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DEPARTMENT COMPUTER SCIENCE

Assessment of the Implementation of Expanded Program on Immunization (EPI) in the Kintampo North Municipality

BY

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in Partial Fulfilment of the requirement for the degree of

MASTER OF SCIENCE IN HEALTH INFORMATICS

Declaration

I Bruce Kpen hereby declare that the work presented here is the result of my own investigation, and that except for other people's works, which have duly been acknowledged at the reference section, this dissertation has never been presented to this university or elsewhere for any Master of Health Informatics. I am therefore responsible for the views expressed and the factual exactness of its contents

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DEDICATION

This work is dedicated to my lovely and supportive wife, Mrs. Christiana Kpen. I am also grateful to Mr. & Mrs. Martin Kpen and Mr. & Mrs. Richard Ndinyah for their prayers and advice.

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DEFINITION OF TERMS

Cluster: a collection of elements grouped within defined geographical or administrative boundaries

Cluster survey: a survey in which after the population under study is subdivided into clusters only some subjects from selected clusters are studied

Household: a group of people who live and eat together

Immunization coverage: proportion of individuals in the target population who are fully immunized.

Immunization with card: proportion of children who have their immunization card showing they have received particular antigen

Immunization with History: this represents the study population who do not have immunization cars but reports immunization was given

Antigen: disease causing organism

Random number: a number selected by chance

Reasons for immunization failure: reasons why children or women do not come for immunization

Tetanus toxoid: the tetanus vaccine used for vaccination

TT2+ coverage: the proportion of respondents who have received at least two doses of tetanus

Valid doses: doses that were administered when the child had reached the minimum age for the vaccine, and where administered with the proper spacing between doses

Partially immunized: refers to a person who have not received all the vaccines due at a particular age.

Fully immunized: a person who have received all the vaccines due at a particular age

Vaccination: the act of introducing a vaccine into a child or person

Immunization: the process of introducing a vaccine into a person to confer immunity against a particular disease.

Abbreviations

WHO: World Health Organization

MOH: Ministry of Health

MHD: Municipal Health Directorate

OPV: oral polio vaccine

DPT/Hep/Hib: Diphtheria, pertussis, tetanus haemophillus influenza type b and hepatitis B vaccine

PCV: pneumococcal conjugate vaccine

HC: vaccine received at the health center

OUT: vaccine received during outreach service

HOS: vaccine received at the hospital

PRIV: vaccine received at a private health facility

TT0: people who have not received tetanus toxoid before

TT1: people who have received the first dose of tetanus

TT2: people who have received the second dose of tetanus

TT3: people who have received the third dose of tetanus

TT4: people who have received the fourth dose of tetanus

TT5: people who have received the fifth dose of tetanus

TT2+: people who have received the at least two doses of tetanus

TT5+: people who have more than five doses of tetanus

BCG: Bacillus Calmette Guérin

EPI: Expanded Program on Immunization

SPSS: statistical package for solutions and services

Abstract

This study was done to assess the implementation of the Expanded program on immunization in the Municipality. The study concentrated on all the antigens given to children under the EPI program as well as the tetanus immunization coverage of women with children between the ages of 0-11 months old. The study carried out was a descriptive cross sectional study which made use of 30 clusters. A total of 417 respondents were interviewed. These included 208 mothers with children 12-23 months old and 209 mothers with children 0-11 months old. The objective of the study was to evaluate the expanded program on immunization through; the assessment of caretaker's knowledge, determination of antigen coverage among children and tetanus immunization coverage among women with children 0 - 11 months. The study also looked at the reasons for non- adherence to immunization. The respondents were selected using the cluster survey method employed by WHO in its cluster surveys. The main findings of the study include: only 26.4% of caretakers knew when the child receives the first immunization, about 91% of caretaker knew the correct immunization schedule, 42.3% could not mention the name of any vaccine preventable disease, 98% of children immunized with BCG had a scar, out of the total immunized with immunization cards, and 7.3% received invalid doses. Also, only 2.9% had five doses of tetanus, mothers with some form of formal education recorded 40.2% of the TT2+ coverage as compared to their uneducated counterparts who recorded 31.1% of the coverage. The major reasons for immunization failure included: 33% did not see the need for tetanus immunization, 43.3% did not also see the need to return for subsequent doses of tetanus. Child immunization failure were also due to caretakers unaware of need for immunization, place of immunization being too far and mother being too busy, as these recorded 26.1%, 13.0% and 13.0% respectively. The study also discovered that 59.4% of mothers interviewed for tetanus toxoid could not trace their immunization records. Based on the findings, of the study, it is recommended that; a data base management should be developed to manage immunization data of clients by determining the validity of immunizations given, tract immunization defaulters, prevent over dosing of clients with antigens and generate reports for immunization activities. It was also recommended that a mobile phone application should also be developed to prompt mothers when their children are due for immunizations.

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CHAPTER ONE

1.0 Introduction

Vaccine preventable diseases are a major cause of morbidity and mortality in the world. All individuals are prone to this group of diseases; however, children less than five years old are the most vulnerable. Studies by Anil Chandran *e tal*. (2011) show that, vaccine preventable diseases contribute to about 2.5 million deaths of children in the world. Apart from the pain resulting from the loss of a loved one it also impacts on productivity as parents spend time and money to take care of their sick children. Immunization, considered as one of the major breakthrough in public health still remains as the most cost effective way of protecting individuals from communicable diseases. For instance, in 2003, immunization alone was able to avert 2 million deaths.

Communicable and vaccine preventable diseases use to be a major cause of discomfort, pain, disability and deaths sometime in the past. A lot of resources were channeled in finding a permanent cure to some of the world's most dangerous plaques to no avail until a major breakthrough was made in the development of small pox vaccine by Edward Jenner in 1796. The administration of the small pox vaccine discovered by Edward Jenner was able to eradicate the small pox disease by 1970 in the world. Since then, the World Health Organization has never looked back. Major achievements have been made in the use of vaccine in protecting individuals from disease. The technical know -how and skills acquired through the use of vaccines further led to more innovative ways of expanding the coverage of immunization in the world. The WHO and other Health partners through the world health assembly introduced Expanded Program on immunization to reach all

vulnerable groups in the world. Other programs such as National immunization days, Sub-National immunization days, and immunization of women in their reproductive age against tetanus were also instituted with the aim of increasing immunization coverage to reduce the burden of disease. Until the introduction of these strategies immunization coverage of the six main antigens in developing countries were far below 50% of the target population (Nshimirimana, Mihigo, & Clement, 2013)

In Africa vaccine preventable disease kill a lot of children less than five years. Africa contributes almost half (43%) of children who die from vaccine preventable disease. It is known that one million children die from vaccine preventable diseases in Africa each year. This is attributed to the low immunization coverage recorded in most countries in Africa. World Health organization requires that countries achieve 90% of immunization coverage to help eradicate or reduce these deaths caused by vaccine preventable diseases to the barest minimum; however, the immunization coverage in most countries in Africa leaves much to be desired. The WHO and UNICEF estimates that only 57% of the target population go for the doses of diphtheria, pertussis and tetanus vaccines.(Ryman, Macauley, Nshimirimana, Taylor, & Shimp, 2009)

In Ghana the immunization covers antigens such as tetanus, diphtheria, tuberculosis, measles, yellow fever, pertussis, polio, haemophilus influenza type b, hepatitis b, rota, pneumococcal vaccines. These form the routine vaccines used

Immunization has been encouraging through the expanded program on immunization organize throughout the country. However, the country is yet to achieve the 90% immunization coverage set by the World Health Organization. The difficulty faced in achieving these target are attributed to poor and untimely release of funds to serve the

deprive areas of the country otherwise known as the' hard to reach' areas and poor data capture especially in the city of Accra. It is reported that penta III immunization saw a decline in coverage from 89.3% in 2009 to 87.1% in 2010. However, significant improvement has been made in infant and under five mortality starting from 1983 to date; and this is attributed to the increase in the immunization coverage in the county as a whole. (GHS, 2010).

1.1 Problem statement

Vaccines remain one of public health greatest achievements. Vaccine use have been able to stop the spread of disease and in some cases eradicate those diseases completely. A very good example is the small pox disease which claimed a lot of lives before its vaccine were discovered. Recently disease such as Ebola has become a public health problem because the populace of the worse affected countries was not vaccinated against such deadly disease.

Vaccine preventable disease comes with a lot of cost to the individual, the society, the nation and the world as a whole. The world Health Organization in 2008 estimated that a total of 8, 795000individuals died from vaccine preventable disease in 2008 alone with about half of the deaths (4, 202000) from Africa. These deaths usually occur mostly among pre-school children usually less than five years old.

Vaccine preventable diseases are usually cause-specific, that is they are mostly caused by viruses and bacteria. These diseases become more serious in populations where most of its members are vulnerable or not immunized against the disease causing organism. However, if majority of the population (80% and over) are protected they provide herd immunity

which turns to protect those not immunized. Refusal and obstacles to immunizations therefore serve as a major contributory factor to the spread and the devastating effects of vaccine preventable diseases. National immunization survey of the United States of America indicates that immunization has the potential to prevent an estimated 322 million illnesses, 21million hospitalization, 732000 deaths and a net savings of $295 billion direct cost as well as $1.38 trillion in total societal cost between the periods of 1994 to 2013.(Cynthia, Whitney, Zhou, Singleton, & Schauchat, 2014)

To improve vaccine coverage in the world particularly in Africa, the world health organization instituted the expanded program on immunization in 1974 with aim of improving immunization coverage in the world by improving availability and accessibility to vaccines. Today, some areas in the world have been able to reach 80% and over coverage of their populace eligible to receive various vaccines. It is worth noting that, before the inception of Expanded Program on Immunization, Africa was recording less than five percent of total immunization coverage. (WHO, 2014).

These interventions by the world health organization have helped to improve on the immunization coverage in the country. Kintampo North Municipality in the Brong Ahafo region has experience success in the fight against vaccine preventable disease however immunization coverage of certain antigens still remains low. The 2004 annual report of the Kintampo District recorded a total coverage of 72% of tetanus immunization as well as 67% immunization coverage for measles.

The barriers to this poor immunization coverage could be seen as: system barriers, which look at barriers as a result of vaccine supply and distribution to areas where they are needed. The second commonest barrier to immunization services is described as the provider barrier

to immunization which looks at the knowledge of the provider about the vaccines, its contraindications and functions. It is believed that the providers' knowledge of vaccines will help them educate recipients about the vaccine and to encourage its use. These barriers together or individually may lead to poor immunization coverage in any country(Kimmel, Burns, Wolfe, & Zimmerman, 2007)

Vaccine preventable diseases though not common still exist in our country as well as the Kintampo North Municipality. This study is therefore intended to find out the reasons for the low immunization coverage in the District and to find possible ways of improving upon it.

1.3 Main Objectives

To assess the implementation of the expanded program on immunization in the Kintampo North Municipality

1.4 Specific objectives

The specific objectives of this study include:

1. Assess mother's knowledge on immunization
2. To determine immunization coverage level of all antigens of children between 12-23 months' old
3. To determine TT2+ coverage of mothers with children between 0-11 months
4. Ascertain reasons for non –adherence to immunization.

1.5 Justification

Vaccine preventable diseases are a major cause of morbidity and mortality for so many years until the discovery of vaccines in the seventeenth century. The expanded program on immunization was introduced by the World Health organization to increase the immunization coverage in member countries with the aim of scaling up the coverage to

90% of the eligible population to provide herd immunity that will in turn protect the rest of the unimmunized population. Despite the effort by WHO to improve immunization coverages to 90% the Kintampo North Municipality Still records immunization coverages below 80%. This research was conducted to ascertain the reasons for these low coverages; in doing so the knowledge level of care takers, immunization coverages, the reasons for non-adherence to immunization schedules were studied.

Two newly introduced antigens for diarrhea and pneumonia, were also studied, it also looked at the quality of the vaccination given to clients and ways to improve on the immunization coverage.

1.6 Research Questions

To achieve the objective of this study, the following research questions are posed;

a. What is mothers' knowledge on immunization?
b. What is the immunization coverage of antigens of children between 12-24 months old?
c. What is the TT2+ coverage of Mothers with children between 0-11months old?
d. What are the reasons for immunization failure?

1.7 Significance of the Study

The significance of the study is to determine the immunization coverage, the quality of immunization coverage and factors leading to reduce immunization coverage in the Kintampo North municipality. The study will also help Identify obstacles that hinder improvement of immunization coverage and making recommendations that will inform policy decisions in improving immunization coverage in the Municipality. The study is

also intended serve as a reference document for similar studies in other Jurisdictions as contents will be made available through publication

1.8 Scope of the Study

The research was conducted in the Kintampo North municipality and included:

1. Mothers or caretakers with children between the ages of 12-24 months
2. Mothers with children between the ages of 0-11 months

1.9 Limitation of the study

1. Human experience was put in numbers, due to the quantitative research approach used.
2. Communities which had total populations of less than four hundred were taken out of the sample frame. Therefore, individuals who were found in such communities could not participate in the study.

1.9.1 Organization of Study

The study is organized based on five chapters which include:

1. The introduction; which looks at the literature of immunization as part of the introduction, it looks at the problem statement, the research questions and objectives, scope of the study research variables as well as assumptions made
2. Literature review; this chapter looks at relevant literature about the topic of the research, this relevant literature is reviewed based on the four research objectives and research questions posed.
3. Methodology; this describes the methods used in selecting the sample for the study, it also looks the study type, the sample size and sample size estimation, sample technique as well as training done before the collection of data

4. Presentation and discussion of results. This chapter displays the findings of the study in figures and tables. This chapter also discusses the results based on the research objectives and questions in relation to relevant literature reviewed.
5. Findings, Recommendations and conclusions, this looks at key findings and recommendations based on the key findings

CHAPTER TWO

2.0 Literature review

2.1 Introduction

This chapter looks at the background of the study. It also looks at studies conduct by other researchers in the field of Public Health particularly in immunization aimed at improving health of individuals in different parts of the world. For the purpose of this study the literature reviewed is based on the following objectives: the mother's knowledge about immunization, the immunization coverage of antigens among children,

the tetanus coverage of women with children less than one-year-old and also to ascertain reasons for immunization failure.

