

UNIVERSITY FOR DEVELOPMENT STUDIES

**ASSESSING THE FACTORS CONTRIBUTING TO LOW COVERAGE OF EXPANDED
PROGRAM ON IMMUNIZATION (EPI) IN THE KASENA NANKANA MUNICIPAL
OF GHANA**

BY

LARLE KWABENA FRANCIS

2018



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(UDS/CHD/0259/16)

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SCHOOL OF ALLIED HEALTH SCIENCES, UNIVERSITY FOR DEVELOPMENT
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DECLARATION

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Larle Kwabena Francis
(Student name)	Signature	Date

I hereby declare that the preparation and presentation of this thesis was supervised by me in accordance with the guidelines on supervision of the thesis laid down by the University for Development Studies.

Dr. Thomas Azongo
(Name of Supervisor)	Signature	Date



DEDICATION

I dedicate this thesis to my family members especially my wife (Akamah Patience Akisiba), my daughter (Angella Atiswin Larle Francis) and my principal (Alhaji Abdul Rafiu Agboola all those who will use the work one day as a reference documents.



ABSTRACT

Immunization is one of the world's most cost-effective health interventions that help prevent childhood diseases. However, many infants especially in developing countries are not usually fully vaccinated. This study was conducted to assess the factors contributing to low coverage of expanded program on immunization (EPI) in the Kasena Nankana Municipal of Ghana. The study employed an analytical cross sectional study design. Simple random sampling technique was used to sample the study participants. In all 134 respondents made up of 120 lactating mothers with babies aged 0-23 months and 14 health care workers formed the study population. The analysis was done using Statistical Package for Social Sciences (SPSS) Windows Version 22.0 and Microsoft Word 2013 and results presented in the form of descriptive and inferential statistics. Findings showed that, all the study respondents indicated that they had ever heard of immunization with majority (87.5%) identifying the health centres as their sources of knowledge. Findings further showed that, age of mothers was positively associated with the uptake of immunization of their babies ($p < 0.001$). Also, 30% of the babies did not have scar present on the right hand of the child which showed most (34%) of the babies to be partially immunized at the time of the study. From the results, majority of the respondents identified side effects of vaccination (81.7%), long distance to the nearest health centre (76.7%) and vaccines out of stock (40.8%) as factors affecting immunization of babies at the study area. The study concluded that, knowledge of lactating mothers concerning immunization was adequate except that the uptake of vaccination among babies was found to be low. The study recommends more health education by healthy workers on importance of immunization at the study place.



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LIST OF ACRONYMS

EPI	Expanded Programme on Immunization
WHO	World Health Organization
DPT	Diphtheria-Pertussis-Tetanus
TT	Tetanus Toxoid
NIP	National Immunization Programme
KNM	Kasena Nankana Municipal
BCG	Bacillu Calmette Guerin
CDC	Centers for Disease Control
DTaP	Diphtheria-tetanus-acellular Pertussis
REALM	Rapid Estimate of Adult Literacy in Medicine
ANC	Antenatal Care
MMR	Measles-Mumps-Rubella
HBM	Health Belief Model
SPSS	Statistical Package for Social Sciences



CHAPTER ONE

Introduction

1.1 Background of study

Mothers play an important role in immunization of their children. A target of 95% immunization coverage is necessary for the sustained control of vaccine preventable diseases (Coleman, Howard & Jenkinson, 2011). Immunization has saved over 20 million lives in the last two decades (Adeolu, 2001). This is because more than 100 million infants are immunized each year in the world against vaccine preventable diseases (Do & Hotchkiss, 2013; Adeolu, 2001).

Immunization is defined as the creation of immunity against a particular disease (Zhao & Luman, 2010). It could be the treatment of an organ and/or making a body immune to subsequent attack by a particular pathogens through giving of vaccine (Mutua, Kimani-Murage & Ettarh, 2011). These vaccines protect individuals at risks of acquiring infection by inducing a variety of immune mechanisms (Parve, 2004).

Vaccination provide protection to the individuals who receive the vaccine, as well as the community by the prevention and reduction of the spread of the vaccine preventable diseases (herd immunity) (Mutua, Kimani-Murage & Ettarh, 2011; Cui & Gofin, 2007). Vaccines stimulate a protective immune response against acute and chronic infectious diseases (Angela, Fakunle, Fajola & Edet, 2012). Immunity so acquired can be active or passive (Parve, 2004).

Vaccines are among the most cost-effective and successful public health treatments available for preventing diseases and death in the world (Etana & Deressa, 2012). The timely delivery of childhood vaccinations helps to increase protection from vaccine preventable diseases while minimizing risks to the child and decreasing the chance of outbreaks of the disease (Mohamud, Feleke, Worku, Kifle & Sharma, 2014; Coleman, Howard & Jenkinson, 2011).





The Expanded Programme on Immunization (EPI) was initiated by the World Health Organization (WHO) in 1974 to control vaccine preventable diseases worldwide (Expanded Programme on Immunization (EPI, 1998). These diseases are diphtheria, polio, tuberculosis, measles, pertussis and tetanus (Zhao & Luman, 2010).

Ghana launched the Expanded Programme on Immunization (EPI) in June 1978 with six antigens – BCG, measles, diphtheria-pertussis-tetanus (DPT) and oral polio for children under one year of age together with tetanus toxoid (TT) vaccination for pregnant women. The launch was in response to the national health policy to reduce morbidity and mortality of vaccine preventable diseases which then contributed significantly to both infant and child mortality in the country (Mutua, Kimani-Murage & Ettarh, 2011).

It was also in consonance with the immunization policy of the government which sought to ensure that all children receive these vaccines before their first birthday of life (Angela, Fakunle, Fajola & Edet, 2012). In 1992, fourteen years after the launch, the government added Yellow Fever vaccination to the National Immunization Programme (NIP).

The Polio Eradication Initiative (PEI) introduced in 1996 offered a major boost to the NIP through the resources offered for capacity building at all levels, funds for operational activities, adequate cold chain logistics, systems strengthening, partnerships, transportation facilities etc (Babalola, 2010; Owolabi, 2010).

In most developed nations, immunization programmes have had dramatic success in reducing morbidity and mortality rate significantly. Such programmes have helped in the eradication of diphtheria, measles, neonatal tetanus, pertusis and poliomyelitis (Ateudjieu, 2013; Rogie, 2013).

1.2 Problem statement

Although, about three quarters of the world's children's population is reached with the required vaccines, only half of the children in Sub-Saharan Africa get access to basic immunization (Kidane, 2006; Mosiur & Sarker, 2010). In the year 2012, reports revealed that, South Asia and sub-Sahara African countries accounted for 9.9 million and 9.6 million, respectively of the children that did not have access to immunization (WHO & UNICEF, 2013). In most of these countries poor functioning health service delivery system impeded the efforts to meet immunization targets (WHO & UNICEF, 2013).

Further, in poorer remote areas of developing countries, only one in twenty children have access to vaccination (WHO & UNICEF, 2013). Therefore, children living in remote areas and border areas are difficult to be reached. Also, most children lack access to vaccination due to social barriers such as lack of information by their caretakers or mothers, or lack of inspiration to get their babies vaccinated (WHO, 2010).

Reports from Nigeria have shown that the coverage of immunization has been fluctuating especially after the global universal childhood immunization efforts ended in 1990. This could have resulted from low political will and social support, inadequate funding and poor community involvement and participation in the program (Sadoh & Eregie, 2009).

From International comparative data, Nigeria and Ghana immunization coverage rates are among the worst in the world (WHO & UNICEF, 2013). Routine immunization coverage in Nigeria is one of the lowest national coverage rates in the world with 38% for January-December 2005 and 50% January-May 2011 (Sadoh & Eregie, 2009; Angela, Fakunle, Fajola & Edet, 2012).

The Ghana Health Service Report (2007) revealed low coverage of immunization of children aged 12-23 months of age. In the Kasena Nankana Municipality, EPI performance as against



national target has not been impressive. Successive years from 2013-2015 has constantly depicted a downward trend of immunization coverage of children aged 12-23 months. It has been reported that, most of the antigens have appreciated marginally but did not meet national target whilst measles declined slightly from the already poor performance from 59.8% to 59.6% in 2014 (KNM, 2015).

From the available data, inadequate levels of immunization against childhood diseases remain a significant public health problem in the study setting. The reasons for the incomplete vaccination and non-uptake of immunization services are poorly understood in the study area. To date, no empirical studies have been done to assess the reasons. This study was conducted to fill this gap.

1.3 General objective

The main objective of the study was to assess the factors contributing to low coverage of expanded program on immunization (EPI) in the Kasena Nankana Municipal.

1.4 Specific objectives

1. To examine the knowledge of lactating mothers with children aged 12-23 months on immunization in the Kasena Nankana Municipal
2. To determine the EPI vaccination coverage of children aged 12-23 months in the Kasena Nankana Municipal
3. To examine the likely factors affecting full immunization coverage of children aged 12-23 months in the Kasena Nankana Municipal
4. To assess the readiness of health facilities to provide vaccination services to mothers with children aged 12-23 months in the Kasena Nankana Municipal



1.5 Research questions

1. What is the knowledge level of lactating mothers with children aged 12-23 months on immunization in the Kasena Nankana Municipal?
2. What is the EPI vaccination coverage level of children aged 12-23 months in the Kasena Nankana Municipal?
3. What is the full immunization status of children aged 12-23 months in the Kasena Nankana Municipal?
4. Are health facilities ready to provide vaccination services to mothers with children aged 12-23 months in the Kasena Nankana Municipal?

1.6 Significance of the study

The findings from this study may be shared with the nurses and midwives in health facilities to receive the findings needed to develop a sound program of health care for lactating mothers with different social construction for immunization for their babies aged 12-23 months in the Kasena Nankana Municipal. The findings of this study when published would serve as a resource of reference material for baseline data in the study area concerning immunization status of babies. Information generated by the study would be useful for designing interventions and formulating health educational messages aimed at improving immunization coverage in the district.

The findings from this study also would benefit Governmental organizations such as the Ministry of Health (MoH), Ghana Health Service (GHS) and the Kasena Nankana Municipal Health Directorate concerning lactating mothers' knowledge of immunization and choice of it for their babies.



1.7 Scope of the study

Immunization uptake by people is a complex subject and the survey of it has many dimensions. The delimitations assisted the researcher to gather the data within the time framed for the study. The survey concentrated on only assessing the factors contributing to low coverage of expanded program on immunization (EPI) in the Kasena Nankana Municipal.

The study only examined the knowledge level of lactating mothers with children aged 12-23 months on immunization and assessed the EPI vaccination coverage of children aged 12-23 months. The study also identified factors affecting full immunization of children aged 12-23 months and looked at readiness of health facilities to provide vaccination services to mothers with children aged 12-23 months. Only lactating mothers with babies aged 12-23 months and health care workers formed the study population.

1.8 Conceptual framework

The researcher developed a conceptual framework for the study. A conceptual framework used in a study relates to a set of abstract related constructs whose purpose is to explain a phenomena of interest, express assumptions about the study variables and reflect a philosophical stance (Mutua et al, 2011).



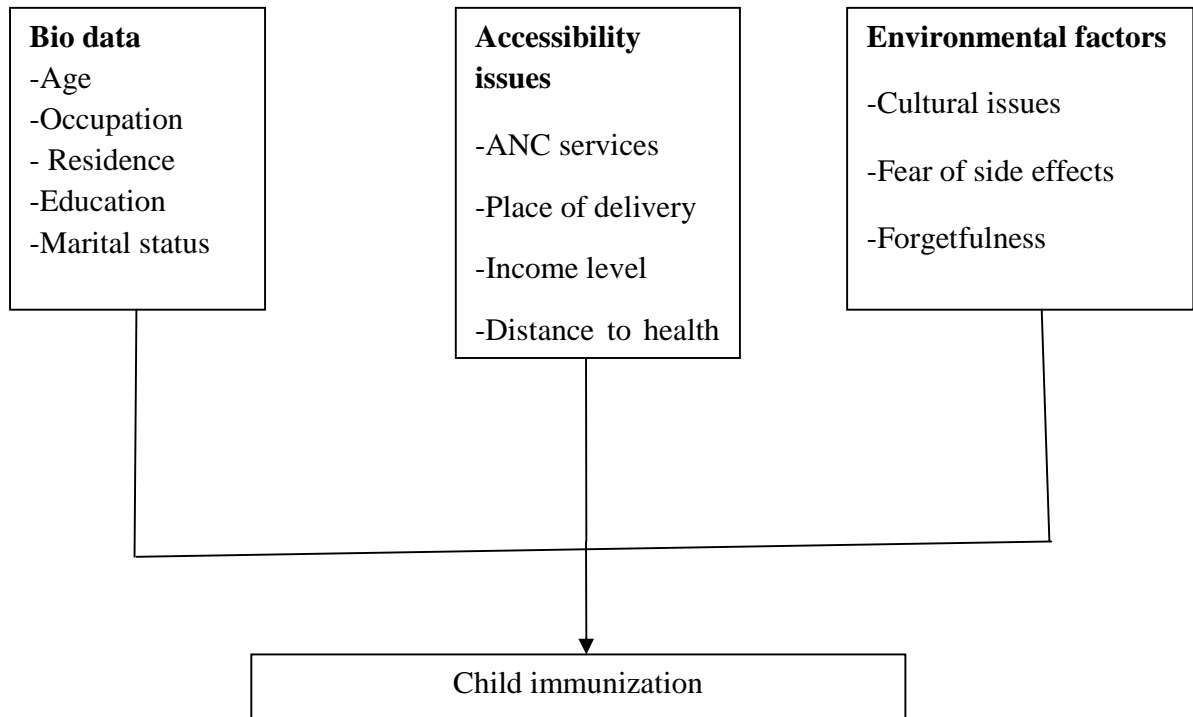


Figure 1.1: Conceptual framework

Source: Author's own construct, 2018

Figure 1.1 presents a conceptual model of multiple factors that influence immunization status of babies. The model depicts three interacting levels of influence which impact children immunization status: Demographic characteristics of the mother, accessibility issues and environmental factors. The demographic characteristics assumed to influence immunization status of children include the age and educational status of the mother while the accessibility factors that influence children immunization status are; distance to health care centres and ANC attendance. It is assumed that, mothers who attend ANC regularly may know the importance of immunization and are likely to send their babies for immunization whilst those who stay closer

to the health centre may also have the opportunity to visit the health centre regularly for health care of their babies.

Environmental factors may also influence the immunization status of children. For example in certain culture where mothers observed a period of seclusion from the outer world may prevent the mother from taking the child to the health centre for immunization. These identified factors tend to affect the lifestyle of the individual. When the mother's lifestyle is altered, it tends to affect the knowledge and perception of immunization which could affect the immunization status of the child negatively.

1.9 Operational definition of terms

- **Accessibility:** Measured according to mothers' verbal information on impression of the distance, time spent to reach the nearest vaccination site and the money spent on transport.
- **Correct vaccination:** The child was "correctly vaccinated" if it had a BCG scar and had received all the EPI vaccines.
- **Defaulter:** When the child missed at least one of the recommended vaccine
- **Dropout rate:** This is the rate difference between the first and the last dose
- **Full immunization:** Receiving all the required immunization vaccines (i.e. a dose of Bacille Calmette Guerin (BCG), three doses of oral polio (OPV), three doses of diphtheria, pertussis and tetanus (DPT) and one dose of measles by a child by age 12-23 months.
- **Missed opportunity:** If a child came to a health facility and did not receive the vaccination for which he or she was eligible.



1.10 Structure of the thesis

The study is organized into six chapters. Chapter one contains the introduction, the background of study, problem statement, objectives of the study, research questions, significance of the study, delimitations of the study, conceptual framework of the study and operational definition of terms. Chapter two reviews the relevance literature. Chapter three presents the methodology that was used in conducting the study.

It contains profile of the study setting, research design, study population, sampling technique, sample size determination, data collection procedures, sources of data collection, data validity and reliability, data processing and analysis and ethical considerations. Chapter four contains the data analysis and presentation and chapter five presents the discussion of the data from the respondents. Chapter six contains the summary of the research findings, conclusion and recommendations. There are appendices for the research tools used by this study.



CHAPTER TWO

Literature review

2.1 Introduction

This chapter presents a critique of the current relevant literature. It provides a context to the subject of this research and establishes a gap in the existing literature, providing a rationale for the study. A variety of sources and databases were used for the literature collection, including CINAHL, MEDLINE, Pro quest Nursing and Allied Health Source and Google Scholar.

2.2 Concept of immunization

According to the Center for Disease Control (CDC, 2012), the term immunization is often used interchangeably with the terms vaccination or inoculation. Immunization can be defined as “the process by which a person or animal becomes protected against a disease” (CDC, 2012, p 2). Vaccination can be defined as “injection of a killed or weakened infectious organism in order to prevent the disease” (Burns, Walsh & Popovich, 2010; p 23).

Immunization or vaccination is achieved by means of a vaccine, which is a product that generates immunity, consequently protecting the body from disease (CDC, 2012). Vaccines are highly regulated, complex biologic products designed to induce a protective immune response both effectively and safely (Etana & Deressa, 2012). Vaccines can be administered through injection, aerosol, or orally (Fischhoff, 2010).

The Expanded Programme on Immunization (EPI) was initiated by the World Health Organization (WHO) in 1974 to control vaccine preventable diseases worldwide (EPI, 1998). The World Health Organization launched the Expanded Program of Immunization (EPI) to make vaccines available to all children and thereby control vaccine preventable diseases worldwide (Mennito & Darden, 2010; O’Connor, 2011).





The vaccination of children, has led to a significant reduction in morbidity and mortality from different diseases, thereby lowering the infant mortality rate (Johner & Maslany, 2011; Kumar, Aggarwal & Gomber, 2010). Research has shown that, with the exception of provision safe drinking water, “no other human intervention surpasses the impact immunizations have had on reducing infectious disease and mortality rates, not even antibiotics (Smith, Lipsitch & Almond, 2011; Smith, 2010)

The routine immunisation schedule in most countries comprises six vaccine preventable diseases: namely measles, diphtheria, pertussis, tetanus, polio and tuberculosis (Kim, Johnstone & Loeb, 2011). Before the age of one year the schedule should be completed by all children (Bernard, 2000). Women of childbearing age should also be given tetanus toxoid (TT) vaccine to prevent neonatal tetanus (Adedayo et al, 2009).

Routine vitamin A distribution is often integrated within national EPI programmes, and targets children aged 6-59 months and post-natal mothers (Betsch, Renkewitz, Betsch & Ulshofer, 2010). Currently, the EPI administers eight vaccines: BCG (tuberculosis vaccine), oral polio vaccine (OPV), diphtheriapertussis- tetanus (DPT) vaccine, hepatitis B (HepB) vaccine, measles vaccine, yellow fever vaccine, and heamophilus influenza type B and tetanus toxoid (TT) vaccines (Coleman, Howard & Jenkinson, 2011).

According to the World Health Organization (2013), recommended schedule for routine immunization are BCG should be taken at birth; DPT should be taken at 6, 10 and weeks after birth; OPV should be taken at birth; 6, 10, 14 weeks and measles and yellow fever vaccine should be taken at 9 months.

2.3 Knowledge of lactating mothers with infants on immunization

Knowledge of lactating mothers is an important factor influencing immunization among infants (Takum et al, 2011). A number of studies indicate that mothers who have inadequate knowledge about immunization and immunization schedules were more likely to have children who are not immunized or partially immunized (Owolabi, 2010; Rogie, 2013).

Stamler (2012) conducted a mixed-methods research study with 15 lactating mothers with one child and 15 lactating mothers with more than one child, who brought their children to a childhood immunization clinic in Canada. They discovered that mothers had inadequate knowledge and comprehension regarding vaccine safety in their babies.

The findings revealed that only 23% of the study respondents knew of the importance of vaccination after taking their babies home whilst the rest had no knowledge on vaccine safety for their infants. The findings showed that majority of the study participants were very skeptical about the management of any side effects after vaccination. This prevented a good number of them from going to the health centres to have their babies immunized. The study concluded that knowledge of study participants was very low on childhood immunization.

Similarly, Machingaidze, Wiysonge and Hussey (2015) conducted an interviewed with 315 parents of children admitted to a hospital in North India using a semi-structured questionnaire to determine their reasons for partial immunization or non-immunization. One hundred and forty (52.4%) of the participants stated that inadequate knowledge about immunization was a reason that their child was not immunized or partially immunized. The study concluded that knowledge of study participants concerning immunization was low. The study however found that study participants had good intention for immunization for their babies.





Another study, Kidane (2006) revealed that women with infants aged 0-23 months in Ethiopia identified health workers, friends, mass media and family members as their sources of information on immunization of their children. The study concluded that study participants knowledge on immunization was good. Gautret et al. (2010) have also stated that media stories frequently share few mothers views regarding vaccine safety, which can give mothers with infants less than 24 months the false impression that the majority of mothers shared this opinion. And this can affect the immunization status of their babies.

