -0.419) had been found between good nutrition and IMR. It explained according to their opinion pregnant women who do not received good nutrition had a high IMR and vice versa. A low negative correlation had been also found between women who think themselves healthy with IMR (R= -0.28). On the other hand a low positive correlation was found between pregnant women having no major diseases (R= 0.042) and chronic diseases (R= 0.059).

Postnatal cares like breast feeding, food feeding, bathing and health checkup were not very high related with IMR. A negative correlation had been found in breast feed by self (R= -.064), breast feed up to 6 months (R= -0.207), routine breast Feeding (R= -0.232), normal bath means once in a day and bath to baby between 9.00 am to 2:00pm (R= -0.096), health check after birth of babies (R= -0.221) and immediate check when the baby felt sick (R= -0.283). It shows that these factors were affecting IMR but not the biggest factors because all the correlations were not highly negative. In case of immediate breast feed, there was a low positive correlation with IMR which is 0.028 means the relationship between immediate breast feed and IMR was not high as shown in table 7.7.

Table 7.7 IMR and Reproductive Healthcare

IMR and Antenatal Care

Healthcare	Tet	IFA	Iron	Cal	Other Vitamins	Work load	Regular Checkup
IMR	-.161	-.527*	-.527*	-.394	-.423	.018	-.144
Sig.	.486	.014	.014	.077	.056	.938	.534

Correlations[a] IMR and Tobacco Consumption During pregnancy

Tobacco Consumption	Smoke	Khaini	Tuibur	Sahdah	Alcohol
IMR	**.432**	**.071**	**.103**	**-.328**	**.247**
Sig.	.050	.759	.656	.147	.280

IMR and Delivery

	Institutional Delivery			Expert delivery		
Delivery	**PHC**	**Sub-Center**	**Hospital**	**Nurse**	**Health Worker**	**ASHA**
IMR	.294	.031	-.383	-.356	-.097	.050
Sig.	.196	.892	.087	.113	.675	.828

IMR and Pregnant Women's Health Correlations

Women's Health	Healthy	No Major Diseases	No Chronic Diseases	Good Nutrition
IMR	-.285	.042	.059	-.419
Sig.	.211	.858	.800	.059

IMR and Postnatal Care Correlations c.

Postnatal Care	Feed Immediate	Feed Self	Feed up to 6 Months	Routine Feeding	Normal Bath	Check after birth	Check when Sick
IMR	.028	-.064	-.207	-.232	-.096	-.221	-.283
Sig.	.905	.783	.367	.312	.679	.335	.214

IMR and Vaccination Correlations[c]

Vaccination	BCG	DPT	OPV	Hept. B	Measles	MMR	Hib	Hibsag
IMR	-.131	-.372	-.633**	-.443*	-.422	-.484*	-.430	-.441*
Sig.	.571	.097	.002	.044	.057	.026	.052	.045

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

c. Listwise N=21

Source: Field Survey

There was a negative correlation between vaccinations to the new born babies and IMR. A high negative correlation was found between OPV and IMR which is -0.633. MMR (R= -.484), Hepatitis B (R= -0.443) Hibsag (R= -.441) Hib (R= -.430), Measles

(R= -.422), and DPT (R= -0.372) also had a high negative relationship with IMR while BCG vaccination had a low negative correlation with IMR which is -0.131. Therefore postnatal care vaccination to the new born babies affects IMR.

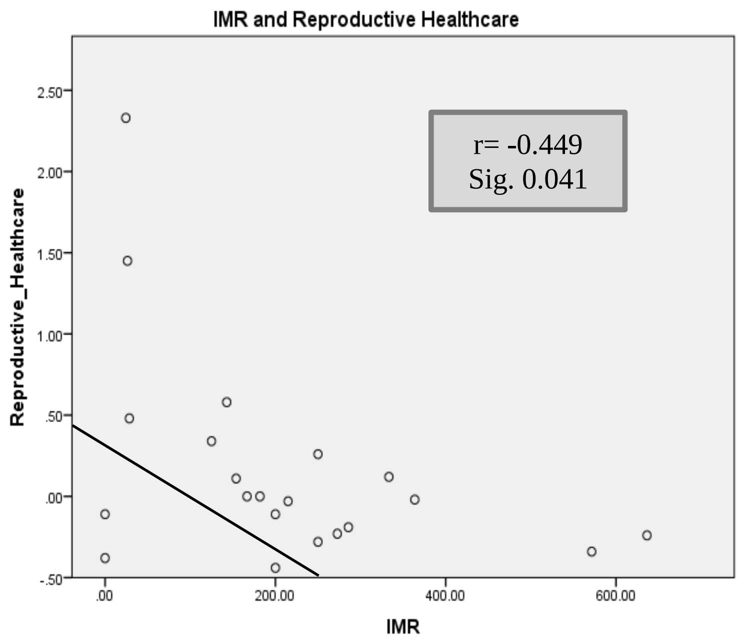

Figure 7.6 IMR and Reproductive Healthcare

7.8 Comparisons between IM and No IM

The nutritional attainment differential between mothers having Infant Death (IM) and do not have for all times have been measured. The per capita per day intake was compared between the two. That intake was lower in Infant death mother (IM) than no Infant death mother (No IM). Figure 7.7 explained nutritional attainment differential between women having infant mortality (IM) and women having no infant mortality (No IM). The highest difference was found in Vitamin B6 in which women having infant mortality had 59.30 per cent lower than women had no infant mortality. Vitamin C intake was also highly difference between the two i.e., 48.99 per cent higher in women had no

IM than women having IM. Difference was also found on other nutrients like Choline (46.67%), Folic Acid (38.68%), Crude Fiber (38.22%), Calcium (36.11%), Carotene (36.09%), Iron (26.57%), Iron (26.61%), Protein (26.57%), Phosphorous (19.89%), Fat (18.38%), Thiamine (18.02%), Riboflavin (17.06%), Energy (13.68%), Niacin (12.90%) and Carbohydrates (10.55%). Minerals intakes were also difference between them. For instance Sodium intake of pregnant women having no IM was 49.25 per cent higher than pregnant women having IM. It reveals that IMR was affected by mineral status of pregnant women. Status on Minerals like chloride and Selenium were highly difference between women having IM and no IM such as 47.64 per cent and 40.78 per cent respectively. The difference was also found in other types of minerals like Potassium (36.03%), Copper (22.17%), Chromium (16.41%), Molybdenum (13.54%), Manganese (12.06%), Magnesium (11.60%) and Zink (10.89%).

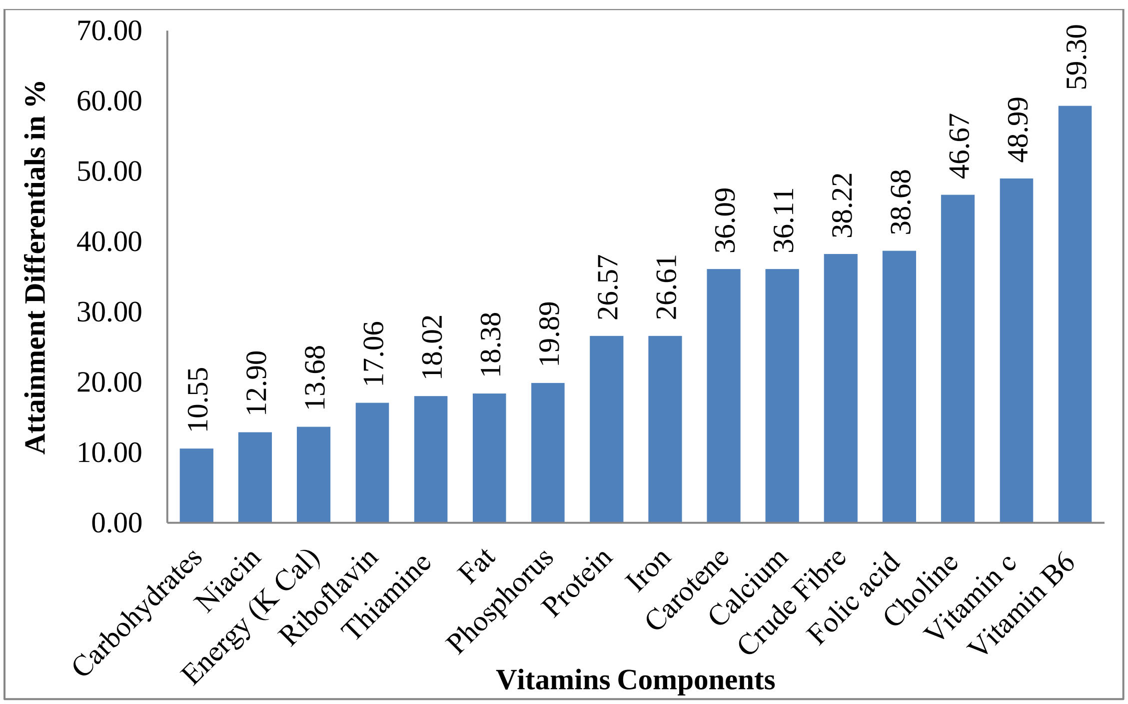

Figure 7.7 Nutritional Attainment Differentials between IM and No IM (Vits)

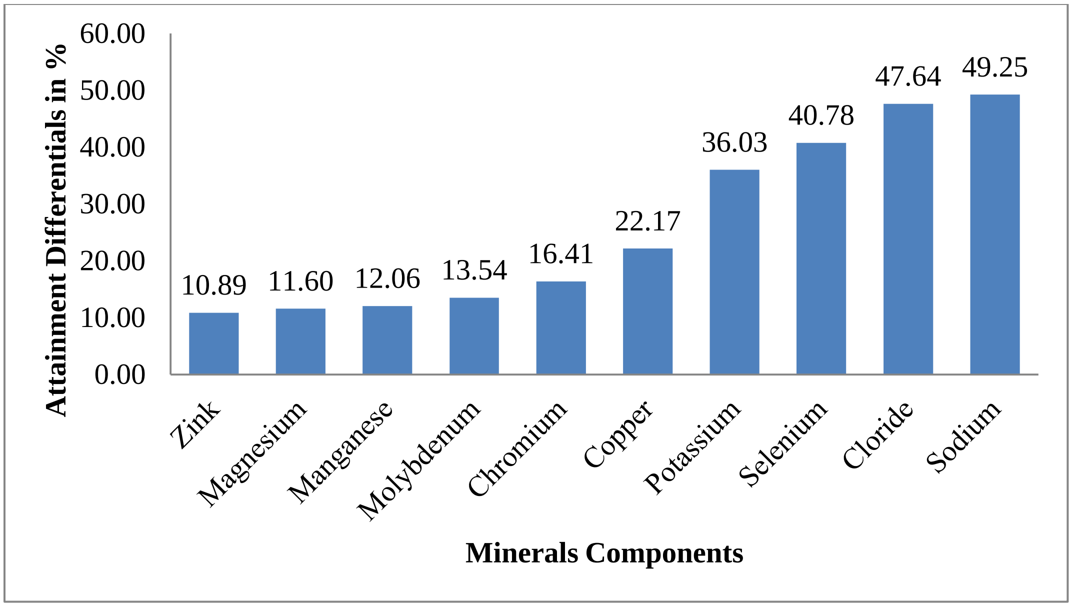

Figure 7.8 Nutritional Attainment Differentials between IM and No IM (Mins)

Figure7.9 explained the difference between women having IM and No IM on antenatal care. It showed that antenatal care was better among No IM women than IM women in the study area. The number of women having full doses of tetanus injection account 12.97 per cent among IM women while it was 13.33 per cent in No IM women. It indicated that tetanus injection affects IMR. Difference between IM and no IM women was found on other antenatal care like IFA injection has taken by 8.49 per cent among no IM women while only 1.13 per cent among IM women got IFA injection during pregnancy.

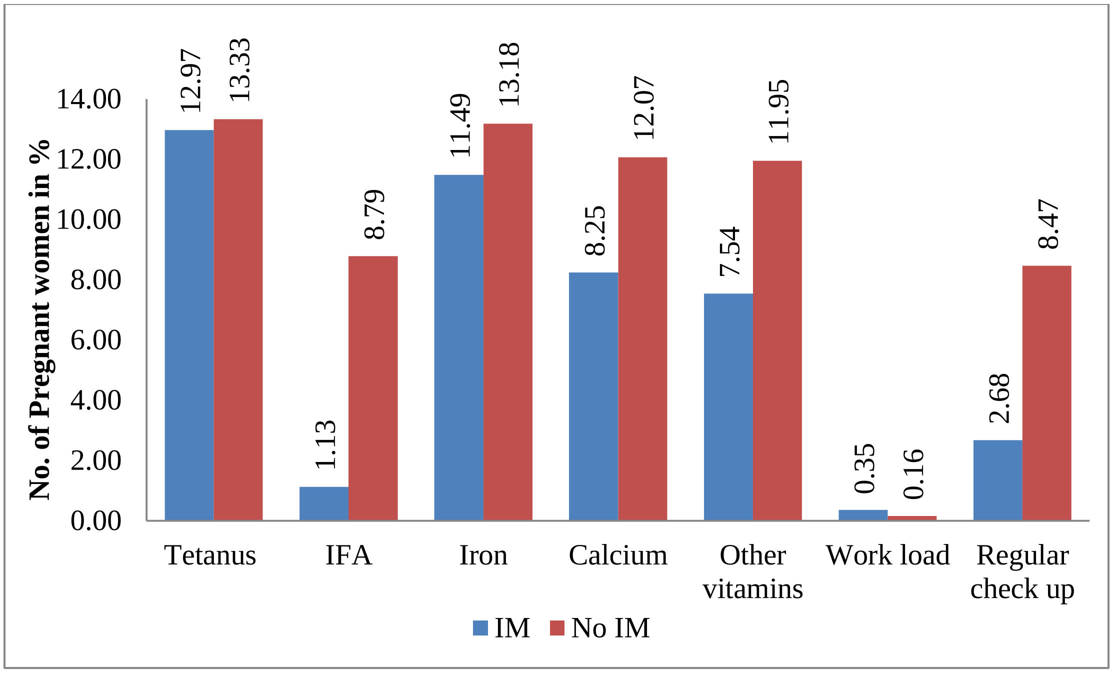

Figure 7.9 Comparisons between IM and No IM in Antenatal Care

As shown in the figure 7.10 there was a difference between IM and no IM women in tobacco consumption during pregnancy. It was found that 11.84 per cent of no IM women were free from smoking during pregnancy while 7.89 per cent among IM women. Like ways among the IM women 4.44 per cent were free from khaini while 3.37 per cent among no IM women. 10.75 per cent of women among No IM do not used Tuibur consumption during pregnancy while it was 7.40 per cent among IM women. For Sahdah consumption during pregnancy, 5.79 per cent of no IM women do not practice while it was 4.37 per cent among IM women. Among no IM women, 11.84 per cent were free from alcohol drinking during pregnancy while 8.10 per cent among IM women.

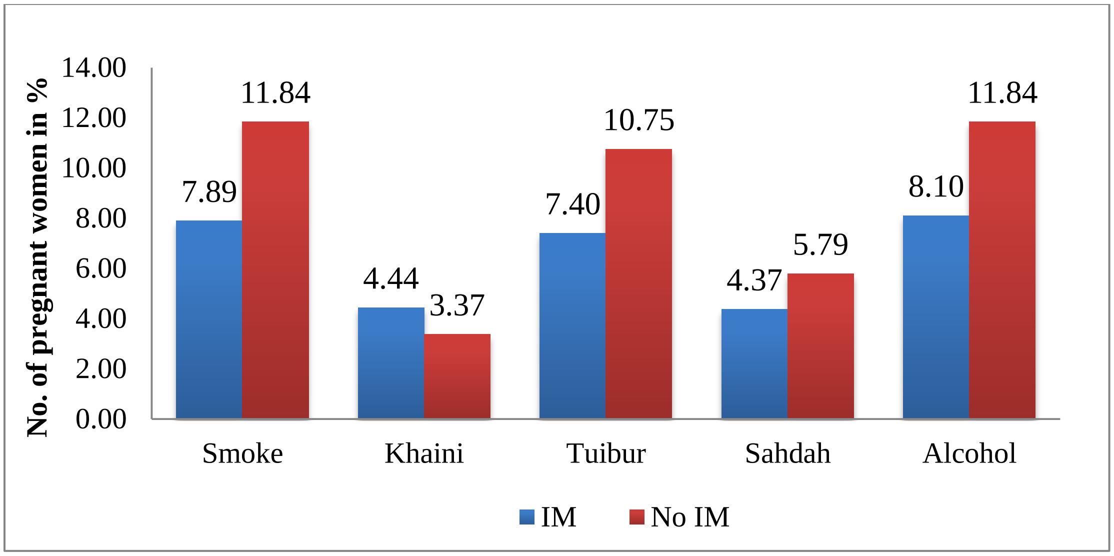

Figure 7.10 Comparison of Tobacco Free Mother between IM and No IM

Among no IM women, 9.90 per cent of the total pregnant women delivered their babies at Hospital while it was 3.95 per cent among IM women. In term of expert delivery 11.24 per cent of a new born baby were delivered by expert like Doctor, Nurse, Health worker and ASHA etc. among no IM women while it was only 6.34 per cent among IM women (figure 7.11).