2.3: Mother's knowledge about immunization.

Mothers and caretakers are very important in the life of a child particularly as to whether the child will receive immunisations and any health interventions. Selvakumari (2011) indicated in a study that Knowledge about the importance of immunisation of caretaker is very important indicator in determining the immunisation status of the child especially in children under five years old., because several factors such as ignorance misconception and inadequate knowledge on the part of the mother or caretaker has a direct impact on the health of the child and whether the child will participate in any health or immunisation activities.

A case control study of mothers with children between the ages of 12-23 months carried out by Olumuyiwa e tal (2008) indicated mothers with low educational and socio economic status had the chunk of children which were not immunized, it also indicated that mothers with illiteracy lacked knowledge on vaccine preventable disease as compared to their colleague literate mothers. The same study however indicates that in the face of illiteracy, educating mothers about vaccine preventable diseases was very effective as mothers are always eager to learn and apply what will bring good health to their children. To improve on immunization the findings of the study shows that an increase in educational status of care takers is likely to increase knowledge in immunization.

Completeness of vaccination was significantly correlated with knowledge of mothers on immunization and adequate attention should be given to this if high coverage levels are to be sustained.

A study carried out in Taif, Saudi Arabia among mothers with children from 0-12 month's old shows majority of mothers (86.9%) had very good knowledge about the timing of when the child should receive the first dose of vaccine in life as well as the entire immunization schedule for their kids. The study found out this good knowledge in immunization schedules has a direct impact on the immunization coverage of the area.(Yousif, Ahmed, Mustapha, & Abubakar, 2013)

Health facility support in the form of health educating mothers about the reasons for immunization the number of doses a child is supposed to receive, immunization schedules could be very important in improving immunization coverage. A study carried out in Napal by Davkota *e tal.* (2013) to find out the parents' knowledge and Practices to childhood immunization revealed that majority of mothers (72.5%) had very good knowledge about the number of doses their children are supposed to receive this was made possible through a vigorous health education on the media about immunizations.

Another study carried out in Italy to find out the mothers' knowledge, attitude and behavior towards immunization concluded that 54% of mothers had some knowledge about vaccine preventable diseases as they were able to mention tuberculosis, hepatitis and measles as some of the known vaccine preventable disease. It was also found out that 25% of the mothers did not have any knowledge about vaccine preventable diseases. It was said, out of the total number of mothers who had good knowledge about vaccine preventable disease

46.4% of them were highly educated and also sent their children for vaccination on time. Fifty (50%) of mothers who were illiterate however did not send their children for vaccination when they were due.(Sanaa, Ahmed, & Abdel-El Rahman, 2013)

Three hundred and thirty-nine mothers were recruited to take part in a cross sectional study aimed at finding out the determinants of immunization coverage in rural Nigeria. In this study, it was realized that majority of participants (97%) had satisfactory knowledge about vaccination in the initial study. About 55% of the respondents also knew the signs and symptoms of vaccine preventable diseases. However, after an intervention in the form of educating mothers was done, it was realized that 81% of children were fully immunized as against 61.9% before the intervention. This shows that the knowledge acquire by caretakers about best health practices is directly correlated to the level of educational support they receive from care givers. To reduce the number of children who do not received any vaccines, health workers or professionals must be equipped to give proper health education to caretakers since most caretakers will find it difficult sending a child who is not sick to the health facility for immunization only for that child in some instances to exhibit unpleasant side effects of the vaccine such as fever. The study therefore recommended that efforts should be directed in health educating caretakers as a way of improving the immunization coverage (Olumuyiwa et al., 2008)

Immunization coverage in this part of Africa and other parts of the world are still low due to the misconception arising from lack of education of caretakers and parents. This was made evident when a study carried out by Smaillbegovic (2003) revealed that 34% of mothers refused to send their children for vaccination against vaccine preventable diseases because they believe it is riskier to immunize than not immunizing their children at all. The

study also revealed that information given by the health worker about immunization services was very poor and therefore needed to be improved according to the needs of caretaker to change their perception about immunization services rendered to them.

Another study carried out in a village in Kano state of Nigeria revealed that, despite the ongoing health education and social mobilization about immunization and public health services twenty-five percent (25%) of caretakers were still not aware of the immunization services in their community even though seventy-five percent were aware of the immunization services available. The study also revealed that, eventhough a higher percentage of caretakers knew about immunization services, eventhough a greater majority sixty-eight percent (68%) of them had very poor knowledge about when to send their children for the next immunization. The study also showed about 54% of caretakers would not like their children vaccinated due to the fear of adverse effects whilst 59% knew vaccination will provide their children with protection against communicable or infectious diseases and therefore were willing to send their children for the next immunization session. This study also associates the level of knowledge of caretakers to their level of education as caretakers' knowledge were seen to increase with an increase level of education. Religion and husband influence were not left out as they were seen as a major source of influence to child immunization.(Kabir, Iiiyasu, Abubakar , & Gajida, 2005).

Immunization is cost effective in preventing children from acquiring childhood communicable diseases which could lead to their premature deaths. As good as this may seem some mothers still refuse immunization services offered to them free of charge, this was the case when a study was conducted among mothers with children less than five years old in a teaching hospital in Enugu, Nigeria. In this study, it was discovered that about

23.6% of mothers have never immunized their children against any of the vaccine preventable diseases. A sizeable number of mothers (3%) refused for their children to be immunized. These findings were all attributed to the level of knowledge among mothers as those with high level of education were seen to have better understanding and acceptance of immunizations. The study also saw majority of mothers (75.4%) as having a fair knowledge and perception of immunization activities and campaigns as they willingly took part.(Selvakumari, 2011; Tagbo, Uleanya, Nwokoye, Eze, & Omotowo I.B., 2012) carried out a study to investigate nursing mothers knowledge about routine immunization in children hospital in south west Nigeria, their study revealed that majority of nursing mothers who were interviewed (71.4%) have knowledge on immunization schedules whiles 28% did not have any knowledge about immunization. it was also realized that mothers with secondary education complied with their immunization schedules better than those without secondary education. They also had knowledge on the common childhood diseases. Mothers with secondary education also understood well the role of immunization in preventing diseases.(Moses KO. & Khadijat, 2012)Immunization is said to be the most single important public health intervention that is capable of reducing childhood diseases and deaths to the barest minimum. However certain obstacles militate against the achievement of these goals. One of the important factors that could enhance or otherwise prevent the achievement of this goal is the mother or the caretaker's knowledge about immunization. A study, carried out in the Enugu state in Nigeria where 235 mothers with children less than five years were interviewed. It was realized that two percent (2%) mothers did not know why children are immunized while four percent (4%) believe immunization has the ability to treat all diseases. Fourteen percent (14%) and eighty percent (80%) of them said vaccines were to prevent all diseases and the major childhood diseases

respectively. Most of the mothers interviewed (89.8%) knew vaccines are made up of substances or chemicals that are capable of protecting children from diseases whiles a smaller number of them (1.3%) said the vaccines contain harmful substances. Majority of respondents (34%) were not able to mention any adverse event following immunization. Only 10.6% however were able to mention two or more adverse events following immunization. The study concluded there was poor knowledge about immunization and the adverse events following immunization and therefore advocated for health education to improve on their knowledge since this could affect the immunization status of the children of such mothers. (Nnenna, Davidson, & Babatunde, 2013).

Rasheed (2008) conducted a study in Lagos state in Nigeria to find out the knowledge level of Mothers with regard to what they will do to prevent their children from vaccine preventable diseases. The study found out that mothers believe that given self-medication to their children is better than sending their children for immunization sections. A sizable proportions of mothers (33.5%,56.5%,47.1% 44.6%, and 42.1%) preferred to give herbal concoction as a treatment of polio, measles, small pox tuberculosis and whooping cough respectively rather than taken their children for routine immunization. This misconception needs to be corrected through targeted health education.

2.4 Immunization coverage level of antigens of children between 12-24 months' old

Immunization is capable of preventing and reducing vaccine preventable disease to the barest minimum. Disease such as measles, yellow fever, diphtheria, pertussis, and tuberculosis could be things of the past if we take our immunization coverage is improved. According to WHO (2014) the immunization coverage target of 90% is known to confer

herd immunity against vaccine preventable disease. Sadly, as good as immunization may seem, coverage remain almost the same with no significant improvement. It is disappointing to know that some areas still record very low coverage of certain antigens, example the global coverage of haemophilus influenza was 52% whiles Western pacific and South-East Asia also recorded 18% and 27% of haemophilus influenza coverage respectively. The coverage of measles is almost stagnant at 84%.

Immunization coverage for individual vaccines is as important as the overall coverage of all the antigens. A child by the first birthday is supposed to receive a dose of BCG, three dozes of polio three of DPT/Heb/HIP, a dose of measles and a dose of yellow fever. The child is expected to receive these vaccines in addition to Rota and pneumococcal vaccines by the time the child is 23 months old. These vaccines are usually given to these children for free, in spite of this there has been low coverage of these antigens around the world especial in developing countries. A study carried out in Mumbai in India indicates that, with the exception of BCG which recorded 97.1% coverage, measles recorded very low figures indicating that most of the children drop out before they are due in nine months to receive measles vaccine. The study also indicate that, the children who were fully immunize and not immunize at all stood at 44% and 5% respectively. These results recorded were seen as an improvement over a previous survey which recorded 36% and 30% of children who were fully immunized and those yet to receive vaccine for the first time respectively.

The reason for these poor immunization coverage was attributed to poor knowledge on the part of mother or caretaker, low educational status of mother, high births and place of delivery (Sharma, Mahajan, & Velhal, 2013)

Very low coverage of immunizations are recorded in slum and rural areas and these leads to so many deaths in these slums as the children found in this area turn to be much more vulnerable as compared to their counterparts in urban and well developed towns or cities. It is estimated that about three million children die each year from disease preventable by just a dose or two of a vaccine and most of these children are sadly found in the developing countries. A cross sectional study carried out by Prakash, Gupta & Srivastava (2013) in Lucknow- a slum in India indicated low coverage for children who are fully immunized and those immunized with specific antigens. The study which included a total 198 children indicated 74.7% of children were fully immunized,11.1% receive some antigens and 14.1% have never received any vaccine in their lives. For the specific antigen coverage DPT-1 and DPT-2 recorded the highest coverage of 85.9% BCG 82.3% DPT3 and OPV-3 77.8%. Dropout rate from the first to the last dose and from the first to third recoded 8.3% and 9.4% respectively. This study also proposes the need to intensify health education on the need for parents to vaccinate their children as lack of health education was found to be the reason for the abysmal performance.

The coverage of immunization depends on several factors including the educational status of caretaker, marital status, and distance to health facility as well geographical characteristics of the area the child or caretaker resides. In a study conducted in KwazuluNatal where poorer areas (Rietvlei) and rich urban areas(Paarl and Umlazi) were used for the study to compare the immunization coverage in these areas. It was revealed that the coverage of antigens was better in the richer areas than the poorer areas as 94%, 88% and

62% of immunization coverage was recorded in Paarl, Umlazi and Rietvlei respectively. Timeliness of vaccine administration was also seen to follow similar pattern just like the immunization coverage(Fadness et al., 2011)

Conflicts are a source of concern since it predisposes individuals to disease and does not allow for intervention to be implemented. A study by Mbabazi *e tal*. (2013) in Sudan indicated that immunization coverage was very low during the time of the conflict. DPT3 recorded 20% coverage when Sudan was relatively volatile and this increase to 80% in 2011 after a peace agreement was signed in 2005. In 2012 when a cross sectional study was conducted using a 30 cluster survey, it was realized that children who were fully immunized were only 7.3% of children due for immunization. BCG, DPT-1, DPT-2, DPT3 measles recorded a coverage of 28%, 25%, 22% and 16.8% respectively with dropout rate between DPT-1 and DPT-3 recording 21.3%. It was also realized that records keeping was very poor as immunization with regards to history or caretaker reports that immunization given was very high as that stood at 45.7%. The study therefore suggested more investment in improving the quality of immunization rather than investing more in cold chain equipment.

Another study was carried out in Peri-urban area in Kenya by Mania, Karanga & Kombich (2013) to find out immunization and its determinants among children who are 12-23 months old recorded a total of 76.6% of children as fully immunized. It also recorded 99.5%, 98.7%, 96.6% and 98.9% as coverage for BCG, OPV1, OPV2, OPV3, and Penta 1 respectively. The same study saw the coverage for Penta2, Penta3, and measles to be 96.6%, 90.0% and 77.4% respectively.

2.5 Tetanus toxoid coverage of women with 0-11 months old children.

Tetanus immunization is given to women in their reproductive age or pregnant women to reduce the devastating impact of tetanus on the mother and the unborn child. The first dose of tetanus is given at first contact with the woman, the second dose is given a month later after the first dose, third dose three months after second dose and the fourth and fifth doses given at a year interval. Whiles the first dose gives no protection from tetanus, the second, third, fourth and fifth doses gives 1-3years protection, 5 years' protection, 10years protection and protection for all childbearing ages and possibly longer respectively(WHO,2002). Neonatal tetanus has the ability to kill all neonates infected. It first presents with the baby becoming very weak and the child dying with painful muscle spasms. Women are supposed to take five doses in their entire life time, however, a woman who has taken the second dose of the tetanus vaccine is deemed to be protected from the effect of tetanus on her and her baby. It is estimated that 94% of neonatal and maternal deaths due to tetanus are prevented by just a minimum of two doses of tetanus vaccine. The interval between the first , second, third, fourth and five dose is first contact, a month, six months, one and one year respectively(Blancowe, Lawn, Vandelaer, & Roper, 2010).