A qualitative, focus group design study with 24 mothers in Hawaii was conducted to determine why their infants, aged 12-23 months, were not fully immunized. One of the findings which emerged from this research was mother's knowledge deficits about vaccine schedules and misunderstanding about the importance of immunizations (Hernandez, Montana & Clarke, 2010). The study concluded that although mothers with infants aged 12-23 months had ever heard of immunization from friends, health centres and the print media, their knowledge concerning immunization was inadequate.

Similarly, in a study which included 30 lactating mothers which were interviewed with parents discussing childhood immunization in three United States cities, namely Kansas City, Philadelphia, and Eugene, the authors discovered that in general parents had knowledge of understanding of how vaccines work, which made them less vulnerable to misinformation, including easily-accessible information on the internet (Fischhoff, 2010).

Kuehn (2010) conducted a mixed-method study, using focus groups and door-to-door surveys in Bakersfield, California to examine the current immunization status of infants aged zero to 23 months and identify barriers to childhood immunization. A number of knowledge barriers were identified, such as mothers confusion regarding what immunizations were, how vaccines work,



why vaccines were important to their babies, and lack of information provided by health care providers at health centres. The study concluded that mothers with infants aged 0-23 months had less knowledge on immunization, since they did not know the right time to return for the next vaccination.

Parental acceptance and rejection of available immunizations is vital to both effective provider-parent communication concerning vaccination decisions and public health campaigns to optimize vaccination coverage (Kumar, Aggarwal & Gomber, 2010). A large amount of anti vaccination media, action groups, and websites may further make matters worse by broadcasting negative vaccine information and highlighting reasons for concern that often have no scientific evidence (Mosiur & Sarker, 2010; Painter et al. 2010).

In a descriptive cross sectional study done by Pati et al. (2010), the study employed a mixed method of data collection. Simple random sampling technique was used to sample the study respondents. Findings from the study showed that, demographic data of respondents was found to influence immunization status of their babies. The analysis revealed that, study participants educational status was associated with knowledge of immunization. The study recommended that more education should be provided to illiterate mothers in the importance of immunization in their children.

However, a descriptive cross sectional study conducted by Johner and Maslany (2011) revealed that there was no relationship between residential status of study participants and having the belief that vaccines works well in babies ($p>0.112$). Using one-on-one interviews, a qualitative study (n=30) sought to determine parents' vaccination comprehension and decision-making processes (Pati et al. 2010). The respondents of the study were primarily women with infants aged 0-23 months. This study primarily focused on the effectiveness of childhood vaccine.



Twenty-four of the parents (80%) reported first learning about vaccination from their healthcare providers, with the others reporting having read about it first from books.

When asked about drawbacks to getting their child vaccinated, 37% of the parents stated lack of knowledge which they rated as moderately serious. The better parents felt about how well vaccinations had been explained to them, the more they thought that not vaccinating their child would hurt other children. In general, parents trusted pro-vaccination communications more than anti-vaccination ones. When asked what source they would consult for more information on vaccinations, 33% of parents stated they would ask their healthcare provider or look for a government source while 70% said they would perform an internet search while others stated that they knew the next schedule for vaccination.

The parents in this study were generally more favorable toward vaccination but had limited understanding of how vaccines actually work. When asked about the need for additional information, most parents would consult the internet before asking their health care provider which may make them vulnerable to false information. The study concluded that knowledge of mothers on vaccination was adequate.

In Malawi, Ethiopia, India, Bangladesh, and the Philippines, a multiregional study that was done showed there was a very significant general demand for better quality of vaccination services among mothers (Sadoh & Eregie, 2009; Kennedy et al. 2011) because damage was being done to the Expanded Programme on Immunization (EPI) by poor communication between health workers and clients.

A study conducted by O'Connor (2011) found that there was no relationship between occupational status of mothers and belief that vaccines works effectively in children ($p>0.011$).



Niederhauser (2010) carried out a retrospective, cross-sectional study with 30 children under the age of 0-23 months in all health regions of Catalonia, Spain. The authors discovered that greater immunization coverage was associated with maternal age over 30 years and increased knowledge of vaccines for their infants.

The findings revealed that mothers knowledge based on how good immunization was to their infants, having last child fully immunized and knowledge on the information on child's card was associated with positive immunization compliance of mothers. The findings further revealed that there was an association between mothers home to the health centre, parity status and immunization status of their children ($p < 0.003$)

Mohamud et al. (2014) found that the demand for vaccination by mothers with infants less than 24 months was caused by knowledge that vaccines were good for children and/or a strong feeling of exposure to serious illness. The study however, showed that lactating mothers were not aware of the need for subsequent vaccination.

Painter et al. (2010) has observed that mothers with knowledge on service, child having been at least vaccinated once and having perceived knowledge that vaccination is good for their babies influence mothers cooperating towards vaccination services. Kennedy et al. (2011) studied the knowledge, attitudes, and behaviour of mothers on immunization of 841 children in kindergartens in Italy. The authors found that only 57.8% of mothers were aware of the four mandatory vaccines for children, namely polio, tetanus, diphtheria, and hepatitis B.

The study found that wrong ideas about contra-indications, no faith in vaccination and unaware of need to return for subsequent dose among mothers were significantly associated with mothers knowledge on immunization. The study concluded that this statistic suggests that Italian mothers



may have an ineffective role in the eradication of vaccine-preventable diseases due to lack of knowledge about vaccines.

Inadequate knowledge, limited understanding of vaccines, misconceptions, and lack of appropriate information can contribute to whether or not children are immunized by their mothers or care takers (Kidane, 2006). Since this could influence the vaccination status of babies. A study on compliance rates in Kern county, California by Etana and Deressa (2012) among mothers with infants aged less than 24 months found that parents sited non-compliance as being due mainly to child's illness, procrastination and lack of knowledge about immunization and where to obtain vaccination services.

The study revealed that majority of the mothers cited that enough public education was not done to encourage mothers to take their children to vaccination centres for immunization. A large proportion of mothers, appeared to obtain information on side effects from other sources such as the media or the internet where opponents of vaccinations may invariably publish biased or unreliable interpretations of proven scientific results. The study concluded that there was an indication that health workers should intensify their efforts in educating mothers on benefits of immunization.

In a descriptive cross sectional study conducted by Fischhoff, (2010) findings from the study showed that, all of the respondents reported having previously obtained immunizations for their child or children, however almost 20% failed to strongly agree to continue to get their child or children immunized. The analysis showed that, age of mothers was found to be associated with immunization status of babies ($p < 0.002$).

Other socio-demographic variables were not associated with defaulting. Mothers who had negative attitude about health facility were two times more likely to have defaulter children than

mothers who had positive attitude. The findings of this study imply that it was essential to have a certain amount of communication between parents, nurses, and pediatric healthcare providers.

However, a study conducted by Bulpitt and Martin (2010) revealed that, mothers age did not significantly influence the immunization status of their babies. It was found that forgetting, and not knowing when and where to take the child/children for vaccinations were the factors identified.

Mennito and Darden (2010) also found that marital status of mothers was associated with the immunization status of their babies. The results showed that, mothers who were married were more likely to have faith in vaccination of babies ($p < 0.001$). The analysis of the data also showed that higher educated women got the message that immunizations was important and also had fewer problems with access and concerns with immunizations. A large majority of those reporting that they did not strongly agree to further immunizations were among the least educated surveyed. The finding that the level of education did play a role in the primary caretaker's decisions to immunize their children was of particular interest in that other factors surveyed such as marital status and age did.

2.4 EPI vaccination coverage of infants

The standard measure of vaccination coverage is the percentage of children who have received the requisite number of vaccine doses irrespective of the age at receipt of the vaccine (Banerjee, Duflo, Glennerster & Kothari, 2010). However, to maximal protection against vaccine-preventable diseases, a child should receive all immunizations within recommended intervals (Akmatov & Mikolajczyk, 2012).

Most effective childhood vaccines work by protecting an individual prior to disease exposure (Coleman, Howard & Jenkinson, 2011; Bulpitt & Martin, 2010). This is the reason that pre-



exposure vaccinations for infants are the foundation of successful immunization programs (Bennett et al. 2010). An investigation of clinical preventive measures widely recommended by the US Preventive Services Task Force states that childhood immunization was one of only three services that received a perfect score of 10 based on clinically preventable disease burden and cost-effectiveness (WHO, 2013).

Parental choice to decline or delay childhood immunizations is recognized as an important factor in decreased administration of vaccinations. Such decisions are embedded in complex belief structures (Mayinbe, Braa & Bjunne, 2005; Kennedy et al. 2011). Concerns about vaccination safety have increased, in part because of the decrease in the incidence of once-common vaccine preventable diseases and vaccines properties that cause the public to have elevated safety apprehensions (WHO, 2013).

In the United Arab Emirates (UAE), vaccination coverage is high due to a rigorous follow-up programme; reminders are sent to defaulting parents until their children reach primary school age and beyond. For example, in 2006, coverage for the Bacille Calmette-Guerin Vaccine (BCG) was 98% while for both the Pentavalent (DTP/HBV/Hib) and the Measles-Mumps-Rubella (MMR) vaccines, coverage was 92%. In 2008, average immunization coverage was more than 90% (Shaikh, Taj, Kazi, Ahmed & Fatmi, 2010).

A descriptive cross-sectional study using multivariable analysis was designed to examine and identify attitudes and knowledge about vaccinations in 228 postpartum mothers (Niederhauser, 2010). A pre-tested survey tool based on the results of a qualitative study was administered to the mothers. Majority of mothers planned to have their child vaccinated (96%), some did not want their child vaccinated (1%), others were unsure (0.5%), and some mothers stated their child would receive some vaccines (2%).



According to this study, 29% of these mothers were worried about vaccinating their infants and 31% of the mothers were worried about vaccinations causing death in their infants. Twenty three percent of these mothers also worried that the vaccines would not be effective. The study concluded that mothers were not interested in allowing their infants to be immunized. Thus, the immunization coverage was found to be low.

In a study by Kidane (2006), which evaluated for timeliness in receiving vaccines and the completion rates of the schedule, about 30% of the children presented after four weeks of age for their first immunization; 18.9-65% of the children were delayed in receiving various vaccines compared to the recommended ages for receiving the vaccines. Only 44.3% children were fully immunized. The study showed that, most babies were not fully immunized for their age. The study further recommended that, there was an indication that health workers should intensify their efforts in educating mothers on benefits of immunization.

Immunization is a key component of the health extension program package. However, full vaccination coverage has not been completed in Ethiopia as planned. The full immunization coverage remained only 24.3% in 2011 (Rogie, 2013) and as a result many children in Ethiopia have not received the benefits of full immunization. The country has slightly higher infant and under 5 mortality rates that account for 59 and 88 deaths per 1000 live births, respectively as compared to other developing countries.

According to WHO and UNICEF (2013) the recommendation is for 4 doses of diphtheria-tetanus-acellular pertussis (DTaP) vaccine by 19 to 35 months of age and the goal is a 90% coverage rate. Currently, 82% of children aged 19 to 35 months received 4 or more doses of the combination of diphtheria, tetanus, and acellular pertussis antigens in 2012.



In 2012 the WHO reported about 22.6 million children under the age of one worldwide did not receive Diphtheria-Pertussis-Tetanus Vaccine Three (DTP3) vaccine and more than 70% of these children lived in ten countries of the Democratic Republic of Congo, Ethiopia, India, Indonesia, Iraq, Nigeria, Pakistan, Philippines, Uganda and South Africa (WHO, 2013)

A cross-sectional study examining postpartum mothers' attitudes, knowledge, and trust regarding immunization was completed by Walther (2011). The study results indicated that of the 296 mothers surveyed in a large hospital in Connecticut, 96% of mothers planned to immunize their baby, 1% indicated they would not immunize, 0.5% of the mothers were not sure, and 2% reported that they planned to immunize their child against some diseases. Overall, many of the mothers scored very poorly in terms of knowledge regarding immunization; however, trust in health care providers had a positive effect on immunization rates.

Although childhood immunization is considered important for improving child survival, most morbidity and mortality in children are due to vaccine preventable diseases such as measles, poliomyelitis, whooping cough, tuberculosis, diphtheria, and tetanus (WHO, 2013). According to a survey carried out by Antai (2010) in Nigeria concerning the immunization coverage of infants, the percentage of fully immunized children was less than 1% in Jigawa, 1.5% in Yobe, 1.6% in Zamfara and 8.3% in Katsina. It was also revealed that only 23% of Nigerian children 12–23 months received all recommended vaccines as at 2008 that is one dose of BCG and measles and three doses each of DPT and polio. The findings also showed that 38% of children in Nigeria had not received any vaccinations. The study concluded that the immunization coverage of infants was low.

A previous study Kumar, Aggarwal and Gomber (2010) from Nigeria provided some explanations for partial immunization and missed opportunities and these include late reporting

for immunization by women who said they had forgotten about the scheduled date to report at the hospital, non administration of simultaneous injections, longer interval between DPT3 and measles vaccine (three and a half months) compared to that between the other vaccines in the schedule (four weeks).

The study further showed that, the number of weeks/months postpartum increase, mothers begin to be engaged in other activities such that they may forget and/or may not have time to make scheduled visits for immunizations. The findings revealed that majority of babies who were seen at the hospitals were far above the age at which most of the vaccinations should have been given. The results stated that, health care workers should improve upon their education aspect concerning the importance of mothers bringing their babies for immunization.

Similarly, a study by Angela et al. (2012) compared the immunization cards of all the children aged five years and below admitted into the paediatric wards of the University of Calabar Teaching Hospital, Calabar, Nigeria with the mothers' history of their children immunization status. The results of the study showed that only 560 (60.9%) were fully immunized for age. The results also showed that 244 (26.6%) were partially immunized and 115 (12.5%) had no form of immunization. The prevalence rate of missed opportunity was 39.1%. Most of these patients were in the low lower socio-economic groups. The commonest reason for missing immunization was illness of the child at the time of immunization.

The prevalence of fully immunized children was 24.3%. Specific vaccination coverage for three doses of DPT, three doses of polio, measles and BCG were 36.5%, 44.3%, 55.7% and 66.3%, respectively. The multivariable analysis showed that sources of information from vaccination card [AOR 95% CI; 7.7 (5.95-10.06)], received postnatal check-up within two months after birth [AOR 95% CI; 1.8 (1.28-2.56)], women's awareness of community conversation program [AOR



95 % CI; 1.9 (1.44-2.49)] and women in the rich wealth index [AOR 95% CI; 1.4 (1.06-1.94)] were the predictors of full immunization coverage.

In Ghana, rubella is an acute, usually mild viral disease traditionally affecting susceptible children and young adult worldwide. It is a common cause of maculopapular rash illness with fever. The disease has few complications unless it is contracted by pregnant women, in which case it may lead to miscarriage, stillbirth, or an infant born with congenital rubella infection. Rubella studies have been conducted since 2003 in an attempt to determine the rubella prevalence in the country.

These are the fever-rash surveillance after measles campaign in 2002, sero-prevalence study and the congenital rubella syndrome surveillance. From 2003-2006, 462 rubella cases were detected from the fever rash surveillance. Cases were seen from all the ten regions of the country with majority of the cases occurring among children 1-9 years old. There has also been increasing trend of rubella in the country. In 2011, out of a total of 1,600 measles negatives that were tested for rubella, about 582 (36%) were confirmed positive for rubella. Confirmed rubella cases have been increasing over the years from 135 confirmed cases in 2009 to 160 confirmed cases in 2010 (Akmatov & Mikolajczyk, 2012).

Furthermore, there might be large dropouts of completing subsequent doses of a specific vaccine particularly for DPT and Polio. This can be further exemplified in this analysis that DPT and Polio had only 36.5% and 44.4% coverage compared to BCG and measles immunization coverage which had 66% and 55% coverage, respectively (Mennito & Darden, 2010)

Similarly, in the KNM, reports revealed a slight increase in the number of children vaccinated with BCG. However, a drop was recorded in Pungu, Wuru and Vunania-Kapania Sub-municipals (KNM, 2015). The extent to which modern methods are adopted may still depend on the



people's conviction of the causes of ill-health and on their level of conviction about the efficacy of such modern health measures. Thus, mothers understanding of the EPI schedule play an indispensable role in EPI service utilization because the mothers are aware of the dates, time and place for the various categories of the vaccines.

2.5 Factors affecting full immunization coverage of infants

Underlying factors and barriers to immunizations are critical challenges that can be magnified when a parent has low literacy skills Kumar, Aggarwal and Gomber (2010). Particularly important, low literacy was linked with limited vocabulary skills that also impacted understanding of vital concepts, such as being able to communicate the risks, benefits, and safety of childhood vaccines (Hershberger et al, 2010).

In a descriptive study conducted by Mayinbe, Braa and Bjunne (2005) the findings showed that, reducing the waiting time for patients to be immunized increased the compliance rate of immunization. The findings showed that, about 71.9% of mothers agreed with the contact period as a factor discouraging compliance. Majority of the mothers complained of the long waiting time before been taking their babies to the health centres for immunization and said that was a factor negatively affecting them from sending their children to the hospital for healthcare.

Similarly, a study by Takum et al. (2011) stated that one of the barriers to immunization in Nigeria was the frequent undersupply of vaccines and the need for repeated visits often led to incomplete immunization of children in those that have no easy access to a Primary Health Care services. Kumar et al. (2010) in a study also cited some of the factors identified as affecting the immunization status of children negatively as the place of birth, age of the child in months, current age of the mother, marital status, occupation, religion, level of education, number of children, retention of immunization card, place of vaccination, gender, and knowledge score.





In a cross sectional survey conducted by Mosiur and Sarker (2010), using simple random sampling technique, the study participants were only mothers with infants aged 0-23 months. The findings revealed that, mothers with lower literacy skills also provided more partially correct and incorrect answers. The mothers in the sample with lower literacy skills demonstrated a lack of knowledge and comprehension regarding vaccination safety, with fewer correct responses given for immunization safety than risks and benefits. The study concluded that mothers education was positively associated with immunization status of their children.

In a related development, mothers in a survey identified several reasons why they were not taking their children to hospital for immunization. Majority of the reasons identified included worry about the side effects of immunization (98.0%) and their work schedule. The findings however showed that, the religious belief and cost did not really affect their compliance negatively. Furthermore, 98.0% claimed that their occupations allow them to take their children for immunization.

Most of the women representing 60.8% agreed with the statement that health workers behaviour discouraged compliance. This is in line with findings by Humphreys (2011) who cited provider's attitudes and long waiting period as few reasons by mothers for not taking additional immunization for their children. Indeed a few women were frustrated because they had visited the facility more than one time with no vaccines on ground, absence of service providers or disrespectful providers (Kennedy et al, 2011)

A study done at southern district of Nigeria revealed that mothers with lowest education and unemployed women were less likely to complete a child immunization (Owolabi, 2010). Education empowers a woman to access relevant health services interact effectively and



assimilate information relating to prenatal care, childhood immunizations and nutritional needs (Stamler, 2012).

In the study conducted in Ghana revealed that there was an obvious significance relationship between children's vaccination pattern with mother's education level (Sadoh & Eregie, 2009).

Stamler (2012) found that mothers who completed at least primary level of education were 1.7 times more likely to have their children fully immunized compared to those who had no education. Comparatively, a mixed methods pilot study was conducted to assess the relationship between health literacy and a mother's ability to understand and communicate information about childhood immunizations (Mutua et al, 2011).

This study used a convenience sample of 30 mothers in an urban walk-in childhood immunization clinic in Kenya. The Rapid Estimate of Adult Literacy in Medicine (REALM) instrument was used to determine the mother's actual reading skills. For the intervention, the investigators used the vaccine information sheets, which have a 9th and 10th grade reading level, for two vaccines to give the mother's verbal instructions about risks, benefits, and safety of the vaccines. The findings showed that the younger mothers provided more correct answers, compared to the older mothers who provided more partially correct or incorrect answers. The study concluded that mothers age was associated with immunization status of their babies.

In some societies with cultural discrimination against female children, boys have a greater chance to be vaccinated (Mohamud et al, 2014). Marital status and age of the mothers were not seen to be associated with the use of immunization services. In other settings, both younger (Glenda et al., 2004) and older age of mothers (Cui & Gofin, 2007) has been reported to be associated with incomplete vaccination. Previous studies (Mutua et al, 2011) revealed that educational status of mothers has a strong association with a high vaccine uptake.

A descriptive cross sectional study aimed at finding out the reasons for partial immunization and factors responsible for missed opportunities for immunization in children less than one year of age. Mothers of children within one year of age were the study subjects using a cross-sectional study design. The results showed that, most of the women said fear of side effects, long distance to health centres and bad attitude of health care providers were identified as factors preventing women from taking their babies to hospitals for immunization. The findings also showed that, majority of the respondents complained of shortage of vaccines at some point in time and even wondered why such a situation should arise in the first place (Yohannes, Mesganaw & Michelle, 2014).