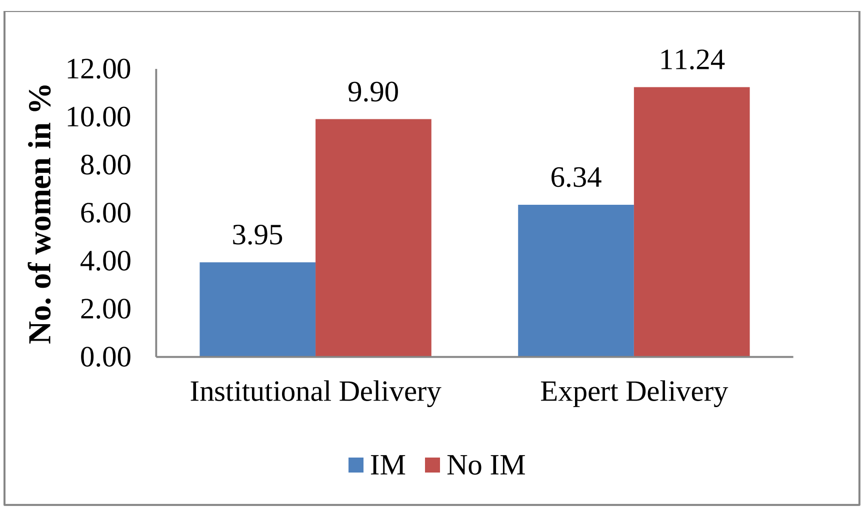

Figure 7.11 Comparisons between IM and No IM on Delivery

The study also found that the difference between IM and no IM women opinion about their health including healthy, no major diseases, no chronic diseases and received a good nutrition. Among the IM women, percentage of women who were healthy was 7.89 while it was 12.93 among no IM women. Pregnant women with no major diseases were 91.40 per cent among IM women and 88.25 per cent among no IM women. It showed that major diseases during pregnancy were almost similar among IM and no IM women. The difference was very low in chronic diseases of a pregnant woman between IM and no IM women. 13.60 per cent of IM women were free from chronic diseases while 14.43 per cent from no IM women. 1.55 per cent of the total IM women think that they received a good nutrition during pregnancy while it was 9.82 per cent among no IM women (figure 7.12).

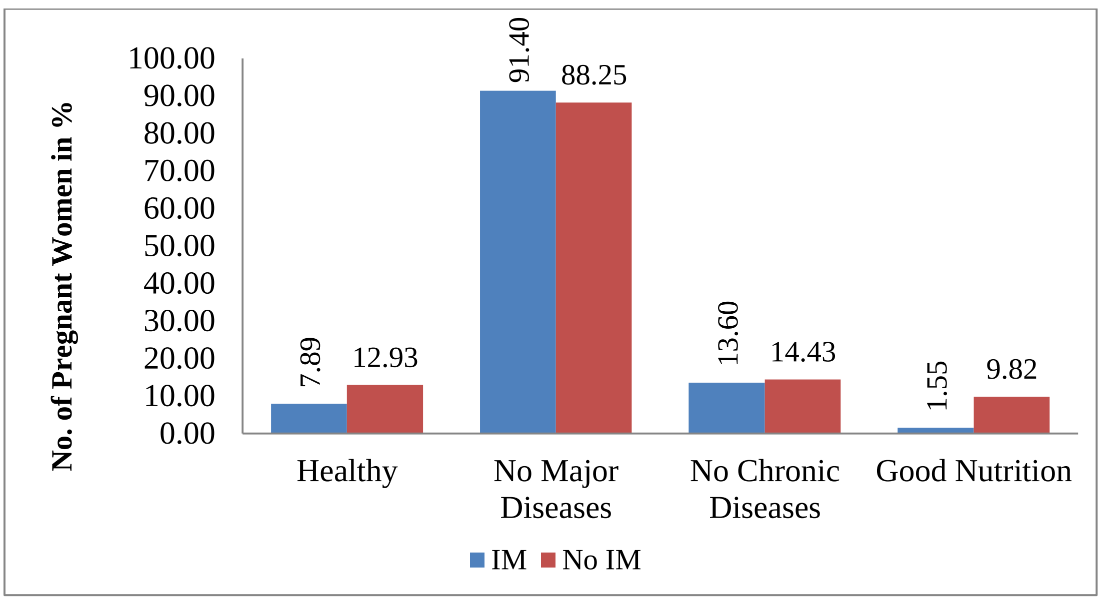

Figure 7.12 Subjective Comparisons between IM and No IM on Women Health

Comparison between IM and no IM women on feeding and postnatal care had been calculated (figure 7.13). Among IM women, 8.17 per cent could immediately feed to the new born babies while it was 13.37 per cent among no IM women. The percentage of women feed breast to new born babies by themselves was 7.33 among IM women and 13.75 among no IM women respectively. 8.17 per cent of the IM women feed breast up to 6 month of a babies while 13.18 per cent among no IM women. Regular feeding of food among IM women was higher than no IM women in which 7.33 per cent of IM women done regular food feeding to the babies while only 0.88 per cent among no IM women maintained regular food feeding. Percentage of women taking normal bath of a new born baby was also higher in IM women than no IM woman which was 11.84 and 9.45 per cent respectively. After birth checkup of a babies account only 4.86 per cent among IM women while it was 11.65 per cent among no IM women. 6.48 per cent of the IM women done immediate checkup when a baby fills sick and other kinds of problems while 12.49 per cent among no IM women have done immediate checkup whenever the baby fills problems.

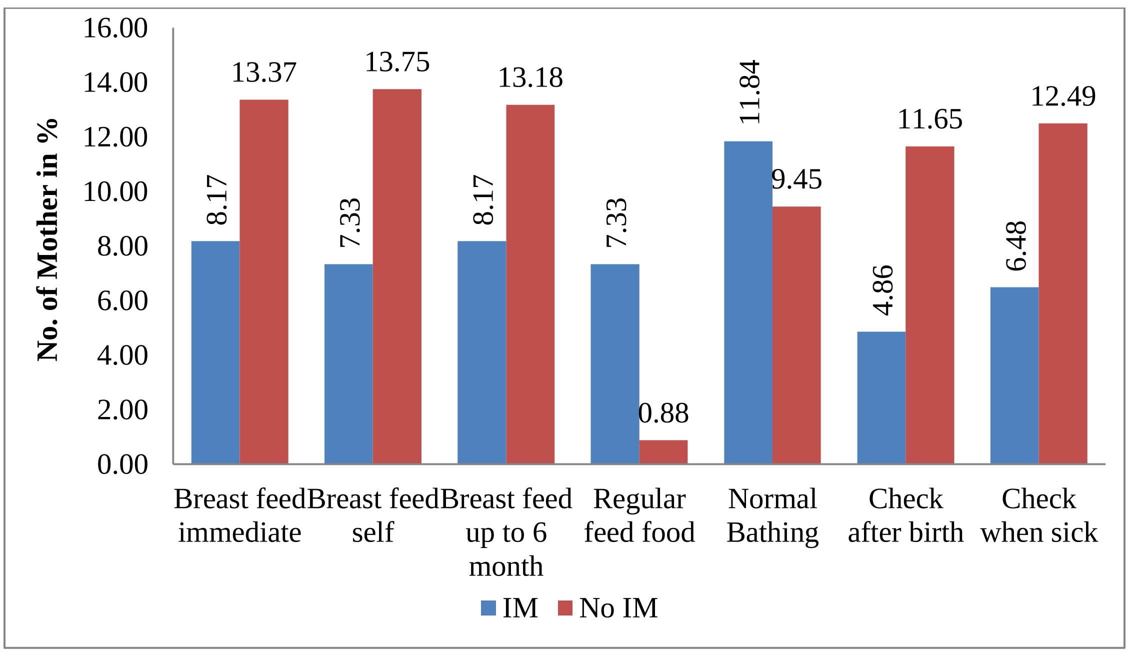

Figure 7.13 Comparisons between IM and No IM on Feedings & Postnatal care

A number of women do vaccination to their babies was also compare between IM and no IM women to know the effect of post vaccination on IMR. As shown in figure 7.14, nine types of post vaccination had been measured between IM and no IM women. The percentage of BCG vaccination given full doses to the babies was 8.88 per cent among IM women and 13.27 among no IM women. DPT vaccination was also higher in no IM than IM women that the percentage was 12.85 and 6.06 respectively. 4.30 per cent of the total IM women had been given OPV vaccine to the babies in a full and normal doses while 12.45 per cent among no IM women. Among IM women, percentage of women took measles vaccination to the baby was 1.90 and 9.32 among no IM women. Percentage of MMR vaccination among IM women (0.49) was lower than and no IM women which was 3.93 per cent. 0.28 per cent of IM women maintained Hib vaccination to the baby while 3.11 per cent have done from no IM women. Hisag vaccination had been done by 0.49 per cent of IM women and 6.66 per cent among IM women to the baby. Hepatitis B vaccination to the baby had taken by 1.13 per cent among IM women and 7.25 per cent among no IM women. 5.57 per cent among IM women had given post vaccination to the baby at a time with regular interval with normal doses while 7.67 per cent have done among no IM women. Thus, post vaccination to the new born baby found better among no IM women than IM women in the study area.

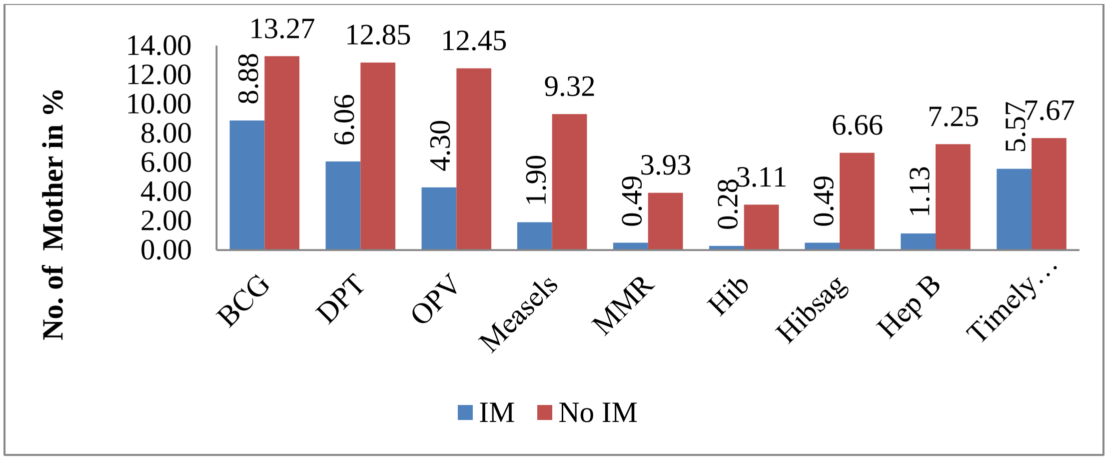

Figure 7.14 Comparison between IM and No IM on Postnatal -Vaccination care

7.9 Extreme Infant Disaster

The study collected that number of infant death per women for their lifetime. If the number of infant death per women who have infant death i.e., Infant Mortality (IM) women for their lifetime is more than 1 it is called as extreme infant disaster. In the study area the extreme infant disaster was very common as shown in the figure 7.15. The average number of infant death per women for their lifetime in the study area was 1.56 which means every woman had loss more than 1 of their babies before attaining one year.

The total number of women having infant mortality was 240 which account 23.14 per cent of the total women surveyed (1037). The highest concentration in this case found in Lungbun I where in, all the respondents had infant death for their lifetime. On the other hand College veng I was the lowest that only one women having infant death i.e., 0.35 per cent of the total respondents.

Table 7.8 Infant Disaster

Village Councils	No. Women having Infant death	No. Women having Infant death (%)	No. of Infant death	No. of Infant death per women
Ahmypi	4	23.53	4	1.00
Chheihlu	11	22.45	14	1.27
Chhuarlung I	16	40.00	28	1.75
Chhuarlung II	15	38.46	31	2.07
Chhuarlung III	9	22.50	22	2.44
Khopai	23	41.82	28	1.22
Lungbun I	16	42.11	24	1.50
Lungbun II	17	53.13	28	1.65
Maubawk CH	4	17.39	13	3.25
Maubawk L	12	24.49	20	1.67
Mawhre	14	35.00	18	1.29
KM 10	8	33.33	11	1.38
Old Tuisumpui	14	50.00	19	1.36
Siatlai	5	16.67	6	1.20
Theiri	28	52.83	42	1.50
Theiva	15	27.78	28	1.87
Tuipang L	15	26.79	22	1.47
College veng I	1	7.14	1	1.00
College veng II	3	2.63	4	1.33
Council veng	1	0.70	1	1.00
Tuisumpui	8	8.00	13	1.63
Total	**239**		**377**	
Average		**27.94**		**1.56**

Source: Field Survey

The disaster was found highest in Maubawk CH wherein the average number of infant death among the infant death women was 3.25. Which means a women who have infant death had loss more than 3 babies for their lifetime. It was also found very high in Chhuarlung III wherein every IM women had loss more than 2 infant during their lifetime. The village was followed by Chhuarlung II (2.07), Theiva (1.87), Chuarlung I (1.75), Maubawk L (1.67), Lungbun II (1.65), Tuisumpui (1.63), Theiri (1.5), Lungbun I (1.5), Tuipang L (1.47), KM 10 (1.38), Old Tuisumpui (1.36), College veng II (1.33), Mawhre (1.29), Chheihlu (1.27), Khopai (1.22), Siatlai (1.2), Council veng (1) , College veng I (1) and Ahmypi (1).

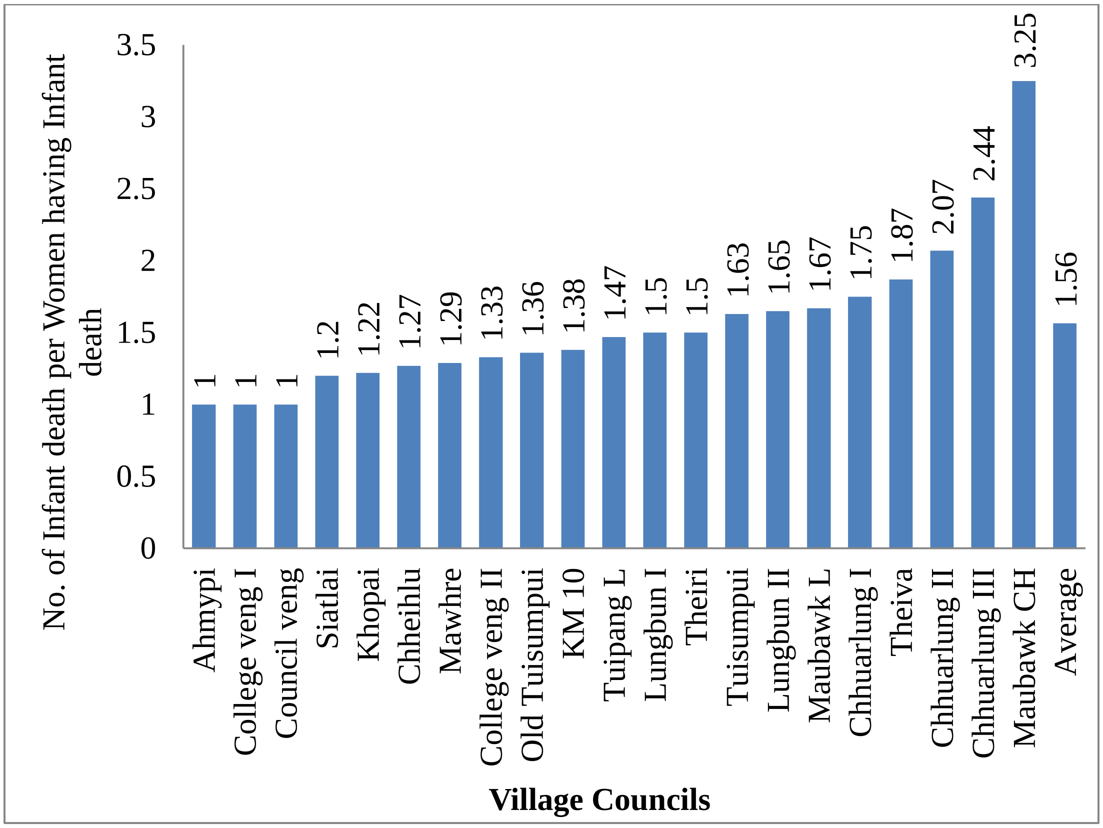

Figure 7.15 Extreme Infant Disasters

7.10 Conclusion

Infant mortality is an important indicator of the health of a nation, as it is associated with a variety of factors such as maternal health, quality and access to medical care, socioeconomic conditions, and health practices. India achieved tremendous economic growth over the past several decades, becoming the world's third largest economy (Drèze, 2013), but its child and infant mortality rates rank among those of the worst 50 nations (Lozano, 2011). Although under-five mortality fell from 145 deaths per 1000 live births in 1985–90 to 130 per 1000 in 2005–10 (UN, 2014), marking a substantial reduction, India is not on track to achieve the Millennium Development Goal to reduce under-five mortality by two-thirds by 2015 (WHO, 2014).