As important as this vaccine appears to be considering the number of lives that just two doses of this vaccine can protected, a lot of women either do not have access or refuse to be immunize with it. A study carried out in the Niger Delta University Teaching hospital by Kunlw-Olowu & Emeka (2011) showed low immunization coverage in Africa. This study recorded 25.2%, 13.6%, 61.2% as the immunization coverage of TT1, TT2, and TT3 respectively during the time of respondent's pregnancy. The study attributed the abysmal

coverage to lack of awareness of mothers about the need for receiving at least two doses of tetanus toxoid vaccine.

Studies have also shown the linkage between tetanus toxoid (TT) immunization among mothers or caretakers and their children immunization status. It is known that mothers who have received any dose of tetanus are 2.43 times more likely to get their children immunized as compared to those mothers who have not taken any TT vaccine. Improving the tetanus immunization coverage also means improving the immunization coverage of other childhood antigens. In another study it was known that mothers will be 70% less likely to immunize their children if they themselves have not been immunized(Mohamud, Feleke, Worku, Kifle., & Sharma, 2014)

A study conducted in rural community of Bangladesh among women of reproductive age revealed that, the tetanus vaccine coverage of women living in rural communities was poorer as compared to those living in urban communities. The study also revealed that a sizeable number of the women (37%) said they were vaccinated but without immunization card or record to show, only 18.5% of those vaccinated had immunization card to show. Out of those with the immunization card, the study revealed that only 14.2% received valid doses of vaccines. The invalid doses were 6.2%, 7.3%, 12.5, 12.3%, and 10.8% for TT2, TT3, TT4 and TT5 respectively. The dropout rates recorded from the study was 5.3%, 14.7%, 31.1%, 20.2% and 55.6% for TT1-TT2, TT2-TT3, TT3-TT4, TT4-TT5, and TT1TT5 respectively. The coverage was also found to be higher among women with some level of education and low among illiterate poor women. To increase the immunization of both children and women it is important to ensure that women are given priority in the

provision of education as women who had some form of education recorded 92.3% coverage whiles their illiterate counterparts recorded 76.5%.

This study also showed that women who fell between the age group of 25 to 29 were more likely to go for tetanus immunization as it was found out that 91% of women who were immunized fell within this age group. Women who fell between the age group of 35 to 39 were the least likely to receive tetanus vaccines as they recorded a coverage of 9.1% (Islam, Ahmed, Ahmed, Farajana, & Mazumder, 2012)

A survey was undertaken in rural Haryana by Singh & Arora (2000) the aim of which was to determine the immunization coverage among adolescents in the rural community. At the end of the survey, it was realized that adolescents who were in school had a better chance of getting immunized as compared to those who do not have any educational background. The study also revealed that adolescents of 17 years old had the highest tetanus immunization coverage as they recorded 44.3% coverage where as 26.7% was recorded among 11-year-old girls. Girls in school recorded 35% of the coverage whiles girls who were not in school recorded 13% coverage. This study indicate education about tetanus as a major approach of improving immunization and reducing the occurrence of the disease was effective.

Tetanus immunization, when given to women of reproductive age, protects both the mother and the baby from neonatal tetanus. Every woman of reproductive age is supposed to receive five doses of tetanus to give her a live long protection against tetanus. However, the baby and the mother are said to be protected when the mother has taken at least two doses of tetanus.

This immunization and the number of women who are protected against tetanus was what a study carried out in Bangladesh sort to determine. At the end of the study it was evident that 85% of women who had children less than one year had received two doses of tetanus and only 11% had received all the five doses of tetanus. those who were protected against tetanus were only 52%(Perry, Weierbach, Hossain, & Islam, 1998)

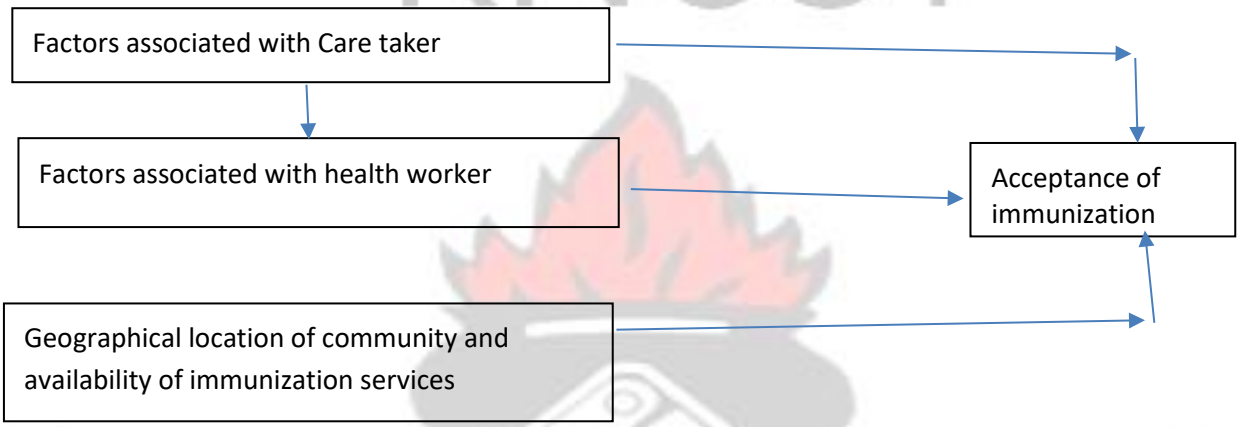
2.6 Reasons for non-adherence to immunization

Immunization drop out has been notice around the world especially in Africa. The reasons why individuals refuse to have an immunization are varied; some of these may be based on religion, socio-economic, lack of education and parental neglect. The world health organization instituted the standard program on immunization to bring immunization to everyone including the poor and the rich, easy to reach cities and towns as well as among hard to reach villages. Upon this effort WHO sadly has not achieved this aim.

For instance, a study carried out in a rural community in Bangladesh indicates that 54.4% of women do not get their tetanus immunizations because they lack awareness about the need to immunize, 48.5% are unaware of the need to receive subsequent doses just as 28.7%, 16.6% and 12.4% do not get immunize because they do not know the next place and time for immunization, fear of side effects of the vaccine, wrong perception of contraindications respectively. The study also indicated that most individuals were not motivated to take the immunization as 15.4%, 6.5%, 3.7% cited no faith in immunization, and postponed the immunization because they were busy with other things, rumors, respectively. Obstacles such as place where immunization is done too far, time for the immunization not convenient, unknown outreach dates, family issues and health staff not

friendly contributed immensely to reasons why immunization is not accessed as these recorded 16.7%, 27.3%, 12.8%, and 10.6% respectively. (Islam, Ahmed, Ahmed, Farajana, & Mazumder, 2012)

Figure7.0: Conceptual Framework of Expanded Program on Immunization



Improvement on the immunization coverage of children depends mainly of three factors. If care takers will send their children for routine immunization service depends on their knowledge on the importance and the need for them to get immunized. One's care takers knowledge improves; it will lead to the reduction in some of the barriers that prevents mothers from sending their children for immunization services. Barriers such as misconceptions about immunizations, care taker too busy to send child for immunization services and those who have no reason for not immunizing their children could be minimized.

The health workers must be available to provide the services and to help health educate care takers on the importance of childhood immunization. They will also need to give vaccines at the appropriate age and interval to improve on the quality and the coverage of immunization services in the district. They also have it as a duty to inform mothers about the next immunization session

The gap between urban communities should be bridge to ensure that immunization services are available to the most remoted community. Services should be brought closer

to them by reducing the distance between the community and point of the service delivery.

When these three factors are taken care of it will lead to the acceptance of immunization services leading to improved coverage

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter of the study looks at how the research was conducted. It also looks at the research design, target population (sample) sampling technique and the instrument for data collection as well as the data analysis procedure

3.2 Study Design and Method

The study design is a descriptive cross-sectional study which is a type of the quantitative research approach. This was used for this study due to the fact that information collected was one-time interaction with the people without manipulating any of the variables. The numerical data was also collected which were analyzed using statistics. The quantitative approach also looks at the 'what' 'where' and 'when' a social phenomenon occurs. Since the research focused was on looking at the number of people given immunization, number of the care takers with knowledge about immunization, the quantitative method became the most appropriate research design to be used. The quantitative approach will help to extrapolate the data collected to predict the behavior of care takes in relation to expanded program on immunization. It also helps the researcher to be more objective and the results can be used for generalization of a larger population. The qualitative is not suitable for the type of study carried out, it could however, be more suitable for the collection of data that cannot be measured or counted but can collected relevant data through observation. The qualitative approach also gives the respondent room to expressed themselves more. It is not as objectives the quantitative approach. Looking at the nature of the study the quantitative approach became the most appropriate method for the study.

3.3 Data Collection Tools and Techniques

The data collection tools used for the study is a modified form of the WHO EPI 30 cluster sample survey forms. Data was collected from mothers with children between 0 to 23 months old by applying cluster survey sampling method as found in the reference manual of immunizations vaccines and biological published by WHO in 2005.

3.4 Research variables

Dependent variable

1. Immunization coverage

Independent variable

1. Sex of the baby
2. Age of mother
3. Religious affiliation
4. Mother's Educational level
5. Mother's occupation
6. Parity

3.5 Assumptions made

1. The immunization coverage of the District is below 80%

2. Majority of children do not complete their immunizations before they are a year old

3. Majority of mothers immunized with tetanus do not have immunization cards

4. The TT2+ immunization coverage is below 80% in the Municipality

5. There is poor record keeping among caretakers.

6. Mothers receive more than the five required doses of tetanus in their life time.

3.6 Sample Size Estimation

In estimating the sample size, the following assumptions are made

1. The immunization coverage is estimated to be 50%
2. Desired level of precision is 1
3. Confidence interval of 95%
4. The difference is estimated to be 2
5. Attrition or non-response rate is 10% of the sample size By calculating the

sample size for proportionate to population size (n_{pps})

$$n_{pps} = \frac{96^2(.5)(.5)}{.10^2} \quad 1.$$

$$2 \quad 192.08 \quad 193$$

The attrition or non-response rate is assumed to be ten percent of the sample size (193)

Which is equal to 19?

193+19=212

Since it is a 30 cluster survey the number to be sampled from each cluster will be

=212/30
=7.0766667 =7

Therefore, the sample size shall be = 7 X 30=**210**

3.6 Sampling technique

The sampling technique used for this study is a modified form of the WHO EPI cluster survey. The population of the District by communities was collected from the Municipal Health Directorate. Communities which had populations less than 400 were exclude from the study. The remaining communities which were 42 in number formed the sample frame from which 30 clusters were selected. This was done by first calculating the cumulative

population of the communities which was (88673). This cumulative population was arrived at by adding the first community population to the second, the second to the third in that order. The sample interval was then calculated by dividing the 30 clusters to be surveyed with the cumulative population of the sample frame. A random number (1,477) which was less than or equal to the sampling interval of (2956) but with the same number of digits as the sample interval was selected. The first cluster was then selected by writing one besides the community whose cumulative population is equal to or exceeds the random number. Cluster two was then identified by adding the random number to the sampling interval. Cluster three was identified by adding sampling interval to cluster two populations. Cluster four was also selected by adding sampling interval to cluster three populations; this was continued until the last cluster was selected (WHO, 2005)

3.6.1 Selecting the first house hold

A central point was located upon reaching the community. A pen was spun to locate the direction to start from, which was the direction in which the pen tip pointed to. The houses along the direction in which the pen tip points to were counted. A random number which falls between the first house and the last house was selected by using the first digit serial number of a five-cedi currency. This was the first house to start from. The subsequent house was the house closest to the second house. Upon reaching the house the following category of people were interviewed:

A. Mothers with children from 0-11months
B. Mothers with children between 12-23months

A total of 7 respondents were interviewed from each cluster

3.6.2 Training

Ten (10) research assistants selected from students of College of Health, Kintampo, who were under taking their vacation attachment in Kintampo were trained for the study. On the second day of trained students were asked to go into communities which were not part of the areas to be studied to pre-test the instrument. The necessary corrections and further training was done to prepare them for the study on the following day.

3.6.3 Data collection

The interviewer requested for the immunization cards of children and mothers who fall within the sample population upon reaching the household. The dates of immunizations was recorded on the data collection tool after which Open-ended and close ended questions was posed to mothers to ascertain their knowledge with regards to immunization services as well as solicit their views about some of the barriers to immunization services in the Kintampo North municipality. A ' +', '0' was indicated at the date column if mothers report that immunization was taken and date of immunization is unknown or immunization was not given respectively.

These data were collected through the administration of an instrument for data collection which was categorized into four sections corresponding to the following research questions:

1. What is mother's knowledge on immunization?
2. What is the immunization coverage level of all antigens of children between 12-24months?
3. What is TT2 coverage of mothers with children between 0-11 months?
4. What are some of the reasons that contribute to immunization failure?

3.6.4 Data analysis

Data collected with the instrument for data collection on the field of study was transferred into the computer for analysis. Application software such as Microsoft excel, SPSS was used in the analysis of data

3.7 Dissemination

The findings of this study are intended to be presented for the award of MPhil/MSc degree in Health Informatics. Recommendations shall be made to the Kintampo North Municipal Health Directorate to help improve upon their immunization activities in the Municipality. Finding will also be made available for further studies and peer review through publication in public health journals.

3.8 Ethical considerations

The study proposal was submitted to the department of Health Informatics for ethical clearance. Permission was sought from Municipal Health Directorate for data collection and informed consent obtained from the mothers of the infants.

3.9 Background of the study area

Kintampo District is one of the Districts in the Brong Ahafo Region, created in 1988. It is the largest District in terms of land marks. The District is also the geographical center of the country, Ghana. In 2004 a District was created from the Kintampo District called the Kintampo South District with its administrative headquarters in Jema. The Kintampo North Municipality which use to be called the Kintampo District is locate between latitude 8º45'N and 7º45'N and Longitudes 1º20'W and 2°1'E.