Similarly, a study by Takum et al. (2011), revealed that vaccination coverage was found to be low among children in Papum Pare district, Arunachal Pradesh, India. The study revealed that, majority of the women was not taking their babies to the health centres for immunization that necessitated the low coverage at the district. One major factor that was identified as a major barrier to the low coverage status of the children was the attitude of staff at the health centres. The study concluded that, the attitude of health care providers was not good.

Additionally, a study was conducted to assess mothers knowledge concerning immunization. The results showed that, fear of side effects and fear of vaccines getting out of potency was identified as reasons for non compliance of immunization. This indicated that vaccines in these facilities were at high risk of losing their potency (Zhao & Luman, 2010). This observation was similar to a study in Cameroon and another study in Ethiopia (Humphreys, 2011; Kennedy et al. 2011) where mothers sampled in a survey cited fear of vaccines expiring and side effects as factors preventing them from taking their babies for immunization.



A study has also linked insufficient refresher training and supervision as a factor preventing women from effectively taking their babies to health centres for immunization, which might contribute to the substandard cold chain and vaccine stock management (Rogie, 2013; Owolabi, 2010). However, there was a significant zonal variation in terms of access to vaccination services for babies with most studies in different places having lower coverage (Mohamud et al. 2014; Mayinbe, Braa & Bjunne, 2005).

In Ethiopia, the overall Penta 3 coverage, a proxy indicator for utilization of vaccination services, was found to be low, and significantly lower in Zone 3, Bench Maji Gedio and East Wolega zones as compared to the North Western zone in Ethiopia (Kennedy et al, 2011). The study concluded that most of the areas still had low coverage with respect to vaccination coverage among children.

A study was carried out to examine factors influencing compliance with immunization regimen among nursing mothers in Moniya Community, Ibadan, Nigeria. The majority, 80.4% of respondents affirmed that they have taken at least one vaccine while 19.6% claimed they have not taken any vaccine for their children. More so, 62.8% have fully immunized their last child while the remaining 37.2% of the respondents did not immunize their children fully (Etana & Deressa, 2012)

This is consistent with study by that compared with the immunization cards of all the children aged five years and below admitted into the paediatric wards of the University of Calabar Teaching Hospital, Calabar, Nigeria with the mothers which reported that only 560 (60.9%) were fully immunized for age. Finding showed that, 244 (26.6%) were partially immunized and 115 (12.5%) had no form of immunization. The prevalence rate of missed opportunity was 39.1%. Most of these patients were in the low lower socioeconomic groups. This study has revealed that

the commonest reason for missing immunization was illness of the child at the time of immunization as stated by 65.4% of the respondents (Fischbacher-Smith, Irwin & Fischbacher-Smith, 2010).

Parents objection, disagreement or concern about immunization safety (38.8%), long distance walking (17.5%) and long waiting time at the health facility (15.2%) are the most common reasons for partial immunization. Missed opportunities for immunization and partial immunization need to be avoided in order to enhance the fully immunized percentage for those children who reach the health facility, especially in rural areas where the immunization coverage is below the expected national coverage (minimum 80%) (Mennito & Darden, 2010).

According to Mennito and Darden (2010), parental beliefs, such as anti-vaccine beliefs, mistrust of information, low risk of vaccine-preventable disease, lack of husband support, belief in alternative health care, and a high risk-benefit ratio were factors which hindered childhood immunization. Fear of side effects, the number of vaccines, and the long-term effects on health were also outlined in a survey as factors affecting immunization coverage of children by (Johner & Maslany, 2011).

The annual report from WHO (2013) showed that more than 30 million children are not immunized because vaccines are unavailable, health-care facilities are poor or nonexistent, or families are uninformed or misinformed. In Italy, the study conducted on EPI coverage using cluster survey of regions comparing mandatory and optional immunizations showed a study increase in coverage for mandatory vaccines, which were free and cost borne by the national health office and decreased drastically for optional vaccines which parents were made to pay a fee for cost of vaccination. In this regard, payment of token fees has been a major hindrance to EPI service utilization in Italy (Johner & Maslany, 2011).



Fifteen qualitative studies on barriers to childhood immunization were reviewed by Fischbacher-Smith, Irwin and Fischbacher-Smith (2010) who discovered a number of themes relating to personal factors, including issues of harm, risk of adverse effects, concern about pain caused by immunization, and the belief that immunization should not occur when the child is ill. This review demonstrates that there are a variety of personal reasons why parents decline childhood immunization.

In Gansu, China, education was found to be associated with immunization of children. This means mothers who were educated were 11 times [OR=10.9] more likely to fully vaccinated their children than children born to mothers without education. In regards to the mother's occupation, children born to mothers that were into professional and managerial jobs were 8 times [OR=7.97] more likely to receive full immunization, clerical and service workers were 5 times [OR= 4.82] more likely to have their children fully immunized than mothers that were not working while children born to mothers that were into other types of job were 2 times [OR=1.67] more likely to receive full immunization than children born to mother that were not working (Mohamud et al. 2014).

It was also indicated that children whose mothers were aged less than 30 years were 2.26 times more likely to be fully immunized (Cui & Gofin, 2007). Socio-economic status (particularly education and wealth status) of individuals strongly controls the behaviour of individuals and thereby controls health-seeking behaviour and ultimately child immunization status (Mohamud et al, 2014).

Studies have shown that socioeconomic status of the family is an important factor that can influence vaccination compliance with higher socio-economic status being associated with higher uptake of vaccination. A strong association was found between mother's wealth status and



full immunization. Out of the 30% that came from a rich household, 60% received full immunization. This means that the children were 7 times [OR=7.47] more likely to receive full immunization than children from poor household and out of the 19% children from a middle class, 19% also received full immunization (Bergin, 2011).

This implies that they were 3 times [OR=2.87] more likely to receive full immunization than children from poor household (Brown et al. 2010). In Bangladesh, children of relatively better-off households had an 80% higher chance of being fully immunized compared to the economically disadvantaged group (Bergin, 2011).

Rural–urban inequities in immunization coverage are certainly linked to supply-related factors, e.g. accessibility to vaccination facilities, provision of childhood immunization services, and demand-related factors, such as the knowledge and attitude of mothers, no available appointments at clinic, time of vaccination inconvenient and vaccinators absent (Babalola, 2010). According to Banerjee et al. (2010) about 38% of children in urban areas reported to be more than twice as likely as rural children (16%) to be fully vaccinated.

Distance to the health post which is an alternative measure of accessibility has been found to affect immunization coverage in Kenya (Bond et al, 1998). Close proximity to the clinic was associated with an increased likelihood of vaccination, with immunization coverage declining with increasing distance from vaccination clinics in Egypt (Canavan et al. 2014). The overall vaccination coverage among children aged 12-23 months was found to be as follows: BCG 86%; Penta1 88%; Penta3 79%; measles 80%; and fully vaccinated 69%; combining all sources of data (card, register and history). Timely vaccination coverage, as defined by vaccination by 12 months of age was: BCG 81%; Penta1 82%; Penta3 72%; measles 68%; and fully vaccinated 60% (Bergin, 2011; Kuehn, 2010).



Similarly, in a study, it was observed that, most mothers were not told of the possible side effects of vaccination. Overall, more than a quarter of mothers were not told about side-effects the child might experience with vaccination. This indicates that there was an opportunity to improve the client provider interaction. There was also other evidence, particularly a lack of counseling and discussion with the mother at outreach sessions as vaccinators were usually rushing to complete the session (Kumar, Aggarwal & Gomber, 2010).

High maternal workload combined with lack of knowledge, and hence less value associated with vaccination were the main reasons to which the unacceptably high dropout rate was ascribed, according to a survey. Limited access and poor quality vaccination service were also identified as the main factors that limit vaccination coverage nationally among children in a survey (Bishop & Shepherd, 2011)

It has been observed that, low ANC attendance among pregnant women where their knowledge concerning immunization status was supposed to be good rather turned out to be poor following limited health education by health staff (Mosiur & Sarker, 2010). It would be optimal to provide immunization information prior to the mother's delivery at health centres, since it has been shown that these mothers respond more to information received earlier rather than at a later date (Kennedy, et al. 2011; Humphreys, 2011; Hernandez, Montana & Clarke, 2010; Etana & Deressa, 2012).

It has also been suggested that, pregnant women who received health information concerning vaccination in their native languages usually adhere to the schedule dates for their babies after delivery as compared to those who may not understand the language used in health promotion (Do & Hotchkiss, 2013; Canavan et al, 2014)



This is because women want to trust health care providers' message concerning their health status (Bulpitt & Martin, 2010). The ability to trust their healthcare provider can be vital to the development of a good client-provider relationship. When the childhood vaccination schedule is not followed as recommended, the child not only will fail to receive timely protection from vaccine preventable diseases at the time when they are most susceptible, but also are at an increased risk of never completing the full vaccination series (Cui & Gofin, 2007).

According to Hernandez, Montana and Clarke (2010) myths, rumors, ignorance and suspicion are major factors found to hinder immunization of children in Uganda. The study found that, 16% believe that childhood diseases were caused by evil spirit, witchcraft and heat. Most (25%) have never heard of measles immunization. Another 27% did not believe immunization was effective while 4% were not allowed to go for immunization by their husbands. Some women believed their children had received some vaccine. Many women felt that immunization was not necessary because the child was not sick.

A study by Kennedy et al. (2011) compared the immunization cards of all the children aged five years and below admitted into the paediatric wards of the University of Calabar Teaching Hospital, Calabar, Nigeria with the mothers' history of their children immunization status. The results of the study showed that only 560 (60.9%) were fully immunized for age. Finding 244 (26.6%) partially immunized and 115 (12.5%) had no form of immunization. The prevalence rate of missed opportunity was 39.1%. Most of these patients were in the in the low lower socio-economic groups.

The commonest reason for missing immunization was illness of the child at the time of immunization. The study revealed that, health care providers did very little to educate mothers concerning the possible side effects of vaccination at the health centres. And this explained why



most of the mothers at the time of the survey attributed side effects experienced by their babies as a reason for non compliance next time. This is an indication that health workers should intensify their efforts in educating mothers on contraindications for immunization.

Similarly, in a study conducted by Mohamud et al. (2014) in Jigjiga District, Somali National Regional State, to compare mother`s reasons for non- immunization and partial immunization of children under five years. The study found that factors including staffing shortages and commitment, management of health facilities, quality of care available, and community communication accounted for differences in quality of service delivery and therefore affected vaccination coverage of children.

Furthermore, mothers` knowledge about child immunization, postponing child immunization and perceived health institution support (Shaikh et al. (2010), institutional delivery and antenatal care (ANC) attendance (Rogie, 2013), tetanus toxoid vaccine, place of residence and household visited by health workers (Takum et al. 2011), women`s decision making autonomy, number of under-five children in the household, mother`s education and proximity to health facilities (Stamler, 2012) were factors identified through small scale studies in the country influencing immunization of children.

Parents also lacked knowledge about the vaccine schedules and misunderstood the importance of immunizations (Walls, Parahoo & Fleming, 2010; Etana & Deressa, 2012; Bond, et al. 1998). Beliefs that vaccines are a choice, mistrust of information, low risk of vaccine-preventable illness, preference for alternative medicine, and high risk-benefit ratio were reasons cited in the parental belief theme category as barriers to immunizations. Parents also feared the child would catch the disease from the vaccine, side effects, the number of vaccinations, and the trauma of the vaccination process for themselves and the child (Takum et al, 2011).



Decisions and choices made by the parents such as substance abuse, complex scheduling, lack of motivation, forgetting about the vaccinations, difficulty getting the children to the clinic, work scheduling, past experience with vaccines, and a lack of family support were also identified as factors affecting immunization status of infants (Takum et al, 2011)

A study was conducted to assess factors influencing immunization status among children. The results showed that children delivered at health facilities were more likely to be fully vaccinated than children delivered at home (Bergin, 2011). This finding was similar with the study done in Mozambique Mohamud et al. (2014) in which children delivered at home was less likely to complete immunization. The explanation related to this may be that, mothers who give birth at health centers/hospitals are closer to the health service or get more information on immunization, and most of the time the first dose of vaccination is given just after birth.

Sex of the child can also predict the immunization status of the child in societies where gender inequality is prevalent. For instance in Bangladesh, females were 0.84 times less likely to be fully vaccinated than male children (WHO & UNICEF, 2013). But in a study done in Ethiopia revealed that, there was no significant relationship between sex and full immunization status (Yohannes, Mesganaw & Michelle, 2014).

Similarly, distance to health facility was associated with full child immunization among mothers. Children whose mothers said distance to health facility was not a big problem were 7 times [OR=6.53] more likely to receive full immunization compared to children whose mothers said it was a big problem to get to health facility (Kim, Johnstone & Loeb, 2011).

In a study conducted by Machingaidze, Wiysonge and Hussey (2015) using mothers with infants aged 0-23 months in Zambia. The mothers were purposively sampled and interviewed. The findings revealed that, women were more likely to vaccinate their infants. The overall



vaccination coverage among children aged 12-23 months for each vaccine was as follows: BCG 86%, Penta1 89%, Penta3 79% measles 80% and fully vaccinated 69%. Timely vaccination coverage, as defined by vaccination by 12 months of age and evidenced by written record was as follows: BCG 81%, Penta1 82%, Penta3 72%, measles 68%, and fully vaccinated 60%.

Child vaccination coverage significantly varied among zones-for instance; Penta3 coverage ranged from 20% in Zone 3 to 92% in the North Western zone. Valid dose analysis showed that valid vaccination coverage was as follows: BCG 83%; Penta1 69%; Penta3 57%; measles 50%; and complete vaccination 36%. The study concluded that study participants had good vaccination attitude.

A study done in Niger Delta area of Nigeria revealed that there was an association between the place of delivery and immunization status of a child (Sadoh & Eregie, 2009). A child born in a health unit was significantly more likely to have been vaccinated with BCG which is given immediately after birth, and to be up to date with their vaccination compared to a child delivered at home (Zhao & Luman, 2010).

Many researchers have identified specific barriers to immunization, single parenthood, lack of time and/or energy, lack of knowledge and information, bad health care attitude, availability of vaccines, limited access to immunization, child sickness, fear of side effects, lack of transportation, limited clinic hours, long waiting times, unpleasant past experiences, parental emotions and/or concerns (Humphreys, 2011), some women also believed that too many vaccines could be harmful to the child (Do & Hotchkiss, 2013).

Large percentage of women gave reasons that showed total reliance on immunization campaigns for child immunization (Canavan, et al. 2014). Excuses tendered such as waiting for immunization Officers to come back and lack of availability of other vaccines during the

exercise revealed lack of understanding of the routine immunization as a source of child immunization (Bishop & Shepherd, 2011).

Most women also gave reasons related to mother's unavailability, including sickness, travel time and time constraints. A few mentioned provider's attitudes and long waiting period as their reason for not taking additional immunization for their children (Zhao & Luman, 2010). The study concluded that, health care workers did very little to educate mothers against the reasons for non compliance of vaccination at the study place.

Parents are educated consumers with access to the internet, which facilitates their ability to swap and discuss information regarding immunization hazards and benefits, and as a result parents may delay or withhold immunizations out of fear (Etana & Deressa, 2012). Regarding specific reasons for either incomplete or no vaccination, the main contributing factors were as follows: mother being too busy (27%); being unaware of the need to for vaccination (22%); vaccinator being absent (21%); postponed until another time (21%); being unaware of the need to return for subsequent doses (19%); place and/or time of vaccination unknown (16%); vaccine not available (17%); place of vaccination too far away (10%); and time of vaccination inconvenient (10%) were noted (Khokhar et al. 2005; Betsch et al. 2010; Babalola, 2010)

Strategic communication and health education to increase awareness of the need for vaccination and subsequent doses is vital. Enhancement of the interpersonal communication skills of providers is important to improve their interaction with mothers especially at ANC is importance to allay all fear before delivery concerning vaccination (Ayebo & Charles, 2009; Austvoll-Dahlgren & Helseth, 2010). Involving opinion leaders in community mobilization is essential to deliver key messages to the community as well as tracing defaulters (Mayinbe, Braa & Bjunne, 2005)





Demographic and socio-economic details of mothers, migration history, the status of immunization received and mother's use of health care services were elicited through a face to face interviewer-administered questionnaire. The immunization status of the child was determined from the immunization card, and in the absence of immunization cards, mothers were asked to recall whether the child had received different vaccines (including the number of doses for each) (Niederhauser, 2010).

Separate questions were asked to extract information on each age-appropriate vaccine to be received. Before data collection, a parent or legal guardian of each child enrolled provided signed informed consent. In each household surveyed the informed consent form was discussed with the parents or legal representatives of the child, and signed by one of them once there was a decision to participate. The survey was considered to involve no biological specimen collection or vaccination, therefore, it did not require Zhejiang Provincial CDC institutional review board approval according to the MoH's regulation of ethical review of biomedical research involving humans (Mennito & Darden, 2010)

Mothers were asked about the reasons for failure to vaccinate their children. The survey revealed that 51% of reasons for failure were due to obstacles and 34% and 15% were due to lack of information and lack of motivation respectively (Mohamud et al. 2014). Some of the reasons were more prominent in specific zones. For instance, mother being too busy appeared to be most common in Gedio (41%) and place of vaccination too far was reported in 28% of cases in other Zones.

Lack of information was more likely to be the reason for failure of vaccine uptake in Bench Maji, Gedio and Afar than the other zones. The study concluded that varied reasons were found

to be affecting mothers uptake of vaccination for their children. It was suggested that more health education programs should be enrolled out concerning the importance of vaccination of children.

2.6 Health facilities vaccination services to mothers with infants aged 12-23 months

Routine immunisation is the basis of the EPI activities (WHO, 2013). On a regular basis vaccines for measles, diphtheria, pertussis, tetanus, polio and tuberculosis, are provided in health facilities all over the world (Sadoh & Eregie, 2009). Vaccinations are given in static, out-reach and mobile health facilities (WHO, 2013). The immunisation schedule including the above vaccines stretches over the child's first year and tetanus vaccination is given to women of childbearing age at designated places (Mennito & Darden, 2010).

In the United Arab Emirates (UAE), vaccination coverage is high due to a rigorous follow-up programme; by health staff. Reminders are sent to defaulting parents until their children reach primary school age and beyond by text messages (Kim, Johnstone & Loeb, 2011). This has resulted in an increased coverage for the Bacille Calmette-Guerin Vaccine (BCG), Pentavalent (DTP/HBV/Hib) and the Measles-Mumps-Rubella (MMR) vaccines.

In a survey conducted among health staff concerning how ready they were to assist mothers with infants to get access to immunization services in Uganda, almost all the health centers and one-third of health posts had at least one refrigerator for EPI activities. However, refrigerators were not functional in 32% health centers and 71% of health posts at the time of the survey. Moreover, at least two-thirds of facilities encountered breakdown of their vaccine refrigerators in the previous three months.

Of those facilities which had functional refrigerator, the temperature reading was outside of the recommended range of 2-8°C in 46% health posts and 23% health centers on the day of the visit.



Among facilities that stock vaccines overnight, 67% health centers and 40% health posts experienced shortage of vaccines in past six months (Do & Hotchkiss, 2013).

Indeed a few women were frustrated because they had visited the facility more than one time with no vaccines on ground, absence of service providers or disrespectful providers (Do & Hotchkiss, 2013).

Quality of outreach services, cold chain, as well as linking community with health services were among the influencing factors of effectiveness of immunization programs in resource-poor setting. The relative effect of each one of the above factors may significantly vary according to geographical areas (Callreus, 2010).

In most health facilities cases of vaccine-preventable diseases are tracked in curative service tally sheets daily or weekly, take the numbers from the matching lines on these sheets to calculate the monthly tally, which is then used in the monthly summary report (Akmatov & Mikolajczyk, 2012). If curative service visits are entered in a register without being added to tally sheets, review the consultation register for the total number of cases of each vaccine-preventable disease each month. If no consultation register is kept or if curative care for cases is done within immunization services, keep line lists for vaccine-preventable diseases and tally them for the monthly summary (Mutua, Kimani-Murage & Ettarh, 2011)

In a study by Hernandez, Montana and Clarke (2010), which evaluated for timeliness in receiving vaccines and the completion rates of the schedule, about 30% of the children presented after four weeks of age for their first immunization; 18.9-65% of the children were delayed in receiving various vaccines compared to the recommended ages for receiving the vaccines. Only 44.3% children were fully immunized. Data from phase I of the study was used as the basis for



the development of the pilot intervention study to increase access and decrease barriers to immunizations in health facilities.

The intervention phase utilized a walk-in clinic with evening and weekend hours, staffed by a nurse practitioner who assessed the child, ordered the immunizations, as well as administered the immunization. The patients in this study that were seen at the clinic were given a picture personalized reminder calendar that contained a schedule of immunizations for that child. For this study, 90% of the clients were not up to date with their immunizations prior to accessing the clinic.

