DETERMINANTS OF INFANT MORTALITY IN SAIHA DISTRICT, MIZORAM

(A DISSERTATION SUBMITTED FOR THE AWARD OF THE DEGREE OF MASTER OF PHILOSOPHY IN ECONOMICS)

BY

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TO

THE DEPARTMENT OF ECONOMICS

SCHOOL OF ECONOMICS, MANAGEMENT

&

INFORMATION SCIENCES

MIZORAM UNIVERSITY

2016

MIZORAM UNIVERSITY

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CERTIFICATE

This is to certify that the dissertation entitled, "**Determinants of Infant Mortality in Saiha District, Mizoram**" by L.B.Ngoze has been written under my guidance. This dissertation has been written under my guidance. This dissertation is the result of her investigation into the subject and was never submitted to any other University for any research degree.

DECLARATION

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I, L.B.Ngoze, do hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form the base of the award of any previous degree to me or to do the best of my knowledge to anybody else, and that the dissertation 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 Master of Philosophy in Economics.

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ACKNOWLEDGEMENT

First of all, I praise the Almighty God for all the blessings He bestowed upon me.

I would like to offer my sincere appreciation to my Supervisor, Dr. Lalhriatpuii, Assistant Professor, Department of Economics, Mizoram University. This dissertation appears in its form due to her sincere assistance, guidance and patience. May God bless her even more.

I also like to thank the Department of Economics, all the faculty and staffs, for their support and the opportunity they have offered me to be part of their family. I could never felt more at home.

Last but not least, I would like to express my deepest gratitude to my loving and ever supportive family. You are the reason why I push harder every day. You are my strength.

(L.B.NGOZE)

For Norah and Annie

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1.1 INTRODUCTION

The term *infant* is typically applied to young children between the ages of 1 month and 12 months. Infant mortality is the number of deaths of infants under one year old per 1000 live births. It reflects the effect of economic and social conditions on the health of mothers and newborns as well as the effectiveness of the health systems. Infant mortality is an important indicator of the health of a community as it is associated with a variety of factors such as maternal health, quality and access to medical care, socio economic conditions, and health practices. Its decline is not only desirable but also indicative of an improvement in general living standard. Infants are defined in demography as exact age group, namely , age 'Zero' , or those children in the first year of life, who have not yet reached age one. Infant Mortality Rate (IMR) in a year can be found out with the following formula:

$$IMR = do/B \times 1000$$

Where,

IMR = Infant Mortality Rate in a year

do = Number of deaths among children of age 01 in a year

B = Number of live births in a year

Forms of infant mortality are perinatal mortality and neonatal mortality. While the former is late fetal death (22 week gestation to birth), or death of a newborn up to one week postpartum (Andrews et.al 2008), the latter refers to newborn death occurring within 28 days postpartum. Neonatal death is often attributed to inadequate access to basic medical care, during pregnancy and after delivery. This accounts for 40-60 % of infant mortality in developing countries (Norton, 2005).

Every year nearly 10 million children die before their fifth birthday. The direct causes are acute respiratory infection, diarrhoea, malaria, measles, malnutrition and perinatal disorders (Lindstrand et.al 2006). Infant mortality has dropped significantly in the west due to recent healthcare and sanitary improvements and high technology medical advances, but continues to remain high in underdeveloped countries. The international conference on Primary Health Care held in Alma Ata in 1978 was the first global forum to consider how child mortality could be reduced by systematic development of the primary health care system. Since then, the United Nation has been actively involved in reducing the IMR in developing countries.

Over the years, India has attained impressive achievements in child survival. A fast decline in IMR in India has been observed in the

past. The IMR has dropped by an average rate of 4.56% per year over last five years. India's high rate of child mortality exists in spite of long standing commitment to child survival through the series of national health programs like the National Health Policy of 1983, Ministry of Health and Family Welfare 2002. The country is a signatory to the Millennium Development Goals (MDGs), and has thereby committed to reduce the Under 5 Mortality Rate (U5MR) to less than 41 per 1,000 live births by 2015 in order to obtain MDG4.

Socio-economic, maternal health and environmental disparities have been associated with the variations across various States and Social groups in India. Among the social groups infant mortality has been observed to be higher among Scheduled Tribe families than the general population. Accelerating reduction in infant mortality calls for new approaches that goes beyond disease-, program-, and sector-specific approaches. We require a comprehensive approach, including increasing the coverage of key child survival interventions. Targeted interventions focussing on poorly performing areas and increased investment in maternal and child health is needed. Strengthening of primary health care in real sense, based on principles of equitable distribution, inter sectoral coordination.

Community participation and appropriate technology will be the cornerstone of interventions.

1.2 CAUSES OF INFANT MORTALITY

The leading causes of infant mortality are birth asphyxia, pneumonia, term birth complications, neonatal infection, diarrhoea, malaria, measles and malnutrition. The most recent data on causes of child deaths in India are from the latest SRS report. Amongst all under 5 deaths, perinatal conditions (33.1%); respiratory infections (22.0%), diarrheal disease (14 %) are the most common causes of deaths. It is notable that unintentional injuries (3.2 %) contribute more deaths than that by nutritional deficiencies (2.8%), congenital anomalies (2.7 %) or malaria (2.7 %). Further analysis suggest that prenatal conditions (46.3 %), followed by respiratory infections (21.8 %) and diarrheal diseases (9.7 %) are the most common causes of deaths of infants (0-11 months).A study of the causes of neonatal death estimated by Chandrakant et.al (2010) stated that the major causes of neonatal deaths in India are Sepsis and pneumonia: 30.4% , birth asphyxia (19.5%) and pre-maturity (16.8%). They further estimated that the children in the country have 68 times higher risk

of dying in neonatal period, than in the rest of the childhood (1-59 months).

1.3 SAIHA DISTRICT PROFILE

Saiha district is one of the eight districts in Mizoram State. It is bounded on the north and northwest by Lunglei district, on the west by Lawngtlai District and on the south and east by Myanmar. The district occupies an area of 1399.9 km square. According to the census of India 2011, the population is 56,574 which is the least populous district of Mizoram. This gives it a ranking of 628th in India (out of a total of 640). The district has a population density of 40 inhabitants per square kilometer. Its population growth rate over the decade 2001-2011 was -7.34%; the only district in Mizoram to have decreased population. Saiha has a sex ratio of 979 females for every 1000 males, and a literacy rate of 90.01%. In 2006, the Ministry of Panchayati Raj named Saiha one of the country's 250 most backward districts (out of a total of 640). The district has 2 RD blocks, Saiha and Tuipang. The majority of the district inhabitants are Mara people, who also have an Autonomous District Council called Mara Autonomous District Council.

In census enumeration, data regarding child under 0-6 age were also collected for all districts including Saiha. There were total 9,653 children under age of 0-6 against 11,191 of 2001 census. Of total 9,653 male and female were 4,997 and 4,656 respectively. In 2011, Children under 6 formed 17.06 percent of Saiha District compared to 18.33 percent of 2001. There was net change of -1.27 percent in this compared to previous census of India.

1.4 WOMEN'S HEALTH: GLOBAL PERSPECTIVE

Every year, some 287,000 women die from complications related to pregnancy and childbirth. 99% of these deaths occur in developing countries. More than half of these occur in sub-Saharan Africa, and one third in South Asia. In wealthier countries, the availability of affordable and effective treatment prevents the conditions that continue to kill pregnant women in developing settings. Due to a lack of information, problems accessing health centres, and unaffordable medical care, every day nearly 1,600 women and 10,000 newborn infants die as a result of preventable complications. The main causes of maternal mortality are hemorrhage, sepsis, obstructed labor etc. Pregnancy outcomes are influenced by a

women's health and differ by factors such as race, ethnicity, age, location, health care access, education, and income.

Past studies have often reported mother's (or women's) education to be the single most important predictor of infant mortality rate. A number of prior studies have assessed the impact of a variety of health and nutrition variables. Other studies point to the impact of breast feeding, fertility, income inequality, sanitation, etc. With few exceptions, aspects of women's status other than women's education have been neglected in studies.

Preconception health focuses on actions women can take before and between pregnancies to increase their chances of having a healthy baby, including thinking about their goals for not having or not having children and how to achieve those goals, addressing health issues with their health care provider before getting pregnant, and adopting a healthy lifestyle.

Women's health care focuses on the physical, psychologic, and social needs of women throughout their lives. Various factors and conditions affect women's health. The pathologies that kills women during their pregnancies, deliveries, or just after giving birth are the same throughout the world. What makes the difference is access to quality health care. The percentage of deliveries assisted by qualified

medical staff is 61% worldwide, but this drops to 34% in developing countries. Without medical care, pregnant women are far more likely to die from obstructed labor. Care during pregnancy and prenatal consultation improves the mother's health during her pregnancy and encourages fetal development. Therefore, the number of stillbirths is reduced.

Perinatal mortality studies point to the link between the health of the mother and the birth outcomes. The high perinatal mortality rates in India reflect the poor status of women, including poor nutritional status (malnutrition and anaemia), low rates of literacy, lack of autonomy and early marriage and childbirth. In addition, low rates of antenatal care, low utilization of obstetric and other health services and large numbers of deliveries by untrained personnel result in poor maternal health and poor birth outcomes, such as low birth weight and prematurity. Furthermore, the effects of maternal characteristics are not limited to the perinatal period. Improving female education and nutrition, and increasing the use of health services during pregnancy and delivery, are all important for reducing childhood mortality rates.

1.5 NATIONAL POLICIES ON CHILD'S HEALTH IN INDIA

This section analyzed the various steps taken by Government of India for improving women and infant health in India. The Ministry of Women and Child Development has come up with several schemes deciding the norms of child nutrition. Some of the major schemes are:

1.5.1 National Guidelines on Infants and Young Child Feeding

The first National Guidelines on Infant and Young Child Feeding (IYCF) were formulated by Ministry of Women and Child Development in 2004, and revised in 2006.

These guidelines emphasize the importance of breastfeeding. Breastfeeding must commence immediately after birth and continue exclusively for six months before other forms of milk are introduced. Appropriate and adequate complementary feeding must commence thereafter and breastfeeding can continue for up to two years.

Its main objective is to ensure and accelerate the promotion, protection and support of good IYFC practice. Undernutrition is a contributory factor in one third to half of all deaths taking place in children under five years of age. 43 percent children in India under five years are reported to be underweight and 48 percent are stunted

(NFHS-3; 2005-06). Onset of malnutrition occurs in the very early years of growth. Even during first six months of life, when most children are breastfed, 20-30 percent are underweight. Underweight prevalence increases rapidly from birth to age 20-23 months.

One of the key reasons for under nutrition in early life is the faulty and sub-optimal infant and young child feeding practices, which is further compounded by factors such as low birth weight and repeated episodes of illnesses like diarrhea and acute respiratory infections. The first two years of life provide a critical window of opportunity for ensuring appropriate growth and development of children through optimal feeding.

India's National Nutrition Policy and the National Plan of Action on Nutrition clearly articulate the role of health sector in promoting breastfeeding through training of health workers. Similarly, the National Guidelines on Infant and Young Child Feeding 2006 and the Infant Milk Substitutes: Feeding Bottles, and Infant Foods (Regulation of Production, Supply and Distribution) Act 1992, and Amendment Act 2003 also state the role of health care system in ensuring Optimal Infant and Young Child Feeding Practices. While the adoption of good IYCF practices on the ground remained

suboptimal, NRHM provides an immense opportunity to strengthen and scale up the optimal IYCF practices.

The National Rural Health Mission provides a valuable opportunity to bring greater attention and commitment to promote IYCF interventions at the health facility, the community outreach and household levels.

1.5.2 National Nutrition Policy

This policy was adopted by the Government of India in 1993 under the aegis of the Department of Women and Child Development. It advocated a multi-sectoral strategy for eradicating malnutrition and achieving optimum nutrition for all. The policy advocates the monitoring the nutrition levels across the country and sensitizing government machinery on the need for good nutrition and prevention of malnutrition. The National Nutrition Policy also includes the Food and Nutrition Board, which develops posters, audio jingles and video spots for disseminating correct facts about breastfeeding correct facts about breastfeeding and complementary feeding.

1.5.3 Reproductive and Child Health (RCH) Programme

Reproductive and Child Health (RCH) programme is a comprehensive sector wide flagship programme, under the umbrella of the Government of India's (GoI) National Health Mission (NHM), to deliver the RCH targets for reduction of maternal and infant mortality and total fertility rates. RCH programme aims to reduce social and geographical disparities in access to and utilisation of quality reproductive, maternal, newborn, child and adolescent health services. Launched in April 2005 in partnership with the State governments, RCH is consistent with Government of India's National Population Policy-2000, the National Health Policy-2001 and the Millennium Development Goals. Six key components of the RCH programme are Maternal Health, Child Health, Nutrition, Family Planning, Adolescent Health (AH) and PCPNDT. Maternal health is central to the development of any country in terms of increasing equity & reducing poverty and building social capital. India has made remarkable progress in reducing maternal deaths in the last two decades. Millennium Development Goal (MDG) 5 is to reduce Maternal Mortality Ratio (MMR) by three quarters between 1990 & 2015. Based on the UN Inter–Agency Expert Group's MMR estimates in the publication "Trends in Maternal Mortality: 1990 to

2013", the MDG target for MMR in India is estimated to be 140 per 1,00,000 live births by the year 2015 taking a baseline of 560 per 100,000 live births in 1990. As per the latest report of the Registrar General of India, Sample Registration System (RGI-SRS), Maternal Mortality Ratio (MMR) in India has declined from 212 per 100,000 live births in the period of 2007-09 to 178 per 100,000 live births in the period 2010-12. If the current pace of decline in MMR is maintained India will achieve an MMR of 141 per 100,000 live births which is very close to the India's MDG5 estimated target of 140 per 100,000 live births. Building on the phenomenal progress of the JSY scheme, Janani Shishu Suraksha Karyakram (JSSK, launched in 2011 provides service guarantee in the form of entitlements to pregnant women, sick newborns and infants for free delivery including caesarean section and free treatment in public health institutions. This includes free to and fro transport between home and institution, diet, diagnostics, drugs, other consumables and blood transfusion if required.

The child health programme under the National Health Mission (NHM) comprehensively integrates interventions that improve child survival and addresses factors contributing to infant and underfive mortality. Since neonatal deaths are the biggest contributor to child

deaths which is approximately 57% of the under five deaths, improving child survival hinges on improving newborn health. It is now well recognised that child survival cannot be addressed in isolation as it is intricately linked to the health of the mother, which is further determined by her health and development as an adolescent.

1.5.4 The Integrated Child Development Services Scheme (ICDS):

This Scheme is one of the most comprehensive schemes on child development in the country and perhaps in the world. The Ministry of Women and Child Development has been running the scheme since 1975 in pursuance of the National Policy for Children. It aims at providing services to pre-school children in an integrated manner so as to ensure proper growth and development of children in rural, tribal and slum areas. This centrally sponsored scheme also monitors nutrition of children. The beneficiaries of the scheme are children in the age group of 0-6 years, pregnant women and lactating mothers. ICDS is the largest outreach programme operational through Anganwadi Centres (AWC) which serves as first outpost for health, nutrition and early learning services at the village level.

The objectives of the scheme are:

- To improve the nutritional and health status of children in the age-group 0-6 years;
- To lay the foundation for proper psychological, physical and social development of the child.
- To reduce the incidence of mortality, mobidity, malnutrition and school dropout;
- To achieve effective co-ordination of policy and implementation amongst the various departments to promote child development; and
- To enhance the capability of the mother to look after the normal health and nutritional needs of the child through proper nutrition and health education.

This scheme has expanded rapidly in its scope and coverage, and today it covers approximately 7.6 million pregnant women and lactating mothers and around 36 million children less than 6 years of age.

Though immunization activities under ICDS have appreciable and its coverage has increased many folds since inception, there are

issues- Lack of basic amenities and infrastructure and low pay to AWW- many Anganwadi centers do not have proper infrastructure including clean water and proper space. Continuance of low stagnated wages to AWW does not help. Lack of awareness and education- it has been a major stumbling block especially in rural areas. It has led to less than expected coverage. Severe budget cuts for ICDS has also left the scheme in tatters and lack of state's institutional support and outsourcing to private players which leads to issues in ineffective implementation. Thus, since the scheme focus on holistic development of the children and women (specially pregnant and lactating), constituting nearly 70% of the vulnerable group in the society, we need to streamline legislative, administrative and civil societal efforts along with strengthening Panchayati Raj Institutions (PRIs) so that the scheme attains its objectives.

ICDS has been operational in Mizoram since 1978-79. At present, there are 27 ICDS projects having 2244 Anganwadi Centres. Considerable progress has been achieved in the field of women and child development through ICDS programme which has been implemented in Mizoram. More importantly, a general awareness of the need to give a good foundation to children up to the age of 6

years, and care for pregnant and lactating mothers has been generated. There are 26 ICDS Projects covering all the 27 RD blocks. Out of the 27, one project is located at urban slum areas of Aizawl, the State Capital. Initially, the scheme covered 15% of the total population and the eligible beneficiaries covered at the initial stage were only 20%. With the opening of more ICDS Projects, the scheme covered about 95 % of eligible beneficiaries.

A major challenge was in implementation gaps that arises out of inadequate resource investment, inadequate funding, lack of convergence, lack of accountability of those managing and implementing the programme, especially, at the level of Anganwadi centres and supervisory level, lack of community ownership and the general perception about ICDS being a 'Feeding' program and not as an early childhood development program.

1.5.5 Janani Shishu Suraksha Karyakram (JSSK)

In view of the difficulty being faced by pregnant women and parents of the sick new- born along-with high expenditure on delivery and treatment of sick newborn, Ministry of health and Family Welfare has taken a major initiatives to ensure better facilities for women and

child health services. It is an initiative to provide completely free and cashless services to pregnant women including normal deliveries and caesarean operations and sick new born (up to 30 days after birth) in Government health institutions in both rural and urban areas.

It was launched on 1st June 2011 and has provision for both pregnant women and sick new born till 30 days after birth are Free and zero expense treatment, free drugs and consumables, free diagnostic and diet, free provision of blood, free transport from home to health institutions, free transport between facilities in case of referral, drop back from institutions to home, exemption from all kinds of user charges. The initiative would further promote institutional delivery, eliminate out of pocket expenses which act as a barrier to seeking institutional care for mothers and sick newborns and facilitate prompt referral through free transport.

The concept of healthy mother and healthy baby is an important aspect of reproductive health care programme. In a developing country like India, poverty, illiteracy and multiple pregnancies take their toll of mother's health and that of the breast-fed infant. High prevalence of anemia and malnutrition among the reproductive age group women, particularly during pregnancy and lactation can have

irrevocable effects on the infant's health. This necessitates development of field centers to monitor the nutrition status and anemia in the population at large and to introduce user-friendly supplementation programmes to alleviate the nutrition related disorders. Also in a country like ours, infections and ill health necessitate long term drug therapy of the mother even during lactation and it is well established that most of the drugs present in the maternal circulation get transferred to breast milk.

1.6 INFANT MORTALITY RATE REPORTS FROM VARIOUS INSTITUTIONS

In this section, reports from various institutions such as UNICEF, WHO, CDC are highlighted. All these institutions, though with their various approaches in determining the nature of infant mortality worldwide and in India, agreed the need to decrease IMR and steps needed to be taken so as to reduce it.

1.6.1 United Nations Children's Fund (UNICEF) Report:

According to the report released by United Nations Children's Fund (UNICEF) the global Infant Mortality Rate (IMR) decreased from

61deaths in 1990 to 37 deaths in 2011. Annual infant deaths declined from 8.4 million in 1990 to 5 million in 2011.