The District shares boundary to the west with East Gonja District, to the North with Central Gonja District, to the south with Kintampo south District and to the south-East with Pru District. The District lies east of the Regional capital Sunyani. The municipality covers a total land area of 5,108km^2 which forms about 12.9% of the total land area of the Region

3.9.1 Vegetation

The District is strategically located between the savanna belt and the forest belt; due to this the vegetation is a mixture of savannah and forest. The forest areas are usually located within the fringes of rivers and other water bodies. Some of the commonest trees located in the forest include: Dawadawa, Boabab, odum, onyina, wawa and sheanut. The trees are usually scattered on the land except the forest areas. The nature of the land makes it conducive for the rearing of cattle and cultivation of tubers, mangoes, cashew, tobacco cereals, legumes, and vegetables (MHD annual report,2014)

3.9.2 Population

The District has an estimated population of 104,572 comprising female population of 52768 (representing 50.46%) and 51804 Male, (representing 49.54%) with a growth rate of 2.5%. (PHC,2010).

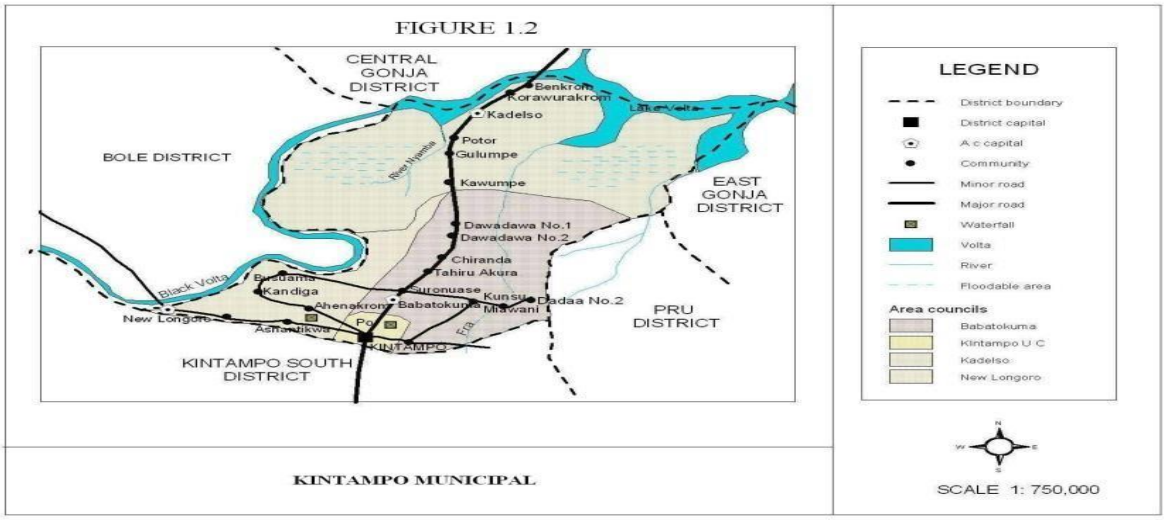


Figure 1: map of Kintampo North Municipality

3.9.3 Labour Force

The District has a 64% of its population falling between the age groups of 15-64 years. This category is considered to be a group of people who can work to earn a living and also contribute to the development of the District the remaining, 36%, is made up of 29.5% and 6.5% of children and adults above 65 years respectively.

Table 1 shows the population distribution of the Municipality

Table 1: Population of the Municipality

Category	Population
Total population	106,986
Children 0-5years	21,397
Children 12-23 months	4,297
Children 0-11 months	4,279
Adolescents	18,188

Source: Population and housing census, 2010

3.9.4 Occupational Distribution

Table 2 contains the occupational distribution of the municipal population

Table 2: Occupational distribution

Occupation	Frequency	Percentage
Agric	48,390	71.1
Commerce	9,324	13.7
Industry	2,790	4.1
Service	7,555	11.1
TOTAL	**68,059**	**100**

Source: Population and Housing census, 2010

3.9.5 Rural – Urban Split

Majority of the inhabitants of the Kintampo North municipality live in the rural areas. It is estimate that about 73.1% of the District population lives in the rural areas whiles only 26.9% lives in urban areas. This is greater than the regional figure of 32.6% urban and 67.4% rural it is generally known that the illiteracy rate poverty and ignorance is generally greater in rural areas than the urban areas due to the lack of opportunities that exist in these rural areas. Due to this it is also espected that the health of the people will be poorer due to the absence of well-equipped health facilities in these areas. For instance, it is estimated that a total of 64% of the population rely on streams as their source of drinking which is far greater than the National average of 48%.

3.9.6 Ethnicity and Religion

The ethnic composition of the municipality is heterogeneous with the Mos and Nkoranzas being the indigenous custodians of the land. There are however, a large proportion of northern tribes which forms the third force in the District not forgetting of other Akan tribes, Ewes, Gas and others.

In terms of religion, Christians dominate, comprising 62.2% of the total population and the Muslim Community 29.6%. This may be due to immigration of settler farmers from the north who are mostly Muslims. Traditional religion still has a place in the municipal and is practiced by 8.2% of the population.

3.9.7 Festivals

Festivals celebrated in the District include the Yam and Bush Burning festivals by the Mos, Nkyefie festival of the Bonos, Damba festival of the Dagombas/Mamprushies and Gonjas, Munufie festival by the Nkoranzas and Krubi festival by the Wangara settlers in Kintampo.

Table 3 shows the distribution of health facilities in the Kintampo North Municipality

3.9.8 Educational/Literacy Levels

It is estimated that 47% of the inhabitants have had formal education up to senior high school, 10.6% senior high school whiles 0.4% have tertiary education. However, 42% have no formal education. The overall literacy rate of the Municipal stands at about 58.4 per cent as against the national figure of 67 per cent

The Municipal has a low standard of education, as majority of the school-age population are primary and junior secondary/middle school leavers (47% and 45% respectively), who cannot read and write properly.

The drop-out rate between the primary and the JHS is about 89%; 92% for boys and 82% for girls.

3.9.9 Health Facilities in Kintampo North Municipality

Table 3: health facilities in Kintampo North Municipality

Facility	Number in municipality

Hospital	**2**
Health centers	**2**
Clinic	**3**
CHPS	**16**
Maternity home	**1**

Source: MHD annual report, 2014

CHAPTER FOUR
RESULTS

4.1 Introduction

This chapter looks at the results obtained from the study. The results are presented in tables according to the specific objectives with its key findings below the tables. The chapter also looks at the discussing of findings in relation to relevant literature reviewed.

4.2 Demographic characteristic of respondents

Table 4 shows the demographic characteristics of respondents

Table 4: demographic characteristics of respondents

Sex of respondents	Frequency	Percentage
Male	7	3.4%
Female	201	96.6%
Age range of respondents		
12 – 19	18	8.7%
20-27	80	38.5%
28-35	77	37.0%
35+	33	15.9%
Level of education		
No formal education	92	44.2%
Primary school	38	18.3%
JHS/middle school	57	27.4%
SHS	14	6.7%

Tertiary	7	3.4%
Marital status		
Single	44	21.2%
Married	162	77.9%
Divorce	1	0.5%
Widow/widower	1	0.5%
Occupation		
Unemployed	38	18.3%
Farmer	84	40.4%
Trader	47	22.6%
Artisan	32	15.4%
Government worker	7	3.4%
Parity		
1	61	29.3%
1-3	80	38.5%
4-5	49	23.6%
6+	18	8.7%
Monthly family income		
Below GH 100	142	68.3%
GH 100-150	32	15.4%
GH 160-200	8	3.8%
GH250-300	9	4.3%
GH350-400	3	1.4%
GH450-500	1	0.5%
GH 500+	13	6.2%

A total of 96.6% of caretakers interviewed were female, 38.5% percent of them were between the age ranges of 20-27 years. Forty –four point two percent (44.2%) of

respondents interviewed have no formal education, 77.9% married whiles 21.2% are single. Farming is the predominant occupation with 40.4% coverage. Majority of respondents (68.3%) have their monthly income below 100 cedis.

4.3 Mother's knowledge about immunization activities

Table 5 shows the caretakers knowledge about the period the children receives their first immunization in life

Table 5: period child receives first immunization in life.

Time of first immunization	Frequency	Percent (%)
At birth	55	26.4
A Month Old	53	25.5
After 40 Days	28	13.5
1week	42	20.2
2weeks	6	2.9
Do Not Know	24	11.5
Total	**208**	**100.0**

About a quarter of caretaker's report child receives the first immunization just after birth whiles 2.9% said child receives the first immunization after two weeks of birth.

Table 6 shows the knowledge of caretakers about the times they usually send their children for an immunization session

Table6: time caretakers send their children for immunization sessions

Time of immunization	Frequency	Percentage (%)
When The Child Is Sick	3	1.4
Once A Month	191	91.8
When Less Busy	5	2.4
Do Not Know	9	4.3
Total	**208**	**100.0**

Majority of caretakers (91.8) knew when to send their children for immunizations whiles minority (1.4%) send their child for immunizations when the child is sick.

Table 7 shows the knowledge of mothers about the total number of routine doses of vaccines a child receives before the child is a year old

Table 7: number of doses of vaccines received by a child before child is a year old

Number of vaccines	Frequency	Percentages
1-3	100	48.1
4-6	18	8.7
7-9	52	25.0
10-12	30	14.4
13-15	8	3.8
Total	**208**	**100.0**

Almost half of respondents (48.1%) mention one to three doses of vaccines received by the child before age one whiles 3.8% mentioned 13 to 15 doses of vaccines received before the child is a year old

Table 8 shows the reasons why caretakers vaccinate/ immunize their children Table 8: reasons for vaccinating/immunizing children

Reasons for vaccination	Frequency	Percentage
Treat Them Of All Disease	33	15.9
To Prevent Disease	149	71.6
Requirement Of GHS	3	1.4
Do Not Know	23	11.1
Total	**208**	**100.0**

Majority of caretakers (71.6%) immunize their children to prevent diseases whiles 11.1% do not know why children are vaccinated

Table 9 shows the knowledge of mothers about the types of vaccine preventable diseases they know

Table 9: knowledge of caretakers about vaccine preventable disease they know

No. Of vaccine preventable diseases mentioned	Frequency	Percentage
DON'T KNOW	88	42.3
1	58	27.9
2-3	46	22.1
3-5	15	7.2
5+	1	.5
Total	**208**	**100.0**

Forty-two point three percent (42.3%) of caretakers did not know any vaccine preventable disease whiles only 0.5% of caretakers knew more than five vaccine preventable disease.

Table 10 shows the adverse events following immunization (AEFI) as mention by caretakers.

Table 10: caretakers' knowledge on adverse events following immunization

AEFI	Frequency	Percentage
Don't Know	32	15.4
Fever	168	80.8
Extensive Limb Swelling	5	2.4
Diarrhoea	1	0.5
Nausea/Vomiting	2	1.0
Total	**208**	**100.0**

Majority of caretakers mentioned fever as the adverse event following immunization whiles 1% mentioned nausea and vomiting as the adverse event.

Table 11 shows the educational level of respondents and the immunization coverage of their children.

Table 11: educational level of caretakers and immunization status of child.

Level of education	Children sampled(a)	Not immunized(n=a)	Partially immunized(n=a)	Fully immunized(n=a)
No. formal education	93	2 (2.2%)	7(7.5%)	84(90.3%)
Primary school	38	0	2(5.2%)	36(95.0%)
JSS/middle school	57	0	3(5.3%)	54(95.0%)
SHS	14	0	1(7.1%)	13(93.0%)
Tertiary	6	0	1(16.6%)	5(83.3%)

The table shows that, out of the total of 208 children sampled, a total of 51.9% of children who were fully immunized were children of caretakers with some level of formal education whiles those with no formal education contributed 40% of the immunization coverage

4.4 Immunization coverage of all antigens of children 12-23 months' old

Figure 2 shows the immunization coverage of antigens of children 12 to 23 months

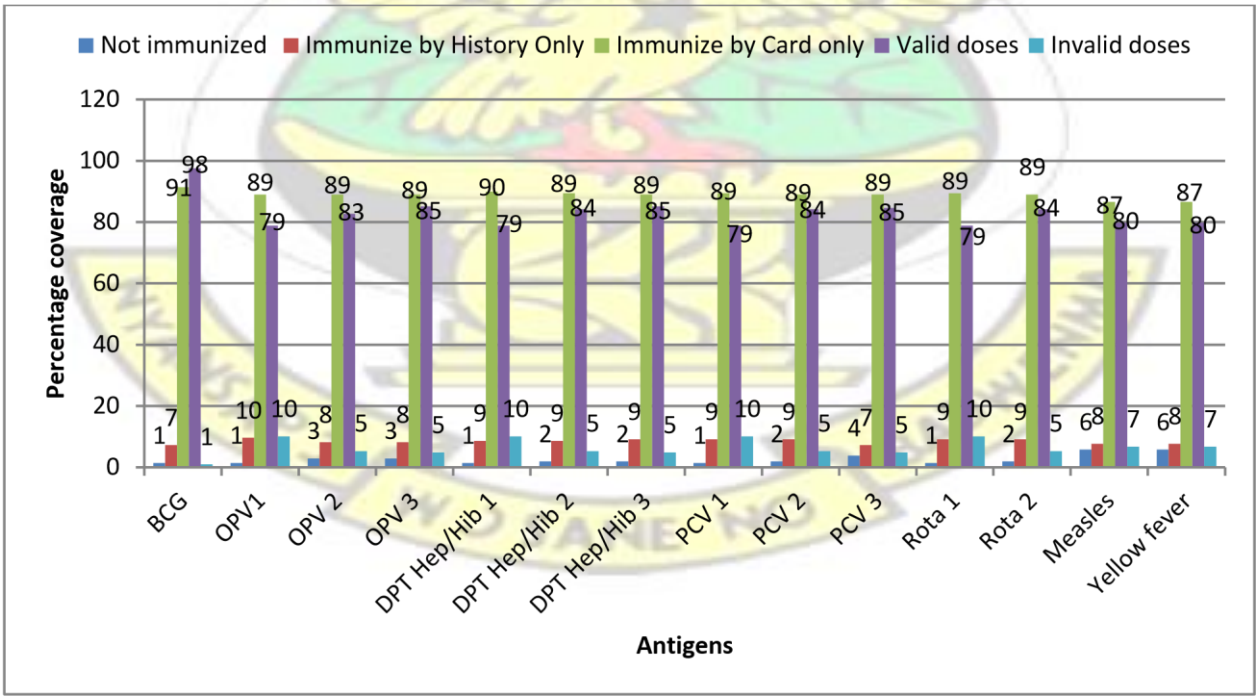


Figure2: immunization coverage of antigens

figure 2 shows that, those who had BCG scar recorded a high percentage of 98% whilst measles and yellow fever recorded 80% each. Health workers did not record. A total of 36% did not receive all the antigens.