The remaining 10% either were up to date (5%) or had no known immunization status (5%). After their clinic visit, 53% were up to date with immunizations, 42% were considered in progress, and 5% were unable to be determined if they were up to date or not because they did not have complete immunization records. The study concluded that, the overall up to date immunization status for all patients at the clinic improved significantly between the pre-intervention (42%) and post-intervention (65%) chart reviews ($\chi^2=31.395$, $P < 0.000$).

System factors included public health immunization programs available, trust in government and health professionals, mandatory vaccines, and barriers to immunization (Adeolu, 2001). They also found that in an area with high immunization coverage, parents reported that protection from vaccine-preventable disease was a primary benefit of immunization (Antai, 2010). Less than half of children have received each of the recommended vaccinations, with the exclusion of polio 1 (67%) and polio 2 (52%) (NPC, 2003). And more than three times as many urban children as rural children are fully vaccinated (25 per cent and 7 per cent, respectively) (NPC, 2003).





In a study to assess health care services providers' attitude towards readiness to conduct immunization services for infants aged 0-23 months. Moreover, 43% of health posts and 38% of health centers had some significant interruptions of routine EPI service. In some places, incomplete vaccination and low vaccination coverage have contributed to outbreaks of vaccine-preventable diseases (Austvoll-Dahlgren & Helseth, 2010)

Furthermore, inadequate technical and managerial capacity has been observed at all levels, along with missed opportunities and insufficient prioritization of EPI within health and health-related programs (Coleman, Howard & Jenkinson, 2011). Additionally, a lack of regular technical supervision, high staff turnover and inconvenient service delivery strategies for mothers accounted for the failure to achieve satisfactory results in routine vaccination programs in India (Banerjee et al, 2010).

The routine immunisation coverage in Ethiopia has not reached the targeted figures and planned objectives. Sustainable improvements in the service delivery are needed, in order to protect the Ethiopian children from unnecessary suffering and death. According to the most recent EPI review, conducted in 2001, constraints of the program are lack of supervision, high drop-out rates, inadequate number of trained health workers and inadequate supplies like cold chain equipment (EHNRI, 2012)

In a cross sectional survey conducted by Bergin (2011) using purposive sampling technique to sample respondents concerning health workers readiness to handle vaccination programs. Nearly 28% of health facilities missed at least one EPI session in the past six months mainly due to the following reasons: unavailability of vaccines from a higher level (53%); the vaccinator may have had other priorities and was unable to attend sessions (26%) and the vaccine not collected in a timely manner (11% of cases).



Eighty-six percent of health posts and 87% of health centers had a defaulter tracing mechanism available primarily through register review. Less than 5% of facilities used a defaulter tracing box or tickler file as a defaulter tracing mechanism. Most of the time, health workers not were involved in tracing defaulters.

Furthermore, inadequate technical and managerial capacity has been observed at all levels, along with missed opportunities and insufficient prioritization of EPI within health and health-related programs (Adedayo, et al. 2009). Additionally, a lack of regular technical supervision, high staff turnover and inconvenient service delivery strategies for mothers accounted for the failure to achieve satisfactory results in routine vaccination programs in Ethiopia (Betsch et al. 2010; Banerjee et al, 2010).

The standards provide guidance on practices that eliminate barriers to vaccination, including eliminating preventable prerequisites for receiving vaccinations, eliminating missed opportunities to vaccinate, improving procedures to assess vaccination needs, increasing understanding about vaccinations among parents and healthcare providers, and improving management and reporting of adverse events (Kidane, 2006).

Similarly, most common reasons for non-immunization were lack of knowledge about childhood immunization schedule and where to sources for it. Other reasons include lack of awareness about health benefits of immunization. The most common reasons for incomplete immunization were inadequate vaccine supply in health facilities (Mohamud et al, 2014; Antai, 2010).

About one-fifth of the women gave reasons that revealed their lack of knowledge about immunization benefits, routine immunization schedule and the required number of doses. Some women believed that their children were too young to receive specific vaccines, particularly those involving the use of needles and syringes (Mohamud et al, 2014).



In an article on immunization, Marfe (2007) explains that parents' knowledge and understanding of immunization is important so health care providers can provide support. Parents must receive information on vaccine benefits and risks, so they can make an informed decision about immunization (FMoH, 2012). Health workers must improve on the quality and reach of the program of vaccination. Vaccine wastage should be reduced (Cui & Gofin, 2007). Unless properly addressed, this erroneous information on side effects, together with a possible diminishing perception of the lethality of vaccine preventable diseases, could adversely affect vaccine coverage (Niederhauser, 2010).

In a quantitative study using the National Immunization Survey in Canada, Stamler (2012) discovered that parents who had doubt about vaccines indicated that advice or information from a health care provider was the primary reason why they changed their mind about delaying or refusing a vaccine. Walther (2011) conducted a quantitative study with parents of children in London, England, to explore the knowledge, attitudes, and concerns of 76 parents of non-immunized children regarding immunization. The finding revealed that the immunization decision-making process is complex, and advice from health professionals during the decision-making process could be helpful to parents.

According to Kuehn (2010), health care professionals are often the primary source of advice regarding immunization. The study revealed that parents feel the information obtained by health professionals is biased and information on the safety of vaccines is withheld. The findings also showed that in a small number of cases, health care professionals advised their clients not to immunize their children, and in other situations were told to separate the MMR [measles, mumps, and rubella] vaccine into separate injections.



In Bangladesh, children of relatively better-off households had an 80% higher chance of being fully immunized compared to the economically disadvantaged group (Kumar, Aggarwal & Gomber, 2010). This may be due to the fact that children who are from poor homes find it difficult to be reached by the health services and parents may encounter barriers to reach health facility compared to those of better socio-economic status. Other studies have found no difference in vaccination rates with respect to socio-economic status (Kuehn, 2010). Thus, health care workers could develop more practical ways of encouraging women irrespective of their economic status to be serious with the immunization status of their children.

Luman et al. (2005) had very different views of the role of health care professionals or health promoters with mass childhood immunization programs. They suggest that health promoters, such as physicians, should persuade parents to immunize their children, rather than allow the parents to make the decision. In addition, Humphreys (2011) proposed that mass childhood immunization programs are concerned with uptake, rather than consent, and consequently the risks of immunization versus natural infection are not clearly portrayed.

In cross sectional study conducted by Etana and Deressa (2012) problems with personnel to manage vaccine distribution, equipment for vaccine storage and transport, maintenance of equipment as well as monitoring were identified as problems affecting health care provision of immunization to children.

According to Canavan et al. (2014) health workers cited that they were doing vaccination at the health centres daily for every child. Any child coming to a health facility for any reason or a child coming to a facility for any vaccinations should get the routine EPI doses that the child is eligible for during the time of the visit to eliminate the possibility of missed opportunities. Early ANC booking and screening of immunization status of the babies and administering doses to all



eligible babies could increase immunization coverage. Moreover, utilization of clean facility birth and clean cord practice should be promoted during ANC care.

Quality of outreach services, cold chain, as well as linking community with health services are among the influencing factors of effectiveness of immunization programs in resource-poor setting like Nigeria. The relative effect of each one of the above factors may significantly vary according to geographical areas (Pati et al, 2010). Knowledge of local impediments to effective immunization programs is very important in the development and implementation of appropriate solutions.

On the other hand, vaccinator absence, unavailability of vaccine, place of vaccination too distant, and inconvenient vaccination times were also mentioned by a significant number of mothers. These issues could be improved by conducting regular and focused education and communication activities on the need for vaccination, as well as interpersonal communication and negotiation on the need for subsequent doses of vaccines. It is also equally important to expand the vaccination delivery sites (the outreach, static or mobile sites) to make these more accessible and convenient for mothers.

Access and utilization of vaccination services were significantly higher amongst children of mothers with education attainment, in the highest wealth quantile and low parity ($p < 0.05$) groups in this study (Machingaidze, Wiysonge & Hussey, 2015). Quality of vaccination services were demonstrated by the validity of doses given, BCG scar formation, card retention and client-provider interactions.

The survey indicated that about 69% of children with written evidence of vaccination (card and register) were fully vaccinated at any time before the survey because health staff did very good to promote vaccination services among women (Mayinbe, Braa & Bjunne, 2005). However, only



36% of children received valid doses of the vaccines. This indicates that health workers did not screen children adequately before vaccination (Niederhauser, 2010).

Almost identical findings were reported by national vaccination survey. Scar formation from BCG is a proxy measure for prior BCG vaccination and injection technique. This study found that 19% of children vaccinated with BCG had no BCG scar (card and history). This is likely to be due to poor injection technique or sero-conversion (Mosiur & Sarker, 2010). A considerable proportion of children reported to be vaccinated during the survey had no vaccination card for verification. The card retention rate was found to be 61%, slightly higher than reported in the national immunization coverage survey (Painter et al. 2010), but almost in line with the national cluster survey conducted in 2006 (Owolabi, 2010).

Moreover, more than a quarter of health facilities missed at least one EPI session in the previous six months (Akmatov & Mikolajczyk, 2012). This may lead the community to lose trust in health service providers and the health system. It might also be a factor contributing to high drop-out rates and low utilization of vaccination services (Angela et al. 2012). The national immunization coverage survey (Kidane, 2006) reported that 45% of health facilities had interrupted EPI services.

The survey also revealed that more than 90% of health facilities collect vaccines at least once in a month according to guidelines, nevertheless more than half of them encountered stock-out of any vaccine in the previous three months (Machingaidze, Wiysonge & Hussey, 2015; Cui & Gofin, 2007). This indicates that the availability of vaccines has not been adequate to enable the program run smoothly. This might be due to collection or requisition of inadequate amount of vaccines (Burns, Walsh & Popovich, 2010; Kumar, Aggarwal & Gomber, 2010).

More than half of the facilities' refrigerators were not functional at the time of the survey mainly due to unavailability of energy/fuel and the refrigerators not being installed (Kuehn, 2010; Machingaidze, Wiysonge & Hussey, 2015). An additional 27% of health facilities encountered breakdown of vaccine refrigerators. Furthermore, about a quarter of refrigerators were found to be outside of the recommended temperature range (Mayinbe, Braa & Bjunne, 2005; Mutua, Kimani-Murage & Ettarh, 2011).

A study aimed at finding out the reasons for partial immunization as well as to identify factors that contributed to missed opportunities for vaccination in children less than one year of age in a rural area in the North central geopolitical zone of Nigeria. The major reasons for incomplete vaccinations were that the mother was too busy or unaware of the need for vaccination or of the need to return for subsequent doses; unknown place and/or time of vaccination were also mentioned by the majority of mothers (Mennito & Darden, 2010; Luman et al, 2005; Machingaidze, Wiysonge & Hussey, 2015).

2.7 Theoretical foundation of the study

The study adopted the Health Belief Model. Initially the model was developed in the 1950s by a group of social psychologists in an effort to explain the widespread failure of people to participate in programs to prevent and detect disease (Becker, 1979).

The model states that individuals engage in preventive health behaviour based on three main factors. These factors are perceived vulnerability, perceived severity and perceived benefits. This means that a person would have to believe that he or she is susceptible or vulnerable to a disease in order to take any action. The value of compliance is therefore based on the probability that in

the client's view, compliance would reduce the perceived threat and not be too costly in money, time and emotional energy (Becker, 1979).

The Health Belief Model (HBM) has been one of the most widely used psychosocial approaches to explaining health related behaviors. The Health Belief Model has been applied to a broad range of health behaviors and subject populations (Burns, Walsh & Popovich, 2010). For the purpose of this study, the six major health belief model constructs were used in the study design by assessing psychosocial mediators of vaccine acceptance or declination, (a) perceived susceptibility to vaccinations, (b) perceived severity to vaccinations, (c) perceived benefits of vaccination, (d) perceived barriers to vaccinations (e) self-efficacy for obtaining a vaccination, and (f) cues to action to vaccinate (Painter et al, 2010).

Hence, the preventive action taken by the mother of the child depends on the individual's perception that the child is personally susceptible and that occurrence of the disease would have at least some severe implication of a personal nature. The assumption here is that taking action reduces susceptibility. The perception of threat is also affected by modifying factors. These include demographic, social, psychological and structural variables. These can influence both perception and corresponding cue necessary to instigate action.

The health belief model is selected for this study because it can help to explain some factors responsible for non-compliance with immunization. The elements of the model assisted the researcher in recommending the most effective health education interventions that could influence mother's readiness to take their children to immunization health centres.



2.8 Summary of the literature reviewed

In summary, this study draws on existing literatures to identify the predictors of full childhood immunization with survey data collected across the globe. In line with previous studies, it assessed the role of maternal characteristics, child characteristics and access to health facility factors in immunization uptake. In this way, the researcher expects to make a significant contribution to the literatures.

Overall, it was discovered that there is a significant amount of published literature on immunization. Current literature addresses barriers to immunization and immunization attitudes and beliefs. Several researchers studied parental beliefs in relation to immunization and discussed the benefit/risk analysis on the immunization decision-making process.

It became apparent that various studies which relate to this topic are conducted quantitatively, through surveys or questionnaires. Although considerable literature has been located on this topic, few studies examined immunization practices in Ghana. Ghana studies were found; however, these studies rather prevail largely on organizational reports rather than childhood immunization in general.

No literature was located which examined the perceptions of health care professionals on mothers' understanding and decision-making regarding childhood immunization especially at the study area. The current research study expands on the present literature to include a deeper understanding of how mothers formulate decisions not to participate in childhood immunization, explores the perceptions of health care professionals on immunization, as well as compares the knowledge of mothers on childhood immunization.



CHAPTER THREE

Methods

3.1 Introduction

This section contains the methodology that was employed to conduct the study. It includes subsections such as the research design, research setting, population of the study, sample size calculation and sampling technique, data collection process, data analysis, validity and reliability and ethical consideration of the study. These subsections are explained to show how they were employed to collect the data.

3.2 Study setting

The study was conducted in The Kassena-Nankana Municipality. The Kassena-Nankana Municipality is one of the thirteen (13) Municipalities/Districts in the Upper East Region. It shares boundaries to the North with Kassena-Nankana West District and Burkina Faso, to the East with Kassena-Nankana West District and Bolgatanga Municipality, West with the Builsa North District and South with West Mamprusi District (in the Northern Region) (KNM, 2015).

The Municipality is normally under the influence of the North East Trade winds, also known as Harmattan, from November to March each Year. Rainfall is absent during this period and temperatures are high averaging about 40°C. Relative humidity is also often low, averaging about 20%. The South West Trade winds are moist and bring rain to the municipality between May to October. Average rain of 950mm is experienced with peaks in August and average temperature of 29°C is experienced during this period (KNM, 2015)

The population of the Kassena-Nankana Municipality is estimated to be 115,318 with a population density of 102 persons per square kilometer and growth rate of 1.2% (KNM, 2015).



The population density of 92 persons per square kilometer shows how dispersed the population is. The district consists of 99 communities – majority of which are rural, only 13 per cent of the population live in towns. Only Navrongo can be classified as an urban settlement. The settlement pattern of the population is generally dispersed. This settlement pattern has effect on the distribution of facilities especially those of water and sanitation (KNM, 2015).

Table 3.1: List of health facilities in Navrongo

Hospital	Health centres	Clinics	CHPS compounds	
War Memorial Hospital, Navrongo	Navrongo Health Centre	1.St. Martin's Clinic (CHAG)	Gongnia	Yua
	Kologo Health Centre	2.St. Jude Clinic (private)	Nayagnia	Wuru
		3. A.F.A Memorial clinic (private)	Doba	Gia
			KN HC	Pindaa
			P North	Korania
			P South	Naaga
			Nyangua	Zuo
			Manyoro	Vunania
			Natugnia	Kapania
			Gumongo	

Source: KNM, 2014



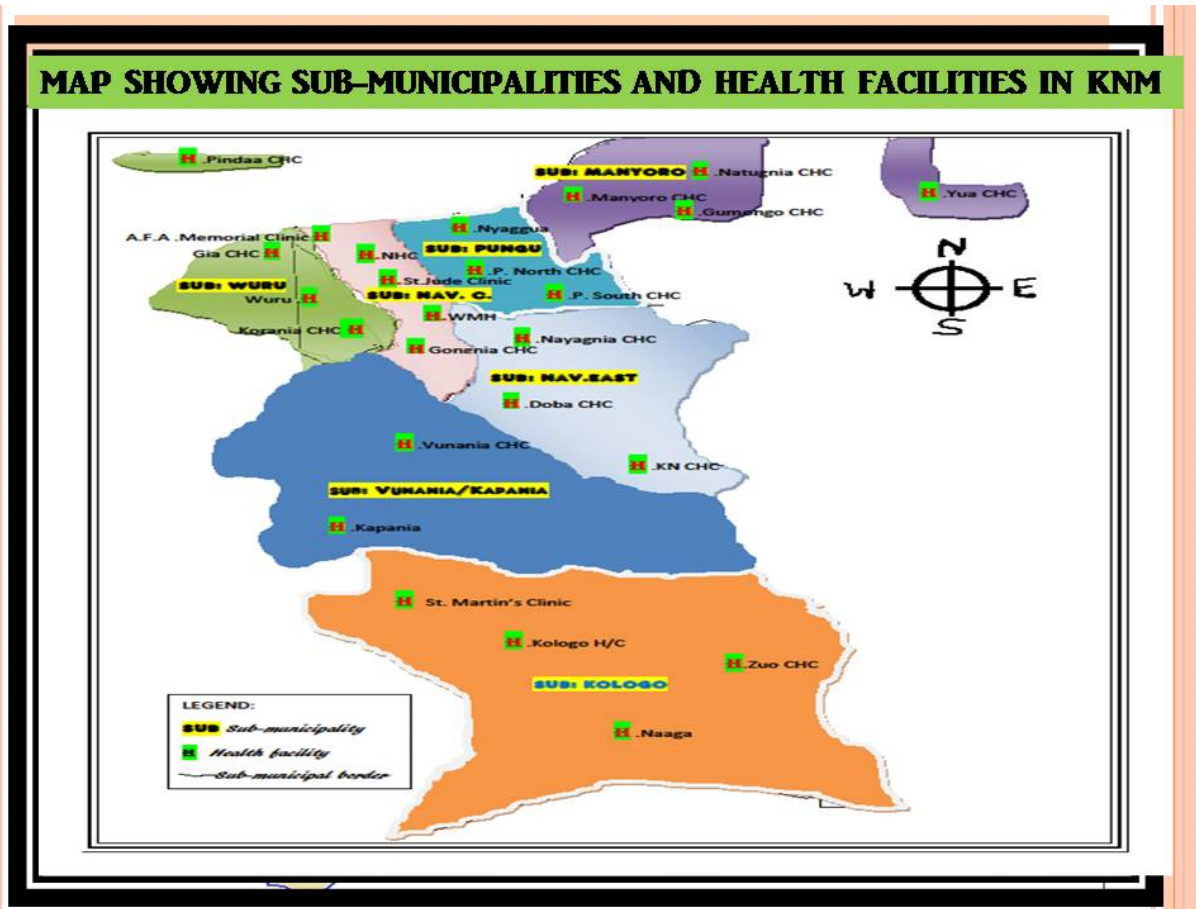


Figure 3.1: Map of Kasena Nankana Municipal

3.3 Research design

This study employed an analytical study design. This design was used to describe and interpret the relationship among the variables in the study at a single point in time. Analytical study design measures exposures and outcomes of interest at the same time. The advantages of analytical study design are that it is relatively inexpensive, takes up little time to conduct and it can estimate the prevalence of an outcome of interest because sample is usually taken from the whole population.

The research used this type of study design because the entire population in the study setting was not used as study population. And from that population an inference could be made about the

entire population. The study is an applied research, as the knowledge generated from this study could influence improvement of immunization coverage among lactating mothers in the study setting. And this could be useful for public health planning, understanding disease aetiology and for the generation of hypotheses.

3.4 Research population

The research population involved 120 lactating mothers with children aged 12-23 month who were sampled from a target population at the study setting at the time of the research work and 14 health care workers who were also sampled at the various health care facilities at the study setting. These people formed the study population of this study. However, the study observed the following criteria in sampling the respondents.

3.4.1 Study inclusion criteria

- Health workers in the KNM
- Lactating mothers with babies aged 12-23 months
- Caretakers of babies aged 12-23 months

3.4.2 Study exclusion criteria

- Mentally retarded lactating mothers with babies aged 12-23 months
- Lactating mothers with babies who needed an emergency care
- Mothers who did not like their children to be used as respondents



3.5 Sample size determination

The sample size was 134 respondents. This sample size was calculated using Snedecor and Cochran (1989) formula. This is explained as;

$$\text{Formula; } n = z^2 pq/d^2$$

Where; n=the desired sample size

z=standard normal deviate (1.65) corresponding to 90% confidence limit

d=degree of precision set at 10%

P=prevalence/proportion (estimated proportion 0.5). Since the number of respondents was not known, P was taken as 50%

$$n = z^2 pq/d^2$$

$$n = (1.65)^2(0.5) (0.5)/(0.1)^2$$

$$n = 68.06$$

An attrition value of 65.94 was added to 68.06 to obtain the sample size.