According to the report, India's IMR showed a minor decline in 2012 compared to 2011. It decreased from 44 deaths for every 1000 live births in 2011 to 42 deaths for every 1000 live in 2012.According to the report, India has realized impressive gains in child survival over the last two decades. However, at the current pace, the country is unlikely to achieve the Millennium Development Goal (MDG) 4- which aims to reduce Under-Five Mortality (U5MR) by two thirds between 1990 and 2015- unless the related socio-economic; maternal and demographic; and environmental determinants are urgently addressed. This is one of the conclusions of the Infant and Child Mortality India Report released by UNICEF and the National Institute of Medical Sciences (NIMS), Indian Council of Medical Research.

Globally the U5MR reduced by 49 per cent from 90 per 1000 live births in 1990 to 46 per 1000 live births in 2013, while India achieved a reduction of 59 per cent in the Under-5 mortality from 126 in 1990 to 52 in 2012, which is higher than the global decline.

Neonatal deaths accounts for 56 percent of the Under-5 deaths in India which is much higher than the global average of 44 percent. In

fact, four states- Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan- account for half of the infant deaths in India.

The report states that more than 2000 newborn die each day in India. The common causes of neonatal deaths are prematurity, birth asphyxia and sepsis. In the post newborn period, twp major killers are pneumonia and diarrhea and under-nutrition is an underlying factor in nearly 45 percent of such deaths. The infant mortality rate of male in India is 39 per 1000 live births while that of female is 42 per 1000 live births. At present UNICEF is supporting national efforts for improving access to the care for girl child through the Janani Shishu Suraksha Karyakaram (JSSK) scheme which has made free health care- an entitlement for pregnant women and infant.

The UNICEF has also played a key role in evidence generation through a key role in evidence generation through Special Newborn Care Unit (SNCU) which showed that despite free care there are more male admissions in SNCUs as compared to females. The SNCUs are effective to address problems of low-birth, pre-term deliveries simulating the environment of the womb.

In addition, improving immunization coverage to address mortality due to vaccine preventable diseases is suggested in the report. As

under-nutrition is an underlying factor in 45 percent of Under-5 deaths addressing adolescent and maternal nutrition will also be critical.

1.6.2 World Health Organization (WHO) Report on Infant Mortality

According to World Health Organization (WHO), in 2015, 4.5 million (75% of all under-5 deaths) occurred within the first year of life. The risk of a child dying before completing the first year of age was highest in the WHO African Region (55 per 1000 live births), over five times higher than in the WHO European Region (10 per 1000 live births).

Globally, the infant mortality rate has decreased from an estimated rate of 63 deaths per 1000 live births in 1990 to 32 deaths per 1000 live births in 2015. Annual infant deaths have declined from 8.9 million in 1990 to 4.5 million in 2015. WHO reports that in urban areas developing countries, infant mortality rate remains particularly high at 61 deaths per 1000 live births in Africa (including 31 countries). In all four regions shown, children in the poorest 20%

urban households are 1.7-2.2 times are likely to die before their first birthday than children in the richest 20% urban households.

In urban areas of Africa, Americas and Asia, infant mortality rate has fallen by 20%, 39% and 25% respectively, between 1990-1999 and 2000-2011 for included countries. Death rates for infants in the poorest 20% urban households have fallen by 24 %, 35 % and 34 % in Africa, Americas and Asia, respectively. Although significant reductions have been made, especially for children from the poorest households, infant mortality rate is still disproportionately higher among the urban poorest populations.

The vast majority of newborn deaths take place in developing countries where access to health care is low. Most of these newborns die at home, without skilled care that could greatly increase their chances for survival. Skilled care during pregnancy, childbirth and in the postnatal period prevents complications for mother and newborn, and allows for early detection and management of problems. In addition WHO and UNICEF now recommend home visits by a skilled health worker during a baby's first week of life to improve newborn survival. Newborns in special circumstances, such as low-birth-weight babies, babies born to HIV-positive mothers, or sick babies, require additional care and should refer to a hospital.

1.6.3 Center for Disease Control and Prevention (CDC)

CDC is committed to improving birth outcomes. One of the goals of CDC is the dissemination of strategies used by high-functioning Perinatal Quality Collaborative (PQC).

The Center for Global Health and Prevention (CDC) collaborates with the Government of India, Indian institutions, and international organizations to address a wide range of infectious and non-communicable diseases. Together we work to strengthen India's health system to reach national and international goals. CDC opened the first India office in 2001 to support the Life Initiative for HIV/AIDS prevention and control. Today CDC maintains offices in New Delhi and Hyderabad with staff supporting initiatives of the Division of Global Health Protection, the Global Immunization Division, the Division of Global HIV and Tuberculosis, and the Influenza Program.

Since 1993, CDC has assigned experts to WHO regional and country offices in India to support surveillance of vaccine-preventable diseases. CDC's technical support and leadership has been instrumental in developing and implementing polio eradication strategies, maternal and neonatal tetanus elimination strategies, strengthening the national immunization program, and supporting

accelerated control of measles and rubella. In 2014 India was certified polio-free.

In support of India's Ministry of Health and Family Welfare's National AIDS Control Organization, CDC has focused its efforts on preventing new infections, increasing access to services for persons living with HIV and tuberculosis (TB), and establishing a single monitoring and evaluation system. CDC provides technical assistance on a broad range of issues, including prevention of parent to child transmission of HIV, addressing HIV prevention and treatment needs of people who inject drugs, care and treatment of key affected populations, addressing co-morbidities of TB and HIV, strengthening laboratory systems, and district-level capacity to address HIV and TB, and strategic information.

CDC has provided technical assistance for TB control efforts since 1997. Nationwide overage of Directly Observed Therapy (a leading TB control strategy) was achieved in 2006. Since 2007, CDC has provided guidance on expanding TB/HIV and TB infection control, provided technical assistance to multidrug resistant TB activities, and supported TB program strengthening, operational research and surveillance.

In 2012, the GDD India Center, located at India's National Centre for Disease Control, established the India Epidemic Intelligence Service program (EIS) – a post graduate field training program modeled after the US EIS. CDC supports the Indian EIS Programme by providing technical assistance and a resident advisor. The majority of EIS officer graduates return to positions in district, state and national level programs where they lead surveillance and outbreak response efforts.

CDC has supported capacity-building for surveillance since 2004, leading to improved characterization of circulating influenza viruses and rapid detection of novel viruses. CDC-supported laboratory training and preparedness workshops have strengthened India's response measures against seasonal, avian, and pandemic influenza. The improved capacity has led to a better understanding of influenza epidemiology in India. CDC also collaborates with Indian partner organizations to research the influenza burden in India, evaluate the effectiveness of influenza vaccines, and identify optimal timing for influenza vaccination, all of which help inform national influenza vaccination policy. CDC Influenza Division also has an assigned influenza staff at the WHO regional office.

CDC provides expertise and consultation on a number of critical non-communicable disease issues in India, including chemical and radiological contaminants, preparedness for environmental emergencies, and household air pollution. CDC also provides expertise and support to help India consistently implement the four surveys of the Global Tobacco Surveillance System, managed by CDC and WHO.

1.7 OBJECTIVES OF THE STUDY

1. To study infant mortality trend and the provision of child health care.
2. To examine set of indicators causing infant mortality in the study area.
3. To suggest measures for the reduction of infant mortality within the study area.

1.8 RESEARCH QUESTIONS

1. Is there correlation between maternal education and infant mortality?
2. Does the pre and post natal care reduce infant mortality?
3. Is lack of availability of medical care a contributing factor to infant mortality?

1.9 METHODOLOGY

Primary Data

A Case study on Saiha town was conducted which was collected through structured questionnaire. The study covered a period of 5 years i.e, 2011-2016 and a total number of 57 samples were drawn from Saiha town. A set of indicators such as contraceptive, birth interval, vaccination, Iron Folic Acid (IFA) in take, nutrition, chronic illness and consumption of tobacco were used to study their impact on infant mortality and mothers' health. In this study, the household and individual level factors associated with infant mortality in Saiha District was examined.

Secondary Data

Secondary data analysis was done covering the whole district of Saiha based on Saiha hospital records and National Rural Health Mission (NRHM) records. Other relevant information was collected from published and unpublished sources like books, magazines, journals, e-resources etc. The data collected was analyzed using relevant and appropriate statistical tools.

There is lack of empirical evidence on infant mortality in Saiha District. The available data of this district is mainly secondary in nature. Therefore, this study is an attempt to fill in the gap in order to have a clear picture of infant mortality in Saiha District.

This chapter is an attempt to draw relevant literatures in support of the present study.

Caldwell (1979)[1] in his study claimed that the mother is of prime importance in child survivorship and it is her knowledge, autonomy in the household, decision making and ability to interact with outside agencies, that define the level of household child mortality even if the outer limits are set by the economic resources of the household and the medical facilities in its area. The interactions between household influences and child survival can be viewed from two perspectives. The first one being that of developing and the other is that of developed countries. Developed countries have so far passed through many stages in combating and eventual reduction of infant mortality, and therefore act as a yardstick for developing countries.

Jayachandran (1980)[2] reported that the various socio-economic and demographic variables favored Punjab in having a lower level of infant mortality rate; it was much higher compared to Haryana. The high infant mortality rate in Punjab might be due to the fact that they

[1] Caldwell, J.C (1979), 'Education as a Factor in Mortality Decline: An Examination Nigerian Data,' *Population Studies,* 33 (3), 395-413.
[2]Jayachandran, J(1980),' Infant Mortality Differentials in Punjab and Haryana' Bombay, Himalaya Publishing House.

did not fully appreciated the beneficial effects of large amount of money being spent on medical aid facilities.

Jain et.al, (1988)[3] in their study attempted to account for the pace of decline in the infant mortality rate over the period 1968-78 and provided a framework for analysing factors that contributed to it These included proximate factors (such as non medical factors and medical care during the antenatal period, care at birth, and preventive and curative care in the postnatal period); maternal factors (age, parity, and birth intervals); and household- and community –level factors (water, sanitation, and housing). Then, as now, opinions differed as to the relative importance of socioeconomic development and health services in reducing infant mortality rate. The study concluded that a substantial decline in infant mortality rate is possible without significant improvement in economic development, even though the relative importance of various determinants could not be assessed. It made a case for increased access to a minimum package of essential services that would significantly reduce high infant mortality rates: reproductive health services; perinatal care; improved breastfeeding practices;

[3] Jain, A & Visaria, L(1988),'*Infant Mortality in India: Differentials and Determinant',* Sage Publications, pp.127-167.

immunization; home-based treatment of diarrhoea; and timely introduction of supplementary foods.

Hobcraft (1993)[4] found in his study the survival chances of children born to educated mothers are argued to be greater due to several demographic reasons. Educated mothers tend to marry and have children later and have fewer children; therefore the excess risk of infant mortality for teenage mothers is reduced. Also, educated mothers experience lower maternal mortality and per birth maternal mortality because of greater usage of health services, avoiding risky pregnancies and of experiencing fewer pregnancies and children without mothers are less likely to survive.

The result of this study conducted by Hobcraft imply that net effect of maternal education after controlling other socioeconomic variables are very similar to its gross effect. Despite this, the impact of maternal education on infant health is found to be weak in the sub- Saharan African countries by several studies Hobcraft has discussed. In an attempt to explain this result he has several suggestions. First, the greater independence of women in sub-Saharan Africa than in many Asian and Muslim societies may lead

[4] Hobcraft, J(1993),'Women's Education, Child Welfare and Child Survival: A Review of Evidence', *Health Transition Review , Volume* 3 No (2): 159-175.

to weak relation. Second, interaction of traditional practices with maternal education may result in higher infant survival rates of mothers with no education than mothers with a few years of education. Third, weak health infrastructure in sub-Saharan Africa may prevent more educated mothers to take advantage of their knowledge ; there may be a threshold of social development to benefit from education level. Finally, the shortcoming of data may lead to this weak relationship between maternal education and infant mortality.

Education of mother is claimed to influence the survival chances of children also beyond the first year of life. Longer breastfeeding durations implemented by educated mother may lead to this long lasting effect (Hobcraft et.al 1984).

Desai and Alva (1998)[5] investigated the effect of maternal education on three indicators of child health-infant mortality, children's height for age and number of vaccinations received using Demographic and Health Survey data for 22 developing countries. The authors argued that maternal education may be a proxy for the socio economic

[5] Desai, Sonalde and Soumya Alva (1998).' Maternal Education and Child Health: Is There a Strong Causal Relationship?' *Demography* 35(1)71-81.

status of the household as well as for characteristics for the community of residence. Thus more educated women are more likely to have come from higher socio-economic strata and are likely to reside in areas with better health systems as well as water and sanitation systems.

Manda (1999)[6] used data from the 1992 DHS in Malawi to study the relationship between infant and child mortality and birth interval, maternal age at birth and, birth order, with and without controlling for other relevant explanatory variables. He also investigated the direct and indirect (through its relationship with birth intervals) effects of breastfeeding on childhood mortality. The study employed proportional hazards models. The results show that birth interval and maternal age effects are largely limited to the period of infancy.

As the child increases in age, the influence of social and economic variables on the mortality risk is enhanced, and the relationship between bio-demographic variables and mortality risk is strengthened. The study further shows that breastfeeding status does not significantly alter the effects of preceding birth interval length on

[6] Manda S.O.M (1999),'Birth Intervals, Breastfeeding and Determinants of Childhood Mortality in Malawi', *Social Science and Medicine*, 48(3): 301-312.

mortality risk, but does partially diminish the succeeding birth interval effect.

Nair et al. (2000)[7] documented the positive influence of maternal health care programmes on infant survival in India. The data for analysis was taken from NFHS 1992-93 reports of India and major states. All maternal care indicators were highly correlated with differential mortality measures. The findings of the study revealed the importance of education and health care practices with respect to maternal care services and infant and child survival. Child health programmes and family planning together accelerated the reduction of both mortality and fertility.

Rajaram (2000)[8] analyzed the fertility and child mortality in India based on secondary data available at the district level. Most of the variables viz. female literacy, female age at marriage, family planning, availability of health services, urbanization, economic structure showed their effects in the expected direction. Urbanization

[7] Nair, N.S.,R.S Rao, S. Chandrasekhar, D. Archarya, and H.V. Bhatt (2000),' Socio Demographic and Maternal Determinants of Low Births Weights: A Multivariate Approach,' *Indian Journal of Pediatrics*, 67:9-14.

[8] Rajaram, S. (2000),' Fertility and Child mortality in India: A District Level Analysis Using simultaneous Equation,'Demography India, 29(1):53-74.

was a powerful variable that influence both mortality and fertility. It has significantly negative influence on both fertility and under five mortality. Under five mortality was significantly lower in areas with a high urbanization, later marriages, and higher use of sterilization methods. The social stratification measure, the percentage of scheduled castes and tribes has a strong positive relationship to under five mortality. However, the adult female literacy has a significantly negative effect on fertility, but it was not a powerful variable in explaining the under five mortality.

Gangadharan et al. (2000)[9] used probit analysis to model child mortality in Pakistan and found that girls have a significant lower probability of dying in age group 0-1 but have a significant higher probability of dying in the age group 1-5. Thus the higher mortality of girls in the age age group 1-5 reflects discrimination against girls in the form of lower health and other resource inputs. Additionally, they found mother's education beyond a certain threshold and increased duration between births to significantly reduce child mortality.

[9] Gangadharan, P and Maitra, P (2000),' Does Child Mortality Reflect Gender Bias? Evidence from Pakistan,' *Indian Economic Review* Vol.35, No.2, pp. 113-131.

Gandotra and Das (2001)[10] evaluated the determinants and infant mortality in Gujarat and Maharashtra. They documented that infant mortality was found to be high when, the age at effective marriage of mother was below 18 years, interval between last two live births was below 18 months, and when the mother was illiterate. Mother's young age had negative impact on infant mortality.

Hill (2001)[11] has reported an inverse relationship between mother's educational level and economic status (wealth index) and child mortality. While for the relationship between rural/urban residence and child mortality, urban areas showed higher mortality risks than rural but when adjusted for HIV prevalence, child mortality was lower in urban areas.

Kovsted et al. (2002)[12] investigated the impact of health knowledge on child health and mortality in Bissau, the capital of Guinea Bissau using modeling. Using the mother's knowledge of malaria as a proxy for health knowledge and controlling for covariates, they concluded that the importance of maternal education in child health outcomes diminishes or disappears when health knowledge is introduced into

[10] Gandotra MM and Das NP (2001) ,'Determinants and Causes of Infant Mortality in Gujarat and Maharashtra.' *Demography India* 30(2):313-328.
[11] Hill, K (2001), ' Childhood Mortality in Kenya: An Examination of Determinants in the Late 1980s to Mid 1990s'.
[12] Kovsted, Jens Anders; Portner, Claus Christian; Tarp, Finn (2002),' Child Health and Mortality in Guinea-Bissau: Does Health knowledge Matter?' *Journal of African Economies* Vol.11, issue 4, pp. 542-560.

the model. However, it was established that health knowledge has significant effect on both child mortality and health when instrumented for to capture endogeneity.

Bour (2003)[13] studied the effect of maternal education on childhood mortality in Ghana using the Ghana Demographic and Health Survey date (1998) and the World Bank data of 2000. Using graphic and linear regression models, the study confirmed that there is an inverse relationship between mother's education and child survivorship. While the study provides insight into the relationship between maternal education and child survivorship, it failed to account for the role of the public sector via public health investment. In addition, the hypothesized linear relationship employed in the study is oversimplified.

El-Ghannam (2005)[14] investigated that the relationship between fertility rate differentials and child mortality, female life expectancy, age at the first marriage for women, Mean years of women education, and participation of women in labor force among low developed countries and more developed countries. The results suggested that increased total fertility rate in LDC's were more

[13] Daniel Bour (2003) ,'Mother's Education and Childhood Mortality in Ghana'. Health Policy Vol. 64(3):297-309.

[14] El-Ghannam (2005), ' An Examination of Factors Affecting Fertility Rate Differentials as compared Among Women in Less and More Developed Countries'. *Journal of Human Ecology*, vol 18 (3) pp: 181-192

occurred among women who had more children die and who had participated more in labor force.

Moreover, the result implied that total fertility rate decreased among women's in MDC's that had more number of years of female life expectancy and more participation in labor force. He also found that child mortality was quite high in those countries that fallen into the poor and extremely poor health and education. Therefore, the total fertility rate could be more some LDC's than MDC's.

Other contributing factors included; such as adequate age at first marriage, raising educational attainment, and improvement health care of women that reduced child mortality rate. These factors supported in lowering total fertility rate of women in LDC's

Wang (2003)[15] in his study conducted for both national level and separately for rural and urban level determinants of infant and child mortality finds that besides income per capita access to electricity, vaccination in the first year of infants' lives, public per capita health expenditure and access to piped water and sanitation are significant at national level at decreasing child mortality. These results alter some when considered separately for rural and urban areas. Access

[15] Wang, L.M (2003),'Determinants of Child Mortality in LDCs- Empirical Findings from Demographic and Health surveys', *Health Policy,* 65(3):277-299.

to electricity becomes the most significant determinant in urban areas whereas in rural areas vaccination is the only significant factor.

James and Subramanian (2004)[16] developed a framework, to understand the determinants of neonatal mortality. They suggested two sets of factors: one relating to mother (like demographic, nutritional, genetic etc.) and the second relating to health seeking behavior and availability of quality health services. The study observed that many maternal factors do not play a crucial role in determining neonatal mortality except the birth interval variables. This points to the fact that mere enhancement of nutrition or socioeconomic factors may not help in controlling neonatal deaths in the country. The delivery, under medical supervision showed a positive significant relationship with neonatal mortality. It indicates the need to provide standard hospital care to save life of neonates.