Table 12 shows the immunization coverage in rural communities

Table 12: immunization coverage in rural communities

Antigen	History	Card	Valid doses(n=117)
BCG	4	111	115(98.3%)
OPV3	6	107	102(87.2%)
DPT Hep/Hib 3	8	107	102(87.2%)
PCV3	8	107	101(86.3%)
Rota 2	3	108	97((82.9%)
Measles	8	102	91(77.8%)
Yellow fever	8	102	91(77.8%)

Presents of BCG scar recoded 98.3% coverage whilst 77.8% was recorded for measles and yellow fever respectively

Table 13 shows the immunization coverage in urban communities

Table 13: immunization coverage in urban communities

Antigen	History	Card	Valid doses(n=91)
BCG	11	79	88(96.7%)
OPV3	11	78	75(82.4%)
DPT Hep/Hib 3	11	78	75(82.4%)
Pneumococcal 3	7	78	75(82.4%)
Rota 2	11	78	78(85.7%)
Measles	8	78	75(82.4%)
Yellow fever	8	78	75(82.4%)

Presents of BCG scar recoded 96.7% coverage whilst 82.4% was recorded for measles and yellow fever respectively.

Figure 3 compares the immunization coverage of urban communities to rural communities in the municipality.

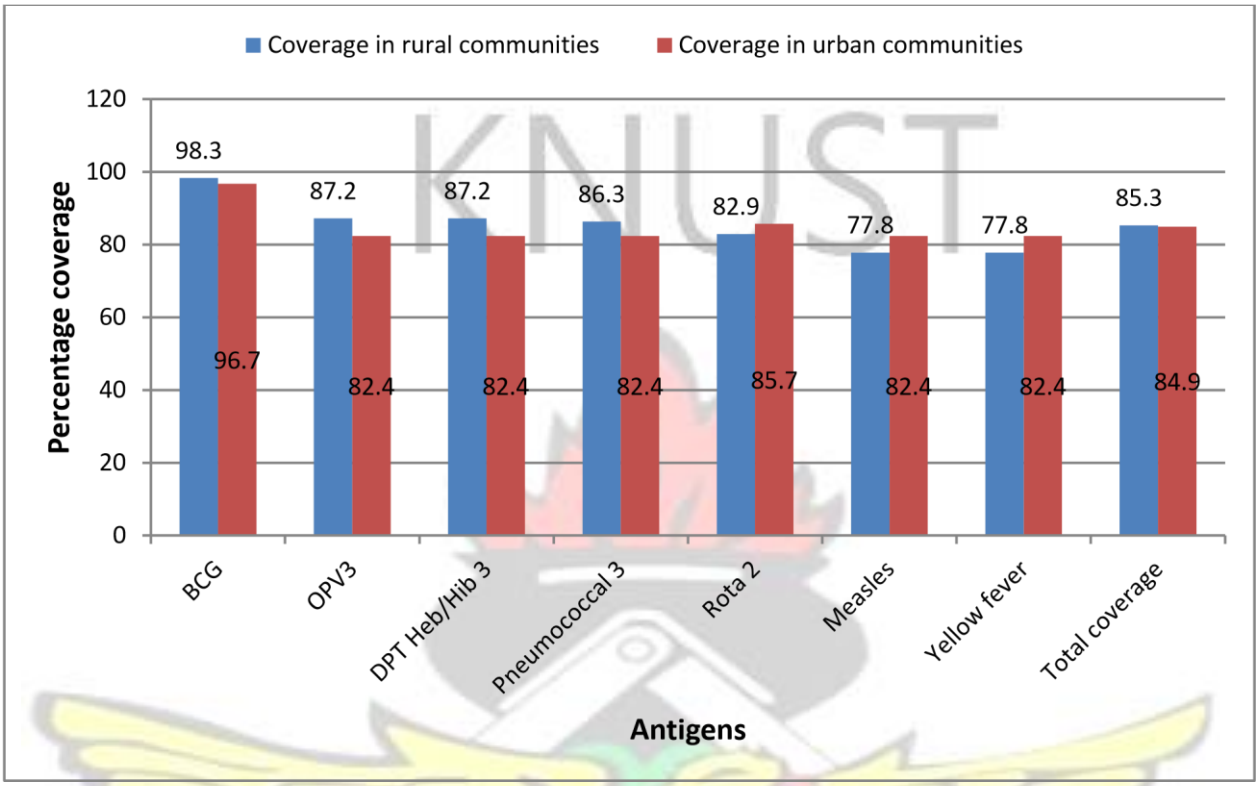


Figure 3: comparative analysis of immunization coverage in rural and urban communities. The rural communities recorded higher immunization coverage than those staying in the urban communities as they recorded 85.3% as against 84.9% coverage in urban communities

Table 14 shows the immunization status of children in the study

Table 14: immunization status of children in the study

Immunization status	Frequency	Percentage (n=208)
Not immunized	2	0.96%
Partially immunized	14	6.7%
Fully immunized with valid doses of antigens	127	61.1%
Fully immunized with card	169	81.3%
Fully immunized with card and history	192	92.3%
Fully immunized by age one with card and history	144	69.2%
Fully immunized by age one with valid doses of antigen	100	48.1%

A total of 61.1% of children were fully immunized with valid doses of antigens whiles 0.9% were not immunized at all.

4.5 Tetanus coverage of mothers with children 0-11 months old.

Table 15 shows the tetanus immunization coverage of women with children between 0-11 months old.

Table 15: tetanus toxoid immunization coverage of women with children 0-11 months old

Doses	Frequency	Percentage (%)
TT0	22	10.5
TT1	38	18.2
TT2	71	34.0
TT3	35	16.7
TT4	12	5.7
TT5	6	2.9
TT5+	25	12.0
TT2+	149	71.3

A significant number of women (10.5%) have never received any dose of tetanus toxoid whilst 12.0% have received more than the required number of doses in their life time.

Table 16 shows the immunization status as compared to the formal education status of respondents interviewed.

Table 16: compares immunization coverage with educational status

Educational status	Not immunized	TT1	TT2	TT3	TT4	TT5	TT5+
No. formal education	14(63.6%)	8(21.1%)	26(36.6%)	21(60.0%)	2(16.7%)	3(50%)	13(52%)
Primary school	1(4.5%)	12(31.6%)	10(14.1%)	5(14.3%)	5(41.7%)	2(33.3%)	7(28.0%)
JSS/Middle school	5(22.7%)	15(39.5%)	28(39.4%)	6(17.1%)	5(41.7%)	1(16.7%)	5(20.0%)
SHS	2(9.0%)	3(7.9%)	6(8.5%)	3(8.6%)	0	0	0
Tertiary	0	0	1(1.4%)	0	0	0	0
Total (n)	**22**	**38**	**71**	**35**	**12**	**6**	**25**

Table 16 shows the summary of TT coverage among those with formal education and those without formal education Table 19: summary of TT coverage

Indicator	Frequency	Percentage (%)(n=209)
No immunization among those with formal education	14	6.7
No immunization among those without formal education	8	3.8
TT2+ among formally educated	84	40.2
TT2+ among formally uneducated	65	31.1

Those with formal education recorded 40.2% of TT2+ coverage whiles their counterparts recorded 31.1%

Mothers with some form of formal education recorded a TT2+ coverage of 40.2% whiles those without any formal education recorded coverage of 31.1%

Figure 4 shows the immunization coverage of respondents according to their age range

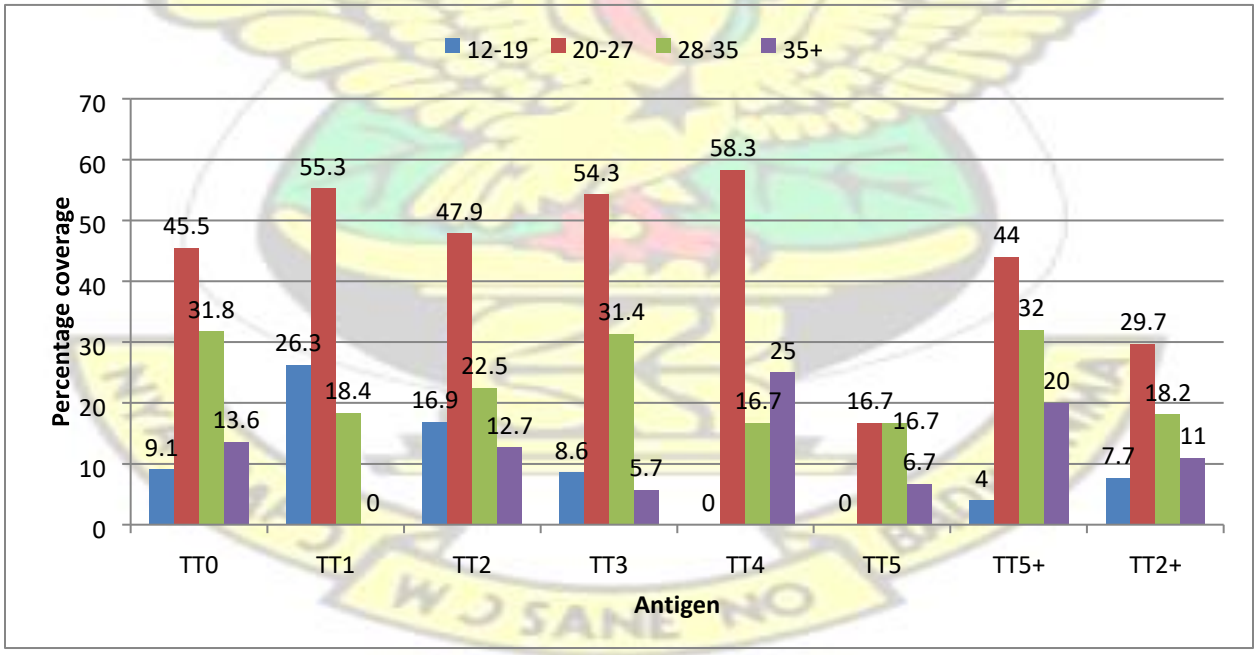


Figure 4: proportional percentage of TT coverage among different age categories

The 20-27 age groups recorded the highest TT2+ immunization coverage of 29.7% of the total number that age category interviewed whiles the age group of 12-19 recorded the least TT2+ immunization coverage of 7.7%

Figure 5 compares immunization coverage in urban and rural communities

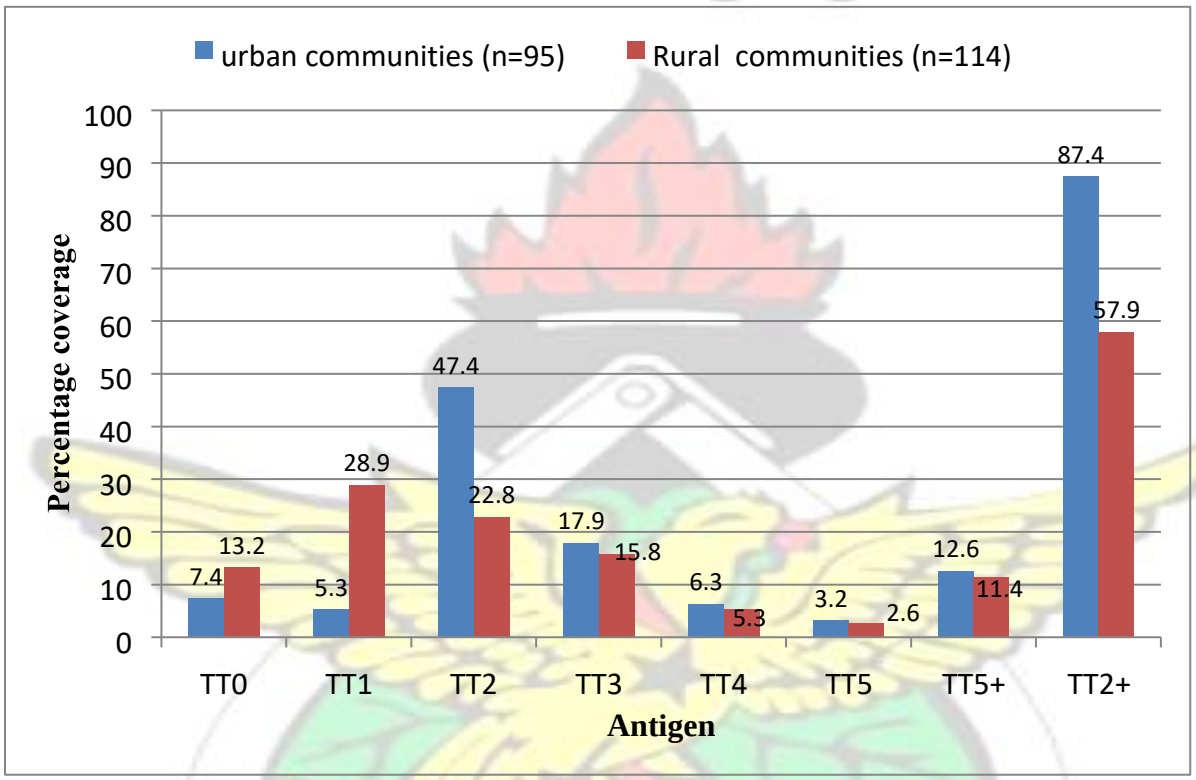


Figure 5: immunization coverage in rural and urban communities

Most women living in the urban communities (87.4%) have received at least two doses of tetanus toxoid as compared to their counterparts in rural communities who recorded coverage of 57.9%

Table 17 shows immunization coverage by possession of card ad history

Table 17: immunization coverage by card and history

Type of immunization	Frequency	Percentage
Tetanus immunization with card	76	40.6%

Tetanus immunization by history	111	59.4%
Total	**187**	**100%**

More than half of the women (59.4%) did not have immunization records card during the time of the study. However, only 40.6% could produce their record cards for verification.