3.6 Sampling technique

This study used simple random sampling technique to sample respondents in the study setting. When the research team visited the homes and health facilities to interview the study participants, they had in their possession small pieces of papers with 'yes' or 'no' written on them.

At the various homes of respondents, at the place where they were more than one lactating mother at homes, they were humbly told to pick the pieces of papers to show who qualified for the interview based on the outcome. Same was done at the health facilities since nurses were at post working and their number was a little large. All those who picked the small pieces of papers



with 'yes' written on them were interviewed as the study participants. This sampling technique was chosen to give each lactating mother and health care worker in the study setting an equal chance of being selected for the study.

3.6 Data collection tools

Self designed structured questionnaires with closed and open ended questions written in English were used to collect the primary data (See attached appendix I and II). There were two structured questionnaires. One was designed for the lactating mothers whilst the other one was an interview guide designed for the health care workers.

The questionnaire that was used to administer on the lactating mothers was structured according to the specific objectives of the study. The use of the questionnaires gave the researcher an opportunity to better describe the situation and opinions of respondents concerning immunization.

3.7 Procedure for data collection

The data was collected with the help of trained research assistants. The research assistants used the questionnaires to collect the primary data. The questionnaire for the lactating mothers had sections seeking information on participants' demographic data, knowledge of lactating mothers with children aged 12-23 months on immunization, EPI vaccination coverage of children aged 12-23 months, factors affecting full immunization coverage of children aged 12-23 months and readiness of health facilities to provide vaccination services to infants.





Under the demographic data of the respondents, the study collected data on their age assessed in years, occupational status, marital status, education level, parity status, distance to the nearest health centre in hours and residential status.

The knowledge of lactating mothers with children aged 12-23 months on immunization was collected under section B of the structured questionnaire. That aspect of the questionnaire contained 15 variables on that objective. Majority of the questions were asked in the form of a table using a modified version of the Likert scale to include only three scales. These scales were measured on 'agree' 'disagree' and 'neutral'.

Study participants under each of the two major tables in that objectives were asked their opinion on those questions concerning their knowledge on immunization to indicate against each variable the extent to which they "agree", "disagree" or remain "neutral" on how those variables influence immunization of their children. Three questions in the form of closed and open ended were also used in addition to the table to collect data on that objective.

EPI vaccination coverage of children aged 12-23 months at the study area was collected under section C of the questionnaire. It was made up of 5 study variables. Scrutinizing babies' immunization cards and taking careful history, data was collected on immunization coverage at birth and subsequent visits. The correct intervals for immunization were determined comparing the dates of vaccination with the date of birth.

The child was described as being "fully vaccinated" if he/she had a BCG scar and had received all the EPI vaccines within the minimum intervals of time, that is DTP/OPV first dose not before six weeks of age with an interval of at least four weeks between doses and measles vaccine not before nine months of age. While those who were considered as missed opportunity and never immunized or had only one vaccination were recorded as partially immunized.



Under section D of the questionnaire for the lactating mothers, factors affecting full immunization coverage of children aged 12-23 months were assessed. It contained 20 variables assessed in the form of a table and respondents showed agreed or otherwise with the factors affecting immunization coverage of their babies.

Under section E of the questionnaire for lactating mothers, readiness of health facilities to provide vaccination services to infants was assessed. It contained 9 study variables and 6 were put in the form of a table and respondents showed by agreeing or otherwise with the study variables. It was also put in the modified form of the Likert scale.

Under the structured questionnaire for the health care workers, the study variables were 40 in number. Three major tables were included which contained the bulk of the study variables under that questionnaire. The tables were all put in the form of the three modified Likert scale for respondents to indicate against each study variable since they were literate. The questionnaires were given to the respondents and collected back after filling them at the spot. There was no second chance for filling of the questionnaire to avoid bias.

For data that was collected in the health centres, the researchers established good rapport with the authorities of the health centres before the actual data collection. Respondents who were interested to take part in the study and met the study inclusion criteria were randomly selected.

At the various homes where the lactating mothers were contacted because it was very difficult meeting them at the health centres, the data was collected from mothers who were readily available in their homes or health centres.

Informed consent was obtained from the lactating mothers through thumb impression/signature after explaining the aims and objectives of the study. Households and health facilities were mapped to establish geographic contours of probability of immunization.

On the other hand, secondary data was obtained from reliable records and related literature, such as books, reports from the study area, journals and internet articles. These were reviewed and used in the production of this thesis.

3.7.1 Training of research assistants

Seven research assistants who had an in-depth knowledge in the research topic under investigation and had been in similar data collection activities before were contacted to assist me in the data collection for the period of the two weeks.

The criteria used for the selection of the research assistants were based on the ability to speak and understand the English language fluently and the local language and having fair knowledge of the geographical setting of the study areas.

Training was provided for the research assistants during which the questionnaires were given to them and explained page by page to ensure uniformity in the data collection. The researchers explained the purpose of the research to the study participants. Study participants gave their consent to participate in the study before the research instrument was administered.

3.8 Validity and reliability of the research instrument

To determine the validity of the questionnaire, the initial draft of the self-designed questionnaire was subjected to face validity. The study supervisor and few other friends who were health care workers examined the questionnaires before the actual data collection. The essence of validating the study questionnaires was to ensure that it elicited the information they were designed for.

Concerning the reliability of the questionnaire, pre-test of the questionnaire was done using 5 respondents in Kassena Nankani municipality to get firsthand information on the trends in the



difficulty of questions that would be faced by respondents. This assisted the researcher to restructure and make the necessary corrections before the actual field work.

The questions did not receive much restructuring and so no necessary corrections were made before the actual field work was carried out. To avoid false information during the actual field study, study participants that were used for the pre-test were different from those that were used for the actual study.

In all these threats on internal validity were reduced by administering the questionnaire at one point in time and in the mornings only. The number that was interviewed per day on average was 25. The researchers took 0 to 30 minutes per subject.

3.9 Data analysis and presentation

The collected data was entered into computer after coding using Statistical Package for Social Sciences (SPSS) window version 22.0 package and Microsoft Word Excels 2013. The analysis of the data was done using descriptive and inferential statistics. The findings are presented using mainly frequency tables and charts.

Under the inferential statistics, cross tabulation, Chi-square test and Logistic regression analyses which yielded odds ratio were used to establish the relationships. All statistical tests were performed using two-sided tests at the 0.05 level of significance. P-values reported to three decimal places with values less than 0.001 being reported as < 0.001 . P-values less than 0.05 was considered significant.

3.10 Ethical considerations

Ethical clearance encompasses the ethical code that a researcher is supposed to observe in any scientific research. All the study participants were informed about the purpose of the study and their right to opt out or to respond to questions. Informed verbal consent was obtained prior to



interviewing any study subject. The values, rights and norms of the study subjects, the community, enumerators and supervisors were respected. Permission to use the DHS data in this study was sought and obtained from the KNMHD. Participants were also informed that the study would not attract any incentives or favor and was purely voluntary.



CHAPTER FOUR

Results

4.1 Introduction

This chapter presents the results of the data collected from the study participants. The results are presented using both descriptive and inferential statistics. The study results are presented according to thematic areas. The major themes under which the findings of the study are presented include; the demographic data of the respondents, knowledge of lactating mothers with children aged 12-23 months on immunization, EPI vaccination coverage of children aged 12-23 months, factors affecting full immunization coverage of children aged 12-23 months and readiness of health facilities to provide vaccination services to infants.

4.2 Demographic data of respondents

The demographic assessment of the study participants included age range in years, occupational status, marital status, residential status, educational status and parity of respondents. The results explaining the demographic data of the respondents are showed in Table 4.1 below.

Table 4.1: Demographic data of respondents

Variable	Frequency	Percent
Age		
18-25	20	16.7
26-30	26	21.7
31-35	40	33.3
35+	34	28.3
Marital status		
Never married	30	25.0
Married	80	66.7
Cohabitation	10	8.3
Occupation status		



Salaried workers	32	26.7
Unemployed	25	20.8
Private business	47	40.0
Student	15	12.5
Educational status		
No formal education	12	10.0
Primary	13	10.8
JHS	19	15.8
SHS	33	27.5
Tertiary	43	35.9
Parity		
1-2	57	47.5
3-4	30	25.0
4+	33	27.5

Source: Field data, 2018

From the results presented in Table 4.1, most (33.3%) of the study participants indicated that they were aged between 31-35 years while 16.7% of the study participants indicated that they were aged between 18-25 years. From the results (Table 4.1), majority of the study participants representing 66.7% indicated that they were married while the rest indicated that they were single and cohabitating. The results showed that, 40% of the study participants said they were engaged in private businesses while 26.7% of the respondents indicated that they were salaried workers (Table 4.1).

The findings also showed that, 35.9% of the respondents had tertiary school education while 10% of the rest of the study participants indicated that they had no formal educational training (See Table 4.1). The parity status of respondents that was assessed showed that, 47.5% of the study participants indicated that they had 1-2 children whilst 27.5% of the respondents said they had above 4 children. From Table 4.1, majority of the study participants representing 65%

indicated that they had to walk more than one hour to access health care at the nearest health centre while 35% indicated that they walked less than an hour to reach the nearest health centre. The detail results of study participants' demographic variables are shown in Table 4.1.

4.3 Knowledge of lactating mothers with children aged 12-23 months on immunization

In accordance with the specific aims, the primary variable of interest was the study participant's self-reported intention, or lack thereof, to have the child vaccinated. This assessment of intention in the form of knowledge was quantified using a three-point Likert-type scale of "3- agree", "2- disagree" and "1-neutral" with respect to intention to vaccinate.

The possible scores on these items ranged from one to five. All the values on knowledge were scored based on the positive answers. Overall knowledge about vaccinations was good, with the mothers concerning vaccinations of their babies. Overall mean score of knowledge was 15.18 on the knowledge variables of the study. The lowest value was considered zero with mean score above 10 considered 'knowledgeable of the study participants'. Therefore, based on the value obtained, all the respondents had good knowledge concerning immunization except that the uptake of vaccination among their babies was found to be low.



Table 4.2: Knowledge of immunization

Variable	Frequency	Percent
Ever heard of immunization		
Yes	120	100
Sources		
Health centre	105	87.5
Family members	34	28.3
Media	56	46.7
Friends	12	10.0
Market	9	7.5

Source: Field data, 2018

From Table 4.2, all the study participants stated that they had ever heard of immunization from different sources. Among the few sources this thesis has highlighted as identified by respondents were health centres (87.5%), media (46.7%) and from friends (10%). These findings from the study participants were not surprising because considering the educational background of the study participants, majority of them were educated and their knowledge concerning immunization might have been informed by their exposure to immunization literature.

Besides, the study participants might have also been educated on the need to have their babies who are less than 24 months immunized at the various health centres at the study setting since coverage of immunization at the time of the study was found to be low. See Table 4.2 for details.



Table 4.3: Information gap affecting immunization status of children

Variable	Agree	Disagree	Neutral
Lack of information			
Unaware of need for vaccination	24 (20.0%)	87 (72.5%)	9 (7.5%)
Unaware of need to return for subsequent dose	29 (24.2%)	89 (74.2%)	2 (1.6%)
Time of vaccination unknown	95 (79.2%)	25 (20.8%)	0 (0.0%)
Lack of management of any side effects after vaccination	95 (79.2%)	25 (20.8%)	0 (0.0%)
Lack of motivation			
Postponed until another time	57 (47.5%)	60 (50.0%)	3 (2.5%)
No faith in vaccination	49 (40.8%)	65 (54.2%)	6 (5.0%)
Rumours	94 (78.3%)	14 (11.7%)	12 (10.0%)

Source: Field data, 2018

From Table 4.3, majority (n=87; 72.5%) of the lactating mothers disagreed with the statement that, lactating mothers had no knowledge of the need for vaccination of their children. This could suggest that lactating mothers were aware of the need to have their babies vaccinated at the study setting. From the results (n=89; 74.2%) of respondents disagreed with the statement that lactating mothers had no knowledge of the need to return for subsequent dose of their children while (n=95; 79.2%) of lactating mothers agreed with the statement that, mothers lack of knowledge concerning the place/time of vaccination affect the immunization status of their children.

This result showed that health care workers might have not always informed lactating mothers what time was ideal for them to have their babies vaccinated at the health centres since lactating mothers might be thinking that certain times were meant for vaccination only at the health centres.

From the results, (n=95; 79.2%) of the lactating mothers agreed with the statement that, mothers lack of knowledge of management of any side effects after vaccination affects the vaccination





status of their babies (Table 4.3). This is probably true for most mothers because, if the child should experience any side effect after vaccination, and the mother stays far away from the health centres, it might be a source of worry and restlessness for the whole family. Thus, in order not to get themselves and their babies into this, lactating mothers might just want to stay away from vaccination of their babies.

In addition, acceptance of any program is highly dependent on parental attitudes towards immunization. A fear of adverse effects has a negative impact on paternal attitude towards immunization especially at rural communities with low understanding of the benefits of childhood immunization. From the results, (n=57; 47.5%) of lactating mothers agreed with the statement that mothers were always motivated to postponed until another time to have their babies vaccinated.

For most mothers who were engaged in petty trading, if their scheduled date for the next dose should fall on a market day, it was bound not to have the child vaccinated. It was also showed that, (n=65; 4.2%) of lactating mothers agreed with the statement that lactating mothers lack faith in vaccination. The first antecedent of every behavior is the bahviour intention. If mothers had no knowledge and belief that vaccines do not work for their babies, it was certainly going to be difficult to have their babies vaccinated. See Table 4.3 for details.

Table 4.4: Compliance rate of mothers

Variable	Agree	Disagree	Neutral
Taken vaccines at least once	71 (59.2%)	47 (39.2%)	2 (1.6%)
Last child fully immunized	80 (66.7%)	40 (33.3%)	0 (0.0%)
Aware of information on child's card	89 (74.2%)	27 (22.5%)	4 (3.3%)
Aware of service points	102 (85.0%)	18 (15.0%)	0 (0.0%)
Good intention towards immunization	111 (92.5%)	9 (7.5%)	0 (0.0%)

Source: Field data, 2018

From Table 4.4, majority of the lactating mothers (n=71; 59.2%) agreed with the statement that their babies had ever taken the vaccines at least once while (n=40; 33.3%) of the respondents disagreed with the statement that, their last child was fully immunized. It was further showed that (n=89; 74.2%) of the lactating mothers agreed with the statement that they were aware of the information on their child's immunization card while (n=9; 7.5%) of the respondents disagreed with the statement that they had good intention towards immunization. See Table 4.4 for details.

Table 4.5: Multiple comparison analysis

Independent Variables	Coefficients			
	β	Std. Error	T	Significance
Age	2.311	0.155	4.130	0.001
Education	0.034	0.002	5.290	0.000
Parity	0.110	0.014	-1.786	0.002
Occupation	0.821	0.002	3.221	0.000
Distance	0.036	0.021	-2.942	0.003

Source: Field data, 2018

From Table 4.5, the study assessed the relationship between certain demographic data of respondents and its effects on immunization of their babies. Five out of the seven demographic





data were analyzed under this session. From the results in Table 4.5, all the five demographic variables of the study participants were found to be significantly influencing immunization status of babies positively at 0.001, 0.000, 0.002, 0.000 and 0.003 levels of significance. These variables included age of the mothers, educational status of mothers, parity status of mothers, occupational status of the mother and distance to the nearest health centre. The variables derived as output of the model, are described.

Concerning the age of the mothers, from the result obtained, as the age increases by a unit, the desire to have their babies immunized would increase ($p < 0.001$). This entails when the age of the mothers increases the probability of taking the action to have their babies immunized would also increase. This could be due to the reason that, younger mothers might not like to take their babies to the health centres where they would have the health care workers shouting at them because they were too young to deliver.

From Table 4.5, the occupation status of mothers was highly associated with the immunization status of the baby ($p < 0.001$). This could be due to the reasons that, low socioeconomic status, sometimes resulting in counteractive practical circumstances such as lack of transport, may play a role in preventing the completion of the full set of immunizations by unemployed mothers with little support from their partners. See Table 4.5 for details.

Table 4.6: Relationship between independent variables and no faith in vaccination

Independent Variables	No faith in vaccination			
	χ^2	df	p	Cramer's V
Residential status	13.883	3	0.001	.652
Occupational status	23.932	2	0.000	.336
Parity status	68.031	2	0.031	.232
Marital status	23.711	5	0.012	.622

Source: Field data, 2018

From Table 4.6, this section covers the findings on relationship between certain demographic data of lactating mothers and having faith in vaccination variable by Pearson correlation analysis, Chi-square test and Cramer's V for discrete/categorical variables. From the findings (Table 4.6), there was a statistical relationship between mothers residential status and having no faith in vaccination ($\chi^2=13.883$, $p<0.001$). Since the Chi-square test was found to be positive, it meant that mothers who were in the rural areas were more likely not to have faith in vaccination of their babies as compared to their counterparts in the urban areas.

From the results in Table 4.6 it was found that the marital status of lactating mothers did not significantly influence them to have faith in vaccination ($\chi^2=23.711$, $p<0.012$). The detail results are shown in Table 4.6.

4.5 EPI vaccination coverage of children aged 12-23 months

Immunization is unquestionably one of the most cost-effective and lifesaving public health interventions that can be used to protect children from vaccine-preventable diseases. Unpleasant past experiences with immunization, which included adverse reactions identified among the study participants influence the level of vaccination coverage of babies. This study assessed the





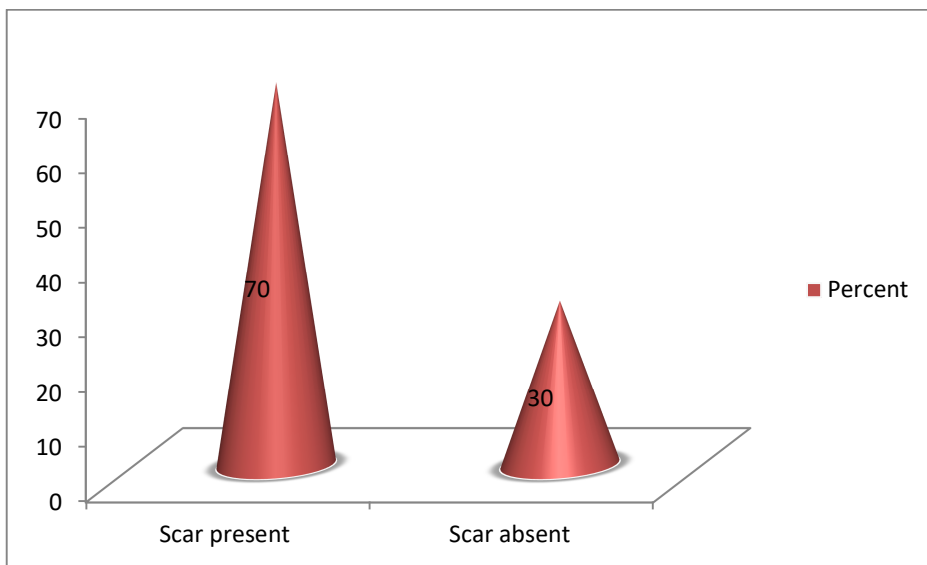
vaccination coverage of babies at the study area by carefully cross checking the immunization card of the child.

When the childhood vaccination schedule is not followed as recommended, the child not only will fail to receive timely protection from vaccine preventable diseases at the time when they are most susceptible, but also are at an increased risk of never completing the full vaccination series.

From the results, not all the babies sampled and their mothers or care takers interviewed had successfully completed the vaccination scheduled.

Based on that, a mean average analysis was done to ascertain the vaccination level at the study setting. Based on the mean score, it was found that vaccination coverage of babies at the study setting was 4.65. Meaning the coverage of immunization was found to be low.

Figure 4.1: BCG on child right hand



Source: Field data, 2018

From Figure 4.1, babies were examined physically on the right hand to check for the presence of BCG scar on the child. The results showed that, majority of the babies representing 70% at the time of the study had BCG scare present on the child whilst the rest had none. This number

(30%), although might appeared insignificant, presents a worrying phenomenon considering the fact that mothers may have not taken their babies for the injection. Thus, this could probably mean that, these babies would be exempted from the protective effects of BCG which is taken at birth.