Kravdal (2004)[17] investigated the effects of the educational attainment of mothers and other women in the community on child mortality in India using the National Family Health Survey of 1998-1999. Child mortality was specified as a discrete-time hazard model

[16] James, K.S and Subramaniam, S.V(2004),'Neonatal Mortality in India: Role of Maternal Factors,' Demography India Vol.33,No.2,p 157-171.
[17] Kravdal, O (2004),'Child Mortality in India: The Community- Level Effect of Education,' *Population Studies* 58(2):177-192.

and some of the explanatory variables considered were education of the mother, average education of women (capturing education of other women in the community) and women's autonomy variables (economic, physical, decision-making and emotional) which were incorporated as potentially mediating or confounding factors.

Jacoby and Wang (2004)[18] examined the linkages between child mortality and morbidity in rural China using a competing risks approach. The key findings are that access to safe water/sanitation and maternal education reduce child mortality risks while use of unclean cooking fuels (wood and coal) significantly reduces the neonatal survival probability in rural areas.

Blunch (2005)[19] examined the impact of maternal literacy and numeracy skills, formal education and adult literacy course participation on child health inputs (vaccinations and postnatal care) and child mortality in Ghana. He adopted an instrumental Variable (IV)- based two-stage least squares (2SLS) estimation technique to account for the potential endogeneity of maternal skills , schooling and adult literacy course participation. His preliminary results

[18] Hanan Jacoby and Limin Wang (2004),' Environmental Determinants of Child Mortality in Rural China: A competing Risks Approach'. *Policy Research Working Paper* ; No 3241.
[19] Niels-Hugo Blunch (2005),'Staying Alive: Adult Literacy Programs and Child Mortality in Rural Ghana' *World Development* Vol.42:114-126.

revealed that formal schooling, adult literacy course participation and literacy and numeracy skills have a positive impact on child health input demand and hence reduce child mortality. The author recommended improvement in child health knowledge through the inclusion of health topics in the curricula of adult literacy programmes.

El-Ghannam (2005)[20] investigated that the relationship between fertility rate differentials and child mortality, female life expectancy, age at the first marriage for women, Mean years of women education, and participation of women in labor force among low developed countries and more developed countries. The results suggested that increased total fertility rate in LDC's were more occurred among women who had more children die and who had participated more in labor force. Moreover, the result implied that total fertility rate decreased among women's in MDC's that had more number of years of female life expectancy and more participation in labor force. He also found that child mortality was quite high in those countries that fallen into the poor and extremely poor health and education. Therefore, the total fertility rate could be

[20] Ashraf Ragab Ell-Ghannam (2005),'An Examination of Factors Affecting Fertility Rate Differentials as Compared Among Women in Less and More Developed Countries' *Journal of Human ecology* 18:(3) 181-192.

more some LDC's than MDC's. Other contributing factors included; such as adequate age at first marriage, raising educational attainment, and improvement health care of women that reduced child mortality rate. These factors supported in lowering total fertility rate of women in LDC's.

Lawn et.al (2005)[21] believes that poverty is the primary cause of many neonatal deaths either through the higher incidence of risk factors like maternal infection or through the decreased access to effective care. Other studies also mention that poor children are more disposed to poor health and are likely to seek care from a health worker when sick.

Prakasam and Prasad (2005)[22] described that household environmental factors were more influencing on mother and child health. Better cooking facilities, availability of water at house, better sanitation facilities might lead to better living condition and in turn might lead to better health by examining the household socioeconomic and environmental, sanitary and child survival

[21] Lawn, Joy and Cousens, Simon(2005),'4 Million Neonatal Deaths: When? Where? Why?' *The Lancet* Vol .365(9462): 981-900.

[22] Prakasam, C.P, Prasad Banarji,M(2005),'Influence of Environmental Factors on Child Survival' Indian Institute for Population Studies Vol.2,No.3.

variables in tribal household in Chattisgarh. Household environmental factors, sanitation facilities, women literacy, husband's literacy, SLI had been considered to know the influence on child survival by different caste in Chhattisgarh. It had been observed that having better environmental factor, households who were having medium and above index value, better work status of women and husband literacy had influence on child survival status among the population.

Sang-Hyop (2005)[23] estimated a household demand for immunization and the effect of immunization coverage on the probability of child survival in rural India. The author argued that mothers with high risk of child mortality may engage in compensatory behavior in the demand for health inputs and that those who are favourable to prenatal care might engage in complementary behavior in the demand for postnatal care (i.e. more likely to obtain postnatal care). To address the problem of self-selection in the demand for health inputs, child mortality model was estimated jointly with the demand for immunization, demand for

[23] Sang-Hyop Lee (2005),' Demand for Immunization Parental Selection, and Child Survival: Evidence from Rural India' Review of Economics of the Household Vol 3,Issue 2,p-171-196.

delivery care, and demand for prenatal care. Child mortality was specified as a proportional hazard model; while the demand for immunization was modeled as an ordered probit. Both the demand for prenatal care and delivery were specified as random effects probit models.

Markowitz (2008)[24] claimed in his study that the link between Sudden Infant Death Syndrome (SIDS) and smoking is robust. Postnatal smoking by mother and other household members besides prenatal smoking is tied to SIDS. Therefore any effort to decrease cigarette consumption is expected to decrease infant mortality. In the article it is found that strict regulations on smoking decreases SIDS. The most significant policy effecting infant mortality is taxation of cigarettes. Also, restrictions of smoking in public areas lead a prominent decline in infant mortality.

Uddin and Hossain (2008)[25] investigated the predictors of neonatal and post-natal mortality in Bangladesh by utilizing the data of Bangladesh Demographic and Health Survey (BDHS) 1999-2000.

[24] Markowitz, S (2008), 'The Effectiveness of Cigarette Regulations in Reducing Cases of Sudden Infant Death Syndrome', *Journal of Health Economics,* 27(1):106-133.
[25] Uddin, Md. Jamal, Hossain, Md. Zakir(2008),'Child Mortality in a Developing country: A statistical Analysis' Journal of Applied Quantitative Methods Vol. 4, No. 3, p 270-283.

The study revealed that infant mortality was varied significantly by several variables. Among all the variables, parental education had significant negative effect on infant mortality, while parental occupation had significant influence on Post-neonatal mortality. The infant mortality was found higher in smaller families and it decreased significantly with increase of mother's standard of living index. Multiple regression analysis carried out by using the significant variables i.e. mother's education, family size, breastfeeding status, mother's age at birth and TT during pregnancy influenced the mortality.

Bhalotra et.al(2008)[26] in their article mention a problem named death trap. Death trap occurs when the death of a child shortens the interval to the next birth and shorter previous birth interval increases the mortality risk of the next child. They find the evidence of death trap in the raw data of India. They also claimed that the interventions to reduce child mortality or lengthen birth interval would have multiplier effects on infant mortality, since these would also affect birth spacing and fertility and indirectly infant mortality again.

[26] Bhalotra S, Van Soest A (2008),' Birth Spacing, Fertility and Neonatal Mortality in India: Dynamics, Frailty and Fecundity,' *Journal of Economics*'143:274-90.

Hossain and Islam (2009)[27] studied the effects of demographic and household variables on infant and child and under-five mortality of Charghat Thana in Rajshahi District of Bangladesh. Logistic regression model was employed to determine which factors effect on infant, child and under-five mortality. It was indicated in the study that age at marriage, mother's age , household conditions and breast feeding practices were significantly associated with infant , child and under five mortality. This study also suggested that higher birth order should be decreased because children with higher birth order had higher probability of death because of the effect of repeated pregnancies in depleting woman's resources and straining her reproductive system and also mothers would be encouraged to breastfeed their children during infant and childhood period.

Tsui et al. (2009)[28] documented that usage of family planning methods can prevent motherchild transmission of human immunodeficiency virus, contribute to birth spacing, lower infant mortality risk, and reduced the number of abortions, especially unsafe ones. It was also shown to significantly lower maternal

[27] Nazrul Islam Mondal , Hossain Kamal, Ali Korban (2009),' Factors Influencing Infant and Child Mortality: A Case Study of Rajshahi District, Bangladesh' Journal of Human Ecology 26(1):31-39.

[28] Tsui, A.O. and Creanga, A (2009),' Does Contraceptive Use Reduce Neonatal and Infant Mortality? Findings From A Multi-Country analysis'. *Population Association of America*

mortality and maternal morbidity associated with unintended pregnancy and family planning practices can help in reducing the mortality rates.

Matthew et.al (2010)[29] in their study found that infant mortality rates (IMR) are highest for very preterm (less than 32 weeks) infants, and the risk decreases sharply with increasing gestational age. In 2006, the IMR for very preterm infants (175.94) was 74 times the rate of 2.39 for term infants. The mortality rate for infants born at 32–33 weeks of gestation was 16.19, nearly seven times the rate for term infants. Although mortality falls with increasing gestational age, even infants born only a few weeks early have a substantially increased risk of death when compared with term infants. In 2006, the IMR for late preterm infants (34–36 weeks of gestation) was 7.08, 2.9 times the rate for term infants. Even within the term period, infants born at 37–39 weeks of gestation had mortality rates that were 28 percent than those for infants born at 40–41 weeks of gestation.

[29] Mathews, T.J, MacDorman, M.F (2010),' Infant Mortality Statistics from the 2006 period linked Birth/ Infant Death Data Set,' *National Vital Statistics Report*, Volume 62, Number 8 ,30;58(17):1-31.

The PMMRC report (2010)[30] reviewed perinatal , neonatal and maternal deaths in New Zealand . Midwifery is well integrated into the health systems in New Zealand , and many practices incorporate homebirth as an option for women. The report found that there were 21 stillborn babies or babies who died in the first month of life that were born at home. Only one of these was an intended birth at home, whereas ten were less than 24 weeks gestation, and five were neonatal deaths after birth at term. The report found that the intrapartum stillbirth and neonatal death rate was high in Maori and Pacific women when compared with New Zealand European and Asian (not including Indian) women, which was recommended for investigation. None of the maternal deaths were to homebirth.

[30] The Perinatal and Maternal Mortality Review Committee (PMMRC) report 2010. Wellington: New Zealand , Health Quality & Safety Commission.

3.1 INTRODUCTION

The IMR often serves as a key development indicator, reflecting the combined effects of economic development, technological change, including health interventions, and the socio cultural environment. Several studies have been attempted to evaluate the impact of individual determinants on this rate since India's Independence. India has experienced an impressive decline in infant mortality since the 1970s. From 130-140 deaths per 1,000 live births in the early 1970s, infant mortality level have declined to as low as 40 deaths per 1,000 live births in 2013. The first phase of the National Family Health Survey (NFHS-4) 2015-16 result showed dramatic improvements in maternal and infant mortality, immunization coverage, nutrition and such criteria in 13 states. The survey also showed a reduction in maternal mortality rates.

The fourth Millennium Development Goal (MDG-4) aimed to reduce mortality- between 1990 and 2015- among children under five by two thirds. India was one of the signatory to commit in reduction of child mortality. However, India has fallen short of its target of 27 Infant Mortality Rate (IMR). IMR has declined both in the urban and rural areas. The latest data from the sample

registration system shows that the infant mortality rates for the urban and rural regions are 27 and 44, respectively, for every 1,000 live births in the year 2013, SRS (1991-2013). In India, infant and under-5 mortality is generally lower in urban than in rural areas. Various factors account for this, including the higher incomes in urban areas, better education in urban areas, the concentration of public infrastructure in urban areas that provides sanitation services, including water supply, household waste and excreta removal, and hospital infrastructure, with health conditions that are more favorable in urban than in rural areas. In India infant and child mortality varies considerably from state to state. States such as Assam, Bihar, Chhattisgarh, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, and Meghalaya have higher infant and Under-five mortality than the rest of India. Efforts have been made during the past two decades to reduce child mortality. Despite socio-economic development and implementation of child survival interventions, high mortality rates are prevailing. There are large variations in the levels of IMR among states. States such as Assam, Bihar, Chhattisgarh, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, and Meghalaya have higher infant and Under-five mortality than the rest of India. Efforts have been made during the past two decades to reduce child mortality. Despite socio-economic development and

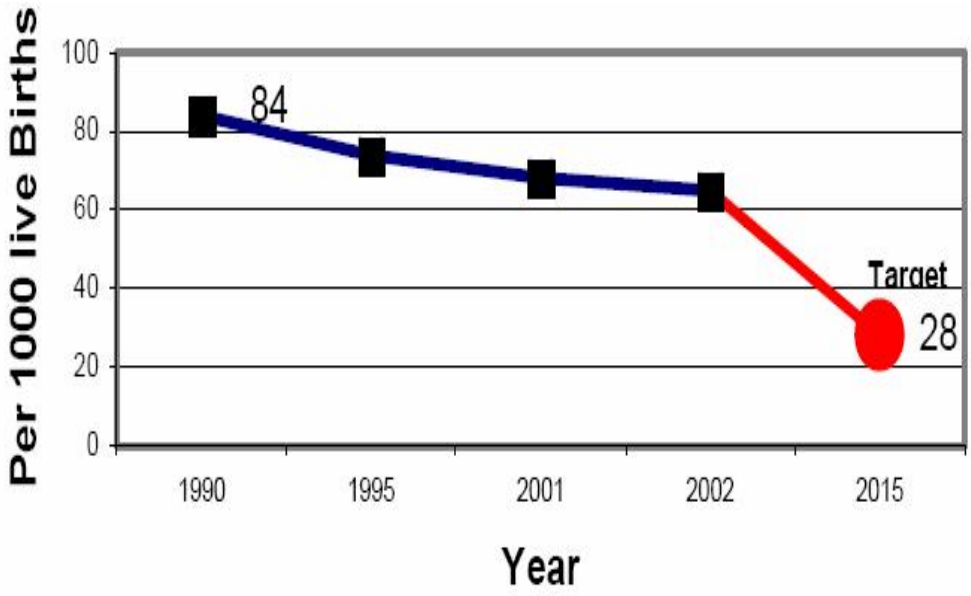
implementation of child survival interventions, high mortality rates are prevailing.

A study conducted by Suresh Sharma(2008) focus to examine the determinants of childhood mortality and child health in India and factors explaining the differential performance of the child immunization and treatment of childhood diseases. For this purpose data are taken from three rounds of the National Family Health Survey of India (NFHS) conducted in 1992-93, 1998-99 and 2005-06. The analysis reveals that infant mortality continues to decline and that the decline in child mortality is even more pronounced.

In India, approximately 1.72 million children die each year before reaching their first birthday. Infant mortality has declined significantly in India from 129 in 1970 to 68 in the year 2000 Fig.3.1. Though, the Infant Mortality Rate (IMR) is decreasing at an annual rate of 2.11 per cent from the early seventies, the decadal rate (compounded annually) is decreasing at a slower rate when compared between 1981-91 and 1991- 2001. The slow pace of education in the IMR is a major worry for the country's development. To that extent its performance when compared to other Southeast and East Asian countries is poor. While the expected fall

in IMR is at 47 based on the current rate, it is still above the millennium development goal of 28 per 1000 live births by 2015.

GRAPH 3.1: **IMR Trend in India, 1990-2015**



Source: World Bank, 2014

The country has observed a continuous decline in IMR. It stood at 192 during 1971, 114 in the year 1980 and 58 in 2005. The decline in IMR has been noticed both for the male and female child during the period. However, the rate of decline is more pronounced in the case of male as compared to female (Graph 3.1).

Table 3.1: Infant Mortality Rate by Sex and Residence

YEAR	Infant Mortality Rate by Sex (Per 1000 live births)			Infant Mortality Rate by Rural-Urban (Per 1000 live births)		
	Male	Female	Total	Male	Female	Total
1980	113	115	114	124	65	114
1985	96	98	97	107	59	97
1990	78	81	80	86	50	80
1993	73	75	74	82	45	74
1996	71	73	72	77	46	72
2000	67	69	68	74	43	68
2003	57	64	60	66	38	60
2005	56	61	58	64	40	58

Source: Ministry of Health and Family Welfare, 2007.

On account of child health interventions, the infant mortality rate in the country has gone down from 114 in 1980 to 58 in 2005. While looking at the IMR of the country, it is observed that there is a continuous decline both in rural as well as in urban areas although urban areas of the country are observing rapid decline in IMR as compared to rural areas attributing this change to better health care facilities easily accessible in urban areas.

3.2 INFANT MORTALITY RATE IN INDIA'S SELECTED CITIES

The following section highlights various studies conducted in selected cities of India which shows various nature and conditions of Infant mortality in India.

3.2.1 RAJASTHAN

Gupta et.al (2009) had published a paper on Changes in Infant Mortality Rates in Rajasthan over 25 years in Health and Population: perspectives and issues, a cross-sectional study conducted in 2005 to find the changes and the causes of IMR in villages of Jaipur in Rajasthan, India. Significant decline in IMR has been observed over a period of two and a half decades. IMR was 55.4 in 2005 and the study show an increase in the proportion of neo-natal mortality as 87.5 per cent. While proportional mortality due to dirrhoea, severe malnutrition, fever and rashes has decreased; proportional mortality due to pre-maturity, low-birth weight, asphyxia, birth injuries and congenital injuries has increased over the years. The interventions for reducing IMR mainly focused on post neo-natal period of infancy such as immunization, promoting ORS use for dirrhoeal cases and management of ARIs are not enough for reducing the IMR. The study suggest that strategies should be focused on

redesigning interventions for safe-delivery and child-birth, improved coverage and quality ante-natal care and nutrition supplementation among pregnant women. The survey covered 2753 households and found a total of 1496 births and 72 infant deaths.

IMR in India and Rajasthan has been declining over the decade within the study period (figure). However, the decline has been slow but steady in the country as well as in Rajasthan, although the state maintained higher levels than the national average through the corresponding period. IMR in Rajasthan almost remained 85 in the decade 1991-2000.

Table 3.2: IMR IN INDIA AND RAJASTHAN 1980-2006

COUNTRY STATE	1980	1986	1987	1999	2000	2001	2003	2004	2005	2006
INDIA	72	71	71	70	68	66	60	58	58	57
RAJASTHA	85	85	83	81	79	79	75	67	68	67

Source: Field Survey, Gupta et al 2009

Table 3.3: INFANT AND NEONATAL MORTALITY (RAJASTHAN) IN 1980 AND 2005

Items	**1980**	**2005**
	n=62	**n=72**
Infant Mortality Rate	124.0	55.4
Per cent distribution of infant deaths by period		
Neo-natal deaths	50.3	66.7
Post-neo-natal deaths	49.7	33.3
Per cent distribution of neo-natal deaths by period		
Within 7 days	51.6	87.5
After 7 days	48.4	12.5
Place of delivery		
Institution	4.0	62.5
Home	96.0	37.5
Assistance during delivery		
Doctor/Health Worker	14.2	66.7
Dai/Traditional birth attendant	80.0	29.2
Family Members	5.8	4.2

Source: Field Survey, Gupta et al 2009

The study findings show three important changes over the years: significant reduction in IMR to less than half; increase in the proportion of neo-natal deaths to total infant deaths; and change in the pattern of causes of infant deaths. There has been a substantial and significant decline in the IMR over a period of two-and-half decades. The 1980 study showed IMR as 1242 while the 2005 research showed IMR of 55.4, a reduction by less than a half, which is statistically significant.