This child mortality occurs very high among under-nutrition (Deaton, 2005). It is estimated that one in every three malnourished children globally lives in India, where 47 per cent of children under age three are underweight, 46 per cent are stunted and 16 per cent are wasted (UNICEF, 2014). According to data from 2005, about one-third of all deaths among children under five year of age were attributable to low birth weight or prematurity, and a further 30 per cent were attributable to diarrhoea diseases (Bassani, 2010). Price of different foods has been rising faster than the rate of economic growth, decreasing food affordability and potentially low nutritional progress (Brinkman, 2010).

This increase may affects/reduce calorie intake, decrease the quality of diets and reduce dietary diversity and balance (Brinkman, 2010). Each of these factors has been associated to risks of stunting, under-nutrition and wasting (Arimond, 2004) which are in turn highly connected with infant mortality cross-nationally (Pelletier, 2003, Black, 2008, Rutstein, 2000 and Black, 2013). As food prices rise, increasing of income required to sustain food intake, expenditures on foods may troop out spending on other health determinants, like children's healthcare (Upadhyay, 2011, Ruel, 2010, Bhutta, 2008, McKenzie, 2003 and Ferreira, 2008). Maternal nutrition is also likely to worsen, swelling risks of low birth weight (Claeson, 2000). Although some families may develop resilience strategies, women and children living in households which are already food insecure may be tipped into acute malnutrition and food shortage.

In the study area, IMR was extremely high in 9.25 per cent of the total villages surveyed where IMR was found as 363.635 to 636.362. A negative relationship had been found in almost all indicators from socio-economics (r= -0.535), food security status (r = -0.444), nutritional status (r = -0.512) and reproductive healthcare (r = -0.449) of pregnant women. Cleanliness of a family (r = -0.578), housing condition (r = -0.550) and annual income a family (r = -0.501) were the most effective factors affecting among socio-economic indices to IMR. All the food security components do not have a very high relationship with IMR. Among the nutrition components, energy intake (r = -0.536), Crude Fiber (r = -0.5), Phosphorous (r = -0.51), Thiamine (r = -0.5), Niacin (r = -0.5), Vitamin C (r = -0.5) and Choline (r = -0.5) were the most important factors which affects IMR in which IMR was higher when the indicators were lower. Copper (r = -0.5) and Chromium (r = -0.5) were the most affective factors affecting IMR among trace minerals. IFA injection and Iron intake during pregnancy were the highest factors affecting IMR where they were negatively related both by -0.527. Tobacco consumption during pregnancy was not a major factor for infant mortality (IM) in which the correlation value of all types of tobacco consumption do not crossed 5. But smoking during pregnancy might be one of the possible factor because the R value of 0.433 explained higher number of smokers higher IMR. Delivery also not highly affects IMR because all the R values were under .5 in the correlation value. Based on subjective perspective women's health during pregnancy were not highly related to each other. But even low correlated the pregnant women who think they have a good nutrition and IMR had -0.419 R value may be the possible factors causing IMR. Postnatal care like breast feedings, food feedings, proper bathing and health checking do not highly affects IMR because all the R value were less than 0.4. OPV vaccination to the new born babies was the most important factors which cause infant death. The R value -0.633 explained a high negative correlation between the two that higher OPV vaccination lower IMR and vice versa.

Nutritional attainment deferential between IM and No IM women in the study area was very high in all kinds of nutrition components and trace minerals component especially Vitamin B (59.30), Vitamin C (48.99) and Choline (46.67) nutrients as well as Sodium (49.25), Chloride (47.64) and Selenium (40.78) minerals. Number of Infant death per women of their lifetime called infant disaster was extreme in Maubawk Ch wherein the number of infant death per women who have infant mortality (IM) was more than 3. It was also very high in Chhuarlung III and Chhuarlung II where extreme infant disaster had been found as 2.44 and 2.07 infant death per IM women respectively. However IMR was extremely high in the study area on the one hand and number of infant per one IM women was very high on the other. It means every woman who had infant mortality (IM) for their lifetime had more than once in their life of Infant mortality on the on hand and they are more vulnerable than the normal women on the other hand. Thus IMR was severely occurred and concentrated on one area wherein a women living with low socio-economic conditions, insecure food, under nutrition and poor reproductive healthcare status.

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CHAPTER - VIII

CONCLUSION

The present study examined Infant Mortality Rate (IMR) in relation with socio-economic condition, food security and nutritional status of pregnant women in Saiha, Mizoram. The study was based on primary data conducted during 2015 covering 1037 household from 21 village councils representing 40 per cent of the total household. Data on socio-economy was measured through scheduled, food security status was measured through family surveyed nutritional status was measured through dietary examination using daily intake recall methods and transformed into nutritive value given by INMSR (Gopalan, 2000). For assessing dietary habits and nutritional knowledge, intonation was gathered through a pre-formed questionnaire. The collected data was analyzed by using different statistical techniques such as Z-Score standardized techniques, Principal Component Analysis, Factor analysis and Correlation through SPSS software.

8.1 Summary of Findings

After calculating all the component indicators the study found socio-economic, food security and nutritional status of a pregnant woman in relation with Infant Mortality Rate in the study area, the major findings are as follows:

8.1.1 Poor Socio-Economic Status

1. The total population the study was 5081 covering1037 household and there were 4.84 persons per family. There were mainly four types of house like bamboo house (15.39%), Assam type (70.74%), semi-permanent (9.85%) and reinforce cement concrete (4.02 %).

2. Educational attainment was very poor that 76.28 per cent of the total population was under Matriculation but only 10.40 per cent were HSLC. 6.37 per cent were HSSLC, Bachelor accounts 4.62 per cent, and Master and its equivalent degree comprise 0.51 and 1.8 per cent respectively. The average annual income of family was

3. All the village councils were classified into different income group like monthly income less than 5,000 (17.44%), Rs. 5,000 to 10,000 (32.87%) Rs.10, 000 to 15,000 (20.22%), Rs. 15,000 to 20,000 (11.88%), Rs. 20,000 to 30,000 (8.57%) and above Rs. 30, 000 (9.03%).

4. Permanent or semi-permanent farming was the main occupation that more than 50 per cent of the total family were engaged. Agriculture, Lumbering, Driver/operator, Farming, Daily workers were the other common occupation.

5. 45.38 per cent of the total family were living with 3 or more rooms, 31.38 per cent were 1 room or lesser and 2 rooms 23.24 per cent. House size was comparatively smaller as compared to number of family members (i.e., 4.84). Thus, there was a limited space on one hand and the houses are made of bamboo and grasses, the quality of houses is critical and it leads to health hazards on the other hand.

6. Cleanliness is one of the important components for the determination of health. 97 per cent households were using toilets. 3 per cent of the total households do not have any toilet facilities. The number of household using Pit Larine was still very high i.e., 67.01 per cent of the total population still using, 30.48 per cent were septic tank and 2.51 per cent have no toilet facilities.

7. Television, Radio, Refrigerator, Washing machine and Long chair/sofa were classified as Assets I. Television (46.48%), Refrigerator (24.35%), Washing machine (21.77%) and Radio (5.10%) are not very common in the study whereas almost all the family have Long chair more than 2 numbers in the study area (93.05%).
8. Household assets II comprises number of family having Bank account, Motor vehicles, Cars, Two Wheeler, Mobile phones, internet connections, Computer facilities, Newspaper, Water connections and Liquefied Petroleum Gas (LPG) connections. Assets like number of households having Mobile phone (85.57%), Bank accounts (75.78%) were more popular in the study area while the assets like Car (2.54%), internet connections (2.72%), Motor vehicles (6.07%), Newspaper subscriber (6.54%), two wheeler (6.62%), Computer facilities (7.61%), Water connection (10.52%) and LPG connections (36.48%) were not commonly found.
9. Thus, Socio-economic status of a family was divided into five classes such as very high, high, moderate, low and very low. Very high class households belong to urban centers like College Veng II, College Veng I and Council Veng comprising 14.29 per cent of the total village councils surveyed. The other 14.29 per cent such as Tuisumpui, Maubawk L and Old Tuisumpui represents high status. Maubawk CH, Ahmypi, Siatlai, Tuipang L and Chheihlu (23.81%) were moderate. Low status comprises 28.57 per cent of the total village councils such as Chhualung I, Theiri, Lungbun II, Chhuarlung, KM 10 and Chhuarlung III. The four villages (19.05%) like Khopai, Lungbun I, Theiva and Mawhre fall under very low socio-economic status.

8.1.2 Food Insecurity

1. Household level food security status was measured according to food security components viz. food availability, food accessibility and food stability comprising 21 food security indicators.
2. Food availability includes per capita per day availability of rice, number of livestock per head and food surplus. The study found that a large number of households were food insecure. The main reasons were less per head livestock availability (1.9376), food scarcity (-29911.5476) and low per capita per day availability of Rice (44.07 gram per capita per day).
3. Food accessibility status was measured by roads' conditions, distance from the nearest urban center, availability of Fair Price Shop (FPS), regularity of food supply through FPS and percentage of main workers. 0.76 per cent of the total villages were connected by all-weather road. The average distance between village and the nearest urban center was also very long i.e., 50.14 km. FPS ratio was 0.0062 which means one FPS supplies foods for 620 people in the present situation. 38.09 per cent of the total village councils do not have FPS as well as 14.28 per cent do not receive food supplies on time or regular interval. Main workers account 54.309 per cent of the total population.
4. To measure food stability status, family annual income, land productivity, irrigational facilities, self-sufficiency on rice and others crops, dependency on market, family food stock and educational attainment were study. Productivity of land was very low i.e., 881.80 kg/hectare. Only 3.89 per cent of the total households were facilitated with proper irrigation. The percentage of family who

are self -sufficient on rice was only 6.87. Family food stock also founds highly insufficient. Only 5.31 per cent of the total household had food stock supporting for 5 months while 42.86 per cent do not have rice stock for 2 months or more.

5. All the village councils were categorized into five food security levels like very low, low, moderate, high and very high. It was observed that the highest number of villages lie under low food security level (38.10 %) while 14.29 per cent villages come under very high foods security level. Villages obtain high to very high level of food security was only 4.76 per cent. 23.81 per cent were medium food security.
6. After calculation from all the three components viz. food availability, accessibility and stability, food security status had measured as KM 10, Tuipang L, Chhuarlung III (14.29 per cent) were very low, Ahmypi, Mawhre, MaubawkCh, Theiva, Chhuarlung II, Theiri, Tuisumpui and Lungbun I (38.10 per cent) were low, Chhuarlung I, Maubawk L, Old Tuisumpui, Lungbun II and Siatlai (23.81per cent) were moderate, College veng I, College veng II, Council veng and Khopai (19.05 per cent) were high and Chheihlu (4.76 per cent) was very high.

8.1.3 Imbalance Dietary Intake

1. Intake per day per pregnant woman of cereal crops like rice and maize was 373.10 grams and 5.09 grams respectively.
2. Small beans, peas, beans and dal were only pulses grow in the study villages. Per capita daily intake of a pregnant woman was small beans (2.64 grams), peas (2.21 grams), big beans (2.66 grams) and dal (20.93 grams).

3. Leafy vegetables like mustard leaves, pumpkin leaves and small beans leaves intake of a pregnant woman per day was 17.70 grams, 18.49 grams and 12.71 grams, respectively. For other vegetables, it was calculated as small beans (6.39 grams), pumpkin (4.15 grams), brinjal (5.36), mock tomato (38.92 grams), tomato (5.47 grams), beans (6.39 grams), cauliflower (3.21 grams) and cabbage (4.98 grams).
4. Per capita per day intake of a pregnant woman in roots and tuber crops were carrot (5.39 grams), potato (31.79 grams), turnip (2.45 grams), radish (1.84 grams), red onion (7.74 grams) and zo onion (3.73 grams).
5. Soya beans and ginger seeds were only regularly consumed. Per day intake of a pregnant woman was is 1.98 and 3.97 grams respectively.
6. Intake in fruits such as orange (2.94 grams), banana (3.37 grams), pineapple (3.01 grams), papaya (2.11 grams) and lemon (2.70 grams) were very less because they were only imported and price was high.
7. Flesh foods including pork, beef, chicken and eggs were regular foodstuff. Per capita per day intake of a pregnant woman was comparatively higher than the other foodstuff such as pork (14.79 grams), chicken (12.64 grams), beef (6.32 grams) and eggs (26.91 grams).
8. Daily consumption of other foodstuff of a pregnant woman includes cooking oil (18.27 grams), milk (22.84 grams) and sugar (6.47 grams).

8.1.4 Mal-Nutrition

1. Protein deficiency was found as 23.51 per cent among all pregnant women. The per capita per day intake was only 48.44 grams which is 23.51 per cent less than

the requirement value (65 gram/ day). Only 9.25 per cent of the pregnant women have attained protein efficiency.

2. The average daily fat intake of pregnant women was 26.92 grams, which is 10.27 per cent less than the recommended dietary requirement (30 gram/ day). 23.81 per cent of the total pregnant women have attained fat nutrition requirement while the other 76.19 per cent are under nutrition.
3. There was a severe deficiency of crude fiber nutrients to all pregnant women. The average per capita per day intake was 3.06 grams which is 85.45 per cent less than the recommended requirement (21 gram per day).
4. Per capita intake of pregnant women in carbohydrate exceeded the recommended value. The average per capita per day intake was 338.65 gram which is 160.50 per cent higher than the recommended value (130 gram/day).
5. Energy deficiency was found among all pregnant women. The average daily energy intake was 1783.70 kilo calorie, which is 29.36 per cent lower than the recommended value of 2525.
6. All pregnant women were suffering from calcium deficiency. The average daily intake (242.44 milligram) was 75.76 per cent lower than the recommended value (1000 milligram).
7. In phosphorous, all the pregnant women exceeded the recommended requirement by 95.59 per cent.
8. Iron deficiency was found among all pregnant women except College veng I and College veng II. Per day Intake of iron by a pregnant women was 20.90

milligram, which is 45.01 per cent lesser than the recommended dietary requirement (38 milligram).

9. All pregnant women could not attain the recommended dietary requirement in Carotene (vitamin A) in which the average daily intake (749.08 micrograms) was lesser than the recommended value of 3300 microgram (77.30 %).
10. Per capita per day intake of thiamine (vitamin B1) was 1.38 milligram which is 4.46 per cent higher than the recommended value (1.3 milligram). Pregnant women from the 10 villages (47.62 per cent) councils attained the recommended daily requirement.
11. Deficiency of Riboflavin (vitamin B2) was founds among all the pregnant women. The average daily intake was 0.69 milligram which is 54.04 per cent lesser than the daily recommended requirement (1.5 milligram).
12. Except Maubawk L and Maubawk Ch village councils, all pregnant women attained the requirement on Niacin (vitamin B3).The average per day intake was 17.46 milligram, which is 24.71 per cent higher than the recommended value (14 milligram/day).
13. All pregnant women in the study area are under-nutrition in vitamin B6 wherein the average intake (0.02 milligram/ day) was 98.60 per cent lower than the recommended dietary i.e., 1.3 milligram per day.
14. Malnutrition on folic acid was found to all pregnant women except in College Veng II. Deficiency was found at 65.83 per cent to the recommended requirement of 100 microgram per day.

