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FACTORS CONTRIBUTING TO IMMUNISATION COVERAGE IN ASSIN NORTH MUNICILPALITY

BY

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DECLARATION

I declare that except for references to other people's investigations which have been duly acknowledged, this dissertation is the result of my own research and that this dissertation either in whole or part has not been presented for another degree elsewhere.

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DEDICATION

This work is dedicated to my dear wife Ama Boatemah Sarpong and my lovely kids; Nana Akua Abogyewaah Ofosu and Nana Kwadwo Fenyi Ofosu for their love, care, support and prayers.

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ABSTRACT

Introduction

Childhood immunization is one of the most successful public health interventions worldwide. It has contributed enormously to public health including the eradication of small pox and near eradication of poliomyelitis. High immunisation coverage is vital in the control, elimination and eradication of vaccine preventable diseases which accounts for many childhood morbidities and mortalities worldwide. The introduction of the Expanded Programme on Immunization (EPI) has made remarkable progress, which includes improvement of immunization coverage among infants and women resulting in considerable reduction in morbidity and mortality from vaccine-preventable diseases. Though, immunisation coverage rates have improved in recent times, there are areas with poor coverage which may possibly lead to build-up of susceptible children and probably cause disease outbreak. Assin North is one of such places with poor immunisation coverage.

OBJECTIVE

The objective of the study was to determine the factors contributing to low immunization coverage in Assin North Municipality.

METHODS

A cross sectional survey was conducted to collect data from 672 mothers or caregivers of children between the ages of 12-23 months from 30 randomly selected communities within the Assin north municipality using a structured questionnaire. Immunisation card and maternal recall were used to assess vaccination status. Chi square and logistic

regression models were used to assess the association between vaccination status and the independent variables.

RESULTS

The proportion of fully immunized children between the ages of 12-23 months in the Assin north district was 85.4 %(574/672).The rest were partially immunized. Maternal factors that affected immunisation coverage included the maternal age, occupation, education level and knowledge on immunisation and vaccine preventable diseases. Reasons for immunisation failure included mothers too busy, unaware of the need to return for subsequent immunisation, and inconvenient immunisation schedules to the mothers.

CONCLUSION

The immunisation coverage for children aged 12-23 months in the Assin north municipal is high. It however, fell short of the recommended 90% target. Level of education and source of knowledge were significantly associated with immunisation status.

RECOMMENDATION

The municipality should intensify their health education on the importance of immunisation, and the schedules for subsequent vaccinations.

KEY WORDS: Immunisation, vaccine preventable diseases, immunisation failure, chi square, and logistics regression.

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LIST OF ACRONYMS

ANC - Antenatal Care

BCG - Bacillus Calmette-Guérin

CI - Confidence Interval

DE - Design Effect

DHA - District Health Administration

DHMT - District Health Management Teams

DPT 3 - Third dose of Diphtheria, Pertussis, Tetanus vaccine

EPI - Expanded Programme on Immunization

GAVI - Global Alliance for Vaccines and Immunization

GHS - Ghana Health Service

HC - Health Centre

Hep B - Hepatitis B (vaccine)

HOS - Hospital (dose received in a hospital)

JHS - Junior High School

MDG's - *Millennium Development Goals*

MOH - Ministry Of Health

NID's - National Immunization Days

Nmin - minimum number of children

NT - Neonatal Tetanus

OPV - Oral Polio Virus Vaccine

OUT - Outreach (dose received in an outreach centre)

Penta 3 - Pentavalent Vaccine

PHC - *Primary Health Care*

RED - Reaching Every District approach

SHS - Senior High School

SIA's - Supplemented Immunization Activities

TBA - Traditional Birth Attendant

TT - Tetanus Toxoid

UCI - Universal Childhood Immunization

UNICEF - United Nations Children's Fund

WHA - World Health Assembly

WHO - World Health Organization

WHS - World Health Statistics

YF - Yellow Fever

DEFINITION OF TERMS

Cluster survey

A survey in which, after the population under study has been subdivided into clusters, some subjects from selected clusters are observed.

Coverage level

Percentage of fully immunized children with valid doses by one year of age.