Another change in pattern of infant deaths was the increasing proportion of neo-natal deaths. The distribution of infant deaths by age showed an increase in the proportion of neo-natal deaths as compared to those occurring in the post-natal period. Neo-natal deaths which accounted for almost 50 per cent of the total infant deaths in 1980 study, increased to two-thirds of infant deaths in 2005. Most marked changes were seen in early neo-natal mortality (within 7 days), that accounted for 87.5 per cent of neo-natal deaths in 2005, compared to 51.6 per cent in 1980.

Causes of Deaths

Change in patterns of causes of deaths which has direct implications for child survival policies and strategies were also reported. The comparison of causes of infant deaths between the first study and the

follow-up study showed a changing pattern of causes over a period of 25 years (Table 3.3). The proportion mortality due to diarrhea has declined substantially from 14.5 per cent to 8.3 per cent during the period. Percentage of deaths due to fever and rashes which also included measles, have gone down from 16.1 per cent to 5.6 per cent. Similar was the pattern for deaths associated with severe malnutrition, with a 57.2 per cent decline from 19.4 per cent. However, pneumonia deaths remained unchanged and continued to be a major cause of death. About one-fourth of deaths were due to pneumonia.

While there has been a decline in proportional mortality due to diarrhea, severe malnutrition and fever/rashes, the proportional mortality due to pre-maturity and low birth weight, asphyxia, birth injuries and congenital anomalies have increased over the period. This was mainly due to increased proportion of neo-natal mortality in infancy.

Table 3.4: CHANGING PATTERN OF CAUSES OF DEATHS OVER A PERIOD OF 25 YEARS

Causes of Deaths	1980	2005
Pneumonia	25.8	27.8
Diarrhea	14.5	8.3
Severe Malnutrition	19.4	8.3
Rashes/Fever	16.1	5.6
Prematurely/LBW	12.9	19.4
Asphyxia	9.7	19.4
Birth Injury	1.6	5.6
Congenital anomalies	0.0	5.6
Total	100.0	100.0

Source: Field Survey, Gupta et al. 2009

The authors have attempted to present the change in infant mortality rates, neo-natal mortality and causes of deaths over a period of 25 years. The study findings show a reduction of 55.4 per cent in the infant mortality rate in three decades. However, the decline has been slow and at times, stagnant in different phases of time periods. The major question to be answered is that what has contributed to this decline? Whether technology and improved child care, or is it the

overall development in terms socio-economic change, access to health care, availability and increased safe drinking water, improved supplementary nutrition and raised levels of education? The slow declining trends suggest that it was not technology alone and exclusively but seems to be the result of a combination of the two. Over the past twenty five years, there has been a phenomenal expansion of health care facilities and services, disease-specific health interventions, and success of developmental programmes such as water and sanitation, education and poverty reduction measures.

3.2.2 ASSAM

In another study conducted by Dr. Nityananda Barman and Dipul Talukdar titled 'Socio-Demographic Factors Affecting Infant Mortality Rate in Assam' where an analysis regarding the IMR in Assam was made, highlighting the different factors affecting the infant mortality rate. The trend of IMR in the state of Assam was also analysed for the year 1998-2012.

Trend of Infant Mortality Rate in Assam:

The Government of India has set up the target of infant mortality rate to 30 per thousand live births by 2016. The possibility of the target stated in NPP 2000 can be accessed from the available data

estimated through Sample registration System (SRS) for the state of Assam. The 15 years trend may suggest that approachability of the target. Data presented in Table provides data on the possibility of the set target.

Table 3.5: Infant Mortality Rate, Assam 1998 – 2012

Year	Total	Rural	Urban
1998	76	80	36
1999	76	79	36
2000	73	76	33
2001	70	74	33
2002	68	72	34
2003	67	70	35
2004	66	69	38
2005	68	71	39
2006	67	70	42
2007	66	68	41
2008	61	66	39
2009	61	64	37
2010	58	60	36
2011	55	58	34
2012	55	58	33

Source: Statistical Handbook, Assam, 2013.

From the above table 3.5 it is observed that in Assam around 55 out of 1000 live birth are death before completing one year of their life span in the year 2012. Like all India, the state has achieved IMR from 76 in 1998 to 55 in 2012, thus reducing the rate by during these 15 years period.

The major findings of the analysis are:

i) The death rate in Assam is further declining. In 2012, the death rate in rural areas becomes 8.3 per thousand and in urban areas it is 5.6 per thousand. The total death rate from 8.0 per thousand on 2011 is declined up to 7.9 per thousand on 2012.

ii) One of the major causes of infant mortality is education of females. It has been found in the study that the rate of maternal mortality is higher in case of illiterate females in comparison to those literate females.

iii) Absence of doctor and nurse is also an important factor of infant mortality.

iv) The gap between two births is also one of the major factors of infant mortality. It is found that longer is the gap lower is the rate of mortality and shorter is the gap higher is the infant mortality.

v) Again one of the major findings of the analysis is that the age of marriage also affects the infant mortality rate. Both under-age and over-age of marriage adversely affect the infant mortality.

vi) In the case of uneducated mother the infant mortality is found to higher in comparison to that of educated mother.

vii) Another important finding of the study is that vaccination is one of the important factors that affect the infant mortality. It has been found in the analysis that the rate of infant mortality is lower in case of vaccinated babies or infants in comparison to that of non-vaccinated babies.

viii) Hygienic conditions are also an important factor or component that affects the infant mortality rate. It has been found that the possibility of death of infants is low brought up in a hygienic condition. During the field survey it has been found that the infant mortality rate is higher is case of non-hygienic condition then the rate of mortality in case of hygienic condition.

3.2.3 Andhra Pradesh

Ushashree et al(2013) ‘A Study of Infant deaths in Tribal Area of Andhra Pradesh’ aimed to determine the prevalence of neonatal deaths and its underlying correlates in tribal area of Andhra Pradesh

and conducted a two phase cross-sectional study (N=230). The first phase involved use of qualitative methods. Semi-structured and open-ended in-depth interviews were conducted in Telugu (local language). This phase helped to obtain specific information from mothers who had delivered in the one year period prior to the study. Analysis of qualitative data was used to construct a questionnaire schedule which was administered in the second quantitative phase wherein a population-based survey was undertaken.

Table 3.6: Demographic and Characteristics of Newborn Babies in Vizianagaram (N=230)

Parameters	Frequency	Percent
Age of baby at the time of study		
<1 month	10	4.3
1-4 months	83	36.1
5-8 months	76	33.0
9-12 months	61	26.5
Total	230	100
Sex of baby		
Male	114	49.6
Female	116	50.4
Total	230	100.0

Source: Field Study, Ushashree et al, 2013.

It was observed that 87% mothers were from the tribal community. Among the responding mothers, 62.2% of them were illiterate. The sex ratio among the live born were similar.

GRAPH 3.2: Post Natal Check up after Delivery

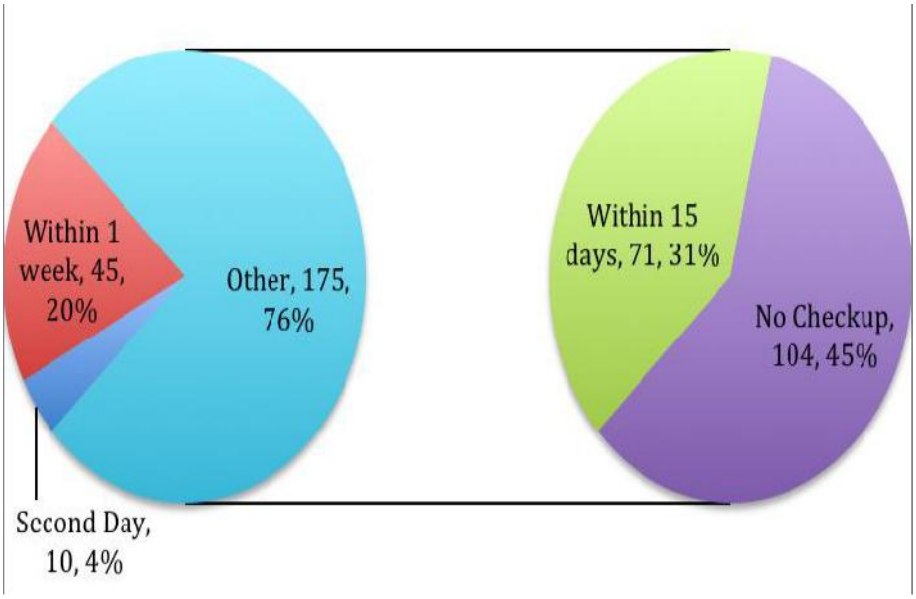


Figure postnatal check up after delivery, n=230

Figure legend: there were only 10 postnatal checkups done on day 2, whereas 45 were within a week and 71 were within 15 days. There were no post natal check-ups done after a greater proportion of deliveries (45.2%, N=104).

It was observed that IMR in Vizianagaram is 239 per 1000 live births in the tribal areas under study and 74% of babies were breast fed immediately after birth.

The study results showed that 55 infants out of 230 live births died within one year amounting to 239 per 1000 live births in the tribal areas under study. Among the infants who died, 28% of them died within first day, 68% within first week (including the first day) and 81% within first month. This shows that majority of the infant deaths are occurring within first month of life and interventions to tackle them should be prioritized in this golden period (**Table 3.6**).

As seen in the table below, 74% of mothers breastfed their child immediately after birth, 24% gave pre-lacteal feeds, 45% of women did not have any post natal check up. (GRAPH 3.2) Only 4% of women had a postnatal check up on the second day.

Table 3.7: Characteristics of Survival of New Born Babies and Breastfeeding Practices in Tribal Areas in Vizianagaram

Parameters interval	**Frequency**	**Percent**	**95%confidence**
Deaths during first year of life			
Total deaths	**55**	**23.91**	**21.9-25.8**
No of Deaths	**175**	**76.08**	**74.1-78.7**
Timing of Deaths			
Within 24 hours of birth	**15**	**7**	**3-10**
Within first 7 days of birth	**21**	**9**	**5-13**
Other period within 1 year of birth	**1**	**4**	**2-07**
Not eligible*	**3**	**1**	**0-03**
Not applicable#	**174**	**76**	**70-81**
Initiation of breastfeeding			
Immediately after birth	**171**	**74**	**69-80**
After one day	**29**	**13**	**08-17**
After three days	**30**	**13**	**09-17**
Type of feed given before initiation of breastfeeding			
Plain water	**16**	**07**	**04-10**
Glucose water	**31**	**14**	**09-18**
Artificial milk	**8**	**04**	**01-06**
Others	**175**	**76**	**71-82**

Source: Field Study, Ushashree et al, 2013.

The outcomes on symptoms related to morbidity in the postnatal period indicate that 38% of infants had a fever. 14% did not take feeds. 12% did not cry after birth. Among these infants who had some symptom, 51% had taken care at hospital for any of the symptoms and 32% had taken care at home. Among the infants treated at hospital, 43% were treated by an allopathic, Registered Medical practitioner (RMP) treated 30% while 18% did not have any treatment. The results also indicate that 46% of babies were sick for at least 2 times for some reason before one month, 17% of babies were sick at least four times within one year and 53% of babies had some infection before one month.

The study findings also indicate that 93% of mothers had no knowledge of identifying sick neonatal symptoms and about 4% of infants have birth asphyxia as a cause of death. On finding about the reasons for not using public health care system— 45% of mothers informed that they do not trust the public healthcare system while 51% of mothers informed that they prefer private because of better care assured by their faith and motivation by RMP.

The results of associations indicated that having more than one child increases the odds for infant death to 69.66 (17.11- 598.4) compared to having just one child. (Can be reverse causation as well);

indeterminate results of having institutional delivery prevent the dying infants by odds of .89 (.46-1.72). The sample did not have enough power to test the hypothesis further. The study results also show that not having even one postnatal health checkup (PNC) had two times higher odds of their infant dying compared to those who do not have had any PNC. The study also found that infants born to mothers who have not completed at least secondary education are at higher odds dying compared to mothers having completed at least secondary education.

The results indicate that IMR in Vizianagaram is 239 per 1000 live births in the tribal areas under study which is 10 times more than that reported by the district (22/1000) and 4-5 times more than Sample Registration System (SRS) data of 2011 for AP (IMR of 55 per1000 lives births in rural areas).5, 7, 10 SRS data has not focused on specific information on tribal areas regarding IMR and the same limitation extends to the District Level Household & Facility Survey (DLHS) data.5

High prevalence of home deliveries and inaccessibility of neonatal care in tribal area indicate a need to develop and promote home based neonatal care practices. The ASHA/TBA are the anchor workers at village level. By improving the skills of these health

workers at community level lot of improvement can be achieved in reducing IMR and NMR. Through this study, we have focused on simple factors that can be targeted through interventions to reduce MMR and IMR in tribal areas of Vizianagarm district. In summary, this study revealed a huge burden of neonatal ill health. A key challenge for effective implementation of neonatal intervention packages is developing and sustaining constructive linkages between families, communities and health facilities through engaging existing cadres of community health workers in neonatal health. There are several models that are cost efficient and have shown good impact in implementation evidence based interventions in tribal areas.

3.3 DISTRICT LEVEL

In yet another paper “Infant mortality Rates in India: District level Variations and correlations” by Shruti Kapoor, examines the correlates of infant mortality in India using district-level data from the 1991 and 2001 Census of India. While infant mortality rates have dropped across districts over this ten year period, there still remains a lot of heterogeneity across districts and hence across the states. Using a panel dataset of 666 districts, the analysis seeks to determine which of socio and or economic factors play an important role in reducing infant mortality rates. In the empirical work, the

explanatory variables used are male and female literacy, male and female labor force participation, the level of poverty, urbanization and other socio-economic variables. The analysis brings out the powerful influence of women's characteristics on infant mortality, especially literacy and labor force participation. Increases in both of these variables significantly reduce child mortality at the district level. Improvements in male laborers in non-agricultural work and reductions in poverty also reduce child mortality, but their quantitative impact is weak in comparison. Further the non-parametric analysis reinforces the results found in the parametric section. They indicate that the action or the impact of the covariates is strongest in the districts which lie in the center of the conditional distribution, rather than those at the extreme. This analysis allowed it to determine in which districts the impact of additional target policies would yield the greatest reduction in infant mortality.

Using a sample of 666 districts from the 1991 and 2001 census, this paper attempts to study the relevant relationships of demographic and socio-economic variables with IMR. The choices of independent variables are partly guided by previous literature on IMR and partly by the availability of data. Special attention has been paid to female literacy, female labor force participation rates, urbanization and

some socio-economic variables. The prime intention of this analysis is to see which variables, economics or social, have a greater impact in reducing infant mortality levels and in which quintile the impact is the strongest.

India is demographically a very diverse country. India is administratively divided into 28 states and 7 union territories. The states are further divided into 593 districts for political and judicial purposes. There are variations in basic demographic indicators not only across states but districts also. At one end of the spectrum, Kerala has demographic features which are similar to those of middle income countries like Bulgaria, Russia and Ukraine: life expectancy at birth is 72 years, infant mortality rate is 12 per thousand live births, total fertility rate is 1.8 births per women and ratio of females to males in the population is well above unity (1.04). At the other end we have the large north Indian states which find themselves in the same league as some of the least developed countries for the same indicators. In Uttar Pradesh, infant mortality rate is 72, life expectancy at birth is 61, total fertility rate is 5.1 and female-male ratio is (0.8), lower than that of any country in the world. In the state of Arunachal Pradesh, there exist a districts such

as East Kameng which has an IMR of 158, as well as districts like East Siang where the IMR is only 64.

Due to wide inter-state and intra-state variations, it is therefore almost meaningless to talk about an average infant mortality rate for India. The study found that female work participation rate, female literacy and the percentage of female laborers in agricultural work seemed to have the strongest affect on IMR. Improving the quality of female human capitals does seem to have a significant and positive association with reducing IMRs. Male variables like male literacy do play a small but not a very significant role in reducing infant mortality. Other economic and cultural factors like poverty, percentage of SC/STs surely contribute to reducing infant mortality. Thus any improvements in these variables will have direct or indirect affect on the child.

A study conducted on Maternal Mortality Rate (MMR) & Infant Mortality Rate (IMR) in selected villages in five districts of Bihar by Ambpali Hastkargha Evom Hastshilp Vikas Swavlambi Sahkari Samiti Ltd Patna indicates that the health services are ineffective and rural poor women are not in a position to access high quality and equitable maternity care as all the rural areas are disadvantaged. The programmes focusing on improving the nutritional status of the

mother and child, by promoting ante and post natal check-ups, breastfeeding, appropriate complementary foods and feeding practices are highly inadequate. Micronutrient nutrition, the control of anemia and the care of children with severe malnutrition, immunization, for strengthening the health system, are urgently needed to be improved. The health and survival of mothers and their newborns are linked, and many of the interventions that save the new mothers' lives also benefit their infants as a UNICEF report, Status of Worlds' Children, 2006, has pointed out. The importance of developing a strong information, education and communication programme with respect to antenatal care and safe motherhood and greater involvement of men in maternal and newborn health care is also critical.

The study cites that infections are the main contributors to infant mortality and malnutrition contributes to over 50% of child deaths. 30% of infants born with low birth weight (LBW) across the world were from India (1998-2004), according to The State of the World's Children 2006, UNICEF. One in four pregnant women has not had a single antenatal checkup and the majority of deliveries take place without the assistance of a health professional. Currently, about one-third of expectant mothers in India are not immunized against

tetanus, which prevents mother and child infection at birth. India has the lowest child immunization rate in South Asia. The proportion of children who have not had a BCG vaccine in India is twice as high as in Nepal, more than five times as high as in Bangladesh, and almost 30 times higher than in Sri Lanka. Scheduled tribe children have only a 26% chance of being immunized.). NFHS-3 has determined that as many as 48% of pregnant women still do not achieve three antenatal visits in pregnancy. Only 23.1% mothers received iron and folic acid for at least 90 days in the last pregnancy. Anemia is widespread in Indian women (56.2%) and this coupled with malnutrition (33% women have a body mass index below normal) ensures that a large number of Indian women conceive when they are not fit to undertake a pregnancy Although 76 percent of women who had a live birth in the five years preceding the survey received antenatal care, only 44 percent started antenatal care during the first trimester of pregnancy, as recommended. Another 22 percent had their first visit during the fourth or fifth month of pregnancy. Just over half the mothers (52 percent) had three or more antenatal care visits. Also the quality of antenatal care left lot to be desired. Less than three in four had their abdomen examined, and less than two in three received other services, including being weighed, having blood pressure measured, and urine and blood

samples checked. Only 36 percent received information about pregnancy complications. Sixty-five percent received (or bought) iron and folic acid (IFA) supplements for their most recent birth, and only 23 percent took IFA for at least 90 days, as recommended. Seventy-six percent of mothers received the two or more tetanus toxoid injections during pregnancy for their most recent birth. Only 4 percent of women took a drug for intestinal parasites during their pregnancy. IFA coverage and tetanus toxoid injections for older women, women with four or more children, women from rural areas, women with no education, and women in households in the lowest wealth quintile are well below the national average. In virtually all categories of women, only a fraction of women who received IFA said that they consumed IFA for at least 90 days as recommended. One-fourth of all pregnancies in the five years preceding the survey underwent an ultrasound test. Urban women were much more likely to have three or more antenatal visits than rural women. Forty four percent of pregnancies in urban women underwent an ultrasound test, compared with 16 percent in rural areas. Pregnant women with at least 12 years of completed education were almost eight times as likely to have an ultrasound test as women with no education. A higher percentage of pregnant women with no living son had an ultrasound test, and this percentage declines as the number of living

sons increases. An examination of the sex ratio of births after a pregnancy with an ultrasound test provides strong evidence that ultrasound testing is being used for sex determination followed by sex-selective abortions. Thirty-nine percent of births in the five years preceding the survey took place in health Facilities; more than half took place in the woman's own home; and 9 percent took place in parents' homes. The more ANC visits that a woman had during pregnancy, the greater the likelihood that her delivery took place in a health facility. First births are more likely to be delivered in an institution than births at higher birth orders. Only 13 percent of births to women in the lowest wealth quintile and 18 percent of births to both women with no education and to scheduled-tribe women are delivered in an institution. Overall, less than 1 in 10 (9 percent) births in the five years preceding the survey were delivered by caesarean section. Among the 34 percent of births that were weighed at birth, over one in five (22 percent) were of low birth weight (less than 2.5 kg). Forty-seven percent of births in the five years preceding the survey were assisted by Health personnel, including 35 percent by a doctor and 10 percent by an auxiliary nurse midwife, nurse, midwife, or lady health visitor. More than one-third of births (37 percent) were assisted by a traditional birth attendant, and 16 percent were assisted by only friends, relatives, or

other persons. Thus, more than half of India's mothers deliver without the assistance of any health personnel. These are only some of the reasons for the unsafe deliveries. Moreover, considering the fact that approximately 28 million Indian women become pregnant every year, the number of women whose health is endangered is enormous. Postnatal check-ups soon after delivery help safeguard the health of mother and baby, particularly for births occurring outside of health care facilities. Almost 6 in 10 women (58 percent) did not receive any postnatal check-up after their most recent birth. About one-quarter of women (27 percent) received a health check-up in the first four hours after delivery, and 37 percent received a health check-up within the critical first two days after delivery. Although the likelihood of a timely postnatal checkup is closely associated with having an institutional delivery, it is notable that 15-24 percent of births even in institutions did not receive a postnatal check-up. Among births delivered at home, only 9-12 percent of births received a postnatal checkup within two days of delivery. Despite an increase in institutional deliveries, 60 per cent of pregnant women still deliver at home.