15. Deficiency in vitamin C was quite low as compared to other minor vitamins. The average intake (27.24 milligram/day) was lower than the recommended value (30 milligram per day) by 9.20 per cent.
16. Deficiency in choline was found to all pregnant women. The average per capita per day intake (87.24 milligram) was 79.47 per cent lower than the recommended requirement (425 milligram/day).
17. Magnesium intake was very high. All pregnant women exceeded the recommended level, in which the average intake (652.78 milligram/day) had exceeded the recommended value by 200 milligram per day, which is 226.39 per cent.
18. All pregnant women could not attain the dietary requirement (3900 milligram per day) of Sodium. The average intake was 99.14 per cent, which is less than the recommended requirement.
19. High deficiency on potassium intake was found to all pregnant women. The average intake was 442.65 milligram/day, which is 77.87 per cent less than the recommended dietary requirement i.e. 2000 milligram/day.
20. Intake of copper nutrition was sufficient enough. The average intake (1.47 milligram) was 28.19 per cent higher than the recommended dietary requirement. Only three villages could not achieve the recommended value.
21. Manganese mineral deficiency was found high. The average intake was 4.58 milligram per day, which is 54.19 per cent less than the recommended dietary requirement (10 milligram per day).

22. Deficiency in molybdenum mineral was found severe. The mean intake was only 0.40 micro grams per day, which is 99.17 per cent less than recommended value (50 micro grams/ day).
23. Malnutrition on Zink was found at all pregnant women. Per capita per day intake (6.05 milligram/ day) was 35.66 per cent lower than the recommended requirement i.e., 9.4 milligram per day. The severe malnutrition had been found as 54.08 per cent lower than the recommended value.
24. All pregnant women were severely under-nutrition in chromium minerals. Per capita per day intake was only 0.04 micro grams which is 99.86 per cent less than the recommended dietary requirement (30 micro gram/ day.
25. All pregnant women exceeded the recommended dietary requirement in selenium minerals intake except Tuipang L. The average per capita per day intake (63.64 micro gram/ day) was higher than the recommended requirement (40 micro gram/ day) by 58.5 per cent.
26. Chloride intake of all pregnant women exceeded the recommended dietary requirement. The average per capita per day intake (348.63 gram/ day) was 771.57 per cent higher than the recommended allowances i.e., 2.3 gram per day.
27. Malnutrition was found at almost all the nutrition components of pregnant women in the study area. This makes it clear that both the quality and quantity intakes were unable to meet recommended dietary requirement. Nutritional efficiency was founds only in some nutrient components like selenium, copper, niacin, thiamine and fat (37.09 %).

28. Thus all village councils were classified into five categories viz., very high, high, moderate, low and very low based on nutritional efficiency level of pregnant women. Very high and high category accounts 9.52 per cent each of the total village councils surveyed, 14.29 per cent were moderate, the highest number such as 52.38 per cent were low status and 14.29 per cent were very low.

8.1.5 Improper Reproductive Healthcare

1. To measure reproductive healthcare of a pregnant women, major indicators such as antenatal care, tobacco consumption patterns during pregnancy, mother's physical strength, delivery, postnatal care and baby's vaccination were study.
2. For antenatal care, tetanus injection was taken by 73.43 per cent of the total pregnant women. While Iron Folic Acid (IFA) injection during pregnancy was only 16.37 per cent. Pregnant women took Iron and calcium supplementary (>50capsules) was 17.37 and 39.97 per cent respectively. Beside this 54.03 per cent took other supplementary vitamins. Only 5.54 per cent of the total women have care (reduced) about their work load during pregnancy but the others pregnant women do not control their work load. Regular pregnancy health checkup (three trimester checkup) was completed by 36.03 per cent.
3. Tobacco smoking, tobacco mouthing such as khaini, tuibur, sahdah and alco-holing had been examined. The average numbers of pregnant women who are free from Khaini was 72.42 per cent. While 87.60 per cent were free from Tuibur, 58.38 per cent from Sahdah and 99 per cent from alcohol.
4. The average number of women who delivered babies at home was 56.70 per cent of the total women. The others delivered at hospital (23.05%), primary health

center (6.05%), sub-center (3.78%) and other unspecified (10.41%). For delivery persons, 30.13 per cent a of pregnant women delivered their babies under nurse delivery, 41.20 per cent by local expert, 9.56 per cent by health worker, 9.25 per cent by Accredited Social Health Activist (ASHA) and the remaining 9.9 per cent were delivered by others.

5. Women's health was examined by studying the four mothers strengthens indicators like normal strength during pregnancy, free from any diseases during pregnancy, women who do not have permanent diseases and women's opinion about their nutrition. 53.95 per cent of all the respondents opined that they had good health during pregnancy. 75.15 per cent had no major diseases during pregnancy, 92.64 per cent not having chronic diseases and 22.18 per cent opined that they received good nutrition during pregnancy.
6. For postnatal care, immediate breast feeding was high that 91.50 per cent of the total pregnant women could feed immediately after the birth of babies. 91.10 per cent also feed only their own breast and 58.87 per cent of feed up to 6 month of their babies. Proper food feeding was maintained by 55.28 per cent of the total women. 57.7 per cent done immediate health checkup of their new born babies and 50.24 per cent of do quick and immediate check for treatment when the babies have any kind of illness.
7. Immunization (vaccination) to the new born babies was maintained very poor. 53.97 per cent of the total women gave BCG vaccination at the time and regular doses while it was only 41.81 per cent in DPT vaccines. Oral Polio Vaccine (OPV) vaccination to the new born babies was given by 47.36 per cent, only

31.60 per cent on measles, 21.58 per cent on MMR, 22.10 per cent on hib, 26 per cent on hibsag and 30.97 per cent on hepatitis B. 54.8 per cent of the total new born babies were given double doses of vaccines due to unavailability of vaccine supply at the right time.

8. After calculating the overall reproductive healthcare status the study area is categorized into five classes i.e., very high, high, moderate, low and very low reproductive healthcare status. 9.52 per cent of the total village councils are very high status, 14.29 per cent are very high, 19.05 per cent are moderate, 33.33 per cent are low and 23.81 per cent are very low status.

8.1.6 High Infant Mortality Rate

1. In the study area, the average IMR during the study was 210.84, which is 46.40 per cent higher than whole district (113). The highest IMR found in Theiri where IMR was 636.363.
2. IMR crossed 100 in 76 per cent of all the villages, 14 per cent had less than 50 but higher than 20 IMR. All live birth infant were survived from only in 2 villages (9.52%).
3. The village councils were divided in to five class of IMR such as very high having IMR of 363.635 to 636.362, high 285.713 to 363.635, moderate having 181.817 to 285.7139, Low 28.570 to 181.817 and very Low which includes villages with zero to 28.570 IMR. Very high in IMR status comprises 9.52 per cent of the total villages study, high IMR class includes 9.52 per cent, Moderate status cover 33.33 per cent low status includes 23.81 per cent and 23.81 per cent are under very low IMR status.

4. There was a high negative correlation between IMR and socio-economic status. The R value of -0.535 explain the higher IMR and the lower socio-economic status and indicates a high negative correlation.
5. The correlation of -0.361 explain a negative correlation between educational attainment and IMR. Type of house and IMR was related at -0.550. A high negative correlation also found in income and IMR (r = -0.501). A low negative correlation found between occupation and IMR in which the R value was -0.344. Number of toilets in a household and IMR were related with high negative.
6. Food availability, food accessibility and food stability and IMR were negatively correlated to each other. The r value -0.444 explains the relationship between overall food security and IMR means lower food security higher IMR.
7. IMR was highly related with food availability indicators like food surplus (r = 0.525), per capita per day availability of rice (r =0.44) and number of livestock per head (r =0.43).
8. A positive correlation was found on food accessibility like types of road (r = 0.277), Population FPS ratio (r = 0.073), while negative correlation found in regularity of FPS (r = -0.070) and percentage of main worker to the total population (R= -0.424) and distance from urban center (r = -0.006).
9. Almost all indicators under food stability had a negative correlation with IMR. Beside land productivity (r = 0.169), thee were negative correlation like annual income (r = -0.501), irrigation (R=0 -.297), self-sufficiency on rice (r = 0-.239), dependency (r = 0-.291), self-sufficiency on other food stuff (r = 0-.311), food stock of a family (r = 0-.293) and education (r = 0-.362).

10. There was a negative correlation between IMR and nutritional status i.e., -0.512. It explain lower nutritional status higher IMR. The negative correlation was found in all kinds of nutrition component such as Crude fiber (r = -0.5), phosphorous (r = -0.51), thiamine (r = -0.5), niacin (r = -0.5), vitamin C (r = -0.5) and choline (r = -0.5) among the vitamin components. Intake of other vitamins like energy (r = -0.536), carbohydrates (r = -0.457), iron (r = -0.445), calcium (r = -0.436) and protein (r = -0.402) had also a negative correlation. A low negative correlation found between fats intake and IMR (r = -0.276), carotene (r = -0.35) and folic acid (r = -0.1).
11. Among the mineral components all there was a negative relationship with IMR. The highest relationship found in copper (r = -0.5) and chromium (r = -0.5). Molybdenum (r = -0.47), manganese (r = -0.46), magnesium (r = -0.4), sodium (r = -0.4), zink (r = -0.4), potassium (r = -0.39), chloride (r = -0.39) and selenium (r = -0.3) had also a negative relationship. Thus it was clear that lower nutritional status of pregnant women the higher IMR.
12. The study found a negative correlation between IMR and reproductive healthcare of a pregnant woman. The r value of -0.47 explains the lower reproductive healthcare higher IMR and vice versa.
13. Relationship between IMR and reproductive healthcare was examined by 6 healthcare components such as antenatal care, tobacco consumption during pregnancy, delivery, women’s health and postnatal care.

14. There was a low negative correlation between IMR and antenatal care like tetanus (r = -0.16), work load (r = -0.018), regular checkup (r = -0.144), IFA (r = -0.527), iron (r = -0.527), calcium (r = -0.394) and others vitamins (r = -0.423).
15. Tobacco consumption during pregnancy and IMR was related with low positive to each other. Smoking during pregnancy and IMR was also correlated with -0.432. The other kinds of tobacco consumption like khaini (r = 0.071), tuibur (r = 0.103) and alcohol (r = 0.247) had a low positive correlation while Sahdah consumption had a negative correlation (r = -0.328).
16. The study found positive correlations between PHC and sub-enter delivery with IMR for 0.249 and 0.031 respectively, while hospital delivery had negative correlation with IMR (r = -0.383). Expert deliveries like nurse and health worker had low negative correlations as -.356 and -.097 respectively. ASHA delivery had a low positive relationship which is 0.050.
17. A high negative correlations (r = -0.419) was found between good nutrition and IMR which means pregnant women who think their nutrition is low have a high IMR and vice versa. A low negative correlation had also found between women who think themselves healthy with IMR (r = -0.28). On the other hand a low positive correlation was found between pregnant women have no major diseases (r = 0.042) and chronic diseases (r = 0.059).
18. Postnatal cares such as breast feeding, food feeding, bathing and health check-up were not highly related with IMR. A negative correlation was found in bread feed by self (r = -.064), breast feed up to 6 months (r = -0.207), routine breast feeding (r = -0.232), normal bath (r = -0.096), check after birth of babies (r = -0.221) and

immediate check when the baby felt sick (r = -0.283). In the case of immediate breast feed, there was a low positive correlation which is 0.028.

19. Vaccinations to the new born babies and IMR had a negative relationship. A high negative correlation was found between OPV and IMR which is -0.633. MMR (r = -.484), hepatitis B (r = -0.443), hibsag (r = -.441), hib (r = -.430), measles (r = -.422), and DPT (r = -0.372) also had a high negative relationship with IMR while BCG vaccination had a low negative correlation which is -0.131. Therefore there was a negative correlation between post vaccination and IMR.

8.2 Major Factors Causing IMR

1. Social and economic backwardness was the leading factor affecting infant death. The correlation value of -0.535 indicates that lower is the socio-economic conditions, higher is the IMR.
2. It was proved that poverty and social well-beings like cleanliness (r = -0.578), housing (r = -0.550) and income (-0.501) were the most important factors causing IMR. Infant death was closely related with cleanliness including availability and types of proper latrine.
3. Nutritional status of pregnant women was the second largest factor affecting IMR. The R value -0.512 clearly shows the relationship between the two.
4. Malnutrition was found very common. Energy deficiency of a pregnant woman highly affects IMR (r = -.536). Like ways, vitamin C (r = -0.5), carbohydrate (r = -0.457), iron (r = -0.445), calcium (r = -436) and protein (r = -0.402) malnutrition also affects IMR.

5. Reproductive healthcare of a pregnant woman was another main factors affecting IMR. The correlation value of -0.449 clearly proved the relationship between them. Much of the Infant death was caused by neglecting OPV vaccination (r = -0.633), without IFA injection (r = -0.527) and no iron supplementary intake (r = -0.527) during pregnancy
6. Food security status was one of the major factors causing IMR (r = -0.444). There was a high relationship between food surplus and IMR (r = -0.525), it shows rice supply through FPS was not nutritious for human health. Food security and nutritional status were highly positive correlated (r = 0.644), it could be discuss as food security affects nutritional status which further affects IMR

8.3 Suggestions

Following suggestions were made for reduction of IMR in the study area based on the findings.

1. Government can enhance smooth functioning of FPS for food security in the rural areas with distribution of quality rice, better accessibility, medical infrastructures, regular and continuous supply of vaccines etc.
2. More emphasis can be given to increase in food, fruits and vegetable crops particularly rice to avail fresh and nutritious foods as well as reduction of dependency.
3. All the women especially during pregnancy should think about dietary requirement and hence balanced and nutritious diets must be taken.

4. All families must have proper toilet to maintain the cleanliness for the health of their babies and environs.
5. All the pregnant women should improve their reproductive healthcare especially injection, iron supplements intake and vaccinations.
6. Awareness program on health and health care should be launched from time to time both form government and local level.

However, poverty and malnutrition exacerbate the risk of infants and children to various infectious diseases like diarrhea and pneumonia, and heighten the probability of death, particularly among children with low birth weight. Demographic and epidemiological studies have documented that poor economic status of household, low female literacy, poor nutritional status of mother, early age at marriage of mother, large family size, low autonomy of women, and inadequate access to health care services typically lead to disproportionately higher risk for the health status of mothers and their children (Pathak, 2011, Raj, 2010, Singh, 2008, Jose, 2008, Mavalankar, 2008, Sunil, 2006, Nanda, 2005, Dasgupta, 2005, Gragnolati, 2005, Pallikadavath, 2004, Mishra, 2004, Pande, 2003, Navaneetham, 2002, Griffiths, 2002, Bloom, 2001, Claeson, 2000, Mishra, 1999, Jejeebhoy, 1997 & Dyson, 7983). Some studies also recognized large socioeconomic and interstate disparities in the maternal and child health status, and have concluded that socioeconomically weaker sections of population disproportionately suffer from poor health status and are also least likely to access health care services (Po, 2011, Pathak, 2010, Chalasani, 2010, Pathak, 2010, Subramanian, 2009, Mohanty, 2009, Subramanian, 2007 & Subramanian, 2006).

Poverty was very popular in the study area. During pregnancy, mother's diet must contain adequate nutrients and energy requirement at each stage to allow proper fetal growth and to maintain her own health (Vause, 2006). Dietary deficiencies during pregnancy are closely related with intrauterine growth retardation, premature birth (<37 weeks gestation), low and malformation such as neural tube defects (Keen, 2003). But at the same time over nutrition during pregnancy is connected to make metabolic disorders such as gestational diabetes mellitus and obesity due to excessive weight gain, as well as health-related problems for the infants in their later life (Mehta, 2008 & Widen, 2015). In addition to adequate nutritional intake, all pregnant women are advised to engage in appropriate levels of physical activity throughout pregnancy to minimize detrimental health risks.

After delivery, appropriate feeding for both breast feeding and food feeding performs a vital role in preventing mortality and achieving optimal growth further development and health outcomes for both babies and women. Thus, WHO and the Chinese ministry of health recommend that infants should be breastfed for the first 6 months of life and continued breastfeeding thereafter with appropriate complementary foods (WHO, 2003 & HMC, 2005).