Drop–out rate

Percentage difference in coverage between BCG and measles (card or card and history).

EPI service utilization

The extent to which immunization services provided by health workers is being patronized by mothers and their children.

Fully immunized child

A child who has received all the prescribed vaccine doses considered to protect the child from vaccine preventable diseases.

Immunization

A process where by a vaccine is injected or introduced into a child to confer immunity to the child against a specific disease.

Immunization center:

A place where mothers and their children attend immunization session.

Immunization cluster sampling technique

A household survey done in a number of clusters of a predetermined number of children to assess immunization services.

Immunization strategy

A well-defined method employed by health workers to meet mothers and their children for immunization services to be executed.

Infant immunization coverage

The percentage of children under one year (24 months old) who have been vaccinated.

Partially immunized child: A child who has missed at least one dose of any of the prescribed antigens.

Reasons for failure to immunize

Reasons why children and mothers do not come or attend or return for immunization session

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Immunization is one of the major public health strategies to avoid childhood illnesses and mortality. In the absence of immunisation, more than five million children would die each year because of diseases that could have otherwise been prevented through vaccination. Immunization is one of the most successful and cost-effective public health investments that can be made for future generations. It is a key strategy and indicator of the achievement of the fourth Millennium Development Goals (MDG) and now sustainable development goals(SDGs) which aims at reducing the 1990's child mortality rate by two thirds by 2015(WHO/UNICEF, 2016) .

Almost one third of deaths among children under 5years are preventable by vaccine. UNICEF and its partners are working to change these numbers and ensure that the lives of all children are successfully protected with vaccines. If immunization is not prioritized, the most marginalized children will not get vaccines, which could mean the difference between life and death

Globally, nearly one in five infants thus, an estimated 19.4 million children missed out on the basic vaccines they need to stay healthy in 2015. Low immunization levels compromise gains in all other areas of health for mothers and children. The poorest and most vulnerable children who need immunization the most continue to be the least likely to get it.

Available vaccines can protect against about 30 diseases, and the quest to develop other vaccines continues. Regardless of interventions made to boost immunization services, 2-3 million children are dying annually from vaccine preventable diseases, and many more fall ill. Also, 1.5 million deaths could be avoided if global vaccination coverage improves. Global vaccination coverage has remained steadily high for the past few years.

Vaccination coverage is the percentage of a target population that receives the full schedule of vaccinations. The schedule includes all the vaccinations recommended by the expanded program on Immunization (EPI), applied at the correct ages (epidemiological adequacy) and correct intervals (immunological adequacy) . Combined institutional activities organized by the public sector at various levels are required to achieve adequate vaccination coverage. Knowledge of vaccination coverage facilitates monitoring the volume of susceptible individuals in the population as well as the identification of factors related to child health and service performance, supporting the planning and restructuring of vaccination program.

Investigations into the reasons for low coverage to vaccination programs are proposed by experts in the medical field and aim to guide interventions to reverse this situation and ensure greater protection for the populations at greater risk.

The factors that interfere with vaccination coverage can be grouped into four areas: immunization system (policy), thus structure for vaccine distribution, parent knowledge and attitudes about the vaccination programs, communication and information, and family characteristics. The family characteristics involves low-income status, residence in rural areas, extremes of maternal age, high parity, low maternal education level, larger families, residence in the area for < 1 year, mother working outside the home, lack of knowledge about vaccine-preventable diseases, transportation difficulties, labor disputes around

workdays lost to care for children, lack of health insurance, and presence of disease among the children.

Vaccination is the administration of a vaccine to stimulate an individual's immune system in order to develop specific immunity to a disease causing organism; and immunization is the process by which an individual's immune system becomes fortified against an agent of disease. Immunization can be achieved in an active or passive manner: vaccination is an active form of immunization and the two terms are used interchangeably.