3.3.1 Reasons for Not Seeking Antenatal Care Services

Mothers who had not sought antenatal care outside the home were asked about the main reason for not going for an antenatal check-up. The findings of NFHS for women who did not receive any antenatal care were quite revealing), the mother said that delivery in a health facility is too expensive. For this group, nearly three-fifths of the births were to mothers who stated that it was not necessary to go for an antenatal checkup. Thus, a large proportion of births are to mothers who do not realize the importance of safe motherhood. It is surprising to note that a higher proportion of urban births (66 percent) than rural births (58 percent) were to mothers who felt this way. Other major factors contributing to the nonuse of antenatal care were lack of knowledge of antenatal care services (13 percent) and financial cost (7 percent). Mothers of 6 percent of births felt that it is not customary in the community to go for an antenatal check-up. Five percent of births were to women who had no time to go for antenatal care and another 5 percent were to women who were not permitted to go for an antenatal check-up. One to 3 percent of births were to mothers who said it was inconvenient to go for antenatal care and that the services were of poor quality.

3.4 STATE DIFFERENTIAL IN INDIA

In India, wide inter-state variations in IMR and MMR are visible. We have extremely low IMR states like Kerala (13/1000) while in 3-4 states, IMR is less than 50 (Tamil Nadu, Andhra Pradesh, Maharashtra and Punjab) (SRS, 2008). But we also have high IMR states like Uttar Pradesh (73/1000), Orissa, Bihar and Madhya Pradesh which perform consistently poorly on antenatal care. The percentage of women who had three or more Ante Natal Care (ANC) visits ranges from 17 percent in Bihar and 27 percent in Uttar Pradesh to at least 90 percent in Kerala, Goa, and Tamil Nadu. States where the provision of Iron Folic Acid (IFA) was far below the national average include Nagaland, Bihar, Arunachal Pradesh, Jharkhand, Uttar Pradesh, and Meghalaya. Infant and Maternal Mortality Rates of Himachal Pradesh were 19 per 1,000 live birth and MMR was 38.3 per one lakh live birth. With respect to under-five mortality, Uttar Pradesh also has the highest rate (96) and Kerala has the lowest rate (16). More than two-thirds of all maternal deaths occur in Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Orissa, Madhya Pradesh, Chhattisgarh, Rajasthan and Assam. Government Health Programmes Safe motherhood practices and child survival programmes have been given importance in Indian

Governmental Health Programmes due to high infant/child and maternal mortality in our country. The Ministry of Health, Government of India, took concrete steps to strengthen maternal and child health services in the First and Second Five Year Plans (1951-56 and 1956-61). The integration of family planning services with maternal and child health services and nutrition services was introduced as a part of the Minimum Needs Programme during the Fifth Five Year Plan (1974-79). The primary objective was to provide basic public health services to vulnerable groups of pregnant women, lactating mothers, and preschool children (Kanitkar, 1979). Since then, the promotion of health of mothers and children has been one of the most important aspects of the Family Welfare Programme in India and has now been further strengthened by introducing the Child Survival and Safe Motherhood Programme (Ministry of Health and Family Welfare, 1992a). The Ministry of Health and Family Welfare has also sponsored special schemes, under the Maternal and Child Health Programme, including the programme of Oral Rehydration Therapy, development of Regional Institutes of Maternal and Child Health in states where infant mortality rates are high, the Universal Immunization Programme, and the Maternal and Child Health Supplemental Programme within the Post-Partum Programme (Ministry of Health and Family Welfare, 1992). A series

of specific disease-centered programmes through the 1970s, ‘80s and ‘90s helped reduce India’s IMR. But still millions of newborns in India die before their first birthday as they do not get the basics home-based essential care and regular post-natal visits by community workers during the most vulnerable weeks of their life. As far as IMR is concerned, it is estimated that 117,000 Indian women die annually during pregnancy, childbirth and the puerperium. Recognizing the importance of health in the process of economic and social development and improving the quality of life of our citizens, as well as the asymmetry in healthcare between urban and rural areas, the Government of India launched the National Rural Health Mission to carry out necessary improvements in the basic health care delivery system. Some of the key goals of the (NRHM 2005-2012) are reducing infant mortality rate to 30 per 1,000 live births and maternal mortality rate to 100 per one lakh against 450 per one lakh live births by 2012 through promoting institutional delivery in the rural areas. An official estimate says half of India's women still deliver babies at home and accounts for the world's 20 per cent child mortality.

3.5 URBAN - RURAL DIFFERENTIAL

The above discussion makes it clear that there is an urban - rural differential in mortality. IMR in rural areas is about 50 percent higher than that in urban areas. Infant and child mortality rates have declined slightly faster in rural areas than in urban areas. Between 1991-95 and 2001-05, infant mortality declined by 27 percent in rural areas, compared with 21 percent in urban areas. During the same period, the child mortality rate declined by 45 percent in rural areas, compared with 40 percent in urban areas. Even in the neonatal period, the decline in mortality was slightly faster in rural areas (26 percent) than in urban areas (18 percent). According to socio-economic characteristics, perinatal mortality is highest for rural mothers, mothers with no education and less than 5 years of education, and mothers in the lowest wealth quintile. In the rural areas of India, maternal and child health services, namely antenatal and postnatal care of mothers as well as care of infants and children are delivered mainly by government-run Primary Health Centers (PHC) and sub-centers. The Female Health Worker, who is an Auxiliary Nurse Midwife, renders maternal and child health and family welfare services at the PHC. The information about relevant matters are also provided at the PHC, namely, The basic maternal

and child care services offered at Primary Health Centres are pregnancy and childbirth; infant and child feeding practices, including breastfeeding; immunizations; episodes of illnesses such as acute respiratory infection, fever and diarrhea, and the treatment received; mother's knowledge and use of Oral Rehydration Salts (ORS); and the level of child nutrition assessed by measuring the weight and height of children.

According to the Bulletin on Rural Health Statistics in India (2006), as per the 2001 population norm, there is a national shortage of 20,903 sub-Centres (SCs), 4803 Primary Health Centres (PHCs) and 2653 Community Health Centres (CHCs). There is only one bed per 6000 people. A large percentage of couples report an unmet need for contraception. Only 30% of couples who want to delay or space child bearing in rural areas, get it. Services for pregnant women and children can also be obtained from private and public maternity homes or hospitals, as well as from private practitioners. In urban areas, maternal and child health (MCH) services are available mainly through government or municipal hospitals, urban health posts, hospitals and nursing homes operated by nongovernmental voluntary organizations, and various private nursing homes or maternity homes. In a nutshell, India still has the highest number of

maternal deaths worldwide and accounts for one-fifth of all global maternal mortalities. Clearly, IMR and MMR in India need to decrease at a much faster rate in the future and this goal can onlybe achieved by giving priority to women, children and their healthcare.

The study made a conclusion that Sub-optimal functioning of the delivery services, lack of ambulances and poor referral services at rural PHCS and government hospitals makes the primary health care of maternal, newborn unavailable to most vulnerable women and children of our sample areas. There is no proper hospital or nursing home for care of critically ill newborn. ANC, Iron and Folic Acid intake, breast feeding, measuring the height and weight of the newborn, ORS use etc are very poor among the sample. There is a large difference between the rural and the urban sample in terms of their use of essential prenatal requirements. Community based Skilled Birth Attendant for maternal and child health care as a cutting age factor in reducing Maternal Mortality are not available for our sample community. The traditional Dais (attendants) cannot cope with delivery time complications. Heavy work load of women in agrarian life style is an important factor for poor maternal and newborn health.Socio-economic and cultural practices of

discouraging pregnant or young girls to go for health centers. Pervasive gender inequality is rampant making the women unaware of the need to take of their own health. There is lack of conviction on necessity of antenatal check-up, lack of knowledge of services of antenatal care services especially among the elder generation who control the younger couples. There is need to aware the community about the advantages if breastfeeding and disadvantages of outside feed. There is need to educate the community about the entire contraceptive scenario.The various factors and their implications for larger health issues of the women. Even the details and the implications of new emergency contraceptive pill have to be informed to them. The implications of the operation at a very young age should also be told to them. The contraceptive awareness programs should have adequate privacy as the young girls are shy to participate in the beginning. There are substantial gaps in health sector infrastructure and essential health requirements in terms of ambulance, equipment, emergency drugs and consumables in primary health care institutions There is lack of intersect oral synergy at the rural level; means the different facilities available at the Panchayat level are not co-coordinated. ICDS and Aanganwadi Worker, sanitation campaigns, drinking water; school health programme should be co-coordinated to create a positive atmosphere

in the rural areas for attitude change and utilization of ANC Facilities. There is poor level of women's empowerment and literacy programs which would also go a long way in influencing the attitudes of the people themselves towards lowering maternal and infant neglect.

This chapter is divided into two sections: the first section presents the IMR in Saiha District based on secondary data during 2011-2016(June). The second section deals with the empirical analysis of IMR in Saiha Town during the same period.

SECTION 1: IMR IN SAIHA DISTRICT: SECONDARY DATA ANALYSIS

4.1: INFANT MORTALITY IN SAIHA DISTRICT

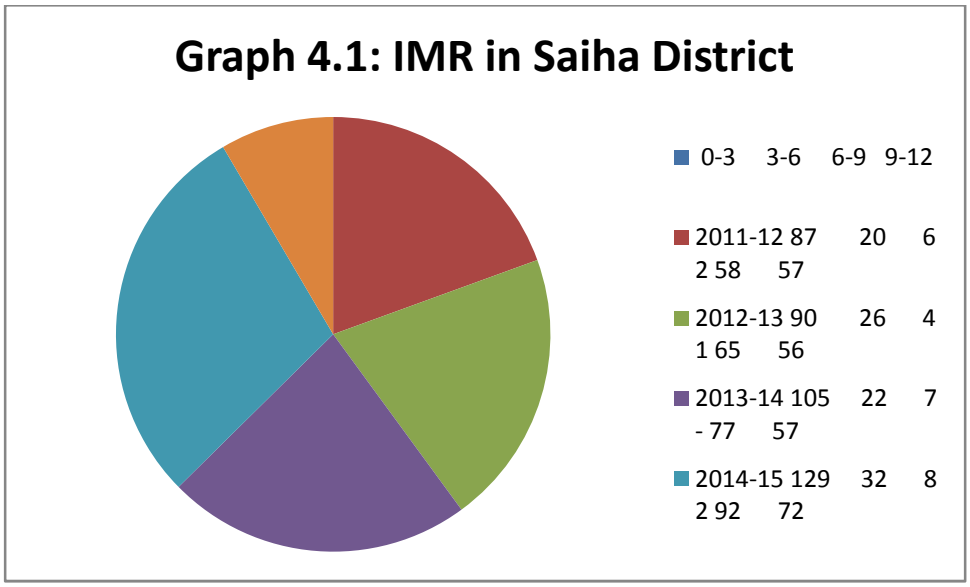
It has been observed that Saiha District has the highest IMR in the state and it is also one of the highest in India. The following table, Table 4.1 shows the trend of IMR in Saiha District.

Table 4.1 IMR in Saiha District 2011-2016(June)

YEAR	MONTHS				M	F	TOTAL
	0-3	3-6	6-9	9-12			
2011-12	87	20	6	2	58	57	115
2012-13	90	26	4	1	65	56	121
2013-14	105	22	7	-	77	57	134
2014-15	129	32	8	2	92	72	171
2015-16	43	5	2	-	27	23	50

Source: NRHM, Saiha District Hospital Record, 2011-2016.

This table is also presented in graph below



As seen in the table above the IMR has been increasing since 2011, 2015-16 recorded 50 infant mortality, this is due to the fact that the record is up to June 2016 only. This may be due to lack of post natal care in the district.

The above table 4.1 showed that the IMR in Saiha District from 2011-2016 has fluctuated considerably over the period. Deaths of infants are not uniformly distributed during the first year of infant life. They occur mostly in the first three months, then, diminished gradually at a declining rate through the rest of the first year. Infant death showed an increasing trend from 2011 till 2014-15. IMR rises from 115 in 2011-12 to 121 in 2012-13, this trend continued to increase to 134 in 2013-14 to 171 in 2014-15 (the highest record in terms of absolute death of infant within the five years period of the

data collected). However, this rate drastically dropped to 50 in 2015-16. The data also show a variation in male-female IMR trend over the five years from 2011-16. Looking at the data from Table 4.1, male-female variations in infant mortality from 2011-16 show that male mortality among infant deaths assume a higher position each year. This trend revealed that male death of 58 to 57 female infant death in the year 2011-12. This trend continued to rise to 65:56 male: female infant death in 2012-13 which continued to 77:57 in 2013-14. The gap further increases to 92:79 male: female infant death in 2014-15. However, as the infant mortality also decline in the year 2015-16, male: female infant death also declined to 27:23.The State Government recently created an awareness of the importance pre and post natal care and strictly monitored the hospitals and their workers. This is expected to reduce the IMR during 2015-16. During 2014-15 infant mortality is the highest among infants in every month's category as presented in the table. Every year male mortality is higher than female but the differences is minimal.

Let us present the birth/death percentage of infants in the study area

Table 4.2: Infant Birth-Death Percentage

Year	Birth	Death	%
2011-12	1458	115	7.887
2012-13	1381	121	8.761
2013-14	1373	134	9.759
2014-15	1425	171	12
2015-16	955	50	5.235

Source: NRHM, Saiha District Hospital Record, 2011-16

The above table is shown in the graph below

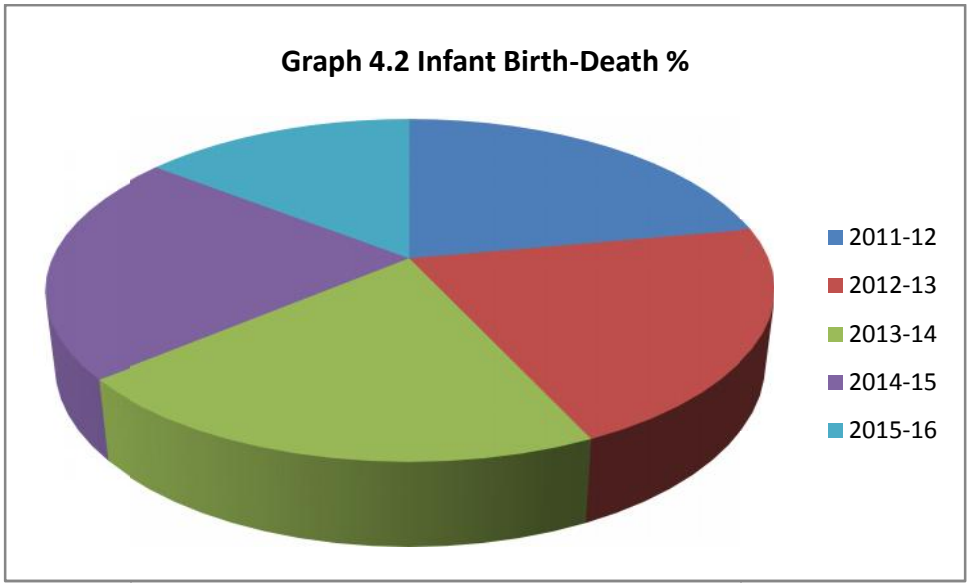


Table 4.3: Immunization

YEAR	Total Infant death	immunized/vaccinated
2011-2012	115	68
2012-2013	121	19
2013-2014	134	17
2014-2015	171	19
2015-2016	50	12

Source: NRHM, Saiha District Hospital Record, 2011-16

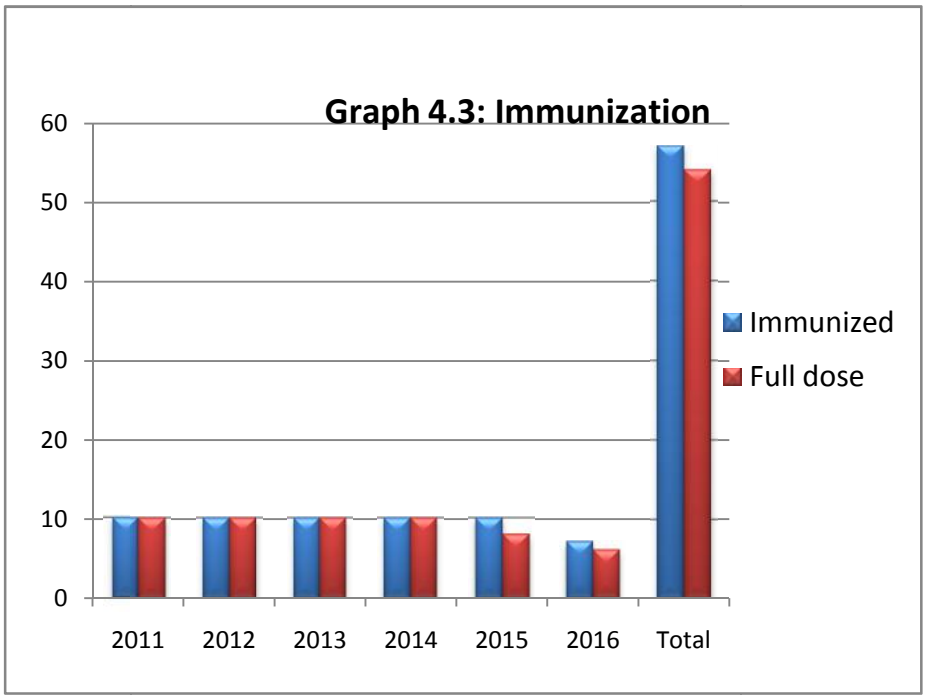


Table 4.3 reveals the status of immunization of infant among infant death from 2011 to 2016. The table shows that out of 115 infant deaths during 2011-12, roughly 68 infants were immunized. Perhaps, the reason for this could be infant deaths below the age of 3 months occupied the highest death rate in almost all the year within the study period. This trend gets escalated for the subsequent years where only 19 infants were immunized during 2012-13 where the total infant death was 121. This shows that only 15.70% amongst infant death were vaccinated. This rate did not slow down in 2013-14 with 134 infant deaths, only 17 infants were immunized which is just 12.68% from the total infant deaths. The year 2014-15 witnessed the highest ever recorded infant death in the district in its absolute term which was 171 infant deaths where, merely 19 infants were recorded as being immunized. This was just over 11% among infant deaths. Among infant deaths of 50 in 2015-16,the table revealed that 12 infants were vaccinated.