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APPENDIX-I

A. VILLAGE LEVEL QUESTIONAIRES

Questions	Write the name/ mention the number
1. Location a) Name of village b) Name of District c) Name of Rural Development Block d) Name of Sub-Division **2. Geography** a) Geographical area b) Terrain c) Latitude and Longitude d) Altitude e) Climate (Average annual temperature) f) Average annual Rainfall g) Average annual humidity h) Wind velocity and direction i) Soil texture j) Forest type **3. Transportation** a) Distance from nearest urban center b) Distance from main road c) Type of road **4. Institutions** a) Anganwadi Center b) Primary School c) Middle School d) Higher Secondary School e) College **5. Drinking Water** a) Source of drinking water b) Availability of drinking water **6. Health** a) Hospital (Private & Government) b) Sub-Center c) Community Health Center **7. Others** a) Household with Electric connection b) Fair Price Shop c) Bank d) Post Office	

B. HOUSEHOLD LEVEL QUESTIONAIRES

House No.____________B4__ B3__ B2__ B1__KZ__F1__F2__F3__F4 Age of House__

Concrete [ ] Semi-permanent [ ] Assam type [ ] Bamboo [ ] Rented House [ ] With Store [ ]

Questions	Answer	Questions	Answer
1. Household Information a) Name b) M/F c) Age d) Education		**1. Household Information** c) Occupation d) Monthly income e) Religion f) Church	
2. **Income and occupation** a) Source of income b) No. of Persons involved		**2. Income and Occupation** c) Time d) Income in Rupees	
3. Household Assets (Nos.) a) Rooms b) Toilets c) Bank Accounts d) TV e) Radio f) Fridge g) Washing Machine h) Long chair/ Sofa i) Decorations		**3. Household Assets (Nos.)** j) Motor k) Car l) Two wheeler m) Mobile Phone n) Internet o) Computer p) Newspaper q) Water connection r) Gas connection	
4. Production/ Productivity a) Agriculture crops		**4. Production/ Productivity** b) Horticulture crops	
5. Livestock a) Name of livestock b) Number of livestock		**5. Livestock** c) Way of used d) Self sufficiency	
6. Food Security a) Self-sufficiency (Rice) b) Dependency (Rice) c) Dependency (other crops) d) Attainability (Rs. 850/ day)		**6. Food Security** e) Productivity of land f) Abundance of foods g) Accessibility h) Food stock	
7. Nutritional Status a) Name of all food intake		**7. Nutritional Status** b) Intake in Kg	
8. Reproductive Healthcare a) Tetanus injection b) T.B vaccination c) Typhoid vaccination		**8. Reproductive Healthcare** n) Health checkup o) Place of Delivery p) Delivery person	

d) Iron intake e) Calcium intake f) Vitamins intake g) Smoking h) Khaini i) Tuibur j) Sahdah k) Alcohol l) Control workload m) Control way of life **9. Infant Morality (IM)** a) No. of live birth b) No. of death before 1 year **10. Women Perception on IMR** a) Is your vaccination effect your children death? b) Is your nutritional status affects your child death? c) If your place of delivery effects your infant death? d) Is a baby vaccination effect your infant death?		q) Breast feeding immediate r) Artificial breast feeding s) Time Food feeding t) Routine of food feeding u) Babies diseases v) Babies bathing w) Babies food control x) Check after delivery y) Post vaccination z) Babies immunization **9. Infant Mortality (IM)** c) No. of women with IM d) Women with multiple IM **10. Women perception on IMR** e) Is your economy affects your infant death? f) If there was hospital in your area, your child would be alive? g) If you have good and enough foods, would infant mortality reduced?	

APPENDIX-II

A. GENERAL INFORMATION OF THE VILLAGES

Village Councils	No. of households	No. of households surveyed	Rural Development Block	Sub-Division	Distance from Urban Center (km)	Distance from main road (km)
Ahmypi	42	17	Tuipang	Tuipang	120	0
Chheihlu	101	49	Tuipang	Tuipang	105	150
Chhualung I	100	40	Saiha	Saiha	45	0
Chhuarlung II	56	39	Saiha	Saiha	45	0
Chhuarlung III	100	40	Saiha	Saiha	45	0
Khopai	137	55	Tuipang	Tuipang	125	0
Lungbun I	95	38	Saiha	Saiha	35	0
Lungbun II	80	32	Saiha	Saiha	35	0
Maubawk CH	56	23	Saiha	Saiha	22	0
Maubawk L	122	49	Saiha	Saiha	22	0
Mawhre	98	40	Tuipang	Tuipang	118	118
KM 10	60	24	Saiha	Saiha	10	0
Old Tuisumpui	69	28	Saiha	Saiha	35	10
Siatlai	74	30	Tuipang	Tuipang	100	0
Theiri	131	53	Tuipang	Tuipang	58	0
Theiva	135	54	Saiha	Tuipang	48	0
Tuipang L	140	56	Tuipang	Tuipang	50	50
College veng I	284	114	Saiha	Saiha	0	0
College veng II	354	142	Saiha	Saiha	0	0
Council veng	250	100	Saiha	Saiha	0	0
Tuisumpui	34	14	Saiha	Saiha	35	10
Total	**2518**	**1037**				
Average					**50.14**	**16.10**

B. GENERAL GEOGRAPHY OF THE VILLAGES

Village Councils	Location	Terrain	Altitude (Mt)	Soil type	Forest
Ahmypi	$22^0$13'-$22^0$28'N & $93^0$01' – 93^0 64' E	steep	1043	Red Clay Dry	Moderate
Chheihlu	$22^0$17'-$22^0$38'N & $93^0$04' – 93^0 86' E	Steep	1147	Red clay	Moderate ly dense
Chhualung I	$22^0$26'-22^0 56' N & $93^0$06' – 93^0 11' E	Hilly	1418	Red Clayey	Moderate Dense
Chhuarlung II	$22^0$26'-22^0 56' N & $93^0$06' – 93^0 11' E	Hilly	1367	Red Clayey	Moderate Dense
Chhuarlung III	$22^0$26'-22^0 56' N & $93^0$06' – 93^0 11' E	Hilly	1428	Red Clayey	Moderate Dense
Khopai	$22^0$11'-22^0 10' N & $93^0$01' – 93^0 52' E	Gentle Steep	925	Red Clay	Moderately Dense
Lungbun I	22^0 28'-22^0 29' N & $93^0$06' – 93^0 15' E	Gentle Hill	1079	Laterite	Moderate dense
Lungbun II	22^0 28'-22^0 29' N & $93^0$06' – 93^0 15' E	Gentle Hill	1079	Laterite	Moderate dense
Maubawk CH	$22^0$26'-$24^0$24'N & $92^0$57' – 92^0 86' E	Gentle Hill	857	Red Clayey	Less Dense
Maubawk L	$22^0$26'-$24^0$24'N & $92^0$57' – 92^0 86' E	Gentle Hill	857	Red Clayey	Less Dense
Mawhre	$22^0$14'-$22^0$18'N & $93^0$06' – 93^0 19' E	Gentle Steep	1322	Red Clay	Moderate ly Dense
KM 10	$22^0$27'-$22^0$55'N & $93^0$03' – 93^0 07' E	Steep Hill	1566	Red Dry	Moderate dense
Old Tuisumpui	$22^0$33'-22^0 38' N & 92^0 59' – 93^0 28' E	Hilly	1182	Dry Red	Dense
Siatlai	$22^0$15'-22^0 95'N & $93^0$02' – 93^0 07' E	Hilly	1401	Clayey	Moderate
Theiri	$22^0$22'-22^0 65' N & $93^0$02' – 93^0 23' E	Hilly	1380	Rocky red clay	Moderate evergreen
Theiva	$22^0$23'-22^0 76' N & $93^0$00' – 93^0 36' E	Gentle Hill	1093	Red dry	Less dense evergreen
Tuipang L	$22^0$18'-22^0 61' N & 92^0 59' – 93^0 00' E	Moderate Steep	1248	Red Clay	Moderate
College veng I	$22^0$48'-22^0 51' N & 92^0 58' – 93^0 00' E	Steep	916	Red clayey	Open
College veng II	$22^0$48'-22^0 59' N & 92^0 58' – 93^0 00' E	Steep	876	Red clayey	Open
Council veng	$22^0$49'-22^0 61' N & 92^0 59' – 93^0 23' E	Steep	1023	Red clayey	Open
Tuisumpui	$22^0$33'-22^0 38' N & 92^0 59' – 93^0 28' E	Hilly	1155	Dry Red	Dense

C. DEMOGRAPHIC CHARACTERISTICS OF THE VILLAGES

Village Councils	Total population	Male	Female	Sex Ratio	Age group (0-14)	Age group (14-60)	Age group (Above 60)	Working Population (%)
Ahmypi	111	52	59	881.36	43.24	46.85	9.91	42.16
Chheihlu	338	186	151	1231.79	153	170	15	50.30
Chhualung I	198	96	103	932.04	79	119	-	60.10
Chhuarlung II	149	78	70	1114.29	63	85	1	57.05
Chhuarlung III	121	59	62	951.61	55	66	-	54.55
Khopai	296	150	146	1027.40	134	162	-	54.73
Lungbun I	85	37	48	770.83	39	38	8	44.71
Lungbun II	111	49	62	790.32	49	56	6	50.45
Maubawk CH	61	28	33	848.48	23	35	3	57.38
Maubawk L	206	88	118	745.76	76	123	7	59.71
Mawhre	242	107	135	792.59	113	127	2	52.48
KM 10	115	59	56	1053.57	68	47	-	40.87
Old Tuisumpui	141	74	67	1104.48	47	81	13	57.45
Siatlai	162	75	87	862.07	66	87	9	53.70
Theiri	222	112	110	1018.18	112	103	7	46.40
Theiva	179	89	90	988.89	87	90	2	50.28
Tuipang L	186	97	89	1089.89	76	103	7	55.38
College veng I	689	329	356	924.16	263	419	7	60.81
College veng II	889	445	440	1011.36	304	582	3	65.47
Council veng	453	221	233	948.50	118	332	3	73.29
Tuisumpui	136	63	72	875.00	65	66	5	48.53
Total	**5090**	**2494**	**2587**					
Average				**875**	**96.82**	**139.90**	**6.35**	**54.09**

D. NUMBER OF EDUCATIONAL INSTITUTIONS IN THE VILLAGES

Village Councils	Aganwadi Center	Primary School	Middle School	High School	Higher Secondary School	College
Ahmypi	1	1	1	-	-	-
Chheihlu	2	2 (G+P)	1	-	-	-
Chhualung I	1	1	-	1	-	-
Chhuarlung II	1	1	-	-	-	-
Chhuarlung III	1	1	1	-	-	-
Khopai	2	2 (G+P)	1	-	-	-
Lungbun I	1	1	1	1 (RMSA)	-	-
Lungbun II	1	1	1	-	-	-
Maubawk CH	1	1	1	-	-	-
Maubawk L	2	2 (G+P)	1	1	-	-
Mawhre	2	2 (G+P)	1	-	-	-
KM 10	1	1	1	-	-	-
Old Tuisumpui	1	1	-	-	-	-
Siatlai	1	1	1	-	-	-
Theiri	2	2 (G+P)	1	1 (RMSA)	-	-
Theiva	2	2 (G+P)	1	-	-	-
Tuipang L	2	2 (G+P)	1	1 (RMSA)	-	-
College veng I	1	3 (G2+P1)	1	2 (G+P)	-	-
College veng II	1	2	2	1	-	-
Council veng	1	1	1	-	-	-
Tuisumpui	1	1	1	-	-	-

G- Government, P- Private, RMSA-Rashtriya Madhyamik Shiksha Abhiyan

E. MEDICAL FACILITIES OF THE VILLAGES

Village Councils	No. of Hospital/ CHC	No. of Sub Center	No. of Clinic center	No. of Doctor	No. of Nurse	No. of Health Worker
Ahmypi	-	-	-	-	-	-
Chheihlu	-	1	-	-	-	1
Chhualung I	1	1	-	1	2	1
Chhuarlung II	-	-	-	-	-	-
Chhuarlung III	-	-	-	-	-	-
Khopai	-	-	-	-	-	-
Lungbun I	-	-	1	-	-	-
Lungbun II	-	-	-	-	-	-
Maubawk CH	-	-	-	-	-	-
Maubawk L	-	1	-	-	-	2
Mawhre	-	-	1	-	-	1
KM 10	-	-	-	-	-	-
Old Tuisumpui	-	-	-	-	-	-
Siatlai	-	-	-	-	-	-
Theiri	-	1	-	-	-	1
Theiva	-	1	-	-	-	2
Tuipang L	-	1	-	-	-	1
College veng I	-	-	1	-	-	-
College veng II	-	1	-	-	-	1
Council veng	-	-	-	-	-	-
Tuisumpui	-	1	-	-	-	1

F. OTHER FACILITIES OF THE VILLAGES

Village Councils	Bank	Post Office	Electricity	Fair Price Shop (FPS)	Regular FPS Supply	Irregular FPS Supply	Metaled Road	Un-metaled Truck able Road	Un-metaled Jeep able Road
Ahmypi	-	-	1	1	1	-	1	-	-
Chheihlu	-	1	1	2	1	-		1	1
Chhualung I	-	1	1	1	1	-	1	-	-
Chhuarlung II	-	1	1	1	1	-	1	-	-
Chhuarlung III	-	-	-	-	-	-	1	-	-
Khopai	-	1	1	1	1	-	1	-	-
Lungbun I	-	1	1	1	1	-	1	-	-
Lungbun II		-	1	1	1	-	1	-	-
Maubawk CH	-	1	1	1	1	-	1	-	-
Maubawk L	-	1	1	1	1	-	1	-	-
Mawhre	-	1	1	1	-	1		-	1
KM 10	-	-	1	1	1	-	1	-	-
Old Tuisumpui	-	-	-	1	1	-		-	1
Siatlai	-	1	1	1	1	-	1	-	-
Theiri	-	-	-	1	1	-	1	-	-
Theiva	-	1	1	1	1	-	1	-	-
Tuipang L	-	-	-	-	-	-		1	-
College veng I	-	-	1	1	1	-	1	-	-
College veng II	-	-	1	1	1	-	1	-	-
Council veng	1	-	1	2	1	-	1	-	-
Tuisumpui	-	1	1	1	1	-	-	-	1
Total	**1**	**11**	**17**	**21**	**18**	**1**	**16**	**2**	**4**

G. DRINKING WATER FACILITIES OF THE VILLAGES

Village Councils	Sources (Nos.)	Pure	Sufficiently Available all seasons	Only summer	No. of water Point	No. of Public latrine
Ahmypi	River (1)	1	-	1	6	1
Chheihlu	Forest (1)	1	-	1	8	5
Chhualung I	Forest (1)	1	-	1	4	4
Chhuarlung II	Forest (1)	1	-	1	2	1
Chhuarlung III	Forest (1)	1	-	1	3	-
Khopai	Forest (1)	1	-	1	11	7
Lungbun I	Forest (1)	1	-	1	6	2
Lungbun II	Forest (1)	1	-	1	6	3
Maubawk CH	Forest (1)	1	-	1	7	2
Maubawk L	Forest (1)	1	-	1	8	1
Mawhre	Forest (1)	1	-	1	6	5
Niawhtlang III	Forest (1)	1	-	1	2	2
KM 10	Forest (1)	1	-	1	4	2
Siatlai	Forest (3)	1	1	-	4	2
Theiri	Forest (1)	1	-	1	9	1
Theiva	Forest (2)	1	1	-	8	4
Tuipang L	Forest (2)	1	-	1	5	6
College veng I	PHE (1)	1	-	1	4	-
College veng II	PHE (1)	1	-	1	3	-
Council veng	PHE (1)	1	-	1	-	-
Tuisumpui	Forest (1)	1	-	1	4	1
Total		**21**	**2**	**19**	**110**	**49**