Table 4.7: Vaccination coverage of children aged 12-23 months

Variable	Frequency	Percent
Age		
12 months	10	8.3
14 months	8	6.7
17 months	13	10.8
23 months	89	74.2
Sex		
Male	51	42.5
Female	69	57.5
Birth dose		
BCG	91	75.8
OPV0	120	100.0
1st dose		
RV1	87	72.5
OPV1	88	73.3
PCV1	89	74.2
Penta 1	93	77.5
2nd dose		
RV2	89	74.2
OPV2	100	83.3
PCV2	98	81.7
Penta 2	102	85.0
3rd dose		
OPV3	79	65.8
PCV3	81	67.5
Penta 3	82	68.3

Source: Field data, 2018

From Table 4.7, records of babies were crossed check to fill certain portions of the study. From the results, it was found that, 57.5% of the babies sampled with their mothers were females while



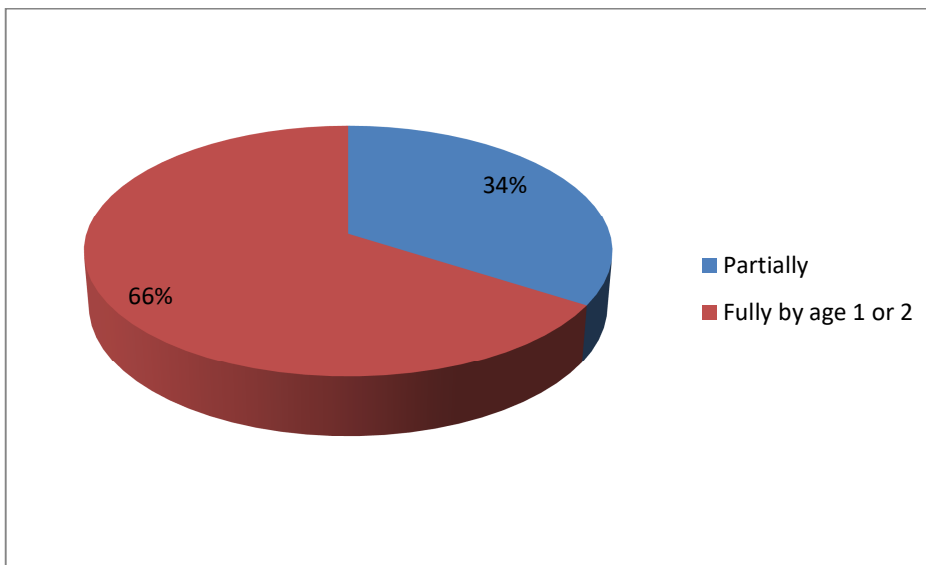
the rest were males. It is showed in Table 4.7, that, 74.2% of the babies were aged 23 months while the rest were aged below 23 months.

From the results (Table 4.7), it was revealed that only 75.8% of babies received BCG at birth dose while majority of the babies representing 77.5% received Penta 1 on first dose. It was also revealed that, 74.2% of babies received RV2 on 2nd dose while 65.8% of babies received OPV3 on 3rd dose. Receipt of vaccines at recommended ages and intervals ensures that the child is adequately protected from target diseases at all times.

From the responses, study participants mentioned BCG, Penta 1, Penta 2, Penta 3, OPVO, PCV, RV1, F/F, M/S1 and M/S2 as the antigen meant for the age of their babies. In KNM EPI performance of the district has been varying over the years and even though a little progress has been realized, the national targets have not yet been met. The national programme expects that all newborns should be reached for BCG vaccination. It also targets 90% for all other antigens except TT2+ which is 85%.



Figure 4.2: Child immunization status



Source: Field data, 2018

The study assessed the immunization status of babies at the study setting. As seen in Figure 4.2, most (34%) of the babies were partially immunized at the time of the study. It is important to state that, mothers play an important role in immunization of their children. Therefore, partial immunization coverage against vaccine preventable diseases is a significant public health problem especially in rural areas in Ghana. And mothers should be encouraged to send their babies to the health centres or vaccination points for them to be vaccinated against any vaccine preventable diseases.

Table 4.8: Relationship between respondents age and immunization status of babies

Age Variable	Immunization status		P value
	Partially (%)	Fully (%)	
18-25	35	65	$\chi^2 = 11.849$; df = 6; p < 0.001
26-30	44	56	Significant
31-35	50	50	
35+	45	55	

Source: Field data, 2018

From Table 4.8, the study assessed the relationship between respondents age in years and the immunization status of their babies using cross tabulation. From the results in Table 4.8, there was a statistical relationship between age of mothers and immunization status of their babies ($\chi^2 = 11.849$; df = 6; p < 0.001). This result could possibly be due to the fact that older mothers might have been informed of the benefits of immunization as compared to younger mothers as evident in the results. This shows that the age of a mother does necessarily influence the choice of immunization of the child by the mother.

4.6 Factors affecting full immunization coverage of children aged 12-23 months

Determinants of receipt of vaccination completion are complex and interwoven. Parents' objection, disagreement or concern about immunization safety, long distance walking and long waiting time at health facilities are the most common reasons for incomplete vaccination/immunization of babies.

Identifying the factors that determine full child immunization in a representative sample of the country will enable the government to provide programmes and service environment through



well-articulated policies, projects and programmes like National Immunisation Policy and Standards of Practice.

This is to ensure increased uptake and ultimately child survival as well as healthy growth of children in Ghana and enhance their quality of life. The study assessed the factors affecting immunization status of babies at the study setting. The findings are presented in the table below.



Table 4.9: Factors affecting full immunization coverage of children aged 12-23 months

Variable	Agree	Disagree	Neutral
Scared of the side effects of the shots	98 (81.7%)	19 (15.8%)	3 (2.5%)
Worried about the number of shots my child gets at one time	55 (45.8%)	65 (54.2%)	0 (0.0%)
Always just forgot	82 (68.3%)	38 (31.7%)	0 (0.0%)
My health care provider told me not to get my child his/her shots	0 (0.0%)	120 (100.0%)	0 (0.0%)
Do not think the shots work to prevent diseases	38 (31.7%)	82 (68.3%)	0 (0.0%)
Complications from previous injections	42 (35.0%)	78 (65.0%)	0 (0.0%)
The clinic/facility was not open at a time mothers could go	92 (76.7%)	28 (23.3%)	0 (0.0%)
Did not have someone to take care of other Children	38 (31.7%)	82 (68.3%)	0 (0.0%)
My child was sick and could not get their shots	12 (10.0%)	108 (90.0%)	0 (0.0%)
The clinic wait was too long	92 (76.7%)	28 (23.3%)	0 (0.0%)
Did not know where to take child for shots	24 (20.0%)	92 (76.7%)	4 (3.3%)
Husband disapproves vaccination of babies	0 (0.0%)	120 (100.0%)	0 (0.0%)
Vaccine out of stock	49 (40.8%)	71 (59.2%)	0 (0.0%)
No available appointments at clinic	29 (24.2%)	91 (75.8%)	0 (0.0%)
The shots cost too much	0 (0.0%)	120 (100.0%)	0 (0.0%)
Time of vaccination inconvenient	92 (76.7%)	28 (23.3%)	0 (0.0%)
Place of vaccination too far	80 (66.7%)	40 (33.3%)	0 (0.0%)
Vaccinators absent	10 (8.3%)	110 (91.7%)	0 (0.0%)
Health staff are not friendly	92 (76.7%)	20 (16.7%)	8 (6.6%)

Source: Field data, 2018

From Table 4.9, as part of factors affecting immunization status of babies by their mothers, findings showed that, all the study participants representing (n=120, 100%) disagreed with the



statement that, husband disapproves vaccination of babies and the shots cost too much as factors affecting immunization status of babies. This is because men may not want to take any blame on the health of the child. Thus, denying women the opportunity to send the child to the hospital is an indication that the child should be left at home to be cared for.

From the results in Table 4.9, (n=92; 76.7%) of the lactating mothers agreed with the statement that, health staff were not friendly while (n=92; 76.7%) agreed with the statement that the clinic wait was too long. For mothers who are business women, spending a long time in the hospital was seen as a waste of opportunity for them to generate income. Thus, mothers would prefer to go to the market to make sales at the expense of sending their babies to the health centre for vaccination unless the child was sick.

From the results, it was also showed that (n=82; 68.3%) of the mothers agreed with the statement that they always forgot to take their babies to the health centre for vaccination on the scheduled date while (n=98; 81.7%) of the mothers agreed with the statement that they were scared of the side effects of the shots. See Table 4.9

Table 4.10: Regression analysis

Variable	OR	95% CI	P value
Age	3.10	1.63-1.86	0.001
Education status	7.2	0.64-0.87	0.000
Occupation status	3.3	2.46-2.88	0.005
Parity	4.4	1.77-1.93	0.003
Distance	5.4	0.68-0.83	0.002

Source: Field data, 2018

From Table 4.10, the results of the regression analysis showed that, mothers who were staying far from a health centre were 5.4 times more likely not to have their babies vaccinated (OR=5.4, CI; 1.63-1.86, P < 0.001). A possible explanation for this could be that visibility of a clinic may



attract a parent's attention and/or act as a reminder to the parent of the immunization status of the child. From the results also, the occupation of mothers were more 3.3 times more likely to affect the vaccination status of babies (OR=3.3, CI; 2.46-2.88, P < 0.005). See Table 4.10.

4.7 Readiness of health facilities to provide vaccination services to infants

It may be difficult for health planners and decision makers to control the indirect influence of economic factors on immunization uptake. However, there remains a need to identify all the interactions between the health system and the communities.

Table 4.11: Readiness of health facilities to provide vaccination services to infants

Variable	Agree	Disagree	Neutral
Actively seeking information from health professionals regarding vaccination	80 (66.7%)	40 (33.3%)	0 (0.0%)
Passively receiving information from health professionals regarding vaccination	90 (75.0%)	30 (25.0%)	0 (0.0%)
Health workers inform them that adherence to and completion of schedule are important	50 (41.7%)	70 (58.3%)	0 (0.0%)
Insensitivity to the patient or family needs/questions	40 (33.3%)	70 (58.3%)	10 (8.3%)
Negative comments from physician	75 (62.5%)	35 (29.2%)	10 (8.3%)
Inappropriate argument with health staff, family members or colleagues about vaccination	80 (66.7%)	35 (29.2%)	5 (4.1%)

Source: Field data, 2018

From Table 4.11, majority (n=80; 66.7%) of the study participants agreed with the statement that, they were actively seeking information from health professionals regarding vaccination of their babies while (n=50; 41.7%) of the study participants disagreed with the statement that, health workers inform them that adherence to and completion of schedule were important. This means that, health workers were not encouraging mothers to bring their babies for vaccination.

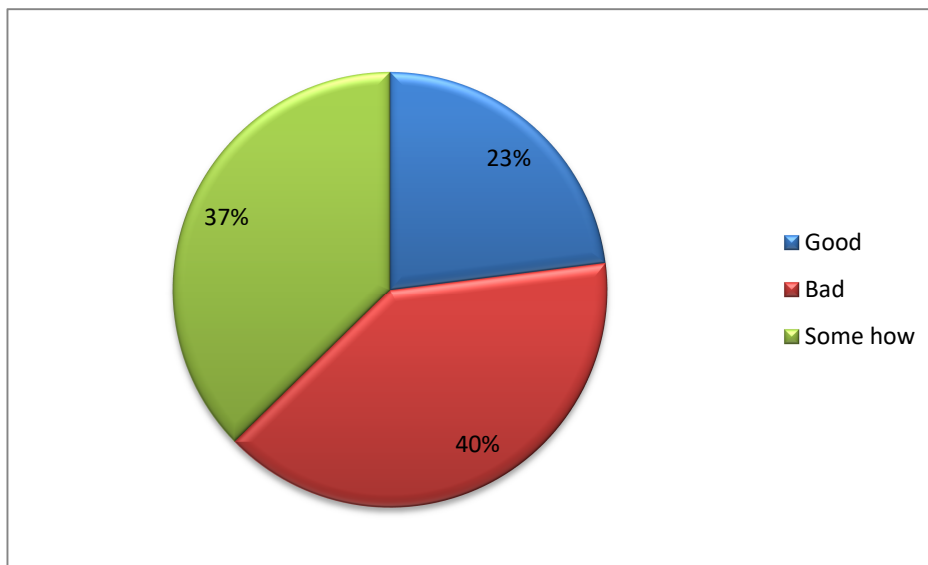




Improving vaccination access across all regions of the country could have a multifaceted effect on healthcare delivery by increasing health worker productivity and coverage area as well as maximizing the efficiency of their health interventions.

From the results (Table 4.11), (n=75; 62.5%) respondents agreed with the statement that negative comments from physicians concerning vaccination affected their babies vaccination status while majority (n=80; 66.7%) agreed with the statement that inappropriate argument with health staff, family members or colleagues about vaccination of their babies affected their babies vaccination status.

Figure 4.3: Health provider attitude



Source: Field data, 2018

From the results shown in Figure 4.3, most (40%) of the lactating mothers rated the attitude of health care providers as bad. Interpersonal factors encompass the human relation that health workers are able to exhibit when patients come to the hospital to seek health care. While 37% of the mothers rated the attitude of health providers as somehow.

It is true that patients may have some difficulty in truthfully putting down their views for the service provided to accept and this is often the case where they had to perceive the attitude as bad. The patients' feelings are what matters even if the staffs' perception is different, since patient satisfaction evaluation is connected with their behaviour and can be used to improve health care services.

4.7.1 Way of improving immunization coverage

- Health workers should put up good attitude towards mothers who come with babies for weighing
- More education on the need for mothers to immunized their children
- Immunization scheduled should not be on market days
- Follow up on defaulters

4.8 Health workers interactions

The health workers were sampled from 14 health facilities within the study setting. These are; Vonania CHC, War Memorial Hospital, Doba Community Health Centre, Navrongo Health Centre, Korania CHPS, Gia CHPS Compound, Korania CHPS, Pungu North Health Centre and Vunania CHC.



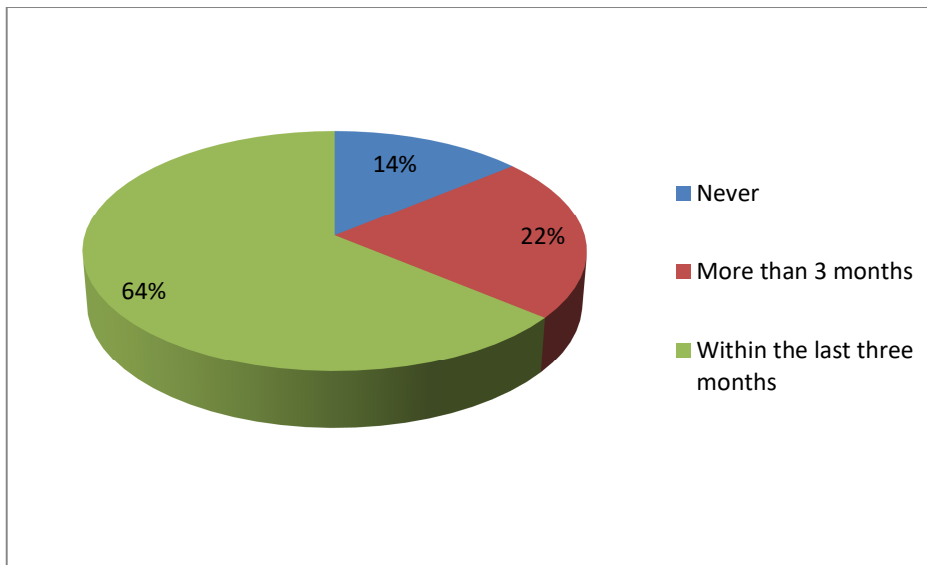
Table 4.12: Vaccination and service delivery strategy

Variable	Frequency	Percent
Frequency of vaccination		
Daily	13	92.9
Weekly	1	7.1
Service delivery strategy		
Static	14	100.0
Outreach	11	78.6
Mobile	1	7.1

From the results (Table 4.12), majority (92.9%) of the health workers said they were doing vaccination daily at their facilities while all the study participants stating that their service delivery strategy for immunization of babies was static at their health facility level. Only 78.6% however, said they were also engaged in some form of outreach programs on vaccination sessions. This could possibly be due to the fact that mothers were no longer coming with their babies for immunization. Continuous awareness raising interventions is vital through CWC on the use of immunization at the grass root level by health extension workers and other development agents. This helps to sustainably improve the awareness, knowledge of the mothers and the general community on the benefits of immunizing their children. This ultimately increases the uptake of vaccination in the community.



Figure 4.4: Frequency of supervisory visits

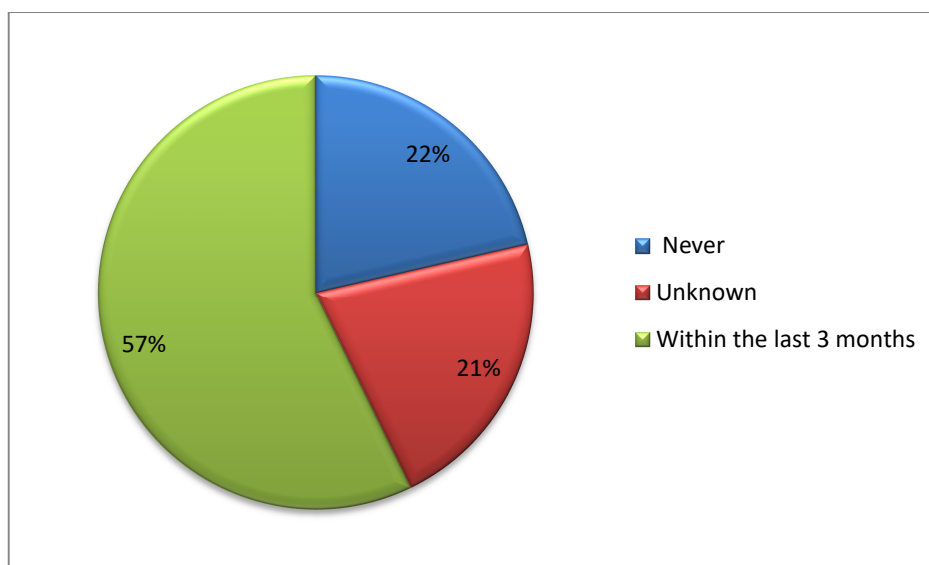


Source: Field data, 2018

Figure 4.4, majority of the respondents (64%) said within the last 3 months that supervisors came while 14% said they had never seen any supervisor coming to visit them at their health facilities. This is a worrying phenomenon considering the fact that, most of the health facilities were found outside Navrongo township, lack of supervisory role in those places could expose the health staff at those places to come to work at their own will without any problem. There is also an urgent need to improve the cold chain management system through training and monitoring, as vaccines in some facilities might be at high risk of losing their potency.



Figure 4.5: Frequency of written feedback from authorities



Source: Field data, 2018

From Figure 4.5, majority (57%) of the health workers stated that they received written feedback from the authorities within 3 months while 22% of the health workers said they had never received any written feedback. From the responses, 8 (57.1%) said they do get supervision and EPI in-service training in their health facilities while 6 (42.9%) said they did not get supervision and EPI in-service training in their health facilities.

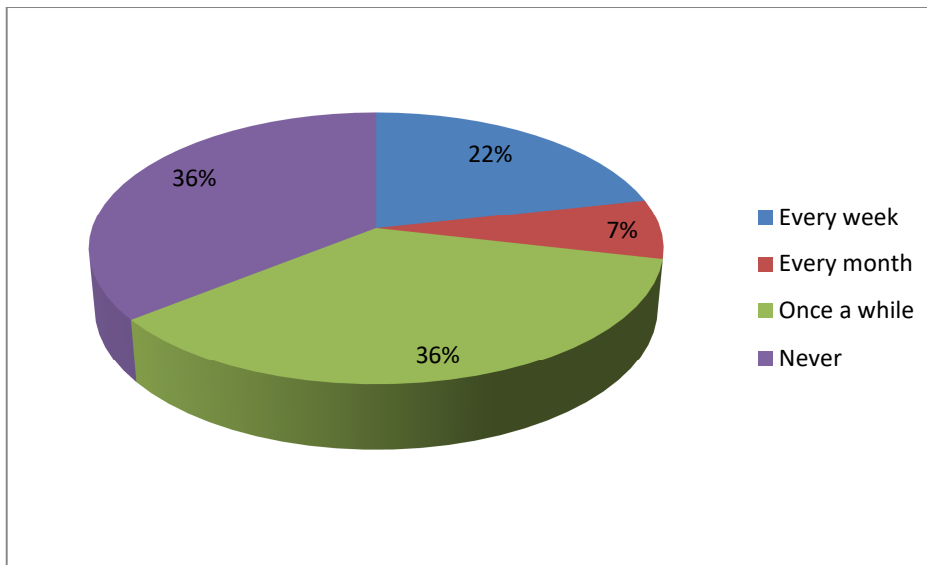
Table 4.13: Records of adverse effects following immunization

Variable	Frequency	Percent
Do not know	2	14.3
Mother	2	14.3
Normal for a very few to react	8	57.1
From the vaccine	5	35.1

From Table 4.13, 57.1% of the respondents said that, it was normal for a few to react to adverse effect following immunization of babies while 35.1% said one reason that accounted for record adverse effect following immunization is from the vaccine/see Table for details.