Section II: IMR IN SAIHA TOWN: EMPIRICAL ANALYSIS

This section contains the result from a field study conducted through a structured questionnaire for the period of 5 years from 2011 to 2016 (June). The data is collected from 57 mothers who lost their

infants during the study period and for each year, 10 questions were prepared except for the year 2016.

Educational levels of mothers are seen to have significant relevance in the survival of infants as educated mothers tend to have more knowledge of infant care. These cares includes post and pre natal care, vaccination, awareness about safety delivery, breastfeeding etc,. Among the respondents, mothers with high school qualification occupied the highest, followed by middle and primary level. Mothers with graduate and above degrees are minimal. Thus, our respondents are all literate and are expected to have basic knowledge of child health care.

Also, the study reveals that maximum numbers of the respondents are married for more than ten years and the age of these respondents are between 25 and 30 years are highest in numbers. This indicates that women in our study area are married and delivered children within the ideal time of pregnancy i.e., 25 to 30 years of age. Mention maybe made here that bearing a child at an early age and older ages can have a negative effect on not only the mother's health but that of her child.

Our study also analyzed the average health expenditure per month of each family where, most family spent between Rs 1000 to Rs 3000

per month. Among our respondents, the main sources of income come from self employment- earning daily wage and higher income group are mostly salaried government employees. The size of family among the study group range from 5to 7 members. Also, all respondents are categorized as Scheduled Tribe (ST).

4.2 USE OF CONTRACEPTIVES AND BIRTH INTERVAL

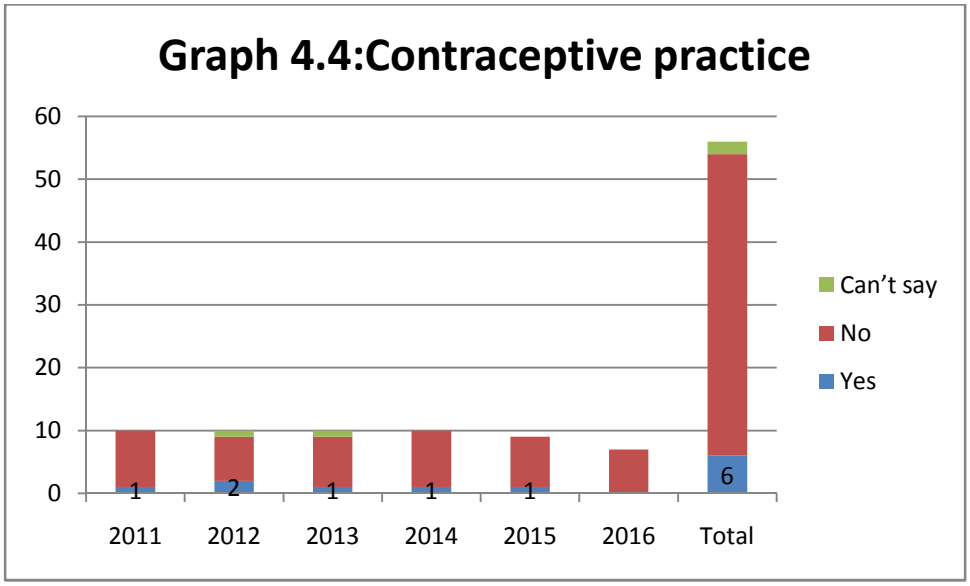
In the past years, a revolution has transformed women's health care. One of the revolutions is the development of contraceptives for women to have spaces in giving births.This contraceptives are of different types and the common ones are oral pills, injections and vaginal insert contraceptives.

The contraceptive practices of the respondents is shown in table 4.4 where 48 respondents said that they did not adopt any types of contraceptives and 6 respondents said they used oral pills.

Table 4.4: Adoption of Contraception Practice

	2011	2012	2013	2014	2015	2016	Total
Yes	1	2	1	1	1		6
No	9	7	8	9	8	7	48
Can't say		1	1				2

Source: Field Survey, 2016



Different studies on women's health have stated that prolonged use of contraceptives often leads to breast cancer, deformity and prematurity of infants and infant's death. As seen in the table 4.4, maximum numbers of our respondents do not adopt any types of contraceptives therefore, it can be concluded that using contraceptives is not a contributing factor to infant mortality in Saiha Town.

Pregnancies starting less than two years after a previous birth are more likely to result in pre term birth, low birth weight and infant mortality. It has been thought that adequate birth spacing is required to give mothers time to recover from the physical impacts of

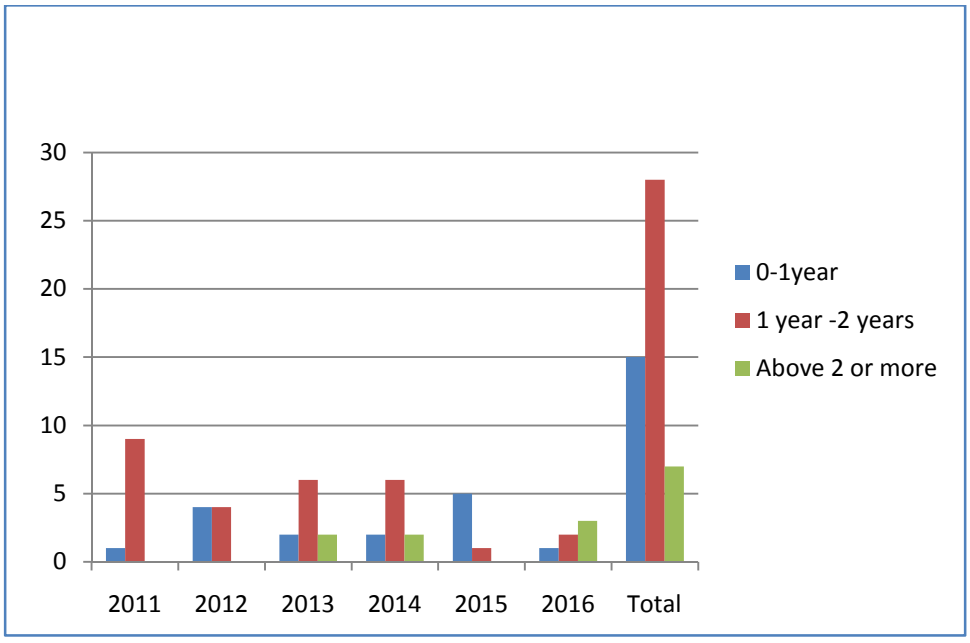
pregnancy. Therefore, in order to find out spacing of birth of our respondents, the following table 4.5 is presented below.

Table 4.5: Birth Space Interval

Years	2011	2012	2013	2014	2015	2016	Total
0-1	1	4	2	2	5	1	15
1-2	9	4	6	6	1	2	28
Above 3 or more			2	2		3	7

Source: Field Survey, 2016

Graph 4.5: Birth Space Interval



The study shows that space interval of less than 2 years is practiced the most within the study period from 2011-16, which is followed by less than 1 year spacing practice. Health practitioners are of the views that having less than 2 years birth interval is harmful for both the mother and the child, especially with lack of health care facilities. Therefore, it can be concluded that narrow gaps in birth intervals is a contributing factor to IMR in Saiha Town.

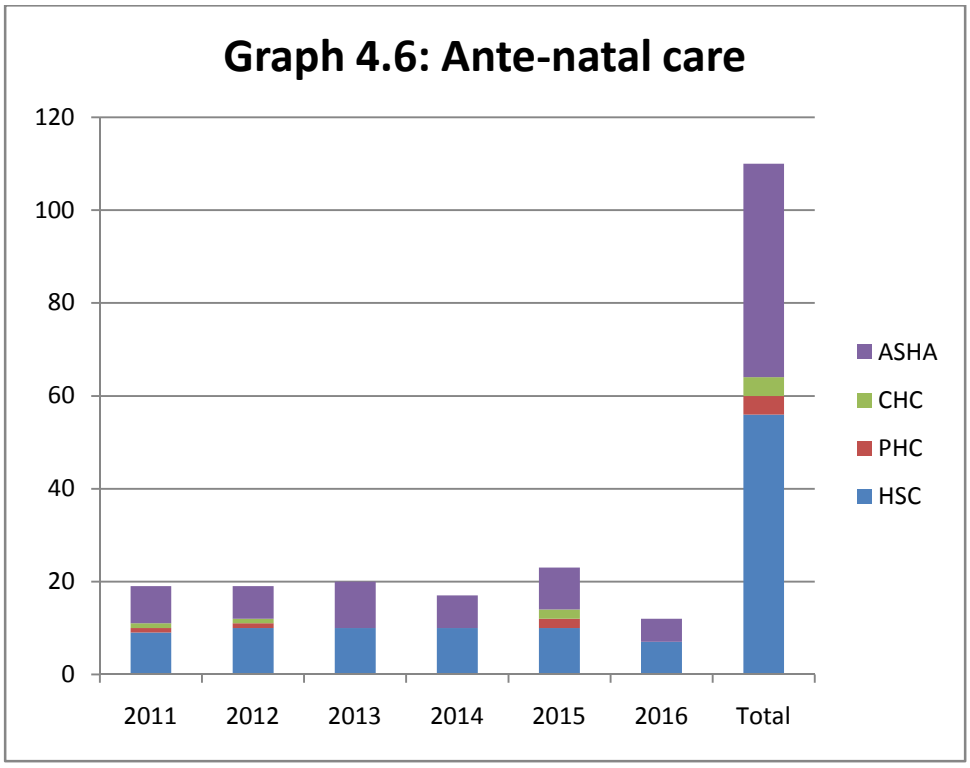
4.3 ANTE- NATAL CARE

There are many factors contributing to infant mortality, one important factor is the condition of the mother during her pregnancy which needed care and medical treatments. If ante-natal care is not taken by the mothers' there can be several negative impacts on the health of not the mother but also of the child. Table 4.6 shows the care received by the respondents during pregnancy (i.e,.for 9 months) at institutions.

Table 4.6: Ante-natal Care (Institution)

Institutions	2011	2012	2013	2014	2015	2016	Total
HSC	9	10	10	10	10	7	56
PHC	1	1			2		4
CHC	1	1			2		4
ASHA	8	7	10	7	9	5	46

Source: Field Survey, 2016



The institutions included in the survey were Health Sub-Centers(HSC), Primary Health Centers (PHC), Community Health Centers (CHC) and Accredited Social Health Activist (ASHAs). 56 respondents visited Sub-Centers and 46 visited ASHA during their pregnancy for consultation and examining their conditions. Therefore, all the respondents took ante natal measures during their pregnancy.

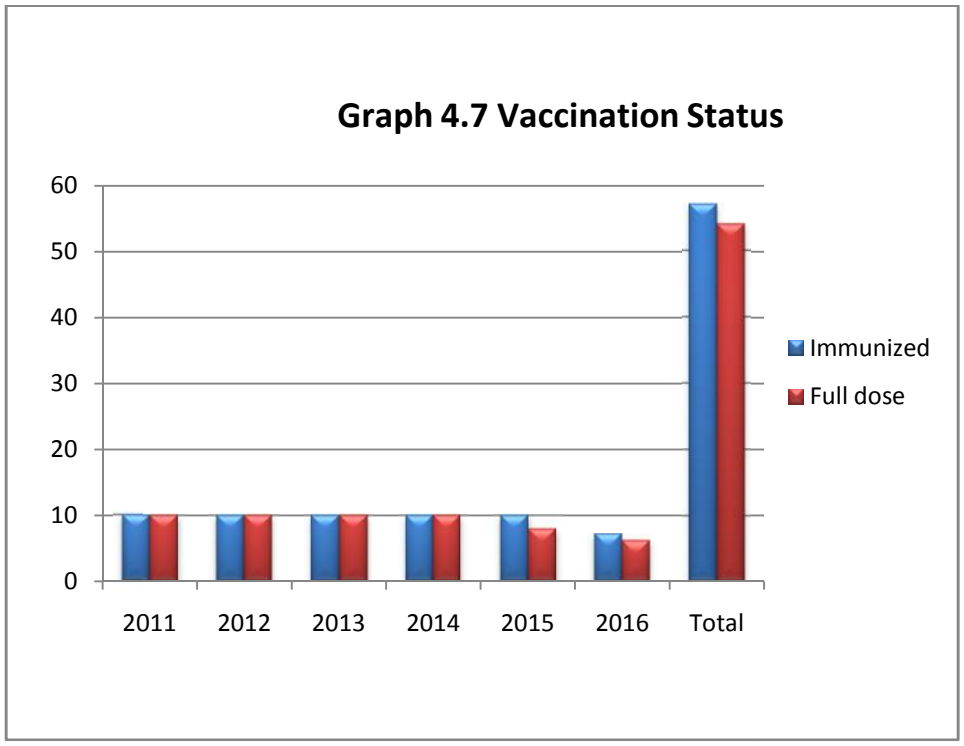
Vaccination protect pregnant women and their babies against serious diseases, this means that vaccination is a must during pregnancy. There are vaccines such as measles, mumps, rubella vaccines which

should be given a month or more before pregnancy. Other types of vaccines, like Tdap vaccines should be taken during pregnancy. The following Table 4.7 below deals with the immunization status of mothers during pregnancy.

Table 4.7: Vaccination Status of Mothers during Pregnancy

Status	2011	2012	2013	2014	2015	2016	Total
Immunized	10	10	10	10	10	7	57
Full dose	10	10	10	10	8	6	54

Source: Field Survey, 2016



From this table, it can be seen that 57 out of 57 respondents were vaccination. However, 3 respondents did not complete the full dose of immunization process. From this finding, we can say that lack of vaccination is not one of the causes of infant mortality in the study area.

Different tests or investigation has to be done during the process of pregnancy. Respondents were asked whether the routine procedure were followed in various tests such as testing on hemoglobin level, urine examination, blood pressure and body weights of the mother and the response reveals that these investigations were done at the required level.

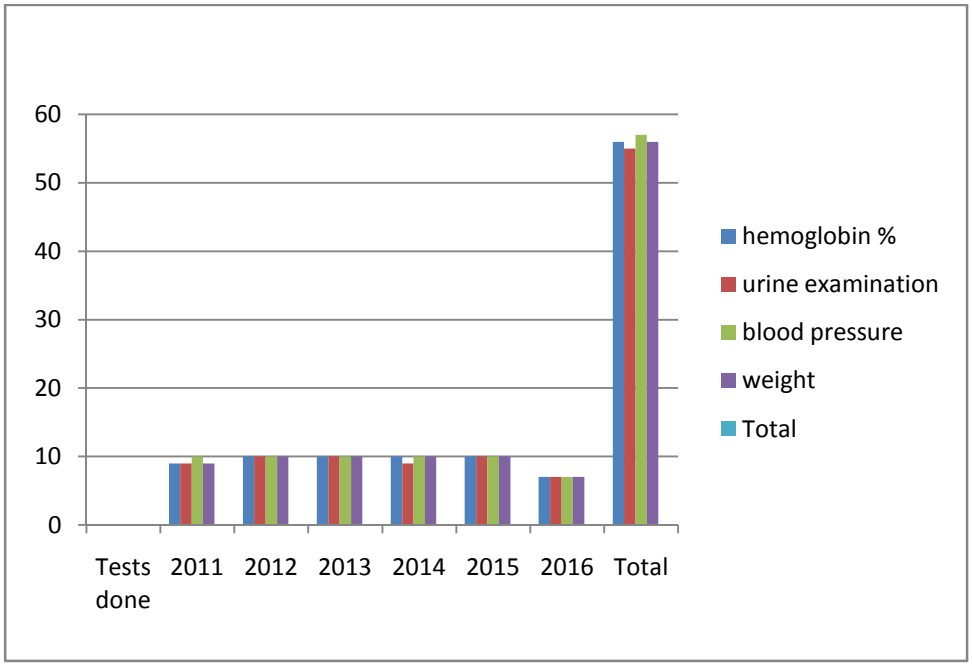
Routine examination is to be conducted during pregnancy where tests are done on mothers for these i,e., Hemoglobin level, urine, blood pressure and weight measurement. These tests are compulsory before every child delivery.

Table 4.8: Investigation Status of Mother

Tests done	2011	2012	2013	2014	2015	2016	Total
Hemoglobin %	9	10	10	10	10	7	56
Urine examination	9	10	10	9	10	7	55
Blood pressure	10	10	10	10	10	7	57
Weight	9	10	10	10	10	7	56

Source: Field Survey, 2016

Graph 4.8: Investigation Status of Mother



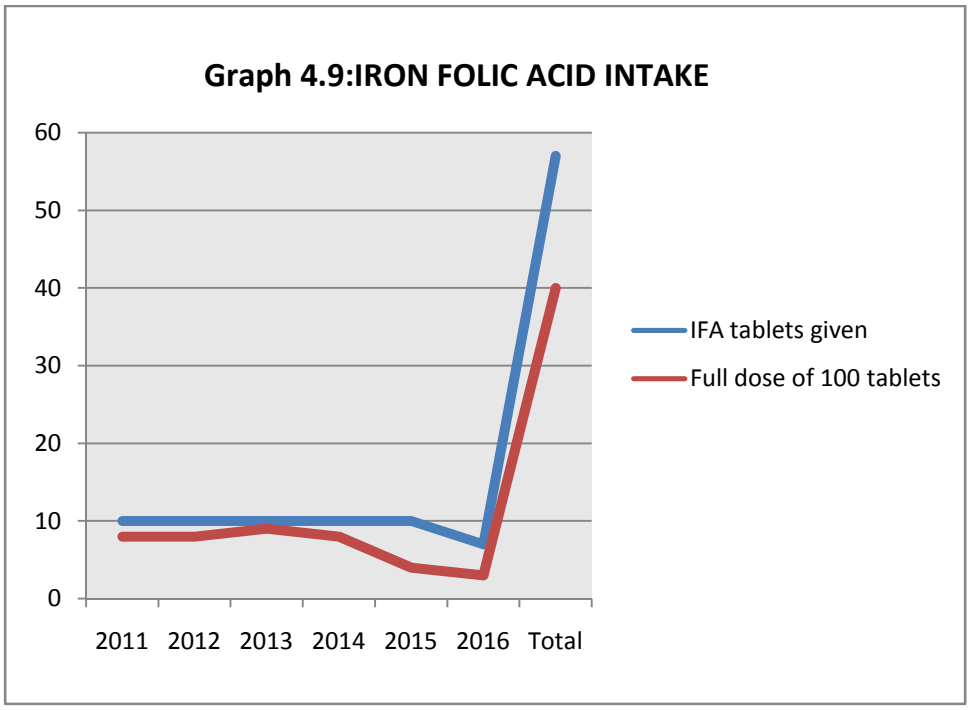
The table above shows that mothers took serious precaution to have full investigations before giving birth.

Daily oral iron and folic acid supplementation is recommended as part of the antenatal care to reduce the risk of low birth weight, maternal anaemia and iron deficiency which may also cause death of infants especially during the first trimester.