APPENDIX- III

A. NUTRITIVE VALUE OF FOOD GRAINS (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Rice	Maize
Protein*	6.8	4.7
Fat*	0.5	0.9
Crude fiber	0.2	1.9
Carbohydrates	78.2	24.6
Energy*	345	125
Calcium*	10	10
Phosphorus**	190	206
Iron*	3.2	0.8
Carotene**	9	90
Thiamine (mg)*	0.27	0.42
Riboflavin (mg)*	0.12	0.10
Niacin (mg)**	4.0	1.8
Vitamin B6 (mg)	0	0
Folic acid (µg)*	0	20
Vitamin c (mg)**	0	0
Choline (mg)***	0	0
Magnesium (Mg) **	157	0
Sodium**	0	0
Potassium**	0	0
Copper**	0.24	0
Manganese (Mn)**	1.10	0
Molybdenum (Mo)***	0.07	0
Zink**	1.4	0
Chromium (Cr)	0.009	0
Selenium**	0	0
Chloride (Cl)**	0	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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B. NUTRITIVE VALUE OF PULSES (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Small Peas	Peas	Big Beans	Dal
Protein*	24.1	19.7	4.5	20.8
Fat*	1.0	1.1	0.1	5.6
Crude fiber	3.8	4.5	2.0	1.2
Carbohydrates	54.5	56.5	7.2	59.8
Energy*	323	315	48	372
Calcium*	77	75	50	56
Phosphorus**	414	298	64	331
Iron*	8.36	7.05	1.4	5.3
Carotene**	12	0	0	132
Thiamine (mg)*	0.51	0	0.52	0.45
Riboflavin (mg)*	0.2	0	0.16	0.21
Niacin (mg)**	1.3	0	1.8	3.5
Vitamin B6 (mg)	0	0	0	0
Folic acid (µg)*	133	0	0	0
Vitamin c (mg)**	0	0	0	0
Choline (mg)***	202	0	352	0
Magnesium (Mg) **	100	0	33	90
Sodium**	20.4	0	43.5	28.5
Potassium**	725	0	39	1104
Copper**	1.29	0	0.17	1.20
Manganese (Mn)**	0.58	0	0	0.69
Molybdenum (Mo)***	0.63	0	0	0.28
Zink**	2.3	0	0	0.9
Chromium (Cr)	0.032	0	0	0.001
Selenium**	189	0	53	177
Chloride (Cl)**	0	0	43	5

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

*** Internet Site

C. NUTRITIVE VALUE OF LEAFY VEGETABLES (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Mustard Leave	Pumpkins Leave	Small Beans Leave
Protein*	4.0	4.6	5.6
Fat*	0.6	0.8	0.3
Crude fiber	0.8	2.1	3.7
Carbohydrates	3.2	7.9	11.5
Energy*	34	57	71
Calcium*	155	392	111
Phosphorus**	26	112	1449
Iron*	16.3	0	0
Carotene**	2622	0	0
Thiamine (mg)*	0.03	0	0
Riboflavin (mg)*	0	0	0
Niacin (mg)**	0	0	0
Vitamin B6 (mg)	0	0	0
Folic acid (µg)*	0	0	0
Vitamin c (mg)**	33	0	0
Choline (mg)***	0	0	0
Magnesium (Mg) **	0	0	17
Sodium**	0	0	55.4
Potassium**	0	0	74
Copper**	0	0	0.10
Manganese (Mn)**	0	0	0.12
Molybdenum (Mo)***	0	0	0.02
Zink**	0	0	0.42
Chromium (Cr)	0	0	0.006
Selenium**	0	0	40
Chloride (Cl)**	0	0	31

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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D. NUTRITIVE VALUE OF VEGETABLES (100 GRAM OF EDIBLE PORTION)

Nutrients Content	**Small Beans**	**Pumpkin**	**Brinjal**	**Mock Tomato**	**Tomato**	**Bean**	**Cauliflower**	**Cabbage**
Protein*	4.5	1.4	1.4	1.6	0.9	7.4	5.9	1.8
Fat*	0.1	0.1	0.3	0.2	0.1	1.0	1.3	0.1
Crude fiber	2.0	0.7	1.3	0.8	0.7	1.9	2.0	1.0
Carbohydrates	7.2	4.6	4.0	4.2	3.6	29.8	7.6	4.6
Energy*	48	25	24	25	23	158	66	27
Calcium*	50	10	18	20	20	50	626	39
Phosphorus**	64	30	47	70	36	160	107	44
Iron*	1.4	0.44	0.38	0.61	1.8	26	40.0	0.8
Carotene**	9	50	74	0	192	9	30	120
Thiamine (mg)*	0.45	0.06	0.04	0	0.07	0.08	0.04	0.06
Riboflavin (mg)*	0.20	0.06	0.1	0	0.01	0	0.1	0.09
Niacin (mg)**	2.6	0.5	0.9	0	0.4	0.8	1.0	0.4
Vitamin B6 (mg)	0	0	0	0	0	0	0	0.4
Folic acid (µg)*	36	13	34	0	0	0	0	0
Vitamin c (mg)**	0	2	12	0	31	12	56	124
Choline (mg)***	299	136	52	0	0	5	127	120
Magnesium (Mg) **	225	0	15	0	15	0	18	31
Sodium**	29.5	0	3.0	0	45.8	32.2	53.0	0
Potassium**	0.96	0	200	0	114	117	138	0
Copper**	0.85	0	0.12	0	0.19	0.13	0.13	02
Manganese (Mn)**	0	0	0.13	0	0	0	0.10	0.18
Molybdenum (Mo)***	0	0	0	0	0	0	0	0.07
Zink**	0	0	0.22	0	0	0	0.40	0.30
Chromium (Cr)	0	0	0.007	0	0	0	0.003	0.005
Selenium**	180	0	44	0	24	182	231	0
Chloride (Cl)**	9	0	52	0	38	47	34	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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E. NUTRITIVE VALUE OF ROOTS AND TUBERS (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Carrot	Potato	Turnip	Radish	Red Onion	Zo Onion
Protein*	0.9	1.6	0.5	0.5	1.2	1.8
Fat*	0.2	0.1	0.2	0.7	0.1	0.1
Crude fiber	1.2	0.4	0.9	0.6	0.6	0.6
Carbohydrates	10.6	22.6	6.2	3.2	12.6	12.6
Energy*	48	97	29	16	59	59
Calcium*	80	10	30	20	40	40
Phosphorus**	530	40	40	20	60	60
Iron*	1.03	0.5	0.9	1.0	1.2	1.2
Carotene**	1890	24	0	3	0	15
Thiamine (mg)*	0.04	0.10	0.04	0.06	0.089	0.08
Riboflavin (mg)*	0.02	0.01	0.04	0.02	0.01	0.02
Niacin (mg)**	0.6	1.2	0.5	0.5	0.4	0.5
Vitamin B6 (mg)	0	0	0	0	0	0
Folic acid (µg)*	15	7.0	0	0	6.0	0
Vitamin c (mg)**	3	17	43	15	11	2
Choline (mg)***	168	100	137	63	0	0
Magnesium (Mg) **	0	30	0	0	16	0
Sodium**	0	11.0	0	33	4.0	0
Potassium**	0	247	0	138	127	0
Copper**	0	0.16	0	0.4	0.18	0
Manganese (Mn)**	0	0.13	0	0	0.18	0
Molybdenum (Mo)***	0	0.07	0	0	0.03	0
Zink**	0	0.53	0	0	0.41	0
Chromium (Cr)	0	0.007	0	0	0.009	0
Selenium**	0	37	0	0	0	0
Chloride (Cl)**	0	16	0	0	0	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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F. NUTRITIVE VALUE OF NUTS AND OIL SEEDS (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Soya beans	Ginger Seeds
Protein*	43.2	1.1
Fat*	19.5	0.7
Crude fiber	3.7	1.3
Carbohydrates	20.9	10.5
Energy*	432	53
Calcium*	240	25
Phosphorus**	690	90
Iron*	10.4	2.6
Carotene**	426	40
Thiamine (mg)*	0.73	0.06
Riboflavin (mg)*	0.39	0.03
Niacin (mg)**	3.2	0.6
Vitamin B6 (mg)	0	0
Folic acid (µg)*	100	0
Vitamin c (mg)**	0	6
Choline (mg)***	0	0
Magnesium (Mg) **	175	405
Sodium**	0	0
Potassium**	0	0
Copper**	1.12	0.74
Manganese (Mn)**	2.11	5.56
Molybdenum (Mo)***	0	0
Zink**	3.4	1.93
Chromium (Cr)	0.028	0.05
Selenium**	0	0
Chloride (Cl)**	0	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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G. NUTRITIVE VALUE OF FRUITS (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Orange	Banana	Pineapple	Papaya	Lemon
Protein*	0.7	1.2	0.4	0.6	1.0
Fat*	0.2	0.3	0.1	0.1	0.9
Crude fiber	0.3	0.4	0.4	0.8	1.7
Carbohydrates	10.9	27.2	11.1	7.2	11.1
Energy*	48	116	52	32	57
Calcium*	26	17	10	17	70
Phosphorus**	20	36	12	13	10
Iron*	0.32	0.36	0.6	0.5	0.26
Carotene**	1104	78	18	0	0
Thiamine (mg)*	0	0.05	0.20	0.01	0.02
Riboflavin (mg)*	0	0.03	0.12	0.01	0.01
Niacin (mg)**	0	1.1	0.1	0.1	0.1
Vitamin B6 (mg)	0	0	0	0	0
Folic acid (µg)*	0	0	0	0	0
Vitamin c (mg)**	30	8	39	12	39
Choline (mg)***	0	0	8	0	0
Magnesium (Mg) **	9	41	33	0	19
Sodium**	4.5	36.6	34.7	23	0
Potassium**	9.3	88	37	216	270
Copper**	0.58	0.16	0.13	0	0.06
Manganese (Mn)**	0	0.20	0.56	0	0.07
Molybdenum (Mo)***	0	0	0	0	0
Zink**	0	0.15	0.11	0	0.07
Chromium (Cr)	0	0.004	0.01	0	0.007
Selenium**	7	7	20	0	0
Chloride (Cl)**	5	8	13	0	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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H. NUTRITIVE VALUE OF FLESH FOODS (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Pork	Chicken	Beef	Egg
Protein*	**18.7**	**25.9**	**79.2**	**13.3**
Fat*	4.4	0.6	10.3	13.3
Crude fiber	0	0	0.5	0
Carbohydrates	0	0	0.2	0
Energy*	114	109	410	173
Calcium*	30	25	68	60
Phosphorus**	200	245	324	220
Iron*	2.2	0	18.8	2.1
Carotene**	0	0	18	420
Thiamine (mg)*	0.54	0	0.15	0.10
Riboflavin (mg)*	0.09	0	0.04	0.40
Niacin (mg)**	2.8	0	5.8	0.1
Vitamin B6 (mg)	0	0	0	0
Folic acid (µg)*	0	0	0	78.3
Vitamin c (mg)**	2	0	0	0
Choline (mg)***	0	0	0	0
Magnesium (Mg) **	0	0	0	0
Sodium**	0	0	52	0
Potassium**	0	0	214	0
Copper**	0	0	0	0
Manganese (Mn)**	0	0	0	0
Molybdenum (Mo)***	0	0	0	0
Zink**	0	0	0	0
Chromium (Cr)	0	0	0	0
Selenium**	0	0	0	0
Chloride (Cl)**	0	0	0	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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I. NUTRITIVE VALUE OF COOKING OIL, MILK AND SUGAR (100 GRAM OF EDIBLE PORTION)

Nutrients Content	Cooking Oil	Milk	Sugar
Protein*	0	3.2	0.1
Fat*	100	4.1	0
Crude fiber	0	0	0
Carbohydrates	0	5.0	99.4
Energy*	900	117	394
Calcium*	0	210	12
Phosphorus**	0	130	1
Iron*	0	0.2	0.155
Carotene**	0	53	0
Thiamine (mg)*	0	0.05	0
Riboflavin (mg)*	0	0.19	0
Niacin (mg)**	0	0.1	0
Vitamin B6 (mg)	0	0	0
Folic acid (µg)*	0	8.5	0
Vitamin c (mg)**	0	2	0
Choline (mg)***	0	0	0
Magnesium (Mg) **	0	0	0
Sodium**	0	73	0
Potassium**	0	140	0
Copper**	0	0	0
Manganese (Mn)**	0	0	0
Molybdenum (Mo)***	0	0	0
Zink**	0	0	0
Chromium (Cr)	0	0	0
Selenium**	0	0	0
Chloride (Cl)**	0	0	0

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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J. RECOMMENDED DIETARY ALLOWANCE FOR INDIAN (PREGNANT WOMEN MODERATE WORK)

Vitamins	**Recommended Value**	**Unit**
Protein*	65	g/d (gram per Day)
Fat*	30	g/d (gram per Day)
Crude fiber	21	g/d (gram per day)
Carbohydrates	130	g/d (gram per day)
Energy*	2525	(K Cal) Kilo Calorie
Calcium*	1000	Mg/d (Milligram per day)
Phosphorus**	550	Mg/d (Milligram per day)
Iron*	38	Mg/d (Milligram per day)
Carotene**	3300	µg/d (Microgram per day)
Thiamine (mg)*	1.3	Mg/d (Milligram per day)
Riboflavin (mg)*	1.5	Mg/d (Milligram per day)
Niacin (mg)**	14	Mg/d (Milligram per day)
Vit B6 (mg)	1.3	Mg/d (Milligram per day)
Folic acid (µg)*	100	µg/d (Microgram per day)
Vitamin c (mg)**	30	Mg/d (Milligram per day)
Choline (mg)***	425	Mg/d (Milligram per day)
Magnesium (Mg) **	200	Mg/d (Milligram per day)
Sodium**	3900	Mg/d (Milligram per day)
Potassium**	2000	Mg/d (Milligram per day)
Copper**	1.15	Mg/d (Milligram per day)
Manganese (Mn)**	10	Mg/d (Milligram per day)
Molybdenum (Mo)***	50	µg/d (Microgram per day)
Zink**	9.4	Mg/d (Milligram per day)
Chromium (Cr)	30	µg/d (Microgram per day)
Selenium**	40	µg/d (Microgram per day)
Chloride (Cl)**	2.3	g/d (gram per day)

Sources:

* Nutritive Value of Indian Foods by C. Gopalan, Rama Sastri and S.C. Balasubramanian, National Institute of Nutrition, Indian Council of Medical Science Research, Hyderabad, 1971, pp. 47-58

** The Healthy Diet Calorie Counter, Kirsten Hartvig, Duncan Baird Publisher, London pp. 175

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APPENDIX IV

A. STANDARDIZED VALUE OF SOCIO-ECONOMIC STATUS

VC	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
V_1	-0.58	-0.15	0.36	-0.14	-1.44	-0.40	0.31	1.54	0.72	-0.19	-0.34	1.13	-0.75	-0.13	-0.41	-0.59	-0.41	-0.43	0.36
V_2	-0.44	0.61	-0.12	-0.69	-0.98	0.38	-1.34	2.13	-0.60	-0.54	0.57	-1.53	-0.65	-1.18	-0.18	-0.24	0.62	0.24	-1.09
V_3	-0.15	0.33	-0.54	-0.34	1.53	-0.17	-0.19	-0.63	-0.82	-0.66	-0.44	-1.20	-0.38	-0.40	-0.41	-0.59	-0.41	-0.43	-0.47
V_4	-0.86	-0.66	-0.86	-0.47	0.84	0.41	0.11	0.32	-0.82	-0.65	-0.67	-1.14	-0.62	-0.21	-0.41	-0.59	-0.41	-0.43	-0.88
V_5	-0.49	-0.61	-0.54	-0.54	0.89	0.22	-0.90	-0.63	-0.50	-0.55	-0.44	-0.85	-0.75	-0.81	-0.41	-0.59	-0.41	-0.43	-0.98
V_6	0.08	-0.55	-0.48	-0.95	-1.22	-0.66	-0.22	0.04	-0.49	-0.92	-1.02	-1.41	-0.57	-1.87	-0.41	-0.59	-0.41	-0.43	-0.68
V_7	-1.00	-0.10	0.20	0.26	0.24	-0.95	-0.96	-0.63	-0.92	-1.01	-0.92	-0.83	-0.75	-0.24	-0.41	-0.59	-0.41	-0.43	-0.96
V_8	-0.74	-0.61	-0.79	1.16	-1.05	-0.46	-0.43	-0.24	-0.24	-0.28	-0.74	-0.47	-0.75	0.33	-0.41	-0.59	-0.41	-0.43	-1.02
V_9	0.50	-0.28	-0.04	0.93	-0.32	-0.54	-0.56	-0.63	-0.11	-0.20	-0.29	0.52	0.32	0.49	0.07	0.17	-0.41	-0.43	-0.20
V_{10}	0.82	0.16	0.70	0.31	1.03	-0.19	0.22	-0.63	-0.08	-0.06	-0.28	0.75	0.05	0.85	-0.18	0.48	-0.41	-0.35	0.42
V_{11}	-0.78	-0.99	-1.20	-0.64	-0.67	-0.79	-0.31	-0.32	-0.50	-0.43	0.34	-0.74	-0.63	-2.68	-0.41	-0.59	-0.41	-0.43	-0.72
V_{12}	-0.90	-0.57	-1.20	-1.12	-0.84	-0.43	-0.43	-0.63	-0.86	-0.24	-1.01	1.13	-0.13	0.85	-0.41	-0.23	-0.41	-0.43	-0.95
V_{13}	-0.35	-0.31	0.22	0.86	1.16	0.16	0.00	-0.63	0.64	0.48	0.36	1.13	0.13	0.85	-0.41	-0.28	-0.41	-0.43	0.22
V_{14}	0.40	-0.68	-1.20	-0.54	0.24	-0.95	-0.15	0.60	-0.33	-0.24	1.08	1.13	-0.42	0.85	-0.41	0.28	-0.41	-0.43	0.23
V_{15}	0.05	-0.99	-0.95	-1.11	0.48	-0.71	-0.51	-0.39	-0.88	-0.83	-0.70	-1.07	2.77	0.85	-0.41	-0.59	-0.41	-0.43	-0.28
V_{16}	-0.91	-0.99	-0.71	-1.03	0.33	-0.83	-0.71	-0.63	-0.64	-0.58	-1.10	-0.34	-0.66	-0.84	-0.41	-0.43	-0.41	-0.43	0.33
V_{17}	0.38	-0.07	1.18	-0.08	0.05	-0.89	-0.34	-0.63	-0.73	-0.68	-0.67	1.13	-0.31	0.85	-0.41	-0.59	-0.41	-0.43	-0.21
V_{18}	2.45	1.70	1.49	0.87	-0.35	2.16	2.09	-0.52	2.02	1.88	1.05	1.09	1.06	0.56	2.77	2.25	2.57	2.73	1.73
V_{19}	2.41	2.40	2.17	0.92	-0.74	2.16	2.04	-0.02	1.78	2.16	1.69	0.80	2.16	0.68	3.07	2.06	3.10	2.46	1.98
V_{20}	0.94	2.33	1.60	2.94	2.05	2.10	2.45	-0.38	1.98	1.91	0.94	0.66	1.27	0.35	0.58	2.47	0.72	1.82	2.01
V_{21}	-0.82	0.03	0.70	-0.64	-1.24	0.38	-0.17	2.89	1.39	1.64	2.59	0.13	-0.40	0.85	-0.41	-0.59	-0.41	-0.43	1.18