4.6 Reasons for TT immunization non-adherence among mothers with children 0-11 months old

Figure 6 shows the reasons why mothers did not receive at least two doses of tetanus toxoid

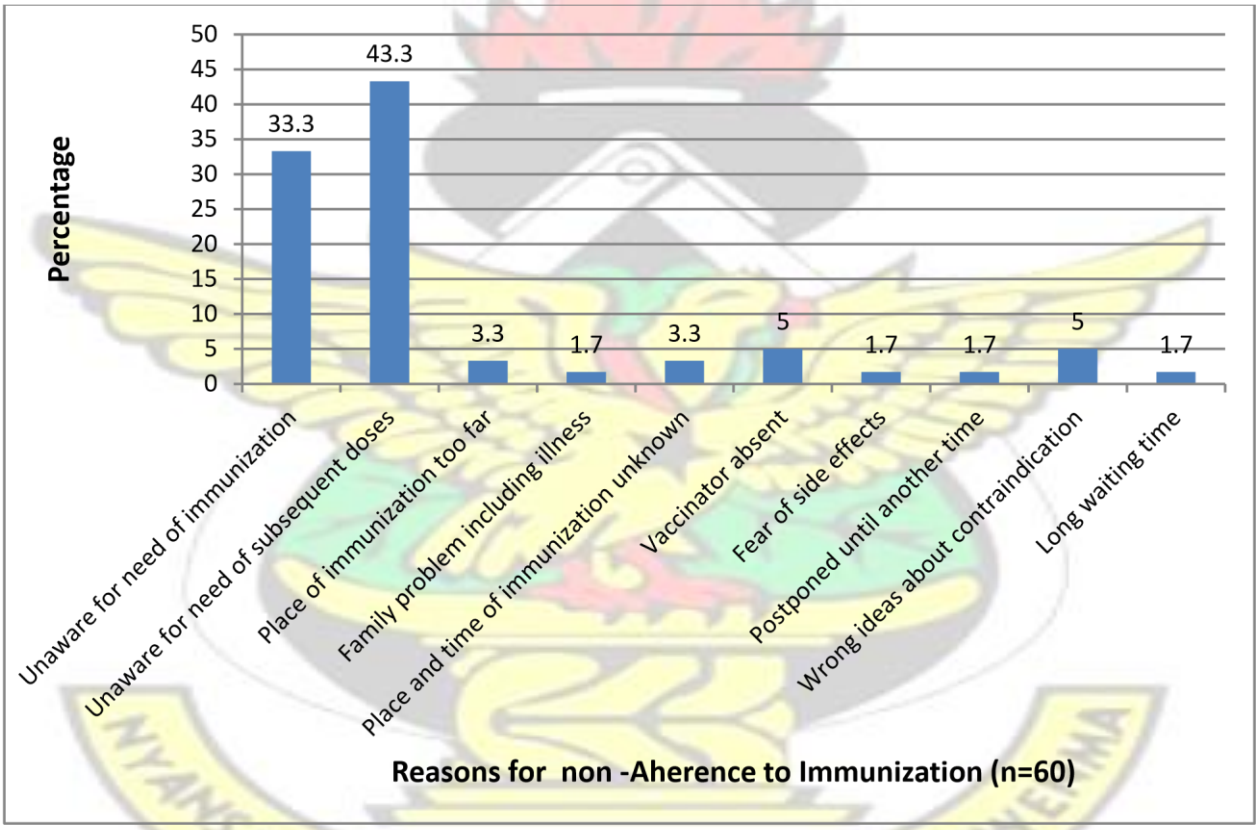


Figure 6: reasons mothers do not adhere to TT immunization

A total of 33.3% did not receive at least two doses of tetanus toxoid because they were not aware of the need for immunization whiles 1.7% did not receive TT2+ for varied reasons

Table 18 shows the reasons given by caretakers as contributing to failure to immunize their children

Table 18: reasons for childhood immunization failure

Reason for not immunized	**Frequency**	**Percentage**
Unaware for need of immunization	6	26.1%
Unaware for need of subsequent doses	1	4.3%
Place and time of immunization unknown	1	4.3%
Postponed until another time	3	13.0%
Wrong ideas about contraindication	1	4.3%
Place of immunization too far	3	13.0%
Mother too busy	3	13.0%
Time of immunization inconvenient	1	4.3%
Vaccinator absent	1	4.3%
Vaccine not available	1	4.3%
Child ill not brought	1	4.3%
Long waiting time	1	4.3%
Total	**23**	**100%**

A total of 26% of caretakers did not immunize their children because they were unaware of the need of immunizations.

CHAPTER FIVE

5.0 DISCUSION

5.1 Introduction

This chapter compares relevant literature to the findings of the study. These findings and literature are organized based on the study objective and the demographic characteristics of the care takers who were interviewed.

5.1 Demographic Characteristics of mothers with children 0-11 months

A total of 417 respondents making up of 208 caretakers with children 12-23 months and 209 mothers with children 0-11 months took part in the survey. These respondents were selected from 30 clusters in the municipality. A total of 208 caretakers with children 12-23 months were interviewed for child immunization whiles 209 mothers with children from 0-11 months were interviewed for their tetanus coverage. Out of the number interviewed for childhood immunization, 96.6% were females with the remaining 3.4% been males. This shows mothers or females are a major stake holder when it comes to the care of the child are they should be a major target if we are to improve on childhood immunizations.

Thirty-eight point five percent (38.5%) of respondents were between 20-27 years old with 12-19 years, 28-35 years, and 35+ years recording 8.7%, 37.0%, 15.9% respectively. This implies that majority of care takers are within 20 – 35 years old. Table 4 indicates that about 44.2% of the caretakers had no formal education with 27.4%, 18.3%, 6.7% completing Junior high /middle school, primary school, senior high school, and tertiary institutions respectively. Formal education is seen to contribute to better understanding of health events and improved knowledge of care takers as seen in a study carried out by Kabir

e tal. (2005) and Sanaa *e tal.* (2013) where by both studies alluded that formal education of the mother was very important in improving the immunization status of the child as mothers with some form of formal education were seen to have better knowledge as well as improved immunization coverage as compared to their counterparts who had no formal education.

Majority of respondents interviewed (77.9%) were married, single parents were 21.2%, divorced, widow/widowers represented 0.5% each. The predominant occupation among respondents is farming representing 40.4% of the respondent; however, those who were unemployed, traders, artisans and public servants represented 18.3%, 22.6%, 15.4% and 3.4% respectively. When caretakers were asked about the number of children they have given birth to, it was realized that 38.5% had between 2-3 children, 23.6% had 4-5 children, 29.3 had one child and 8.7% of them had 6 children and above.

5.2 Caretakers knowledge about immunization activities

Table 5 shows that mother's knowledge about when the child is to receive the first dose of a vaccine was poor among the population interviewed as only 55(26.4%) of mothers knew the correct schedule for first dose. The rest of the caretakers mention when the child is a month old, after 40 days of birth, one week, and two weeks as times for first immunizations as these recorded 28(13.5%),42(20.2%,6((2.9%,) respectively. A total of 11.5% said they did not know when the child is supposed to receive the first vaccine. On the contrary, a study carried out by Yousif *e tal.* (2013) indicated a very high knowledge (86.9%) of mothers who knew when the child is supposed to receive the first dose of immunization when a similar study was carried out in Saudi Arabia. From the findings it is clear that

health education among care takers should be intensified if we are to improve on future immunization coverages.

The study however discovered that, majority of care takers knew the interval between the next immunization as shown in table 6 where 191(91.8%) of caretakers mention one month as the interval for the next immunization, however, 9(4.3%) did not know the interval at all whilst 5(2.4%) said they send their children for immunization when they are less busy and 3(1.4%) will send the child for immunization only when the child is sick. A similar study carried out by Moses *e tal.* (2012) confirms this study when a total of 71.4% was recorded as respondents with very good knowledge on immunization schedules whiles 28% did not have a knowledge in immunization schedules when a similar study was carried out in South west Nigeria to ascertain nursing mother's knowledge about routine immunizations. On the contrary, a similar study by Kabir *e tal.* (2005) however, recorded very poor knowledge about the next immunization schedule when 68% of caretakers interviewed could not tell when to send their children for the next immunization when a study was carried out in Kano, Nigeria.

The knowledge about the number of doses a child should receive during routine immunization was woefully low as 8(3.8%) of caretakers knew that the child should have received between 13- 15 doses of antigens before the child is a year old. The study also indicated a sizeable number of caretakers 100 (48.1%) mentioned 1 - 3 doses, whiles 52(25%) mentioned 7-9 doses, with 4-6 doses, 10-12 doses recording 18(8.7%), 30(14.4%) respectively. The findings of the study are however directly opposite to a study carried out by Davkota *e tal.* (2013) in Nepal which recorded very high percentage of mothers who knew the number of doses to be received by the child before age one. To improve on the

knowledge level of the number of doses received, it is important to intensify health education of care takers about diseases that their children are vaccinated against.

In table 8, the researcher tried to ascertain the caretaker's knowledge on reasons why they subject their children to immunization. Most of them 149(71.6%) knew it was done to prevent the child from contracting communicable disease whiles 23(11.1%) did not know the reason for immunizations. Also, 33(15.9%), 3(1.4%) said it was done to treat the children of all disease and to satisfy Ghana health service requirement respectively. The results made it evident that almost a third of respondents do not know the reason for immunizing their children and this has the possibility of creating apathy toward immunization among care takers it not resolves through health educating them. This study confirms a similar study carried out by Nnenne *e tal* (2013) in Enugu state, Nigeria which showed that 80% of 235 mothers who took part in the study knew vaccines were given to prevent the child from childhood diseases, 4%, 14% said vaccines were meant to treat all diseases and to prevent all disease respectively

The knowledge about vaccine preventable disease was also found to be very low as a sizeable number 88(42.3%) of the respondents could not mention the name of any communicable disease, 58(27.9%) could mention only one, 46(22.1%) could mention the names of between 2-3 types of communicable disease whiles 15(7.2%) and 1(0.5%) could mention 3 -5 and 5plus communicable diseases respectively. The findings in this study is not very different from the study carried out by Sanaa e tal (2013) which realized that 54% had some knowledge about vaccine preventable disease as they were able to mention tuberculosis, hepatitis and measles as some of the vaccine preventable disease they know. However, according to them, 25% of mothers interviewed did not have any knowledge

about vaccine preventable disease. Formal education was proposed as a major way of improving mother's knowledge of immunization as majority of those with some knowledge about vaccine preventable diseases were seen to have some level of formal education.

The study also revealed that most caretakers only knew fever as an adverse event following immunization as fever contributed 168(80.8%) of the adverse events mentioned whiles 32(15.4%) did not know of any adverse event, 5(2.4%), 1(0.5%) and 2(1.0%) mentioned extensive limb swelling, diarrhea, and nausea respectively. On the contrary knowledge about adverse events was very low when a study was carried out in Enugu state, Nigeria by Nnenne e tal (2013). In this study 34% of the respondents could not mention any adverse event following immunization; only 10.6%were able to mention two or more adverse events following immunization. Caretakers in Kintampo North municipality need further education to improve their knowledge on adverse events following since majority of them only know fever as an adverse event following immunization

Formal education is seen as a major way of improving the immunization status of the population as shown in table 11. In this table, it is realized that, the two individuals who had never received any vaccine were children of individuals with no formal education. The overall immunization coverage of those with some form of formal education was found to be higher than those without formal education as those with formal education recorded 59.6% whiles those with no formal education recorded 40% coverage. The study confirms the study carried out by Kabir *e tal.* (2005) and Sanaa *e tal.* (2013) both studies alluded that formal education of the mother was very important in improving the immunization status of the child as mothers with some form of formal education were seen to have better

knowledge as well as improved immunization coverage as compared to their counterparts who had no formal education.

5.3 Immunization coverage of children who are 12-23 months old.

The immunization coverage of BCG was found to be high as the coverage of those with BCG scar was found to represent 98% of the study. The first doses of polio, DPT/Hep/Hib 1, Rota 1, PCV1 recorded 79% coverage each. DPT/Hep/Hib2, PCV 2 and Rota 2 recorded coverage of 84. % each whilst polio 2 recorded 83% coverage. OPV3 and DPT Hep/Hib 3 recorded coverage of 85.1% each whilst PCV 3, recorded 85% coverage as illustrated in figure 1. In the same study, Measles and yellow fever recorded coverage of 80% each. A study carried out in Peri-urban area in Kenya by Mania *e tal* (2013) saw a slide improvement in the immunization coverages as compare to the study carried out in Kintampo. This study recorded a total of 76.6% of children as fully immunized. It also recorded 99.5%, 98.7%, 96.6% and 98.9% as coverage for BCG, OPV1, OPV2, OPV3, and Penta 1 respectively. The same study saw the coverage for Penta2, Penta3, and measles to be 96.6%, 90.0% and 77.4% respectively. Both studies showed a high coverage of BCG because a BCG scar in addition to the immunization records are used to determine coverage of BCG. It is therefore important to educate mothers about proper records keeping. It is also important for the District Health management Teams to adopt more Information Technology base records keeping as a back up to provide records at all times that it is needed.