Figure 4.6: Frequency of adverse effect following immunization



Source: Field data, 2018

From Figure 4.6, health workers were asked to state the frequency of adverse effects following immunization in their facilities. It was showed that, 36% of the health workers said once a while that mother come with their babies to complain of adverse effects of immunization while 22% said every week. See Figure 4.6 for details.



Table 4.14: Reasons for EPI service provisions and interruptions

Variable	Agree	Disagree	Neutral
Vaccines not collected timely	2 (14.3%)	12 (85.7%)	0 (0.0%)
Lack of transport for regular supply	5 (35.7%)	8 (57.2%)	1 (7.1%)
Vaccine was spoiled/expired	3 (21.4%)	11 (78.6%)	0 (0.0%)
Vaccine not available	8 (57.2%)	6 (42.8%)	0 (0.0%)
Vaccinator had other priorities and unable to attend sessions	0 (0.0%)	14 (100.0%)	0 (0.0%)
No kerosene available for refrigerator	6 (42.8%)	8 (57.2%)	0 (0.0%)
Refrigerator required maintenance	6 (42.8%)	8 (57.2%)	0 (0.0%)
Needs means of transport	9 (64.3%)	4 (28.6%)	1 (7.1%)
No sufficient carrier progression	6 (42.8%)	8 (57.2%)	0 (0.0%)

Source: Field data, 2018

From Table 4.14, reasons for EPI service provision and interruptions were assessed. From the results (n=12; 85.7%) of the study participants disagreed with the statement that vaccines not collected timely affected service provision while (n=5; 35.7%) of the health staff agreed with the statement that lack of transport for regular supply affected service provision on vaccination.

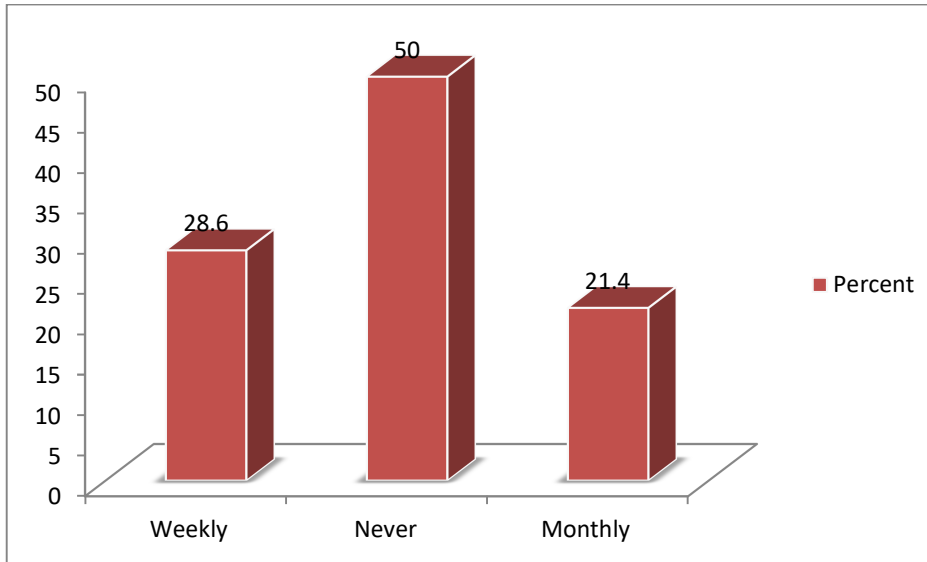
From the results (n=11; 78.6%) of the health workers, agreed with the statement that vaccine that spoiled/expired affected immunization status of babies. From the results, all the health workers disagreed with the statement that vaccinators had other priorities and were unable to attend sessions that affect vaccination of babies while (n=9; 64.3%) agreed with the statement that no means of transport affected immunization status of babies. See Table 4.14 for details.

Quality of outreach services, cold chain, as well as linking community with health services are among the influencing factors of effectiveness of immunization programs in resource-poor setting. The relative effect of each one of the above factors may significantly vary according to



geographical areas. Knowledge of local impediments to effective immunization programs is very important in the development and implementation of appropriate solutions.

Figure 4.7: Frequency of EPI interruption



Source: Field data, 2018

From the responses that were analysed, 9 (64.3%) of the health care workers indicated that they had ever been EPI service interruption at their facilities before while 5 (35.7%) of the health care workers said they had never been EPI service interruption at their facilities before. From Figure 4.7, most of the health workers (28.6%) indicated that they had experienced service interruption weekly. See Figure 4.7.

Table 4.15: Persons involved for defaulter tracing in the health facilities

Variable	Frequency	Percent
Community health nurse	3	21.4
Health volunteers	14	100.0
Nurse	1	7.1

From the results, all the health staff said they had health volunteers who were involved in tracing immunization defaulters while 7.1% said they had a nurse.



Table 4.16: EPI defaulter tracing mechanism

Variable	Yes	No	Do not know
Review of register at health centre	13 (92.9%)	0 (0.0%)	1 (7.1%)
Review of register by other health worker	4 (28.6%)	10 (71.4%)	0 (0.0%)
Register kept by mothers	2 (14.3%)	12 (85.7%)	0 (0.0%)
Box with child card month of expected return	5 (35.7%)	5 (35.7%)	4 (28.6%)

Source: Field data, 2018

From Table 4.16, it was showed that (n=13; 92.9%) of study participants said as part of their default tracing mechanism, they conducted review of registers at health centres while (n=5; 35.7%) said they had box with child card month of expected return.

Table 4.17: Stock-out of vaccines /logistics in the last 1 months in any of the following

Variable	Agree	Disagree	Neutral
BCG	3 (21.4%)	11 (78.6%)	0 (0.0%)
OPV	3 (21.4%)	10 (71.5%)	1 (7.1%)
DPT-HepB-Hib	3 (21.4%)	10 (71.5%)	1 (7.1%)
PCV	0 (0.0%)	14 (100.0%)	0 (0.0%)
Tetanus toxoid	0 (0.0%)	14 (100.0%)	0 (0.0%)
Rota	0 (0.0%)	14 (100.0%)	0 (0.0%)
Safety boxes	0 (0.0%)	14 (100.0%)	0 (0.0%)
AD syringe	2 (14.3%)	12 (85.7%)	0 (0.0%)
Measles	0 (0.0%)	14 (100.0%)	0 (0.0%)
CHRB	0 (0.0%)	14 (100.0%)	0 (0.0%)

Source: Field data, 2018

From Table 4.17, all the study participants disagreed with the statement that they had ever experienced PCV, tetanus toxoid, safety boxes, measles and CHRB out of stock while (n=3;



21.4%) of the study participants agreed with the statement that, they had ever experienced BCG out of stock. All the health workers said client-provider interaction was well.

4.8.1 Ways of improving immunization coverage

The following were considered as ways of improving immunization status as suggested by health workers

- Making all schools having crèche within the catchment areas of health facilities as their outreach points
- Improvement in CWC service in the various schools due to children not coming to CWC during school going age
- Refrigerators should be provided to all health facilities for vaccines storage
- Increasing more outreach services within the study area
- More health sensitization and health education on the importance of child immunization in the communities
- More motorbikes should be provided to enhance movement of health staff to villages
- More staff nurses should be posted at the health facilities to make work more efficient
- Community durbars should be organized periodically on the importance of immunization
- Improving upon home visits and active involvement of community volunteers in immunization



CHAPTER FIVE

Discussions

5.1 Introduction

This chapter of the report closely looks at the main findings of the study and relates them to available literature where appropriate.

5.2 Knowledge of lactating mothers with children aged 12-23 months on immunization

EPI in Ghana aims at protecting every child from the common childhood diseases; namely, tuberculosis, poliomyelitis, diphtheria, neonatal tetanus, whooping cough, hepatitis B, haemophilus influenza type b, measles and yellow fever. The study sought to assess the awareness of mothers with babies less than 24 months of age knowledge on immunization since that could inform their practice.

Pertaining to the results that were obtained from the respondents, all of them indicated that they had ever heard of immunization from various sources. However, majority of the respondents representing 87.5% identified health centres as their sources of information concerning immunization. This finding from the study supports the study by Hernandez, Montana and Clarke (2010) where lactating mothers identified various sources of information concerning immunization.

From the results, majority of the respondents (n=95; 79.2%) identified lack of knowledge of lactating mothers on how best to manage any side effects after vaccination of their babies as a hindrance to immunization. This was a worrying phenomenon among the lactating mothers as majority of them did not want to send their babies to the health centres to have them vaccinated. This finding from the study points to the ineffective role played by health workers on how best





lactating mothers who have their babies reacting to the vaccines after immunization should do at the study area.

It is important to state that, information spread quickly especially among mothers who perhaps might be living in the same vicinity and what happens to one of them is likely to have an influence on the other one. This finding from the study concurs with the study by Stamler (2012) where lactating mothers' inadequate knowledge concerning how to manage any side effects after vaccination affected them from taking their babies to the health centres to have them immunized. This was reported to have slowed the rate of vaccination at the health centres and therefore, affected the vaccination scheduled of their babies.

From the results (n=89; 74.2%) of the study participants disagreed that they were not aware of the need to return for subsequent dose at the hospital with their babies. This is because lactating mothers had knowledge on the need to return for subsequent dose of the vaccination with their babies but might have been occupied on the day of the vaccination. If health workers at the study place have a way of reaching out to these lactating mothers, perhaps the number of women that would go for vaccination might be higher. This finding from the study disagrees with the study done by Mohamud et al. (2014) where lactating mothers were not aware of the need for subsequent vaccination of their babies at health centres.

Findings from the results showed that, majority of the study participants (n=95; 79.2%) mentioned that they were not aware of the time of vaccination in the various health centres. This finding from the study again showed that, mothers with babies less than 24 months old might have their babies vaccinated at the health centres, but since the time was unknown to them, lactating mothers felt reluctant to go to the health centres to ask for the right time.



This finding from the study agrees with the study done by Kuehn (2010) where lactating mothers did not have knowledge of what time they were supposed to have gone for the next vaccination of their children at health centres.

Concerning the lack of motivation among lactating mothers to send their babies for vaccination at vaccination centres, most (n=60; 50.0%) of the respondents disagreed with the statement that they would postpone until another time to have their babies vaccinated. This finding from the study agrees with the study done by Kidane (2006) where knowledge gap concerning vaccination scheduled was identified as factor influencing immunization status of babies less than 24 years.

Additionally, findings from the study showed that, (n=94; 78.3%) of the study participants agreed with the statement that rumours mongering concerning babies that have been vaccinated and negatives effects might influence mothers not to have their babies vaccinated.

Health workers would have to do more to erase lactating mothers concerning the erroneous impression that vaccination is not good. This finding from the study agrees with the study done by Fischhoff (2010) where misinformation concerning vaccination was found to affect the vaccination scheduled of babies less than 24 months.

Concerning the compliance rate of mothers on vaccination schedule of the babies, the results showed that (n=111; 92.5%) of the respondents stated that they had good intention towards immunization. This finding from the study agrees with the study done by Machingaidze, Wiysonge and Hussey (2015) where mothers had good intention concerning immunization.

From the results, the findings showed that, there was a statistical relationship between age of lactating mothers and having knowledge of immunization ($p < 0.001$). Age of lactating mothers was one of the demographic characteristics hypothesized to influence immunization status of babies. This could be due to the fact that, younger mothers may not want to go to the health



centres to have themselves been mocked at or laugh at by health staff. This finding from the study agrees with the study done by Fischhoff (2010) where age of mothers was found to be associated with immunization status of their babies.

The finding however, disagrees with the study done by Bulpitt and Martin (2010) where age of lactating mothers was found not to be associated with immunization status of babies. The results also showed that, there was a relationship between lactating mothers distance from their homes to the nearest health centre and the immunization status of their children ($p < 0.003$). This could be due to the fact that, mothers who were staying far away from the health centres might have difficulties getting access to the health centres and may have other forms of caring for their babies.

Distance to the health centres affects lactating mothers negatively because, mothers with less income may not be able to transport themselves to the nearest health centre even on the date of schedule and this may affect the immunization status of their babies. This finding from the study is similar to the study done by Kennedy et al. (2011) where distance was found to be associated with immunization status of babies.

Inferential analyses of important independent variables, which are expected to have influence on immunization status were selected and tried to find an association. These variables were selected on the basis of theoretical explanations and the result of various empirical studies. To determine the best subset of independent variables that are good predictors of the dependent variable, the p values with Chi-square were generated.

In this method all the above mentioned variables were entered in a single step. The results found the residential status and occupation status of respondents to be positively associated with having faith in immunization of their babies ($p < 0.001$ & $p < 0.001$) respectively. This finding from the



study disagrees with the study done by O'Connor (2011) where there was no statistical relationship between respondents' occupational status and trusting vaccination of babies.

The results also showed that, there was no relationship between marital status of respondents and having faith in vaccination ($p < 0.012$). This finding from the study is at variance with the study done by Mennito and Darden, (2010) where marital status of women was found to be associated with having faith in vaccination of babies ($p < 0.001$). This study showed that parental belief about immunization safety is the major reason for incomplete immunisations among children

Additionally, results from the study showed that, there was a relationship between parity of respondents and immunization schedule of their babies ($p < 0.002$). This could be due to the fact that, respondents with children might have knowledge on the importance of vaccination of their babies and this could have informed their practice. This finding from the study disagrees with the study done by Niederhauser (2010) where parity of mothers was found not to be associated with immunization status of women ($p > 0.011$)

Education of lactating mothers was found to be significantly associated with immunization status of their babies ($p < 0.001$). Educated mothers are more likely to have good understanding concerning vaccination of their babies as compared to uneducated mothers. Misinformation and negative attitude towards vaccination of babies could be erased if mothers had good understanding of the importance of vaccinating babies. Thus, it is significant to state that, this study perhaps draw the conclusion based on the data gathered.

This finding from the study concurs with the study done by Pati et al. (2010) where educational status of mothers was found to influence mothers' knowledge of immunization. Education is one of the important variables, which increases women's ability to adherence to vaccination enhancing good health of their babies. Low level of education and high illiteracy rate is typical in

developing countries. In fact, education level of mothers is assumed to increase the ability to use vaccination in a better way. Therefore, in this study, education level is a variable helping to demand vaccination for their babies enhancing complete status by the respondents.

5.3 EPI vaccination coverage of children aged 12-23 months

The immunization patterns among babies reveal that a large proportion of children, particularly babies less than 24 months, do not receive a full course of immunization. Babies less than 24 months particularly are at risk of not being fully immunized, and it seems that health workers never replicate the patterns of health service use of residents or even rural areas visits. Although the great majority of mothers have contact with the health centers when the child is less than 2 months of age, however, the immunization coverage rates fall noticeably because of dropout rate in the growth of the child.

From the results, the findings showed that, 30% of the babies were not having scars on the right hand side for BCG taken at birth. This finding from the study disagrees with the study done by Shaikh et al. (2010) where the BCG coverage of babies at birth was found to be high. Further, in relation to vaccine preventable serious infectious diseases, some parents minimize the seriousness of the effects of these diseases compared to the risk of adverse effects from immunization.

Thus, for babies that were not vaccinated, these groups constitute an additional hazard as member in the families frequently live in clusters with low coverage that can allow serious outbreaks of vaccine preventable disease. The immunization card was utilized to check for completeness and correctness of immunization schedule, and also for identifying the appropriate use of all available opportunities for immunization.



About two third (66%) of the children were not fully immunized by one year of age and 34% were partially immunized. This finding from the study supports the study done by Rogie (2013) where children in Ethiopia were not fully immunized.

From the results there was a statistical relationship between age of mothers and immunization status of their babies ($\chi^2 = 11.849$; $df = 6$; $p < 0.001$). From the results only 75.8% of the babies received BCG and 72.5% received RV1 at 1st dose. This finding from the study agrees with the report by the WHO (2013). The results from the findings also showed that, 74.2% of babies received RV2 on 2nd dose while 81.7% received PCV2 at 2nd dose. This finding from the study disagrees with the study done by Antai (2010) where babies in Nigeria did not received RV2 on 2nd dose.

The results also showed that, 65.8% of babies receive OPV3 while 67.5% of babies received PCV3 at 3rd dose. This finding from the study agrees with the study conducted by Angela et al. (2012) where missed opportunity for immunization was found to be high. It is important to state that mothers identified concerns with the immunization status of their babies. Therefore, helping to address those concerns could influence the immunization status of their babies.

Mothers complained of health workers forgetting to provide the BCG immunization at birth and mothers always concerned about the adverse side events after BCG vaccination. The OPV coverage rate is also suboptimal, though the OPV campaign is frequently implemented in the study area. Compared with HepB1, the BCG coverage rate was very low at birth.



5.4 Factors affecting full immunization coverage of children aged 12-23 months

The reasons for partial immunization and factors responsible for missed opportunities are poorly understood and little data is available to explain the phenomenon that could support the decision making. The study assessed the factors that were found to be affecting immunization status of babies negatively at the study area.

Provider's attitudes and long waiting period were cited by few mothers as their reason for not taking additional immunization for their children. Indeed a few women were frustrated because they had visited the facility more than one time with no vaccines on ground, absence of service providers or disrespectful providers. From the results, findings showed that (n=92; 76.7%) of the study participants identified long waiting times at hospitals as a factor influencing immunization status of babies. This finding from the study showed that, lactating mothers did not like to go to the health centres to wait very long enough before they were attended to by health care workers. This finding from the study agrees with the study done by Humphreys (2011) where long waiting time was cited as a factor influencing immunization status of babies.

From the results, the findings also showed that (n=82; 68.3%) of the respondents did not see other children they were having at home as a factor influencing immunization status of their current babies. This finding from the study is at variance with the study done by Stamler (2012) where the availability of under-five children was cited as a factor influencing immunization status of babies.

From the results, the regression analysis found distance to be a factor influencing immunizations status of babies (OR=5.4, CI; 1.63-1.86, P < 0.001). The results showed that, mothers who were staying far away from the health centres were 5.4 times more likely not to have their babies





vaccinated. This finding from the study agrees with the study done by Canavan et al. (2014) where proximity to clinic was found to influence immunization status of babies.

Accessibility as a function of distance and need for using transport were identified as confounder variables for incomplete vaccination of babies by mothers in the study area. Long distance trekking involving approximately 1½ h (90 min) to reach the nearest health facility was seen as a strong non-motivating factor with a negative influence in completing vaccination schedules by lactating mothers.

The results also showed that, education of lactating mothers was found to influence immunization status of babies (OR=7.2, CI; 0.64-0.87, P < 0.001). The results showed that lactating mothers who were educated were 7.2 times more likely to have their babies vaccinated as compare to those lactating mothers who were not educated. This was found in the model to be significant.

This finding from the study agrees with the study done by Mohamud et al. (2014) where education was found to be associated with immunization status of babies. In the study area the causes of partial immunization among babies need further exploration, but the study attributed high dropout rate to problems in less demand for vaccinations by mothers especially those in the rural areas, less client satisfaction with services at health centres, and the ability of the immunization program to provide those services at accessible points for lactating mothers.

The result is that the coverage rates of immunization for babies was lower than other vaccines due to a much longer time gap, in which the mothers may forget to return to the health centres.

The results also showed that, occupation of mothers was found to influence the immunization status of their babies (OR=3.3, CI; 2.46-2.88, P < 0.005). Mothers who were employed were 3.3 more likely to have their babies immunized. This could be due to the reason that, salaried



workers were more likely to have some form of financial security and could afford certain things by themselves at home.

This finding from the study supports the study done by Bergin (2011) where employment status of babies was found to influence their immunization status. A client-friendly health facility with a well planned and organized fixed and outreach activities that strongly involve the local community, would help to decrease the mothers' expenses on transportation and the time spent for obtaining vaccination service (Walls, Parahoo & Fleming, 2010). To achieve immunization goals, delivery of potent vaccines through properly maintained cold chain systems and high quality coverage are indispensable (Smith, 2010).

Additionally from the results, findings showed that (n=92; 76.7%) of the study participants cited the behavior of health workers to be bad which was a way influencing the immunization status of babies. This finding from the study supports the study done by Humphreys, (2011) where bad attitude of health care providers affected the immunization status of babies.

From the results, finding showed that (n=98; 81.7%) identified side effects a factor influencing immunization status of babies. This result showed that, health workers have not been very active in educating mothers about the possible reaction to the vaccines in babies. Given that health literacy show a significant relationship with barriers to immunizations in this sample, but education was a factor, education should be focused on addressing the concerns regarding vaccinations. Immunization education should be aimed towards the parents and caregivers with lower educational levels. A variety of methods should be implemented to specifically cater to this population.

This finding from the study agrees with the study done by Takum et al. (2011) where side effects of vaccines in babies were identified by mothers as a factor influencing immunization status.