VC- Village Council, V- Village, X- Indicators

B. NORMALIZED VALUE OF FOOD SECURITY INDICATORS

VC	**X_1**	**X_2**	**X_3**	**X_4**	**X_5**	**X_6**	**X_7**	**X_8**	**X_9**	**X_{10}**	**X_{11}**	**X_{12}**	**X_{13}**	**X_{14}**	**X_{15}**	**X_{16}**
V_1	-0.01	-1.01	0.53	0.55	-1.74	0.65	0.40	-1.01	0.36	0.07	-0.24	-0.33	0.41	-0.31	-0.97	-0.58
V_2	0.53	0.24	-1.07	-1.75	-1.36	0.65	0.40	-0.54	-0.12	-0.67	4.36	4.09	2.85	4.14	1.26	-0.44
V_3	-0.24	0.57	0.60	0.55	0.13	0.65	0.40	0.78	-0.54	-0.53	-0.24	1.11	-0.29	-0.31	-0.97	-0.15
V_4	-0.45	0.15	0.40	0.55	0.13	0.65	0.40	0.37	-0.86	-0.19	-0.08	-0.33	-0.81	-0.31	-0.97	-0.86
V_5	-0.30	-0.39	0.56	0.55	0.13	-1.05	-2.39	0.03	-0.54	2.93	-0.24	-0.33	-0.81	-0.31	-0.97	-0.49
V_6	3.34	0.47	-0.51	0.55	-1.86	-1.05	0.40	0.06	-0.48	0.38	-0.24	0.46	2.20	1.02	-0.30	0.08
V_7	1.06	1.66	0.80	0.55	0.38	0.65	0.40	-1.30	0.20	0.34	-0.24	-0.33	-0.45	-0.31	-0.97	-1.00
V_8	1.30	1.76	0.84	0.55	0.38	0.65	0.40	-0.52	-0.79	-0.12	-0.24	-0.33	0.27	-0.31	-0.97	-0.74
V_9	-1.09	1.07	0.84	0.55	0.70	2.34	0.40	0.42	-0.04	-1.64	-0.24	-0.33	-0.81	-0.31	-0.97	0.50
V_{10}	-0.16	-0.83	0.50	0.55	0.70	-1.05	0.40	0.73	0.70	0.96	-0.11	-0.33	-0.67	-0.31	1.63	0.82
V_{11}	-0.18	-0.52	0.17	-1.75	-1.69	-1.05	-2.39	-0.25	-1.20	-0.44	-0.24	-0.33	0.05	-0.31	1.76	-0.78
V_{12}	-1.09	-0.12	0.61	0.55	1.00	0.65	0.40	-1.82	-1.20	-1.64	-0.24	-0.33	-0.81	-0.31	-0.97	-0.90
V_{13}	-0.48	1.06	0.37	-1.75	0.38	0.65	0.40	0.42	0.22	-0.52	-0.24	-0.33	-0.07	-0.31	0.98	-0.35
V_{14}	0.19	-1.67	0.56	0.55	-1.24	0.65	0.40	-0.08	-1.20	-1.25	-0.24	-0.33	1.26	-0.31	0.85	0.40
V_{15}	-0.36	-1.04	0.07	0.55	-0.20	-1.05	0.40	-1.07	-0.95	0.37	-0.24	-0.33	-0.42	-0.31	0.40	0.04
V_{16}	-0.74	-0.42	0.37	0.55	0.05	0.65	0.40	-0.54	-0.71	0.78	-0.24	-0.33	-0.43	-0.31	0.38	-0.91
V_{17}	-0.78	-1.81	0.20	-1.75	0.00	-1.05	-2.39	0.14	1.18	0.59	-0.24	-0.33	-0.69	-0.31	-0.97	0.38
V_{18}	0.40	0.00	-2.13	0.55	1.25	-1.05	0.40	0.88	1.49	0.46	-0.18	-0.20	0.46	0.33	1.26	2.45
V_{19}	0.47	1.24	-2.44	0.55	1.25	-1.05	0.40	1.51	2.17	0.64	-0.19	-0.16	-0.03	-0.31	0.57	2.40
V_{20}	-0.78	0.07	-1.83	0.55	1.25	-1.05	0.40	2.57	1.60	-0.57	-0.24	-0.33	-0.40	-0.31	-0.42	0.94
V_{21}	-0.63	-0.48	0.55	-1.75	0.38	0.65	0.40	-0.78	0.70	0.05	-0.24	-0.33	-0.81	-0.31	0.33	-0.82

VC- Village Council, V- Village, X- Indicators

C. NORMALIZED VALUE OF NUTRITION (VITAMIN) INDICATORS

VC	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}
V_1	-0.47	-0.82	-0.50	0.61	0.08	-0.46	-0.15	-0.21	-0.34	0.05	-0.16	0.54	-0.41	-0.44	-0.80	-0.63
V_2	0.40	-0.18	0.60	2.06	1.59	0.05	1.12	0.80	0.08	1.66	0.43	2.11	-0.23	-0.34	0.21	0.69
V_3	-0.91	-0.54	-0.84	-0.96	-1.08	-0.81	-1.08	-0.95	-0.74	-1.11	-0.71	-0.99	-0.96	-0.40	-0.86	-0.74
V_4	-0.64	-0.18	-0.83	-0.25	-0.47	-0.61	-0.81	-0.82	-1.20	-0.63	-0.47	-0.33	2.85	-0.45	0.23	-0.31
V_5	0.76	0.95	-0.54	-0.46	0.22	0.37	0.92	0.27	1.22	0.03	2.50	-0.37	-0.23	2.98	-0.56	-0.35
V_6	-0.17	-0.83	0.21	1.05	0.19	0.14	0.03	0.18	-0.21	0.72	-0.01	1.08	-0.23	-0.46	-0.34	-0.35
V_7	-0.79	-0.83	0.13	-0.71	-0.97	-0.17	-0.84	0.17	0.02	-0.87	-0.71	-0.77	-0.41	-0.47	-0.16	-0.46
V_8	0.23	1.21	0.26	0.65	1.01	0.10	0.34	0.26	0.54	0.60	0.20	0.73	-0.23	-0.11	0.19	0.35
V_9	-0.55	0.17	-0.50	-0.99	-0.71	-0.11	-0.97	-0.36	0.02	-0.92	-0.64	-1.03	-0.23	-0.28	-0.17	-0.31
V_{10}	-0.42	-1.54	-0.61	-1.72	-1.38	-0.58	-0.67	-0.78	0.57	-1.31	-0.83	-1.42	-0.41	-0.31	-0.15	0.24
V_{11}	-0.61	-0.59	-0.22	-0.72	-0.85	0.06	-0.71	-0.27	0.15	-0.55	-0.59	-0.65	0.77	-0.41	0.19	-0.15
V_{12}	-0.26	0.05	-0.61	-0.45	-0.74	-0.81	-0.33	-0.57	-1.06	-0.07	-0.22	-0.34	0.02	-0.43	-0.48	-0.43
V_{13}	1.85	-0.18	0.40	-0.60	-0.46	-0.61	-0.53	-0.51	-1.11	-0.34	-0.59	-0.34	-0.69	-0.47	-0.05	-0.22
V_{14}	-0.44	-0.17	-0.71	-1.20	-1.00	-0.74	-0.79	-0.85	-0.93	-0.75	-0.56	-0.97	-0.41	-0.30	-0.51	-0.80
V_{15}	-0.58	-0.71	-0.97	0.05	-0.33	-0.96	-0.53	-0.66	-1.06	-0.38	-0.36	-0.03	-0.69	-0.45	-1.07	-0.84
V_{16}	-0.39	-0.11	-0.66	-0.85	-0.72	-0.75	-0.73	-0.88	-0.54	-0.85	-0.63	-0.76	-0.69	-0.36	-0.70	-0.56
V_{17}	-0.44	-0.90	-0.71	0.97	0.27	0.59	0.19	-0.34	0.32	-0.40	-0.41	-0.21	-0.88	-0.55	-0.46	-0.59
V_{18}	1.73	1.09	2.89	1.20	1.75	2.09	2.04	2.48	1.74	2.20	0.97	1.65	1.65	0.73	3.05	3.40
V_{19}	2.49	2.73	2.02	0.29	1.89	3.14	2.47	2.44	2.72	1.61	2.86	0.77	2.01	2.82	2.50	1.84
V_{20}	0.70	-0.17	1.26	1.48	1.25	0.54	1.10	1.26	0.43	1.39	0.36	1.72	0.07	-0.17	0.10	0.60
V_{21}	-1.49	1.55	-0.07	0.54	0.47	-0.49	-0.07	-0.63	-0.61	-0.07	-0.41	-0.39	-0.69	-0.14	-0.16	-0.39

VC- Village Council, V- Village, X- Indicators

D. NORMALIZED VALUE OF NUTRITION (MINERALS) INDICATORS

VC	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
V_1	0.73	-0.76	-0.97	-0.22	0.69	0.22	0.73	0.38	-0.95	-0.76
V_2	2.28	-0.21	0.12	1.33	2.51	1.82	2.29	2.20	0.11	0.47
V_3	-0.84	-0.65	-0.84	-1.11	-0.83	-0.96	-0.82	-0.83	-0.88	-0.66
V_4	-0.16	-0.72	-0.90	-0.01	-0.19	-0.35	-0.14	-0.26	-0.87	-0.68
V_5	-0.28	-0.51	-0.72	-0.64	-0.31	-0.66	-0.34	-0.37	-0.47	-0.30
V_6	1.18	-0.41	-0.54	0.38	1.12	0.77	1.23	0.88	-0.29	-0.08
V_7	-0.60	-0.18	-0.78	-0.74	-0.64	-1.00	-0.68	-0.61	0.05	0.51
V_8	0.76	0.39	0.83	0.76	0.64	0.93	0.77	0.58	0.76	0.50
V_9	-1.05	-0.51	-0.09	-0.62	-1.03	-0.49	-0.92	-0.94	-0.20	-0.45
V_{10}	-1.47	-0.25	-0.06	-0.99	-1.37	-1.05	-1.48	-1.24	-0.24	-0.38
V_{11}	-0.59	-0.52	-0.33	-0.37	-0.62	-0.60	-0.66	-0.59	-0.32	-0.43
V_{12}	-0.43	0.09	2.47	1.28	-0.35	1.75	-0.31	-0.69	1.85	-0.28
V_{13}	-0.43	-0.29	0.03	-0.58	-0.54	-0.25	-0.45	-0.30	-0.40	-0.47
V_{14}	-1.06	-0.44	-0.66	-0.88	-0.99	-1.09	-1.10	-1.11	-0.72	-0.94
V_{15}	0.10	-0.76	-0.65	-0.44	0.08	-0.11	0.10	-0.16	-0.76	-0.88
V_{16}	-0.84	-0.32	-0.10	-0.67	-0.84	-1.12	-0.98	-0.87	-0.24	-0.29
V_{17}	-0.22	0.02	-0.75	-0.91	-0.30	-0.57	-0.23	-0.43	-1.01	-0.80
V_{18}	1.40	2.51	2.53	2.69	1.50	2.17	1.56	2.15	2.85	3.11
V_{19}	0.32	3.04	1.12	1.06	0.35	0.19	0.31	0.83	1.40	1.94
V_{20}	1.72	0.78	0.30	1.03	1.51	0.57	1.48	1.33	0.70	1.01
V_{21}	-0.52	-0.28	-0.01	-0.36	-0.38	-0.16	-0.36	0.05	-0.37	-0.14

VC- Village Council, V- Village, X- Indicators

APPENDIX - V

A. INTERCORELATIONS BETWEEN IMR AND FOOD AVAILABILITY

Pearson Correlation Sig. (2-tailed	IMR	Availability Per Capita	Livestock per Head	Food Surplus
		Correlations[b]		
IMR	1	.044	.043	.525*
		.850	.855	.015
Availability of Rice Per Capita		1	.348	-.199
			.123	.388
Livestock per Head			1	-.113
				.626
Food Surplus				1

*. Correlation is significant at the 0.05 level (2-tailed).
b. Listwise N=21

IMR- Infant Mortality Rate

B. INTERCORELATIONSBETWEEN IMR AND FOOD ACCESSIBILITY

Pearson Correlation Sig. (2-tailed	IMR	Road Types	Distance from UC	Population FPS Ratio	Regularity of FPS	% of Main workers
				Correlations[b]		
IMR	1	.277	-.006	.073	-.070	-.424
		.224	.979	.753	.763	.056
Road Types		1	.262	.018	.411	.116
			.250	.937	.064	.618
Distance from Nearest Urban center			1	-.011	.218	.379
				.963	.343	.090
Population FPS Ratio				1	.440*	-.355
					.046	.114
Regularity of FPS					1	.011
						.962
Main workers %						1

*. Correlation is significant at the 0.05 level (2-tailed).
b. Listwise N=21

IMR- Infant Mortality Rate, UC- Urban Center, FPS- Fair Price Shop

C. INTERCORELATIONSBETWEEN IMR AND FOOD STABILITY

Correlations[c]

Pearson Correlation Sig. (2-tailed	IMR	Income	Productivity	Irrigation	Self Sufficiency Rice	Dependency	Self Sufficiency other	Food Stock	Education
IMR	1	-.501*	.169	-.297	-.239	-.291	-.311	-.293	-.362
	Sig.	.021	.464	.191	.296	.201	.170	.197	.107
Income		1	.228	-.020	-.056	-.101	-.011	.120	.707**
			.320	.932	.809	.665	.963	.605	.000
Productivity			1	-.146	-.163	-.168	-.109	.004	.096
				.527	.481	.467	.638	.985	.678
Irrigation				1	.935**	.645**	.948**	.297	-.089
					.000	.002	.000	.190	.700
Self Sufficiency Rice					1	.699**	.934**	.210	-.068
						.000	.000	.361	.768
Dependency						1	.794**	.346	.089
							.000	.125	.700
Self Sufficiency other							1	.300	-.014
								.186	.952
Food Stock								1	.328
									.147
Education									1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
c. Listwise N=21