The study carried out in Kintampo North Municipality also revealed that a total of 89% were fully immunized with card and history out of this number, 69% were fully immunized by age one with card and history, also, out of a total of 81.3% of children fully immunize

who had immunization cards, only 61.1% were fully immunized with valid doses of antigen. Also total of 48.1% were immunized with valid doses of the antigens before age one. The findings of this study appears to have recorded better coverage than the study carried out by Sharma, Mahajan & Velhal (2013) which recorded 74.7% as fully immunized, 11.1% who have received some antigens, 14.1% who have never received any vaccine in their life. It is important for health workers to adhere to the minimum interval between immunization to ensure that they do not cause unnecessary pain and waste of vaccines.

The immunization coverage in rural communities was found to be slightly higher than that of the urban communities as the rural communities recorded an overall coverage of 85.3% whilst urban communities recorded 84.9% coverage. The findings is directly opposite with a study carried out by Prakash, Gupta & Srivastave (2013) who discovered immunization coverage to be low in slums and rural areas than urban areas when they carried out a study in Lucknow a slum in india. The same could be said of a study carried out by Fadness *e tal*. (2011) who also discovered the immunization coverage to be better in rich Urban areas of Kwazulu-Natal, south Africa. In their study, Parl and Umlazi which were the rich urban areas recorded a coverage of 94%, and 88% respectively whiles the poorer rural area, Rietvlei recorded a coverage of 62%. The coverage may be different in the Kintampo North municipality due to the distribution of CHPS facilities in the remote areas of the district to cater for their health care needs.

5.4 Tetanus immunization coverage of mothers with children 0-11 months' old

The findings of this study as shown in table 16, indicates that level of education has a direct impact on the immunization coverage. It was discovered that, those who had some form of formal education had a higher coverage of 40.2% a little higher than their counterpart who had no formal education who recorded a coverage of 31.1%. This was the case when a study was carried out in rural Haryana by Singh & Arora (2000) to determine the immunization coverage of adolescent girls in the rural community which indicated a higher coverage of tetanus toxoid (35%) among adolescent girls who were in school as compare to 13% coverage among girls who were not in school. The direct correlation between coverage and education indicates that formal education should be emphasized for it is most likely that an educated mother will be immunized as well as her children.

Tetanus immunization coverage in urban communities was compared by sampling 95 respondents from rural communities and 114 respondents from urban communities. At the end of the study, it was realized that the immunization coverage of those who have received at least two doses of tetanus toxoid in the rural communities 66 (57.9%) was lower than that of the urban communities which recorded total tetanus coverage of 83(87.4%). The rural community also recorded almost twice 15(13.2%) of individuals who have never received any tetanus immunization as compared to their urban counterparts who recorded 7(7.4%). This study confirms a study carried out by Ahmed e tal (2012) which recorded very poor coverage in rural communities as compared to the coverage in urban communities. The same study by Ahmed e tal (2012) also recorded very poor record keeping as only 18% of those immunize had immunization cards to show just similar to the study carried out in the Kintampo North Municipality which also recorded very poor record

keeping among mothers who were interviewed. Only 76(40.6%) of mothers interviewed could produce their immunization cards as much as 111(59.4%) of respondents could not produce their immunization card for inspection but could only report that the immunization was given.

5.5 Reasons for non-adherence to immunization among mothers with children less one year

The predominant reason why mothers did not receive at least two doses of tetanus were that 20(33.3%) of mothers were not aware of the need for immunization, 26(43.3%) were not also aware for the need of subsequent doses and hence received only one dose. A total of 3(5.0%) each also gave their reason as wrong ideas they have about contraindication and vaccinator absent, 2(3.3%) said they did not know the place and time of immunization. Family problems including illness, fear of side effects, postpone until another time and long waiting time all recorded 1(1.7%) each. On the other hand, children did not complete their immunization schedule because 6(26.1%) were unaware for need of immunization, 3(13.0%) of mothers postponed their immunization until another time, 3(13.0%) said the place of immunization was too far, and 3(13.0%) of mothers were too busy. The rest such as unaware of need of subsequent doses, place and time of immunization unknown, wrong ideas about contraindications, time of immunization inconvenient, vaccinator absent, vaccine not available, child ill and long waiting time all recorded 1(4.3%). The findings of the study is similar to a study carried out by Islam, Ahmed,Ahmed,Farajana &Mazumder (2012) which indicated that 54.4% of women do not get their immunizations because they lack awareness about the need to immunize,48.5% are unaware of the need to receive subsequent doses just as 28.7%, 16.6% and 12.4% do not get immunize because they do

not know the next place and time for immunization, fear of side effects of the vaccine, wrong perception of contraindications respectively. The study also indicated that most individuals were not motivated to take the immunization as 15.4%, 6.5%, 3.7% cited no faith in immunization, and postponed the immunization because they were busy with other things, rumors, respectively. Obstacles such as place where immunization is done too far, time for the immunization not convenient, unknown outreach dates, family issues and health staff not friendly contributed immensely to reasons why immunization is not accessed as these recorded 16.7%, 27.3%, 12.8%, and 10.6% respectively

CHAPTER SIX

6.0 SUMMARY, RECOMMENDATION AND CONCLUSIONS

6.1 Introduction

This chapter looks at the key findings recommendations and conclusions made from the study. The conclusion and recommendation are drawn based on the research objectives and research questions

6.2 SUMMARY

6.2.1 Mother's knowledge and perception about immunizations

The study discovered that:

1. Only 26.4% knew when the child is supposed to receive their first dose of vaccine at birth as indicated in table 5.
2. Table 7 indicates mother's poor knowledge about the number of doses the child is supposed to receive before the child is a year old as only 3.8% knew the number of doses.
3. Table 9 indicates, 42.3% of caretakers did not know any vaccine preventable disease.
4. The commonest adverse events following immunization mention was fever as 80.8% of caretakers knew only fever as an adverse event as shown in table 10.
5. Most mothers as indicated in table 8 knew the reason why children are immunized as (71.6%) indicated to prevent diseases.
6. Majority of caretakers (91.8%) in table 6, knew the correct schedule of immunization

6.2.2 Immunization coverage of children between the ages of 12-23months

The study also discovered that:

1. Most children (96.7%) immunized either by history or with card had BCG scar. this is indicated in table 12 as valid doses of BCG.
2. A total of 6.7% of children received invalid doses of antigens
3. Measles and yellow fever recorded coverage of approximately 80% as indicated in figure 2.
4. Figure 3 indicates childhood immunization coverage was higher in rural communities as compared to the urban communities as 85.3% and 84.9% was recorded as immunization coverage for rural and urban communities respectively.
5. The number of children who were fully immunized by age one was 48.9% as indicated in table 14.
6. The total number of children between 12-23 months old immunized with valid doses were 61.1% as indicated in table 14
7. A sizeable number of children did not have immunization cards as indicated in table 14.

6.2.3 Tetanus immunization coverage among mothers with children 0-11 months old.

The study also discovered that:

1. The total number of women who have received TT2+ and hence are protected from tetanus and their babies from neonatal tetanus were 71.3% as shown in table 15

2. A total of 12.0% of mothers also received more than necessary doses of tetanus as shown in table 15
3. Only 14.8% of mothers received the five doses of tetanus as shown in table 15
4. Formal education played a significant role in the tetanus immunization coverage as 40.2% of those who have received at least two doses of tetanus were educated. The uneducated recorded 31.1% of the coverage as shown in table 16.
5. Those who have received at least two doses of tetanus were higher in rural areas as shown in figure 5.
6. More than half (59.4%) of mothers immunized did not have immunization cards. This is indicated in table 17 as immunize with history.

6.2.4 Reasons for non-adherence to immunization schedules among children 12-23 months and women with children 0-11 months' old

1. Almost half of mothers who defaulted in taken at least two doses of tetanus did so because they did not see the need in going for subsequent immunization as shown in figure 6.
2. A little under a third (33%) did not know the need for tetanus immunization as shown in figure 6.
3. It was also discovered that about 26.1% of childhood non-adherence to immunization was because the caretaker was unaware of need for immunization as shown in table 18.

4. A total of 13% decided to postpone the immunization of the child to another time because they were engaged in other social and economic activities as shown in table 18.
5. Another 13% said the place of immunization was too far as shown in table 18.

6.3 RECOMMENDATION

Based on the findings of the study, the Municipal Health Directorate is commended for the good work. However, to improve on the immunization coverage the following recommendations are proposed under the objectives of the study as well as an information technology based recommendation.

6.3.1 Information technology base recommendation.

1. It is recommended that an information technology expert should be contracted by the MHD to develop a data base application for used by the Municipal Health Directorate; this data base application should be able to:
    a. keep immunization data of clients as this will provide a second and reliable source of client data that could potentially prevent overdosing of clients with antigens since their immunization data will always be available to the health worker
    b. tell who is due for the first and the next immunization to help reduce the number of invalid doses given to client

c. generate reports based on community, facility, sub-municipality and District levels to give a clear indication about the performance of the community, facility, sub-municipality and municipality

d. keep track of house numbers, names of clients and phone numbers to help track defaulters.

2. A mobile application should also be developed by MHD, NGOs to help remind mothers about when they are due for the next immunization session

In addition to the information based recommendation, the following are also recommended

6.3.2 Knowledge of caretakers about expanded program on immunization

1. The MHD should intensify health education about the expanded program on immunization especial in areas such as
   a. When the child is supposed to receive the first immunization
   b. The number of doses a child is supposed to receive before their first birth day
   c. The disease the child is immunized against
   d. The importance of immunization

6.3.3 Immunization coverage of children 12-23 months' old

1. The immunization service providers should further be trained by the Municipal Health Directorate with support from other NGOs about the importance of adhering to the minimum interval of at least 28 days when administering the multi dose vials.

2. The MHD should keep soft copies of immunization records as a backup since most mothers easily misplace their immunization cards
3. The communities to be covered should further be zoned into smaller manageable units and health care professionals put in charge of these units. This will help bring immunization services closer to the people.

6.3.4 Tetanus immunization coverage of mothers with children 0-11 months' old

1. The MHD and other stakeholders should intensify health education about the need for all women in their reproductive age to receive five doses of tetanus.
2. Training should be organized by the MHD and its partners for health staff who give tetanus immunization. The need not to give women more than necessary doses of tetanus should be emphasized
3. Mothers should be urged to keep their immunization records well

6.3.5 Reasons for non-adherence to immunization.

Under this objective the following recommendations are made

1. The general public should be health educated by stake holders about the need to receive all doses of immunization.
2. Immunization services should be brought closer to the people by zoning the area to be covered and putting health staff in charge
3. Proper data management is encouraged to track all defaulters.

6.4 Conclusion

In conclusion, the Municipal Health Team has worked very hard over the years in controlling vaccine preventable disease by achieving appreciable level of immunization coverage, however, the total immunization coverage still falls short of the WHO

immunization target of 90%. And more work is needed to be done to achieve better results in the near future if we are to achieve head immunity for every individual to be protected in the population.

To achieve better results therefore, the areas to tackle include; Parents bad record keeping habit as some parents could not trace the immunization cards, and worse of it all, the study further discovered that over 59% of mothers who were interviewed for tetanus toxoid did not have immunization cards.

A sizeable number of mothers were also discovered to have taken more than necessary doses of tetanus toxoid immunizations.

To improve upon the immunization coverage and to avoid over dosing, the MHD and the MOH is encourage to make use of information technology by developing a database application that will help keep immunization data, prevent invalid doses and track immunization defaulters. It was also discovered that improving formal education could, as a long term measure, improve the immunization coverage of the Municipality

6.5 Areas of further research

It is suggested that research should be carried on the following areas

1. Comparative Study into the prevalence of diarrhea case among children immunized with Rota and those not immunized with Rota
2. Comparative study of pneumonia cases among children immunized with pneumococcal conjugate vaccine and those not immunized
3. The prevalence of adverse events following immunization among children less than two years.

Reference

Anil Chandran, S., Srikrishna, S., & Sataya Sekhar, P. (2011). National Family Health Survey-3 reported loe full immunization coverage rates in Andhra Pradesh, India: who is to be blamed? *Journal of Public Health, 33*(4), 489-495.

Blancowe, H., Lawn, J., Vandelaer, J., & Roper, M. (2010). Tetanus toxoid immunization to reduce mortality from neonatal tetanus. *The International Journal of Epidemiology, 39*, 102-109.

Cynthia, G, Whitney, M.D, Zhou, W, Singleton, J., & Schauchat, A. (2014). Benefits from Immunization During the Vaccines for Children Era-United States, 1994-2013. *Morbidity and Mortality Weekly Report, 63*(16), 352-355.

Davkota, S., Simkhada, P., Vanteijingen, E., & Rai, L. (2013). Parents' Knowledge and Practices to Childhood Immunization in Nepal: Implication for Health Policy. *Health Science Journal, 7*(4), 374.

Fadness, L.T, Jackson, D., Engebretsen, I.M.S, Sanders, D., Sommerfelt, H., & Tylleskar, T. (2011). Vaccination coverage and timeliness in three South African areas: a prospective study. *BMC Public Health, 11*. doi: 10.1186/1471-2458-11-404

Islam, M.Z., Ahmed, M.S., Ahmed, N., Farajana, S., & Mazumder, S.K. (2012). Tetanus toxoid vaccination coverage among women of reproductive age: Experience from rural community. *Bangladesh Medical Journal, 41*, 37-41.

Kabir M., Iiiyasu Z., Abubakar I.S., & Gajida A.U. (2005). Knowledge Perception and beliefs of mothers on routine childhood immunization in a Northern Nigerian Village. *African Journals Online, 1*(1), 26.

Kimmel, S.R., Burns, T.I, Wolfe, R.M, & Zimmerman, R.K. (2007). Addressing immunization barriers, benefits, and risk. *journal of Family Practice, 56*(2), 61.