More so, majority of the lactating mothers (n=80; 66.7%) of the identified distance to the nearest health centre as a major factor influencing immunization status of babies. This is because mothers who were not employed were more likely to find it very difficult to have themselves and their babies transported to the health centres especially on the scheduled dates. This finding from the study agrees with the study done by Stamler (2012) where similar results were found among lactating mothers.

The results also showed that (n=65; 54.2%) of the lactating mothers did not consider the number of shots their children gets at one time as a factor influencing immunization. This finding from the study is at variance with the study done by Takum et al. (2011) where mothers considered the number of shots as a factor influencing immunization status of babies. Sometimes also, the most common reasons for incomplete immunization were inadequate vaccine supply in health facilities. About one- fifth of the women gave reasons that revealed their lack of knowledge about immunization benefits, routine immunization schedule and the required number of doses. Some women believed that their children were too young to receive specific vaccines, particularly those involving the use of needles and syringes. More over few women believed that their child had received some vaccines and were apparently well and thriving there was no need for additional vaccines. Some women also believed that too many vaccines could be harmful to the child. Large percentage of women gave reasons that showed total reliance on immunization campaigns for child immunization in most studies.

From the results, findings showed that, all the respondents (n=120; 100%) disagreed with the statement that their husbands disapproved vaccination of their babies with was a factor. This finding from the study disagrees with the study done by Humphreys (2011). Facility level determinants including service interruption, training on EPI and defaulter tracing system were

also independent predictors of complete vaccination of babies. Quality of vaccination services as demonstrated by the validity of doses given, BCG scar formation, card retention and client-provider interactions were generally low.

There is a need to establish an appropriate and uninterrupted vaccine delivery strategy. There is also an urgent need to improve the cold chain management system through training and monitoring, as vaccines in some facilities might be at high risk of losing their potency. To continuously monitor service delivery, quality and the supply chain, a continuous and regular cycle of planning, monitoring and implementation should be established. Regular and focused supportive supervision needs to be strengthened at all levels to gain the commitment necessary for a successful EPI program in the study area.

5.5 Readiness of health facilities to provide vaccination services to infants

Receipt of vaccines at recommended ages and intervals ensures that the child is adequately protected from target diseases at all times. The Ghana Immunization Program has as a primary strategy to ensure that every child in every district is reached and immunized. This will be achieved through a combination of routine immunization. The routine immunization programme will be strengthened and supported especially in “hard to reach” areas and communities health centres. Through health campaigns, the CHPS expansion programme will target these hard to reach areas as a priority and reach them through the establishment of functional zones.

Immunization sessions should be scheduled to be convenient for parents, e.g., health facility managers should assess their facilities’ immunization schedules at least once a week and change them if necessary to reflect the current needs of the community. Community volunteers and





health workers should play an important role in increasing awareness and providing information to lactating mothers especially at rural areas.

From the results (n=80; 66.7%) of the study participants agreed with the statement that they were actively seeking information from health professionals regarding vaccination of their babies.

This could be explained to mean that more health education concerning immunization status was not reaching the people at the time of the study. This finding from the study is at variance with the study done by Kim, Johnstone and Loeb (2011) where health staff were providing health education to women concerning immunization status.

The results also showed that (n=70; 58.3%) of the study participants cited that health workers had not informed them that adherence to and completion of schedule were important. This finding from the study agrees with the study done by Banerjee et al. (2010) where health education was minimally enforced.

The results also showed that, (n=75; 62.5%) of the study participants cited negative comments from physician as a way that would not enhance immunization status of babies. Despite availability of immunization services in the study area, babies were not adequately immunized.

The main reasons is that the developed city's advantage (in terms of improved child health services) is offset by determinants such as mothers' lack of social networks, the poor status of economy and the disruption of utilization caused by health facilities.

From the results, majority (92.9%) of the health workers said they were doing vaccination daily at their facilities. This finding from the study agrees with the study done by Canavan et al. (2014) where health workers cited that they were doing vaccination at the health centres daily.

From the results, it was showed that, 14% of the respondents said they had never seen any supervisor coming to visit them at their health facilities. This finding from the study agrees with

the study done by EHNRI (2012) where lack of supervision was identified as a factor influencing immunization status of babies in Ethiopia.

The results also showed that, (n=12; 85.7%) of the study participants disagreed with the statement that vaccines were not collected timely. This finding from the study disagrees with the study done by Do and Hotchkiss (2013) where vaccines shortage was identified as a factor influencing immunization status of babies.

The results also showed that, (n=6; 42.8%) of the study participants cited that there was no kerosene available for refrigerator to be used. This finding from the study agrees with the study done by Do and Hotchkiss (2013) where similar results were found. All the study participants (n=14; 100%) said they had health volunteers who were in charge in defaulter tracing. This finding from the study agrees with the study by Kim, Johnstone and Loeb (2011) where health facilities were involved in defaulting tracing mechanism.

The results also showed that (n=13; 92.9%) of the study participants cited that they used review of register at health centre as a way of tracing defaulters. This finding from the study disagrees with the study done by Kim, Johnstone and Loeb (2011) where text messages were used to remind parents as way of tracing them.

From the results (n=11; 78.6%) of the health workers said that they had never experience BCG shortage at the health centres. This finding from the study is at variance with the study done by Do and Hotchkiss (2013) where similar results were found. Health centres could improve the immunization status of babies at the study area by implementing certain strategies. These strategies could inform mothers of the need to have their babies immunized fully to prevent them from getting vaccines preventable diseases.





If identified strategies are mapped and implemented effectively, EPI strategy and the schedule for providing antigens to the target children based on the recommendations of World Health Organization (WHO) will be met. Accordingly, EPI in Ghana provides immunization services through static, outreach, and mobile sites to the target groups residing in every corner of the country. Despite these huge efforts made over decades by along with its partners, the expansion of the service fell short of the target set for the National target.

It may be difficult for health planners and decision makers to control the indirect influence of economic factors on immunization uptake. However, there remains a need to identify all the interactions between the health system and the poor communities. Thus, a large-scale communication about the free immunization services and careful monitoring of vaccination procedures should be undertaken to assist the poor communities. The results of this study also showed that the risk of incomplete vaccination status was high in the study area. The reasons for this are probably linked and have been identified.

5.6 Theoretical model

The Health Belief Model is a theory that attempts to explain health-seeking behavior by examining how people perceive disease severity, their likelihood of contracting that disease, the benefits of taking preventive action, and the costs of taking preventive action (Strecher & Rosenstock, 1997). This theoretical framework is useful in helping to explain these findings.

If parents do not perceive vaccine-preventable diseases as severe enough to warrant preventive action or if they do not perceive any particular benefit to their child's health from vaccination, then they will be less likely to complete immunization/vaccination doses for their children or oppose any law or policy that mandates such behavior.

This is by emphasizing the benefits of compliance and by removing obstacles that might prevent compliance. In the context of this study, perceived susceptibility means a high probability of susceptibility to the child killer diseases. The threat posed by these diseases plus the emphasis on the value of prevention by various information sources are assumed to stimulate individuals to take preventive action provided the modifying factors are favourable. That is, there is the availability of resources to aid the action at affordable cost, accessibility to the resources and even distribution of the resources. All these will influence vaccination of babies positively at the study area.

This theory includes barriers conditions that also prevent lactating mothers to get to the health centres (e.g., ease of not getting to a clinic or health care facility for a vaccination) and negative behavioral intention, consisting of attitude about the activity (e.g., obtaining a vaccination is not sensible); negative social influences (e.g., healthcare provider or family member recommends vaccination) and the value of the consequences of the activity (e.g., the vaccination may not prevent the disease). The results showed all these things intent to affect lactating mothers practice of immunization of their babies.



CHAPTER SIX

Summary, conclusion and recommendations

6.1 Introduction

This chapter contains the summary, conclusion and recommendations made by the study to help authorities develop strategies to improve immunization rates in the study setting.

6.2 Summary of the findings

The study showed that all the respondents were aged above 18 years at the time of the study. From the results based on the demographic profile of the study respondents, the results showed that, 28.3% of the respondents were aged above 35 years while 16.7% of the respondents indicated that they were aged between 18-25 years.

Concerning the marital status of respondents, majority of the respondents representing 66.7% said they were married while 20.8% indicated that they were unemployed at the time of the study. Concerning the educational status of respondents, findings revealed that 35.9% of the respondents had tertiary education with 27.5% of the respondents having more than 4 children.

The results also showed that, 65% of the respondents indicated that they had to walk more than one hour to reach the nearest health centre.

From the results, all the study participants had knowledge concerning immunization with majority identifying the health centre (87.5%) as their sources of information. The results showed that 78.3% of the respondents identified rumours as a form of lack of motivation for them to take their babies to the health centres for immunization while 40.8% cited lack of faith in vaccination.

The results showed that, 92.5% of the respondents indicated that they had good intention towards immunization. The results showed that educational status of mothers, parity status of mothers,





occupational status of the mother and distance to the nearest health centre were positively associated with immunization status of babies.

Concerning the EPI vaccination coverage of children aged 12-23 months, 30% of babies at the time of the study had no BCG scar present on the child while respondents cited BCG, Penta 1, Penta 2, Penta 3, OPVO, PCV, RV1, F/F, M/S1 and M/S2 as the antigen meant for the age of their babies. The results also showed that, most (34%) of the babies were partially immunized at the time of the study.

Factors affecting full immunization coverage of children aged 12-23 months were assessed. From the results, majority of the respondents cited side effects of the shots (81.7%), just forgetfulness (68.3%) and long waiting time at the clinic (76.7%) as factors affecting immunization status of babies.

On the part of readiness of health facilities to provide vaccination services to infants, the findings showed that, all the health staff said they had health volunteers who were involved in tracing immunization defaulters. Healthcare service providers can also provide reminder text-messages to help parents keep up with immunization schedules. The development and usage of a phone application can also assist parents to uphold the vaccination schedule, provide reminders, and reliable education.

A reliable source of information readily at their fingertips can also help to alleviate some of the concerns regarding immunizations. There is a need to establish an appropriate and uninterrupted vaccine delivery strategy. The use of mobile technology for vaccine chain management could be considered for proper forecasting, requisition, and monitoring wastage.



6.3 Conclusions

Immunizations are a vital part of herd immunity and the cornerstone to preventive care in every community in the world. This study can provide insight towards gearing education to a special population at the study setting since partial coverage of immunization of babies was still found. According to this study, the educated lactating mothers felt very strongly about having their children immunized and continuing to keep up their children's immunizations status. This group also appeared to have fewer concerns regarding immunizations or with having access to them. This was not the case for less educated lactating mothers or caregivers. There are several implications that this fact could have in health education at the study area.

The prevalence of a positive attitude towards immunizations was found to be average in this group of mothers, and satisfaction with the service was moderate. Knowledge on childhood immunizations, however, was higher.

In order to improve the vaccination coverage in the study area, health care workers should focus particularly on parents of a compromised education and, further, tailor and target their information to appropriate levels of each mother's understanding.

6.3 Recommendations

- The Kassena Nakana Municipal Health Directorate could develop interventions that can be tailored to improve the childhood immunization rates and provide a foundation for developing effective childhood vaccination educational materials for mothers especially at the rural areas.
- Kassena Nakana Municipal Health Directorate could organize refresher training to enhance the knowledge and skills of vaccinators.



- Health care workers should develop context-based delivery strategies including mobile-based delivery is crucial to address the low access and utilization of EPI services particularly in communities/ areas far from health centres. Detailed micro-planning with clear mapping of communities is required to ensure targeted outreach or mobile services to these populations. Detailed planning by individual health facilities and districts of how to reach the unreached and disadvantaged children in the catchment area is essential for improving equity in immunization.
- Ministry of Health should sponsor programs on the need to encourage nursing mothers to comply fully with the scheme through rigorous immunization awareness/campaigns workshops and seminars on benefits of immunization in Kassena Nakani district
- Health workers should be tutored on sound work ethics and behaviour to their client. They should be client-friendly as this variable indicated positive contribution to immunization compliance by the respondents.
- Respondents claimed that the time spent at the centers was too long a reduction in the time is expected to further encourage not only participation but also compliance with the regimen.
- Education programmes that can target poor and uneducated people should be put in place so that they are able to make informed decisions regarding immunization of their children.
- Free health facilities should be made available to every mother so that poor mothers can easily access them.

6.4 Implications of the study findings to health practice

The strength of this study stems from the fact that this study is one of its kind as it is a quantitative study which focuses on the broad perspective of determining the various factors that serve as barriers for the lactating mothers in achieving vaccination for their pre-school children.

This study used a quantitative method of study, as it carefully analyzes certain concepts and variables of a study.

Not only did the results provide an indepth understanding to the identification of the actual barriers, but it also provided a statistical inference. With the introduction of this survey in the study, the validity and reliability for use of this tool in Navrongo is enhanced. The implications for further research from this study are multifold. The study result regarding educational status presents the need to deduce through exploration as to why education might play such a pivotal role in ensuring that mothers within the study area continue to have their children immunized.

The traditional methods of education such as brochures and handouts may not be as informative as previously thought.

Perhaps other methods such as using social media such as whasapp and messaging can enhance the educational experience regarding vaccines. To increase their knowledge base, the education can be provided pre-conception, prenatally, and during the post-natal period.

Educational programs can be provided in church by peers in their same age groups, to target women such as the respondents in this study. Information provided in such sessions, could afford additional education regarding the vaccination schedule and information to help alleviate concerns.



6.5 Contribution of the study to new knowledge

The study has provided information on why lactating mothers could not present their babies for the full immunization coverage. The study has also showed other ways health care workers could reach out to women to immunize their babies at the study place.



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APPENDIX I

Questionnaire

University for Development Studies

School of Medicine and Health Sciences

Good morning/afternoon madam. Kindly take a few minutes to complete this questionnaire.

Your honest answers will be treated confidentially, but your views, in combination with those of others are extremely important in building knowledge on factors contributing to low coverage on expanded program on immunization (EPI) in the Kasena Nankana Municipal.

Section A: Demographic data of respondents

1. Age (years) a. 18-25 () b. 26-30 () c. 31-35 () d. 35+ ()
2. Occupational status a. salaried worker () b. unemployed () c. private business () d. student () e. farmer () f. other (specify).....
3. Marital status a. never married () b. married () c. separated () d. divorced () e.

widowed () f. cohabitation ()

4. Residential status a. rural () b. urban ()

5. Educational status a. none () b. primary () c. JHS () d. SHS () e. tertiary () f. vocational ()

6. Parity a. 1 () b. 2 () c. 3 () d. 4+ ()

7. Distance to the nearest health centre a. less than 1 hour () b. more than 1 hour ()

Section B: Knowledge of lactating mothers with children aged 12-23 months on immunization

8. Have you ever heard of immunization before? a. yes () b. no () c. do not know ()

9. If yes where? a. health centre () b. school () c. family members () d. media () e. market () f. workshop () g. others (specify).....

10. Indicate the extent to which you agree, disagree or remain neutral on the following as statements of knowledge affecting immunization status of children.

Variable	Agree	Disagree	Neutral
Lack of information			
Unaware of need for vaccination			
Unaware of need to return for subsequent dose			
Place/time of vaccination unknown			
Management of any side effects after vaccination			
Lack of motivation			
Postponed until another time			
No faith in vaccination			
Rumours			



11. Indicate the extent to which you agree, disagree or remain neutral on the following as statements of knowledge affecting compliance ratings of mothers

Variable	Agree	Disagree	Neutral
Taken vaccines at least once			
Last child fully immunized			
Aware of information on child's card			
Aware of service points			
Good intention towards immunization			

12. What can be done to improve the knowledge of mothers on immunization coverage of their babies? a. more public education on immunization () b. good staff provider attitude () c. availability of health facilities () d. others (specify).....

Section C: EPI vaccination coverage of children aged 12-23 months

13. Against each of the variables below, indicate whether the child has taken any of the antigens in the tables by using the child health record card

age	sex	Birth dose		1 st dose				2 nd dose				3 rd dose			
		OP	BC	Rv	OP	PC	pen	Rv	Pol	PC	pen	Rv	Poli	PC	pen
		V0	G	1	V1	V1	ta 1	2	io 2	V2	ta 2	3	o3	V3	ta 3
		Y/F	M/ S1	M/ S2	Men A										

14. Check for BCG scar on the right hand of the child.....
15. Which of the antigen given in above question is considered as the correct schedule for age (valid dose)?.....
16. What is the child immunization status? a. partially () b. fully by age 1 or 2 () c. not immunized at all ()

Section D: Factors affecting full immunization coverage of children aged 12-23 months

17. Do you consider the under listed factors affecting immunization status of infants? (multiple answers) a. place of birth () b. Education of mother () c. knowledge of mothers on vaccine () d. occupation of mother ()
18. Indicate the extent to which you agree, disagree or remain neutral with the following factors affecting full immunization coverage of infants

Variable	Agree	Disagree	Neutral
I'm scared of the side effects of the shots			
I worry about the number of shots my child gets at one time			
I just forgot			
My health care provider told me NOT to get my child his/her shots			
I don't think the shots work to prevent diseases			
Complications from previous injections			
The clinic/facility was not open at a time I could go			
I didn't have someone to take care of my other children			
My child was sick and could not get their shots			
The clinic wait was too long			
Did not know where to take child for shots			





Husband disapproves			
Vaccine out of stock			
No available appointments at clinic			
The shots cost too much			
Time of vaccination inconvenient			
Place of vaccination too far			
Vaccinators absent			
Health staff are not friendly			

Section E: Readiness of health facilities to provide vaccination services to infants

19. Indicate the extent to which you agree, disagree or remain neutral at the following as factors affecting health care provision on immunization

Variable	Agree	Disagree	Neutral
Actively seeking information from health professionals regarding vaccination			
Passively receiving information from health professionals regarding vaccination			
Health workers inform me that adherence to and completion of schedule are important			
Insensitivity to the patient or family needs/questions			
Negative comments about physician			
Inappropriate argument with patients, family members or colleagues			

20. How do you think about your health-provider interaction? a. good () b. bad () c. some how ()
21. Suggest any other ways to improve immunization coverage in the area.....
22. Suggest any socio-cultural factors affecting immunization coverage in the area.....

APPENDIX II

Interview guide for service providers

1. Do you get supervision and EPI in-service training in your facility? a. yes () b. no () c. do not know ()
2. How is the frequency of vaccination sessions in the facility? a. daily () b. weekly () c. monthly () d. yearly ()
3. How is the service delivery strategy of your facility? a. static () b. outreach () c. mobile ()
4. For supervisory visits how frequent is it? a. never () b. within the last 3 months () c. more than 3 months () d. unknown ()
5. For written feedback, how often is the practice? a. never () b. within the last 3 months () c. more than 3 months () d. unknown ()
6. Have there ever been EPI service interruptions at your facility? a. yes () b. no () c. do not know ()



7. How often is the practice of EPI interruption? a. never () b. weekly () c. monthly ()
8. How often do you record adverse effect following immunization (AEFI)? a. never () b. every week () c. every month () d. once a while ()
9. What are the reason (s) accounting for record adverse effect following immunization (AEFI) in your catchment area? a. don't know () b. from the vaccine () c. normal for a very few to react () d. from mothers () e. not having much knowledge in vaccine administration ()
10. Indicate the extent to which you agree, disagree or remain neutral with the following as reasons for EPI service provisions and interruptions

Variable	Agree	Disagree	Neutral
Vaccines not collected timely			
Lack of transport for regular supply			
Vaccine was spoiled/expired			
Vaccine not available			
Vaccinator had other priorities and unable to attend sessions			
No kerosene available for refrigerator			
Refrigerator required maintenance			
Need means of transport			
No sufficient carrier progression			
Other			





11. Do you have vaccination defaulters tracing mechanism in your facility? a. yes () b. no ()
c. do not know ()

12. Who are the persons involved for defaulter tracing in your facility is? a. health volunteers
() b. community health nurses () c. nurses () d. others (specify).....

13. Indicate the extent to which your EPI defaulter tracing mechanism of health facility
operate

Variable	Agree	Disagree	Neutral
Review of register at health centre			
Review of register by other health worker			
Register kept by mothers			
Box with child card month of expected return			

14. As part of cold chain management of health facilities, do you have available vaccine
refrigerator? a. yes () b. no () c. do not know ()

15. Have you encountered any breakdown of the vaccine refrigerator in last 3 months? a. yes
() b. no () c. do not know ()

16. Have you experience any stock-out of vaccines/logistics in the last 1 month in any of the following?

Variable	Agree	Disagree	Neutral
BCG			
OPV			
DPT-HepB-Hib			
PCV			
Tetanus toxoid			
Rota			
Safety boxes			
AD syringe			
Measles			
CHRB			

17. How do you think about your client-provider interaction? a. good () b. bad () c. do not know ()

18. Any other ways to improve immunization coverage in the area?.....

.....

19. Any socio-cultural factors that affect immunization coverage in the area?.....

.....

Thank you for the time