IMR- Infant Mortality Rate

D. INTER-CORELATIONS BETWEEN IMR AND MAJOR VITAMINS

Pearson Correlation Sig. (2-tailed)	Correlations[c]						
	IMR	**Protein**	**Fat**	**Carbohydrates**	**Energy**	**Calcium**	**Iron**
IMR	1	-.402	-.276	-.457*	-.536*	-.436*	-.445*
	Sig.	.071	.226	.037	.012	.048	.043
Protein		1	.523*	.295	.627**	.730**	.762**
			.015	.194	.002	.000	.000
Fat			1	.241	.639**	.635**	.576**
				.292	.002	.002	.006
Carbohydrates				1	.853**	.436*	.591**
					.000	.048	.005
Energy					1	.755**	.846**
						.000	.000
Calcium						1	.918**
							.000
Iron							1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
c. Listwise N=21

IMR- Infant Mortality Rate

E. INTER-CORELATIONS BETWEEN IMR AND MINOR VITAMINS

Pearson Correlation Sig. (2-tailed)	**Correlations[c]**					
	IMR	**Crude Fiber**	**Phosphorous**	**Carotene**	**Thiamine**	**Riboflavin**
IMR	1	-.512*	-.518*	-.351	-.557**	-.259
	Sig	.018	.016	.119	.009	.257
Crude-Fiber		1	.827**	.700**	.850**	.565**
			.000	.000	.000	.008
Phosphorous			1	.808**	.913**	.854**
				.000	.000	.000
Carotene				1	.589**	.781**
					.005	.000
Thiamine					1	.667**
						.001
Riboflavin						1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
c. Listwise N=21

IMR- Infant Mortality Rate

F. INTER-CORELATIONS BETWEEN IMR AND OTHER MINOR VITAMINS

Correlations[c]

Pearson Correlation Sig. (2-tailed)	IMR	Niacin	Vitamin B6	Folic Acid	Vitamin C	Choline
IMR	1	-.508*	-.368	-.113	-.500*	-.533*
		.019	.101	.627	.021	.013
Niacin		1	.281	.170	.484*	.609**
			.217	.461	.026	.003
Vitiamin B6			1	.365	.714**	.582**
				.103	.000	.006
Folic Acid				1	.487*	.445*
					.025	.043
Vitamin C					1	.948**
						.000
Choline						1

***. Correlation is significant at the 0.05 level (2-tailed).**
****. Correlation is significant at the 0.01 level (2-tailed).**
c. Listwise N=21

IMR- Infant Mortality Rate

G. INTER-CORELATIONS BETWEEN IMR AND TRACE MINERALS

	Correlations, Pearson Correlation Sig. (2-tailed)										
	IMR	**Mg**	**Sod**	**Pot**	**Cu**	**Mn**	**Mo**	**Zn**	**Cr**	**S**	**Cl**
IMR	1	-.448*	-.435*	-.391	-.522*	-.467*	-.473*	-.459*	-.528*	-.346	-.399
		.042	.049	.080	.015	.033	.030	.036	.014	.124	.073
Mg		1	.381	.284	.759**	.995**	.785**	.995**	.954**	.392	.548*
			.089	.212	.000	.000	.000	.000	.000	.079	.010
Sod			1	.711**	.703**	.388	.469*	.391	.555**	.809**	.903**
				.000	.000	.082	.032	.080	.009	.000	.000
Pot				1	.805**	.310	.729**	.321	.412	.950**	.696**
					.000	.171	.000	.156	.064	.000	.000
Cu					1	.778**	.926**	.784**	.830**	.860**	.804**
						.000	.000	.000	.000	.000	.000
Mn						1	.808**	.996**	.964**	.411	.560**
							.000	.000	.000	.064	.008
Mo							1	.823**	.803**	.719**	.589**
								.000	.000	.000	.005
Zn								1	.963**	.417	.559**
									.000	.060	.008
Cr									1	.523*	.720**
										.015	.000
S										1	.854**
											.000
Cl											1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

IMR- Infant Mortality Rate, Mg- Magnesium, Sod- Sodium, Pot- Potassium, Cu- Copper, Mn- Manganese, Mo- Molybdenum, Zn- Zink, Cr-Chromium, S- Selenium, Cl- Chloride

H. INTER-CORELATIONS BETWEEN IMR AND ANTENATALCARE

Pearson Correlation Sig. (2-tailed)	IMR	Tet	IFA	Iron	Cal	Other Vitamins	Work load	Regular Checkup
				Correlations[c]				
IMR	1	-.161	-.527*	-.527*	-.394	-.423	.018	-.144
		.486	.014	.014	.077	.056	.938	.534
Tetanus		1	.403	.403	.214	.619**	-.094	.619**
			.070	.070	.351	.003	.685	.003
IFA			1	1.000**	.693**	.686**	-.289	.516*
				.000	.000	.001	.203	.017
Iron				1	.693**	.686**	-.289	.516*
					.000	.001	.203	.017
Calcium					1	.835**	-.140	.429
						.000	.546	.052
Others Vitamins						1	-.107	.596**
							.645	.004
Workload							1	.089
								.701
Regular Checkup								1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

IMR- Infant Mortality Rate, Tet- Tetanus, Cal- Calcium

I. INTER-CORELATIONS BETWEEN IMR AND TOBACCO CONSUMPTION DURING PREGNANCY

Pearson Correlation Sig. (2-tailed)	IMR	Smoke	Khaini	Tuibur	Sahdah	Alcohol
			Correlations[a]			
IMR	1	.432	.071	.103	-.328	.247
		.050	.759	.656	.147	.280
Smoke		1	.239	.425	-.356	-.086
			.297	.055	.113	.710
Khaini			1	-.233	-.357	-.135
				.310	.113	.561
Tuibut				1	-.354	-.021
					.115	.928
Sahdah					1	.005
						.984
Alcohol						1

IMR- Infant Mortality Rate

J. INTER-CORELATIONS BETWEEN IMR AND DELIVERY

Pearson Correlation Sig. (2-tailed)	Institutional Delivery				Expert delivery		
	IMR	PHC	Sub-Center	Hospital	Nurse	Health Worker	ASHA
IMR	1	.294	.031	-.383	-.356	-.097	.050
		.196	.892	.087	.113	.675	.828
PHC		1	-.197	-.278	.062	-.132	.198
			.391	.222	.790	.568	.390
Sub Center			1	-.073	-.170	.489*	.155
				.752	.461	.024	.503
Hospital				1	.862**	-.163	-.220
					.000	.481	.338
Nurse					1	-.311	-.129
						.171	.578
Health Worker						1	-.167
							.469
ASHA							1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

IMR- Infant Mortality Rate, PHC- Primary Health Center, ASHA- Accredited Social Health Activist

K. INTER-CORELATIONS BETWEEN IMR AND WOMEN'S HEALTH

Pearson Correlation Sig. (2-tailed)			Correlations		
	IMR	Healthy	No Major Diseases	No Chronic Diseases	Good Nutrition
IMR	1	-.285	.042	.059	-.419
		.211	.858	.800	.059
Healthy		1	.381	-.016	.628**
			.088	.945	.002
No Major Diseases			1	.320	.389
				.157	.081
No Chronic Diseases				1	.163
					.480
Good Nutrition					1

**. Correlation is significant at the 0.01 level (2-tailed).

IMR- Infant Mortality Rate

L. INTER-CORELATIONS BETWEEN IMR AND POSTNATAL CARE

IMR	Correlations c.						
	Feed Immediate	**Feed Self**	**Feed up to 6 Months**	**Routine Feeding**	**Normal Bath**	**Check after birth**	**Check when Sick**
Pearson Correlation	.028	-.064	-.207	-.232	-.096	-.221	-.283
Sig.(2tailed)	.905	.783	.367	.312	.679	.335	.214
	*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).						

IMR- Infant Mortality Rate

K. INTER-CORELATIONS BETWEEN IMR AND POST VACCINATION

Pearson Correlation Sig. (2-tailed)	Correlations[c]				
	IMR	**BCG**	**DPT**	**OPV**	**Hept. B**
IMR	1	-.131	-.372	-.633**	-.443*
		.571	.097	.002	.044
BCG		1	.721**	.446*	-.273
			.000	.042	.232
DPT			1	.803**	.250
				.000	.274
OPV				1	.562**
					.008
Hept. B					1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Pearson Correlation Sig. (2-tailed)	Correlations[c]				
	IMR	**Measles**	**MMR**	**Hib**	**Hibsag**
IMR	1	-.422	-.484*	-.430	-.441*
		.057	.026	.052	.045
Measles		1	.783**	.622**	.658**
			.000	.003	.001
MMR			1	.926**	.889**
				.000	.000
Hib				1	.964**
					.000
Hibsag					1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

IMR- Infant Mortality Rate, BCG- DPT- Diptheria, OPV- Oral Polio Vaccine, MMR- Measles Mums Re, Hib-

APPENDIX - VI

COMPARISON OF IM AND NO IM WOMEN IN RELATION WITH NUTRITIONAL ATTAINMENT DIFFERENTIATION

Nutrition	IM	No IM	Difference	Difference (In %)
Protein	39.53	68.13	28.60	26.57
Fat	24.39	35.37	10.98	18.38
Crude Fiber	2.41	5.40	2.99	38.22
Carbohydrates	308.44	381.17	72.73	10.55
Energy (K Cal)	1616.16	2128.25	512.09	13.68
Calcium	198.87	423.64	224.77	36.11
Phosphorus	908.85	1360.25	451.41	19.89
Iron	18.25	31.49	13.23	26.61
Carotene	549.60	1170.31	620.71	36.09
Thiamine	1.19	1.71	0.52	18.02
Riboflavin	0.55	0.77	0.23	17.06
Niacin	15.96	20.69	4.73	12.90
B6	0.01	0.04	0.03	59.30
Folic acid	15.38	34.78	19.40	38.68
Vitamin C	18.77	54.82	36.05	48.99
Choline	65.60	180.42	114.82	46.67
Magnesium	606.09	765.14	159.05	11.60
Sodium	27.66	81.35	53.69	49.25
Potassium	340.82	724.80	383.98	36.03
Copper	1.25	1.97	0.71	22.17
Manganese	4.23	5.38	1.16	12.06
Molybdenum	0.32	0.43	0.10	13.54
Zink	5.45	6.79	1.33	10.89
Cr Chromium	0.04	0.05	0.01	16.41
Selenium	65.33	155.33	89.99	40.78
Chloride	15.59	43.97	28.37	47.64

IM- Infant Mortality

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BIO-DATA

Name	**:** Lalrinpuia Vangchhia
Date of Birth	: 14/09/1991
Father's Name	**:** V. Liankima
Mother's Name	: H. Suakthuami (L)
Mailing Address	**:** College Veng, Aizawl, House No. V-25 A, Near Taxi Stand, Pin code: 796001, Mobile: 8837341169, Email ID: lalrinpuiavangchhia@gmail.com
Permanent Address	**:** Tualcheng, Champhai District, Pin Code: 796321
Nationality	**:** Indian
State of Domicile	**:** Mizoram
Study Area	: Saiha District, Mizoram
Name of Research Topic	: Food Security, Nutritional Status and Infant Mortality Rate in District Saiha, Mizoram

Publications of Research paper:

A. Book

A Sustainable Livelihood Approach to Poverty Reduction, An empirical analysis of Mizoram, the Eastern Extension of the Himalaya, Springer, Switzerland, 2017, ISBN No. 978-3-319-45622-5.

B. Chapter in Edited Book

1. A Micro- level Analysis of Tourism Department in Mizoram : A Case Study of Artificial Tourist spot in Aizawl City Region in Branding North East India for Tourism destination, Ruby Press & Co, New Delhi, India, 2017, ISBN No. 978-81-933068-0-2

2. Impact of Climate Change on Cropping Pattern: A Case Study on Tualcheng Village, Champhai District, Mizoram in Climate change and Socio-Ecological Transformation, Today's and Tomorrow's Publications, New Delhi, India, 2015, ISBN No. 1-55528-374-8(USA) 81-8019-518-3(India)

3. Altitudinal Zonation of Floral Diversity and its Conservation Pattern in Mizoram, North-East India in Environmental Geography of South Asia, Springer, Japan, 2016, ISBN No. 2198-35422198-3550(Electronic) 978-4-431-55741-8 (E-Book)

4. Impact of Oil Palm cultivation on Rural Livelihood of Mamit and Kolasib District, in Mizoram, Natural Resources Management for Sustainable Development and Rural Livelihoods, Today's and Tomorrow's Publications, New Delhi, India, 2017, ISBN No. 81-7019-584-1(India) 1-55528-434-5(USA)

5. A Sustainable Livelihood Approach to Poverty Reduction, An empirical analysis of Mizoram, the Eastern Extension of the Himalaya, Springer, Switzerland, 2017, ISBN No. 978-3-319-45622-5

C. Research Paper on Journal

1. Nutritional Status and Infant Mortality Rate in Saiha District, Mizoram, India, Current Science, June, 2016, Vol.110, No.12, Page No. 2880-2283, ISSN No. 0011-3891.
2. Identification of Food Security Region for Sustainable Development, Geographic, July, 2016, Vol. 11, Page No. 32.46, ISSN No. 0970-6429
3. Prospect of Oil Palm Plantation in Mizoram, India, Indian Journal of Hill farming, June, 2017, Vol.30, Issue 1, Page No. 139-143, ISSN No. 0970-6429.
4. Food Security Status in Rural Areas Mizoram, North East India, Journal of Mountain Science, 2017, Vol 14 No.4, Page No. 795-805, ISSN No. 495-80411629-016-4092-2
5. Rural Urban Disparity in Nutritional Efficiency Attainment and Infant Mortality Rate in District Saiha, Mizoram, Geographic, July, 2017, Vol.12, Page NO. 29-37, ISSN No. 0975-4121.

D. Research Project Undertaken

Indian Council of Social Science Research (ICSSR) Sponsored major project on "A Sustainable Livelihood Approach to Poverty Reduction, A Geo-empirical Analysis of Mizoram, Eastern Extension of the Himalayas." During 2014-2016'

E. Presentation of Research Papers

1. Presented paper "dentification of Food Security Region for Planning and Sustainable Agriculture Development in the Tribal Areas of Mizoram: A Case Study of Champhai District" (Poster), on Management of Natural Resources for Sustainable Development on Challenges and Opportunities Geography & Resource Management, Mizoram University, Aizawl, India, 6th -7th March, 2014.
2. Presented paper "A Micro-level Analysis of Tourism Development in Mizoram- A case Study of Artificial Tourist Spots in Aizawl City Region," on National Seminar on Branding North east India for Tourism Destination: Issues and Challenges, Department of Management, Mizoram University, Aizawl, India, 21st -22nd March, 2014
3. Presented paper "Food Security, Nutritional Status and Infant Mortality Rate in District Saiha, Mizoram," on National level Interaction programme for Ph.D. Scholar Department of Geography & Resource Management, Mizoram University, Aizawl, India, 5-25 November, 2014.
4. Presented paper "Women Health and Infant Mortality Rate in Saiha District, Mizoram, North East India," on 9th International Geographical Union (IGU) Conference University of Delhi, New Delhi, India, 18th -20th March, 2016.
5. Presented paper "Disparity Level of Food Security in Mizoram: A District Level Analysis," on National Seminar on Regional Disparities and its Consequences Government of Aizawl North College, Aizawl, India, 29th – 30th September, 2016.
6. Presented paper "Food Security And Nutritional Status in Rural Areas of Mizoram, North-East India," on International Conference on 'Regional Cooperation, Conflicts and Constructiveness In south Asia: Strengthening SAARC'. Department of Geography and Research Center, Parvatibai Chowgule College, Margao, Goa, India 21st – 23rd January 2016.
7. Presented paper "Impact of Oil Palm Cultivation on Rural Livelihood: a case Study of Mamit and Kolasib District, Mizoram, North - East India," on International Conference on 'Natural Resources Management For Sustainable Development and Rural Livelihoods', Department of Geography and Resource Management, Mizoram University, Aizawl, India, 26th – 28th October, 2017.
8. Presented paper "Shifting Cultivation and Food Security, a Spatial Comparison of Shifting Cultivation and Wet Rice Cultivation in Mizoram," on Shifting Cultivation and Its Environmental Impact in north- East India, Pachhunga University College, Aizawl, Mizoram, India, 15th-16th March, 2018.
9. Presented paper "Changing Agriculture and Cropping Patter in Mizoram, northeast India," on Regional Seminar on Climate Change: Impact, Adaptation and Response in the eastern Himalayas, Department of Environmental Science, Mizoram University, 1^{st} - 2^{nd} November, 2018.