Kunle-Olowu, A., Kunle-Olowu, O., E.,, & Emeka, U., M.,. (2011). Immunization coverage of antenatal and immunization clinic attendees in the Niger Delta Uniiversity Teaching Hospital. *Journal of Public Health and Epidemiology, 3*(3), 90-93.

Mania, C.L, Karanga, S., & Kombich, J. (2013). Immunization Coverage and its determinants among age 12-23 months in Peri-Urban area of Kenya. *Pan African Medical Journal, 14*(2).

Mbabazi, W., Lako, A.K., Ngemera, D., Laku, R., Yehia, M., & Nshakira, N. (2013). Maiden immunization coverage survey in the republic of South Sudan: a cross-sectional study providing baselines for the future performance mesurement. *The Pan African Medical Journal, 16*, 110. doi: 10.11604/pamj.2013.16.110.3164

Mohamud, N., A.,, Feleke, A., Worku, W., Kifle., M., & Sharma, R., H.,. (2014). immunization coverage of 12-23 months old children and associated factors in Jigjiga District, Somali National Regional State, Ethiopia. *BMC Public Health, 14*, 7-8.

Moses KO., & Khadijat, OO. (2012). Mothers' Knowledge of immunization program and factors influencing their compliance at a childrens' Hospital South West Nigeria. *Journal of pharmacy and Biological science, 18*(2230-7885).

Nnenna, TB., Davidson, UN., & Babatunde, OI. (2013). Mother? Knowledge and perception of Adverse Events Following Immunization in Enugu, South-East, Nigeria. *journal of vaccines and vaccination*(2157-7560).

Nshimirimana, D., Mihigo, R., & Clement, CJ. (2013). Routine Immunization Services in Africa: back to basics. *Journal of Vaccines and Immunization, 1*(1), 6-12.

Olumuyiwa, O., Ewan, FA., Francois, PM , & Vincent, IA. (2008). Determinants of vaccination coverage in rural Nigeria. *BMC Publicc Health, 8*, 381. doi: 10.1186/1471-2458-8-381

Perry, H., Weierbach, R., Hossain, I., & Islam, R. (1998). Tetanus toxoid immunization coverage among women in zone 3 of Dhaka city:the challenge of reaching all women of reproductive age in urban Bangladesh. *Bulletin of the World Health Organization, 76*(5), 449-457.

Prakash, D., Gupta, P., & Srivastave, J.P. (2013). Immunization Coverage Amongst Children Aged 12-23 Months Attending OPD at Urban Health Training Center of Lucknow, India. *India International Journal of Scientific Research, 2*(6), 413-414. doi: 10.15373/22778179

Rasheed, K.O. (2012). Beliefs, knowledge and perception of paediatric vaccination in Lagos State, Nigeria. *Journal of management and sustainability, 2*(1925-4725), 232.

Ryman, T., Macauley, D., Nshimirimana, P., Taylor, L., & Shimp, K. (2009). Reaching Every District (RED) approach to strengthen routine immunisation services:Evaluation in the Arican region. *Journal of Public Health, 32*(1), 18-25. doi: 10.1093

Sanaa, M., Ahmed, Tarek, A., & Abdel-El Rahman, Eman s. (2013). Mothers' awareness and knowledge of under five years children regarding immunization in Minia city Egypt. *Life Science Journal, 10*(4).

Selvakumari, S. (2011). Knowledge of optional Vaccines among mothers of “Under five children”. *Journal of Management and Science 1*.

Sharma, B., Mahajan, H., & Velhal, G.D. (2013). Immunization Coverage: Role of Sociodemographic Variables. *Advances in Preventive Medicine, 2013*, 1-5. doi: 10.1155/2013/607935

Singh, s., & Arora, A.K. (2000). Tetanus Immunization among adolescent girls in Rural Haryana. *Indian Journal of Paediatrics, 67*(4), 255-258.

Smailbegovic M.S., Laing G.J., Bedford H. (2003). Why do parents decide against immunisation? The effects of Health beliefs and health professionals. *Child: Care, Health and Development, 29*(4), 311.

Tagbo, B.N, Uleanya, N.D., Nwokoye, I.C., Eze, J.C, & Omotowo I.B. (2012). Mothers' knowledge, perception and practice of childhood immunisation in Enugu. *African Journals Online, 39*(3).

WHO. (2014). Immunization Coverage. Retrieved January 2015, from WHO

Yousif, M.A, Ahmed, A., Mustapha, A.A, & Abubakar, I.E. (2013). Parents' Knowledge and Attitudes on Childhood Immunization, Taif, Saudi Arabia. *Vaccines & Vaccination, 5*(1), 3.

GSS.(2010)Population and Housing Census:Accra,Ghana

KMHD(2014) Kintampo Municipal Health Directorate Annual Report

WHO(2002) Core information for development of Immunization policy:Geneva

APPENDIX

APPENDIX 1: tools used in data collection

Introduction

My name is Bruce Kpen a Health informatics student OF **KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**. I am here to assess the immunization status of children 12-23months and tetanus toxoid status of women with children less than one year. The exercise is for academic purpose and your confidentiality is strictly assured.

DEMOGRAPHIC CHARACTERISTICES OF CARETAKER

Number in cluster		1	2	3	4	5	6	7	Total
SEX	MALE								
	FEMALE								
Age(years)	12-19								
	20-27								
	28-35								
	35+								
Educational background	No formal education								
	Primary school								
	JHS/middle school								
	SHS								
	Tertiary								
Marital status	Not married								
	Married								
	Divorce								
	Widow/widower								
Parity	1								
	2-3								
	4-5								
	6+								
Occupation	Unemployed								

	trader								
	Artisan								
	Government worker								

Form 1: What is mother's knowledge on immunization?

Ask ones and mark the appropriate answer(s) with 'X'										
Date: cluster Name :										
Number in a cluster			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
House no/land mark										
Q1.	How often do you send your child for immunization	**Whenever the child is sick**								
		Ones a month								
		When less busy								
		Any other specify								
2	How many routine vaccines is your child suppose to receive before age 2years	**Don't know**								
		4								
		10								
		15								
		Any other specify								
3	Mention some of the vaccine preventable diseases you know	0								
		2-3								
		3-5								
		5+								
4	What are some of the expected Adverse Events Following Immunization (AEFI)	Fever								
		Rash								
		Extensive limb swelling								
		Diarrhea								
		Drowsiness								
		Nausea/or vomiting								
		Any other specify								

Form 2: What is the immunization coverage of infants

(1) Cluster number		ame of the child							Total	
(2) Date									card	Card plus history
(3) Area										
Range of birth dates From…… Date:……										
Child number in the cluster		**1**	**2**	**3**	**4**	**5**	**6**	**7**		
House no/land mark										
(5) Birth date										
(7)sex (M,F)										
(8)Immunization card	**Yes/No**									
(9)BCG	**Date/+/0**									
	Scar. Yes/No									
	source									
(10) **DPT/Hep/Hib 1**	**Date/+/0**									
	source									
	Date/+/0									

)

	DPT/Hep/Hib 2	**source**									
	DPT/Hep/Hib 3	**Date/+/0**									
		source									
(11)	OPV 1	**Date/+/0**									
		source									
	OPV 2	**Date/+/0**									
		source									
	OPV 3	**Date/+/0**									
		source									
12	**Pneumococcal 1**	**Date/+/0**									
		source									
	Pneumococcal 2	**Date/+/0**									
		source									
	Pneumococcal 3	**Date/+/0**									
		source									
13	**Rotavirus 1**	**Date/+/0**									
		source									
	Rotavirus 2	**Date/+/0**									
		source									
14	Measels 1	**Date/+/0**									
		source									

	Measels 2	**Date/+/0**									
		source									
15	Y/f	**Date/+/0**									
		source									
Immunization status	Not imm.										
	Partially imm.										
	Fully immunized										
Form 3: The incidence of diarrhea disease among children immunize with rota and those not immunized											
episode of diarrhea within the last month		**0**									
		1									
		2-3									
		4-5									
		5+									

Form: 3 what are the reasons for child immunization failure?

(1)	**Cluster number**		**(4)Birth dates**		**FROM**				
(2)	**Date**				**UNTIL**				
(3)	**Area**								
NOTE: Ask only one questions: **"Why was the child not fully immunized?"** **Mark(X) the single most important reason**									
	Child/woman number in cluster		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
(5)	Sex (M or F)									
(6)	Immunization status	Not immunized								
		Partially immunized								
		Fully immunized								
(7)	Lack of information	Unaware of need for immunization								
		Unaware of need to return for 2nd or 3rd dose								
		Place and/ time of immunization unknown								
		Fear of side effects								

		Wrong ideas about contraindication								
		Other								
(8)	**Lack of motivation**	Postponed until another time								
		No faith in immunization								
		Rumours								
		Other								
(9)	**Obstacles**	Place of immunization too far								
		Time of immunization inconvenient								
		Vaccinator absent								
		Vaccine not available								
		Mother too busy								
		Family problem, including illness of mother								
		Child ill – not brought								
		Child ill – brought but not given immunization								
		Long waiting time								
		Other								
	Tally of households visited									

	Name of Interviewer		

DEMOGRAPHIC CHARACTERISTICES OF MOTHERS WITH CHILDREN 011M0NTHS

Number in cluster		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
SEX	**MALE**								
	FEMALE								
Age(years)	**12-19**								
	20-27								
	28-35								
	35+								
Educational background	**No formal education**								
	Primary school								
	JHS/middle school								
	SHS								
	Tertiary								
Marital status	**Not married**								
	Married								
	Divorce								
	Widow/widower								
Parity	**1**								
	2-3								
	4-5								
	6+								
Occupation	**Unemployed**								
	trader								

	Artisan								
	Government worker								

Form 5: what is the tetanus immunization coverage of mothers with children 0-11 months old?

Cluster number		**Mother's name**							**Total**	
Date									**Card**	**Card plus history**
Area										
Range of birth dates										
From										
Until										
House no/land mark										
Woman's number in the clus	ter	**1**	**2**	**3**	**4**	**5**	**6**	**7**		
Birth date of child										
Total number of life time pr gnancies										
History of TT immunization in last pregnancy										
No. of TT immunization received										
TT1	Date/+/0									
	source									
TT2	Date/+/0									
	source									

	TT3	Date/+/0									
		source									
	TT4	Date/+/0									
		source									
	TT5	Date/+/0									
		source									
	ANC	No. of visits in last pregnancy									
Tally of households visited											
Name of interviewer											

Date = known date of immunization

+ = mother says she was immunized

0 = not immunize

Source of immunization:

OUT= outreach, HOS=hospital, HC= health center, PRIV=Private clinic, NGO= nongovernmental organization, SIA=supplementary immunization activity, OTH=other specify

Form: 3 what are the reasons for tetanus immunization failure?

(1)	**Cluster number**		**(4)Birth dates**	**FROM**						
(2)	**Date**			**UNTIL**						
(3)	**Area**									
NOTE: Ask only one questions: **"Why were you not fully immunized?"** **Mark(X) the single most important reason**										
	Child/woman number in cluster		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
(5)	Sex (M or F)										
(6)	Immunization status	Not immunized									
		Partially immunized									
		Fully immunized									
(7)	Lack of information	Unaware of need for immunization									
		Unaware of need to return for subsequent doses									
		Place and/ time of immunization unknown									
		Fear of side effects									
		Wrong ideas about contraindication									

		Other									
(8)	**Lack of motivation**	Postponed until another time									
		No faith in immunization									
		Rumours									
		Other									
(9)	**Obstacles**	Place of immunization too far									
		Time of immunization inconvenient									
		Vaccinator absent									
		Vaccine not available									
		Mother too busy									
		Family problem, including illness of mother									
		Child ill – not brought									
		Child ill – brought but not given immunization									
		Long waiting time									
		Other									

	Tally of households visited		
	Name of Interviewer		

Appendix 2: sample frame

SUB-DISTRICT	COMMUNITY	POPULATION	CUM POP.	CLUSTER NO.
KADELSO	Kurawura Akuraa	1,544	1544	1
	Alhassan Akuraa	988	2,532	
	Kadelso	3,791	6,323	2
GULUMPE	Portor No.2	4,473	10,796	3
	Portor No. 1	3,509	14,305	4
	Kawumpe	7,951	22,256	5
	Gulumpe	5,204	27,460	6
DAWADAWA	Dawadawa No.2	3063	30,523	7
	Atta Akuraa	1488	32,011	8
	Chiranda	1539	33,550	9
	Jato Akura	1036	34,586	10
	Tahiru Akuraa	908	35,494	11
KINTAMPO	CONTINUATION	4,123	39,617	12
	SUNKWA	3,615	43,232	13
	K - LINE	1,380	44,612	14
	KYEREMANKUMA	3,335	47,947	15
	GRUMAH	3,564	51,511	16
	MO - LINE	3,564	55,075	17
	BABATOR NO. 1	2,331	57,406	18
	BABATOR NO. 2	2,200	59,606	19
	SURONUASE	1,724	61,330	20
	OLD MKT SQR	2,136	63,466	21

	NWOASE	1,452	64,918	22
	FANYINAMA	3,627	68,545	23
	SAWABA	3,117	71,662	24
BUSUAMA	TICHIRA NO.2	770	72,432	25
	BANIANTWE	498	72,930	
	SOGLIBOI/AHENAKOM	457	73,387	
	KANDIGE	805	74,192	
	BUSUAMA	1,254	75,446	26
	YARA	864	76,310	
	NAABA	564	76,874	
	KAAKAA/KAAKA	933	77,807	
	MIAWANI	1,159	78,966	27
	KWABENANUM	1,011	79,977	
	ADOMANO	805	80,782	
	KOBEDA NO.2	932	81,714	28
	BADUKROM	805	82,519	
	EBENEZER /KYINA	555	83,074	
	DABAA NO.1 &2	949	84,023	
NEW LONGORO	NEW LONGORO	2,021	86,044	29
	DWERE/GOMBOI	1,144	87,188	
	ASEANTEKWAA	1,485	88,673	30
		88,673		