Table 4.9: Intake of Iron Folic Acid (IFA) Tablets by Mother

Intakes	2011	2012	2013	2014	2015	2016	Total
IFA tablets given	10	10	10	10	10	7	57
Full dose of 100 tablets	8	8	9	8	4	3	40

Source: Field Survey, 2016



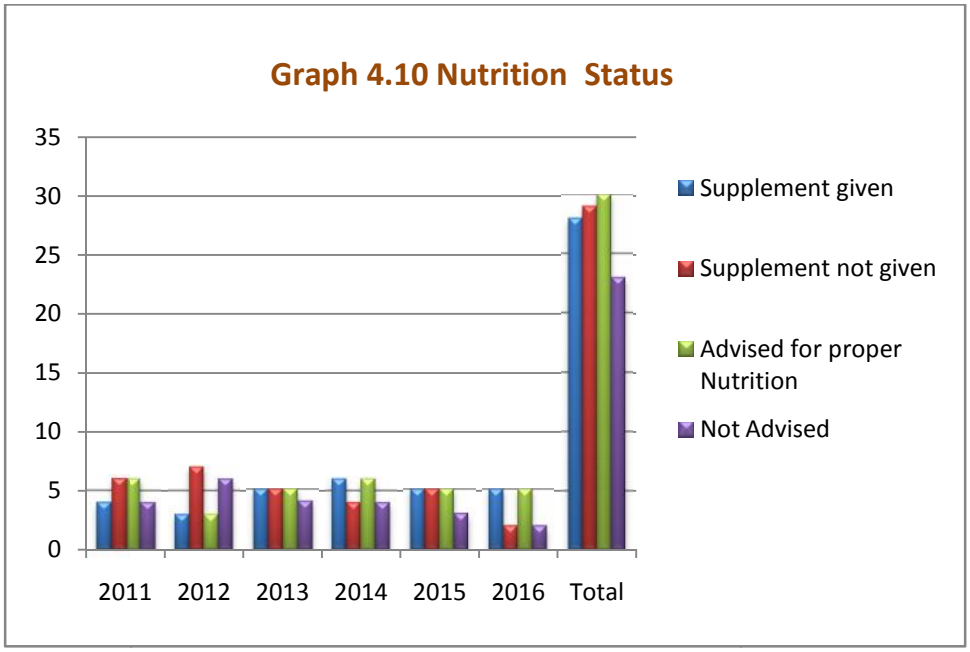
In Table 4.9, the intake of Iron Folic Acid Tablets by the respondents is shown, 57 respondents received the full dose of IFA tablets but only 40 of them actually consumed the full dose. Therefore, it can be concluded that lack of IFA intake is an attributing factor contributing to infant mortality in Saiha Town.

Approximately 300 extra calories are needed daily to maintain a healthy pregnancy. These calories should come from balanced diets of proteins, fruits, vegetables, and whole grains, with sweets and fats kept to the minimum. A healthy, well-balanced diet during pregnancy can also help to minimize some pregnancy symptoms such as nausea and constipation. In India, Integrated Child Development Services (ICDS) schemes provide supplementary nutrition for pregnant and lactating women to enhance the capability of the mother to look after the normal health and nutritional needs.

Table 4.10: Supplementary Nutrition from ICDS

Status	2011	2012	2013	2014	2015	2016	Total
Supplement given	4	3	5	6	5	5	28
Supplement not given	6	7	5	4	5	2	29
Advised for proper Nutrition	6	3	5	6	5	5	30
Not Advised	4	6	4	4	3	2	23

Source: Field Survey, 2016



28 mothers received nutrition while 29 mothers did not receive supplementary nutrition provided by ICDS in their respective areas. Out of these 57 respondents, only 30 were advised properly for proper nutrition and 23 mothers were not. Therefore, it can be said that supply of nutrition is inadequate and proper advice on how to consume these supplements were not given.

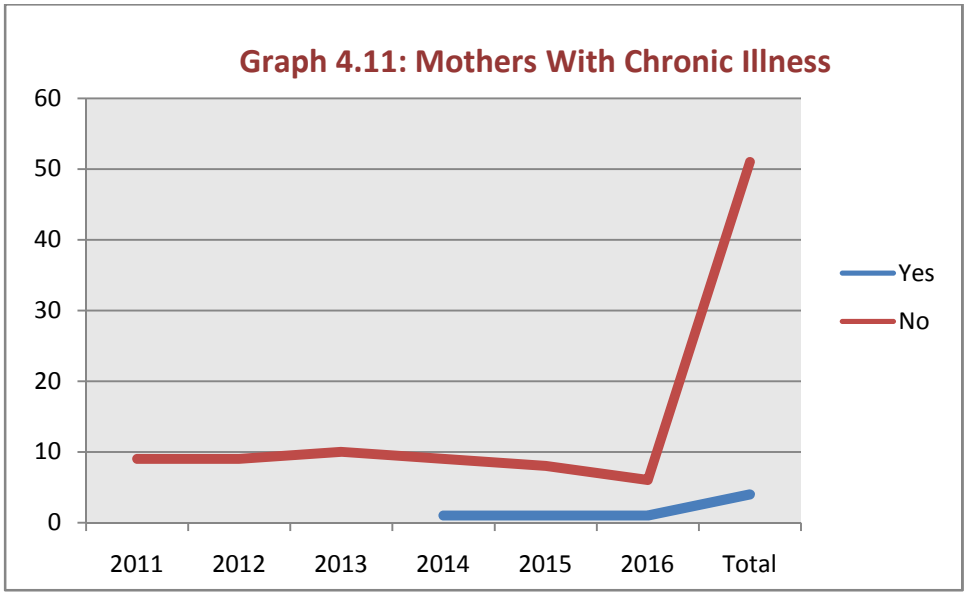
Proper advice by experts in taking proper care of infants . Advice on how to breastfeed the child, to keep them warm and cleanliness is vital for healthy child.

Health status of mothers during pregnancy played an important role in the survival of their infants. Chronic illness of mothers can be a factor that can cause detrimental growth to their child. This study attempted to find the health condition of the respondents during or before giving birth to their child.

Table 4.11: Health Status of Mothers During Pregnancy

No. with Chronic Illness	2011	2012	2013	2014	2015	2016	Total
Yes	**1**			**1**	**1**	**1**	**4**
No	**9**	**9**	**10**	**9**	**8**	**6**	**51**

Source: Field Survey, 2016



4.11 show whether the respondents within the study area has any chronic illness during pregnancy. 51 mothers claimed that they did not suffer from any illness during pregnancy and 4 claimed they suffered from heart conditions. Thus, in Saiha Town, Chronic illness of mothers during pregnancy cannot be counted as contributing factor to infant mortality.

Mizoram is one of the highest consumers of Tobacco products and this does not leave out pregnant women as well. Tobacco consumption is mostly done in a form of smoking and chewing. The table below presents the consumption habits of the respondents.

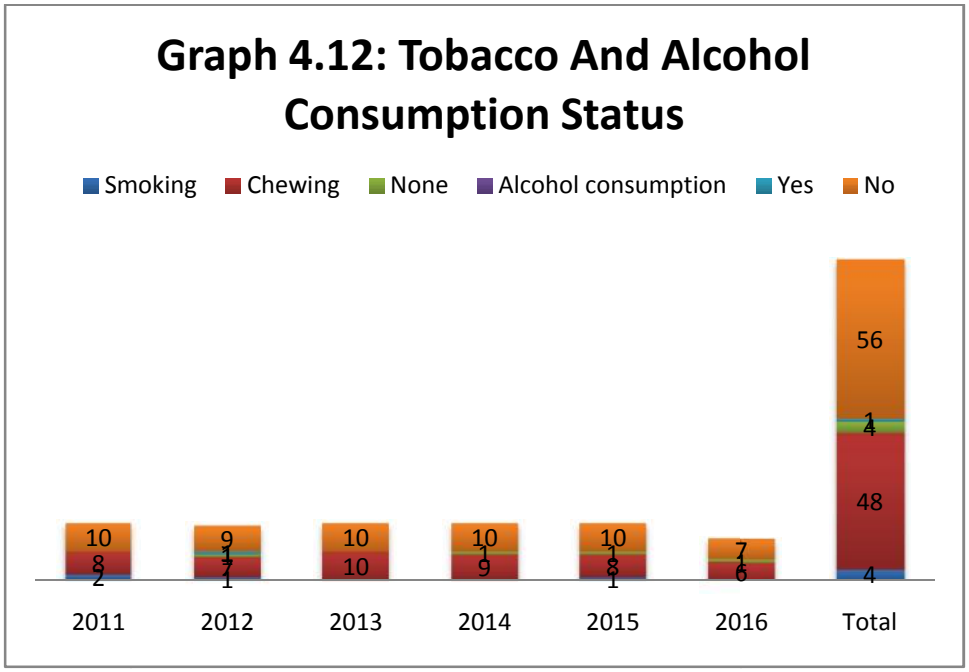
In Table 4.12, consumption habits of tobacco and alcohol of the respondents is analyzed. The table is divided into two sections where the first section showed tobacco consumption habit of the responding mothers and the second section showed the status of alcohol consumption of mothers in the study area. From 2011- 2016(June) 48 mothers consumed chewing tobacco and 4 mothers consume tobacco in the form of smoking while 4 mothers did not consume any type of tobacco. Alcohol consumption status shows that 53 respondents did not consumed alcohol. Our study therefore

shows that consumption of tobacco contributes to reducing health status of women, which eventually effects infant's health.

Table 4.12: Tobacco and Alcohol Consumption Status

Tobacco consumption	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Smoking	2	1			1		4
Chewing	8	7	10	9	8	6	48
None		1		1	1	1	4
Alcohol consumption							
Yes		1					1
No	10	9	10	10	10	7	56

Source: Field Survey, 2016



Awareness of ill effect of smoking and alcohol is vital in general and more importantly for pregnant and lactating mothers. Lack of this knowledge can cause serious ill effect upon the infant as well as the mother and can lower the degree of survival of the child and mother and healthy growth of both the subjects. Knowledge and awareness towards this is also enquired where 49 respondents claimed that they are aware of the ill effect of smoking and alcohol consumption while 8 mothers are not aware of it.

4.4 POST NATAL CARE

The post natal period is a critical phase in the lives of mothers and newborn babies. Most infant deaths occur during this time. Yet, this is the most neglected period for the provision of quality care. Some women gave birth at home with a skilled attendant; others may not have a skilled attendant present. Some women who gave birth at a facility will have to spend more time in the facility following childbirth. WHO recommends that a woman is not to be discharged before 24 hours after birth. Following childbirth at home, it is important that the mother and baby receive a postnatal examination as early as possible, preferably within 24 hours. In our study, condition of post natal check up is examined by asking the

respondents where deliveries were made, who performed the delivery and if breastfeeding is done at the right time and also if any post natal check up is done after few weeks of delivery. The results are shown in the following tables.

Table 4.13 (a): Delivery Status

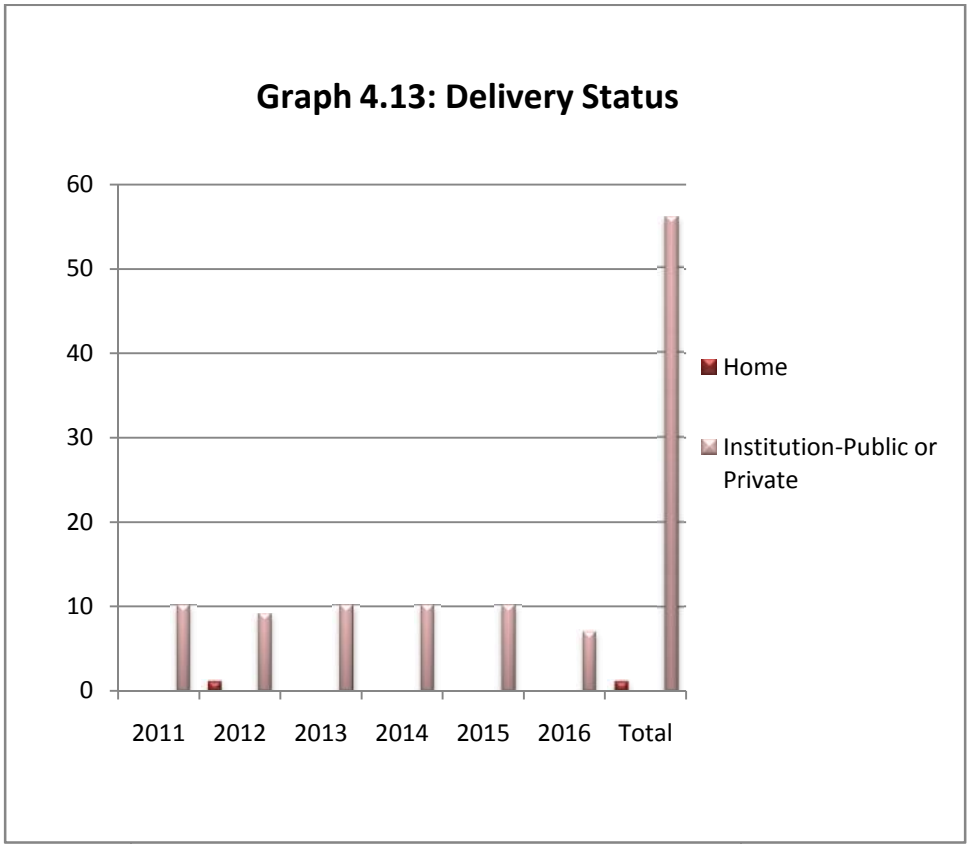
Delivery Status	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Place of delivery							
Home		1					1
Registered Medical Practitioner (RMP)							
Institution-Public or Private	10	9	10	10	10	7	56
Delivery performed by							
1)Gynecologist	1						1
2)MBBS Doctor	2		5	5	1	2	15
3)ANM	8	9	6	6	9	5	43
4)RMP							
5)local Dai-Trained or Untrained	1	2		1			4

Source: Field Survey, 2016

4.13 (b): **Satisfaction Level of Mother at time of delivery**

Response	2011	2012	2013	2014	2015	2016	Total
Yes	10	9	10	9	10	6	54
No				1		1	2

Source: Field Survey, 2016



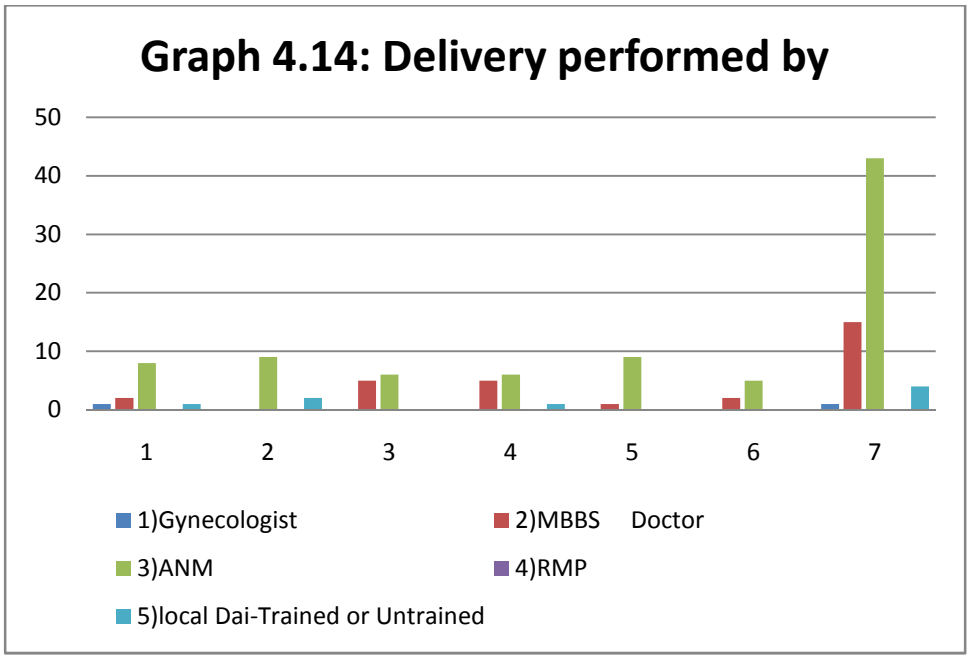


Table 4.13 indicates that there exist high preference of institutional deliveries among the responding mothers where 56 mothers had their delivery in an institution, be it public or private where the study also reveals that these deliveries were performed mostly by Auxilliary Nurse Midwives followed by MBBS Doctors and 4 delivery were performed by local Dai Trained or untrained. The study also reveals the satisfaction level of mothers about their deliveries in these institutions- public or private where 56 mothers responded as quite satisfactory.

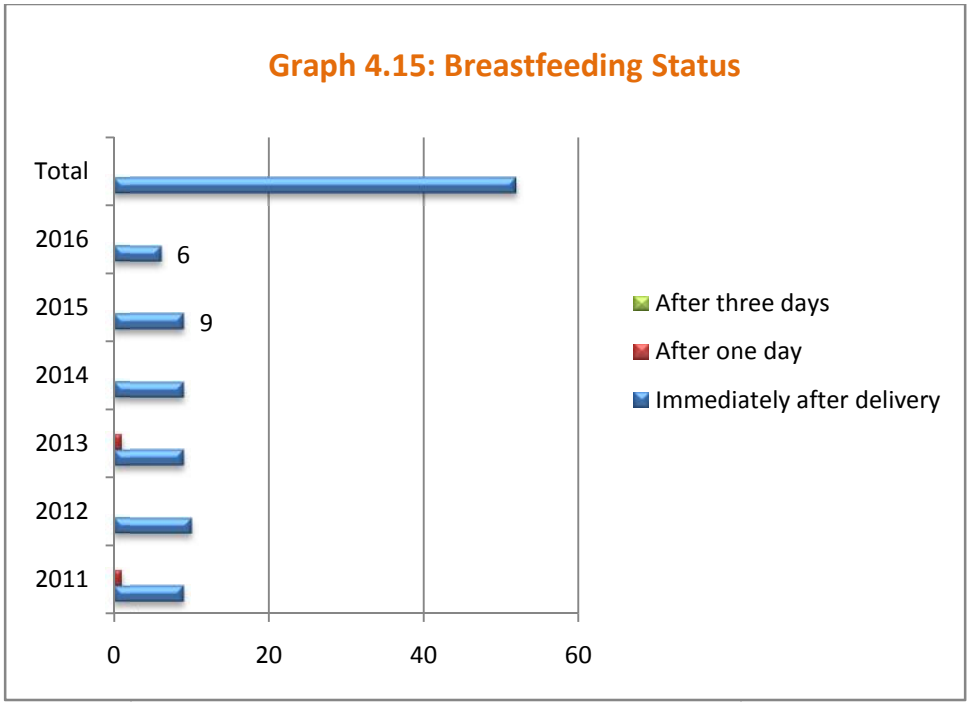
Post natal visit is an important opportunity for mother and child as it ensures the establishment of breastfeeding and addresses any difficulties with attachment and positioning. Studies have shown that

breastfeeding is the single most effective way to prevent infant death; early and exclusive breastfeeding improves newborn care and reduces neonatal mortality, which contributes to the majority of infant deaths. This care taken by mothers in our study is shown in the table below.

Table 4.14: Breastfeeding

Time of first breastfeeding	2011	2012	2013	2014	2015	2016	Total
Immediately after delivery	9	10	9	9	9	6	52
After one day	1	-	1	-	-	-	-
After three days	-	-	-	-	-	-	-

Source: Field Survey, 2016



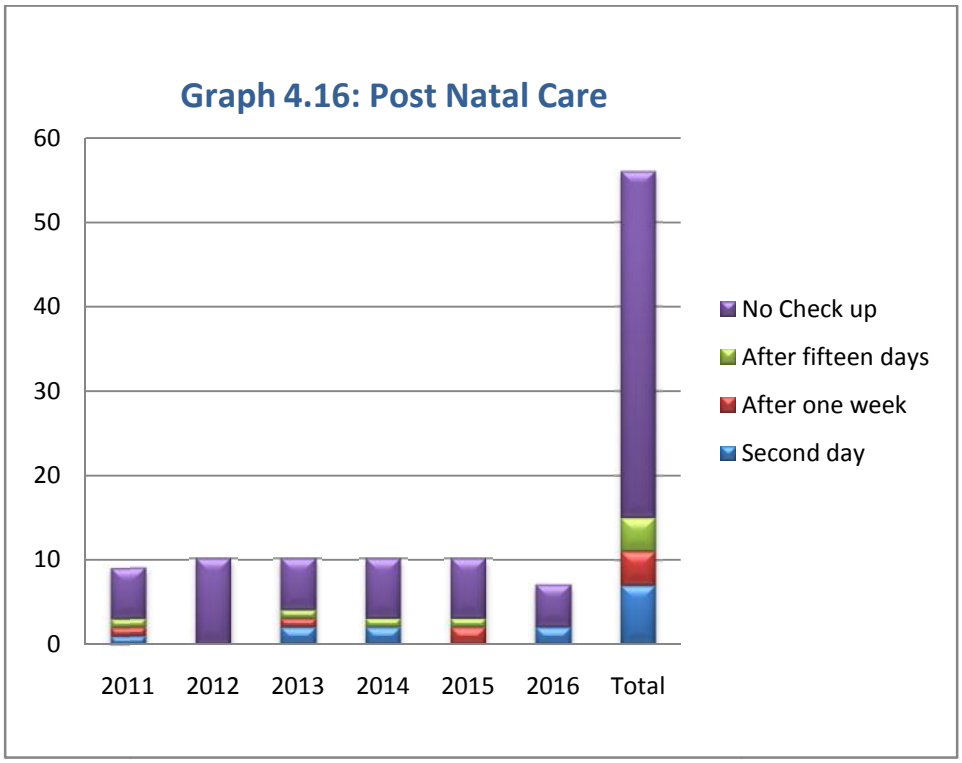
The result indicates that 52 responding mothers breastfed their infants immediately after delivery and 2 respondents breastfed their child after one day. Therefore, our study reveals that mothers breastfed their infants immediately after birth which increases the likelihood of infant survival which is also beneficial to mothers, such as improved lactation and less loss of blood.

Post natal visits to an institution or by experts at home are crucial especially for the first six weeks after delivery.

Table 4.15: Post Natal Care

No. of check up after first delivery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Second day	1		2	2		2	7
After one week	1		1		2		4
After fifteen days	1		1	1	1		4
No Check up	6	10	6	7	7	5	41

Source: Field Survey, 2016



Post natal checkup done by mothers after their first deliveries between 2011 to 2016(June) is shown in the table 4.18 below where the result shows that 41 responding mothers did not go for any kind of post natal check up after delivery of child. 7 mothers went for post natal check up in the second day of delivery and 4 mothers went after one and another 4 after 15 days.

4.5 INFANT CARE

As for the mother and families, there are also some signs for the newborn to be identified and respond to. They has to be advised to seek care immediately if the baby developed difficulty in breathing, fever, bleeding, not feeding etc. A baby who had difficulties breathing at the time of birth and needed resuscitation should be carefully monitored over the next 24 hours. Mothers who are very young; who involved in hard physical work during pregnancy; or who are over- or underweight, or have suffered from malaria or other infection during pregnancy are at a greater risk of giving birth to a low birth weight baby. All these symptoms have to be carefully watched over immediately after birth of the infant, which is more crucial in the first few weeks. Table 4.19 reveals the various symptoms of illness developed by infants and place where these symptoms were treated.

Table 4.16: Symptoms Developed after Birth

Symptoms developed after birth	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Yes	3	3	4	5	3	-	18
No	7	7	6	4	7	5	36
Type of symptoms							
Fever	1	1	2	5	1	-	10
No Cry	1	1	1	1	-	-	4
Rigidity	-	-	-	-	-	-	-
Drowsiness	-	-	-	-	-	-	-
Not taking feed	1	2	1	1	1	-	6
Others	1		1		1	-	3
Place of care							
Home	-	1	-	1	-	-	2
Hospital	3	2	4	4	3	-	16

Source: Field Survey, 2016

There are 36 responding mothers who said that their infants did not develop any symptoms of illness after birth and 18 mothers claimed that their infant developed some symptoms. Among these 10 infants developed fever, 4 infants did not cry after birth, 6 infants are not taking feeds. The study also showed that only 2 infants were treated at home and 16 infants were taken care of at the local hospital. Thus,

our study shows that many infants developed illness in the first few weeks and these symptoms were mostly treated in the hospital. From the empirical analysis, it can be said that just over 33 % infants developed illness after birth and these infants were treated in the Saiha hospital. Even though they were treated in the hospital, these infants could not survive. Thus, we concluded that facilities provided and the treatment procedures are not satisfactory.

Immediate attention is required to treat infants who developed any of the above symptoms, especially by experts. Neglect in this area could proof fatal to infants. Table 4.20 shows treatment of sick infants by experts.

Table 4.17: Treatment of Sick Infant

Medical Practitioners	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Doctor	2	2	3	6	2	1	16
ANM	-	1	-	1	-	-	2
ASHA	-	-	-	-	-	-	-
RMP	-	-	-	-	-	-	-

Source: Field Survey, 2016

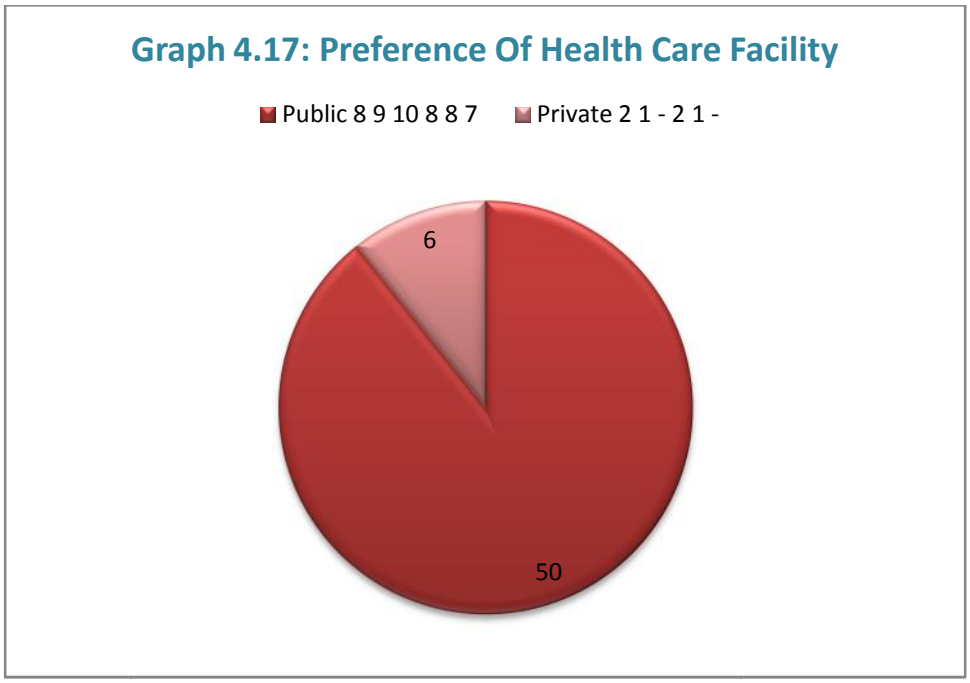
The infants were treated Doctors, Auxilliary Nurse Midwife (ANM), Accredited Social Health Activist (ASHA) or Registered Medical Practitioner (RMP). From the table, it can be seen that 16 sick infants were attended by doctors and remaining 2 by Auxiliary Nurse Midwife. Therefore, from this finding, it can be concluded that medical care provided by the institution in Saiha town is not satisfactory for treatment of infants and also there are only few numbers of pediatricians to care for sick infants.

It is also important to note that when infants are sick, it matters where caretakers takes them for treatment. Instead of taking care of the sick infant at home with blind treatment, it is much more safe and logical to visit a facility where appropriate measures and tools and treatment can be given at the right time.

Table 4.18: Preference of Health Care Facility

Place	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Public	8	9	10	8	8	7	50
Private	2	1	-	2	1	-	6

Source: Field Survey, 2016



When ask about the preferences of the respondents of the health care facilities in their respective area, 50 mothers revealed their preference for a public institution as most of the respondents rely on the cheaper health facilities provided by the Government and 6 preferred private institutions and when asked the reasons for this choice, most of the respondents claimed to have been advised by a Doctor to visit private institutions. This is the case when infant's health condition is severe, where public facilities failed to provide adequate condition for the treatment of the sick infants or even for a routine check- up. Therefore, mothers prefer public institutions over private as the former provides cheaper medical access.

The three major causes that accounts for all neonatal deaths in India are prematurity and low birth weight, neonatal infections and birth asphyxia. Most infant deaths in India are not medically certified since majority occurs at home in rural areas and without prior attention by a healthcare worker. The various diseases that caused infant deaths in our study area are birth asphyxia, low birth weight, infections, hypothermia, septicemia etc.,. as presented in the table 4.22 below.

Table 4.19: Diseases of Infants

Causes of death	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Birth Asphyxia	-	-	-	-	1	-	1
Low Birth Weight	1	1	-	2	-	-	4
Infection	2	3	3	3	2	1	14
Hypothermia	-	1	-	-	-	1	2
Septicemia	3	1	1	2	1	1	9
Pneumonia	-	1	1	1	2	-	5
Fever	-	1	-	-	-	-	1
Unknown	3	2	5	2	4	3	19
Others	1	-	-	-	-	1	2

Source: Field Survey, 2016

Findings from the survey reveals the various causes of infant deaths from 2011 to 2016 (June) shown in Table 4.24 which includes birth asphyxia, Low Birth Weight, Infections, Hypothermia, Septicemia, pneumonia etc,. The unknown reason claimed the highest fatality among infant deaths followed by infections and septicemia. This is based on knowledge of mothers on the conditions of their infants. Some responding mothers knew the exact cause of their infant's death while some did not.

The table above presents 17 infants who developed infections within the first of birth. It also shows that these infections were mostly treated in the hospital and the process of treatment was done by auxiliary nurse midwives.

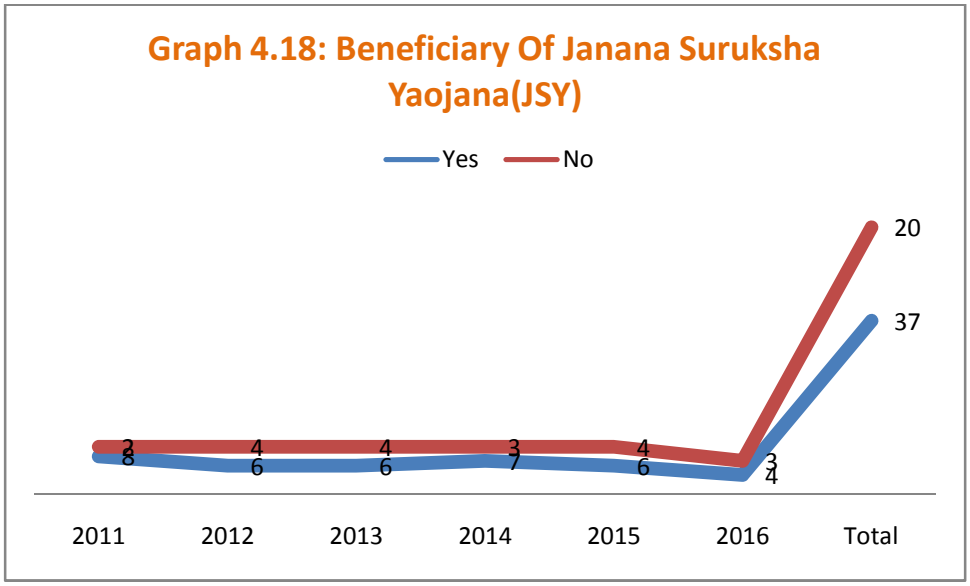
Janana Suruksha Yojana (JSY) is a safe motherhood intervention under the National Rural Health Mission (NRHM). It is implemented with the objective of reducing maternal and neonatal mortality by promoting institutional delivery among poor pregnant women. It was launched in April 2005 by modifying the National Maternity Benefit Scheme (NMBS). This scheme provides financial assistance of Rs. 500/-per birth up to two live births to the women who have attained 19 years of age and belong to the Below Poverty

Line (BPL). Beneficiary of this scheme among our study group is mentioned in the table 4.27 below.

Table 4.20: Beneficiary of Janana Suruksha Yojana (JSY)

JSY	2011	2012	2013	2014	2015	2016	Total
Yes	8	6	6	7	6	4	37
No	2	4	4	3	4	3	20

Source: Field Survey, 2016



Our analysis show that only 37 women are beneficiary to the scheme while, 20 women are not benefitted to this scheme. Since this scheme aim to promote institutional delivery, our result suggested that more awareness about the scheme in Saiha town so that every delivery will be institutionalized which will directly impact infant health care during the time of birth.

FINDINGS

We selected indicators such as contraceptive use, birth interval, vaccination, supplementary nutrition, chronic illness, consumption of tobacco to examine whether they are a factor that causes infant mortality in Saiha District. (*Objective No. 1*)

- Contraceptives use by mothers is not a contributing factor to infant mortality in Saiha Town.
- Narrow gap in birth intervals is one of the reasons that causes continual rise in IMR in Saiha Town.
- Lack of vaccination is not one of the causes of infant mortality in the study area.
- Lack of Iron Folic Acid (IFA) intakes of mothers during pregnancy is an attributing factor contributing that causes infant mortality in Saiha Town.
- The supply of nutrition by ICDS is inadequate in the study area and proper advice on how to consume these supplements were not given to pregnant women.
- Chronic illness of mothers during pregnancy cannot be counted as relevant factor that contributes to infant mortality rise in Saiha town.

- Consumption of tobacco contributes to reducing health status of women, which eventually effects infant's health.
- Over 33 % infants developed illness after birth and these infants were treated in the hospitals of Saiha Town. Even though they were treated in the hospital, these infants could not survive. Thus, we concluded that facilities provided and the treatment procedures are not satisfactory.

(*Objective No. 2*)

- Deaths of infants are not uniformly distributed during the first year of infant life. They occur mostly in the first three months, then, diminished gradually at a declining rate through the rest of the first year. (*Objective No. 3*)
- Male-female variations in infant mortality from 2011-16 show that male mortality among infant deaths assumes a higher position each year. (*Objective No. 3*)
- Medical care provided by the institution in Saiha town is not satisfactory for treatment of infants and also there are only few numbers of pediatricians to care for sick infants. *This finding placated our first research question whether lack of availability of medical care is a contributing factor to infant mortality in Siaha.*

- An unidentified cause claimed the highest fatality among infant deaths followed by infections and septicemia. There is no specific measure adopted so far by the government to eliminate these diseases. *This finding supported our second research question about the two main diseases that caused infant mortality in Saiha District and whether the State government adopted any measures to reduce these two diseases.*

- Our study reveals that mother's breastfed their infants immediately after birth which increases the likelihood of infant survival which is also beneficial to mothers, such as improved lactation and less loss of blood.
- Among the respondents, mothers with high school qualification occupied the highest, followed by middle and primary level. Mothers with graduate and above degrees are minimal. Respondents are all literate and are expected to have basic knowledge of child health care.
- The study reveals that maximum numbers of the respondents are married for more than ten years and the age of these respondents are between 25 and 30 years are highest in numbers. This indicates that women in our study area are married and delivered children within the ideal time of pregnancy i.e., 25 to 30 years of age.

- Our study also analyzed the average health expenditure per month of each family where, most family spent between Rs 1000 to Rs 3000 per month. Among our respondents, the main sources of income come from self employment- earning daily wage and higher income group are mostly salaried government employees.
- The size of family among the study group range from 5to 7 members. Also, all respondents belong to Scheduled Tribe (ST).
- Mothers prefer public health institutions over private as the former provides cheaper medical access.
- Janana Suraksha Yojana (JSY) benefitted maximum number of the respondents.

SUGGESTIONS

- It is important to assess women's perception and awareness of the effect of birth interval of mothers. Optimal birth interval is to be at least 3 years or more for healthy outcome of both the mother and infant. This information can be provided from health facilities, mass media, family members and friends. There is need for in depth education on the benefits of appropriate birth spacing to be included in outreach programs on maternal and child health.
- Aspect of prenatal care information are most effectively encouraged and monitored through meetings with a skilled health

worker before, during and after pregnancy. The implementation of law of minimum age for marriage, expansion in maternal health insurance, easy access to health facilities and participation of husband in prenatal care must be initiated for enhancing the utilization of quality source of prenatal care.

- To provide for pediatric specialists requirements there is need set up of pediatric hospital for providing specialized services and multi-disciplinary approach to the care of children and their families. There is also need for up gradation of existing saiha hospital infrastructure for infant care.
- There is need for more specialists in child care who provides preventive health maintenance and medical care with aims to reduce infant mortality, control infectious diseases, foster healthy lifestyles for families. Steps should be taken to attract these specialists in our study area such as attractive incentives, improving working conditions of pediatricians, good environment of work.
- The study area observed high number of infant deaths below three months. More initiatives are required to bring this number down by providing better care at home and in health facilities. More outreach programs are to be initiated among families about the importance of providing good environment for mother and child during pre and post natal period.

- Supplementary nutrition provided through ICDS to be monitored more closely and vigilantly by authorities and NGOs. Awareness among beneficial families must be raised. Mothers must be educated more on importance of having proper nutrition during and after pregnancy. Home visits by health workers to be more frequent and nutritional intakes be carefully monitored throughout the pregnancy process.
- Better skill trainer of ASHAs needed. Anti-tobacco and alcohol initiatives to be more rigorously implemented, this should covers not only mothers but all family members and the whole community. Health insurance for mother and child is vital and also ease of access to health facilities needed. For this, one call away counters to be set up in every health centers for medical emergencies and consultation. Govts initiative in saiha
- More awareness about the Janana Suruksha Yojana (JSY) scheme is necessary in Saiha town so that every deliveries will be institutionalized which will directly impact infant health care during the time of birth.
- Mother's exposure to mass media, use of clean cooking fuel, clean home surroundings, health intervention programmes should focus on illiterate mothers and on households that are poor, that are headed by members of scheduled castes or scheduled tribes, and that

lack access to a flush or pit toilet. Such programmes should make sure to reach both male and female children.

- Family health programmes should identify families with death experience and provide them with intensified health services and guidance. There must be spread of education, especially among the women in rural areas to reduce the infant mortality rate in the state as the educated women are more conscious regarding infant mortality. The level of income of the family must be increased to reduce the infant mortality rate in the society as one of the major causes of high infant mortality rate is poverty or low level of income of the family. Women upliftment at higher level is required. Vaccination process of mothers and child is to be at higher scale.

Lack of basic socio-economic infrastructure supporting infant survival in the study area played a major role in the increasing trend of infant mortality in Saiha District. More efforts on the part of the Government of Mizoram and various agencies as well as its people in general are requisite so as to reduce infant deaths in the district. The findings and suggestions is hoped to have some policy implications for the policy makers for reducing infant mortality in Saiha District as well as the State of Mizoram.

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