In 2012, all 194 WHO Member States endorsed the Global Vaccine Action Plan (GVAP) which committed every member state to achieve a set target of 90 percent DTP3 vaccination coverage by 2015. As a result, the number of children who did not receive routine life-saving vaccinations has dropped to an estimated 19.4 million, down from 33.8 million in 2000. Most progress has been made in India, Ethiopia, and the Democratic Republic of Congo, while coverage in Pakistan and Indonesia is stagnating. While many countries, such as India, Lao, Chad, and Democratic Republic of Congo (DRC) show sustained progress over the longer term, other countries are yet to show improvement in their performance (Indonesia, Pakistan). Other countries have not been able to sustain high coverage levels (Guatemala and Congo), or have seen positive trends reverted recently (Angola and Mauritania)(WHO/UNICEF, 2016)

The Ebola outbreak in West Africa 2014 and 2015 had a different impact in each of the affected countries. Sierra Leone experienced a relatively mild impact on programme performance (-9 percentage points in 2014) and already seems to be recovering well, while Liberia recorded a coverage of 26 percentages in 2014. The number of countries using new vaccines such as rotavirus (81 countries) and pneumococcal conjugate vaccine (128 countries) has increased, but global coverage remains low at 23% and 32%, respectively.

Vaccine introduction is especially lagging in middle income countries. These countries are often not able to finance introduction with national resources, while they generally don't have access to external funding sources(WHO/UNICEF, 2016).

1.1.1: Immunization in Ghana

The introduction of the Expanded Programme on Immunization (EPI) as a key component of Primary Health Care in Ghana dates back to 1978. Since then the EPI has made remarkable progress, which includes improvement of immunization coverage among infants and women resulting in considerable reduction in morbidity and mortality from vaccine-preventable diseases.

In line with global targets set at the World Health Assembly in 1988, the Ghana EPI has expanded its focus from vaccination coverage to include eradication of poliomyelitis and elimination of measles and neonatal tetanus (NT), which requires intensive disease surveillance and control measures. The country also made substantial progress in the reduction of morbidity and mortality due to measles, and has eliminated maternal and neonatal tetanus as a public health problem. Immunization performance has become a key health performance indicator for the entire health sector and is monitored at all levels(Vision, 2014)

The expanded program on immunisation (EPI) prescribes that children get vaccinated with Bacillus Calmette-Guerin (BCG) and Oral Polio Vaccine (OPV) at birth; three doses of Pentavalent vaccine, pneumococcal vaccine, and OPV at 6, 10 and 14 weeks of age; rotavirus vaccine at 6 and 10 weeks, Yellow Fever vaccine at 9months and measles vaccine at 9 months and 18 months of age.

Penta-3 has been used as the proxy indicator to measure the improvement in childhood immunization. The national average of Penta-3 coverage increased from 90% in 2014 to 95.4% in 2015, however 29% (63) of the 216 districts in Ghana, could not achieve the 80% coverage target for Penta 3 coverage in 2015. The Greater Accra region recorded the highest number (44,487) of unimmunized(Ghana health service, 2015).

1.2 Problem Statement

In 2015, globally, nearly one in five infants thus, an estimated 19.4 million children missed out on the basic vaccines they need to stay healthy whereas about 86% (116 million) received 3 doses of diphtheria-tetanus-pertussis (DTP3) vaccine, protecting them against infectious diseases that can cause serious illness and disability. By 2015, 126 countries had reached at least 90% coverage of DTP3 vaccine(WHO/UNICEF, 2016)

The goal of EPI Programme is to obtain and sustain 90% coverage for all the antigens in line with WHO target. The national immunisation records show that there has been an increase in vaccination coverage rates for all the antigens in the country for the past ten years. There are variations in the immunisation coverage rates between regions and among districts.

The Penta-3 coverage in Ghana increased from 90% in 2014 to 95.4% in 2015.However, almost 30 % (63 districts) could not achieve the 80% coverage target for Penta 3 coverage in 2015.Assin North municipality was one of the districts. The municipality had adequate coverage ranging between 83% -94% from 2009 to 2011.However, the coverage from 2012 to 2015 is far below the national average. This coverage ranges between 52%-63 %(DHD, 2016).

Despite all the interventions like mop up campaign, child health promotion, and home visits adopted by the District Health Directorate, the coverage is still below the expected. Therefore, this research which intends to unearth the factors leading to low coverage rate would help identify some challenges associated with low coverage immunization services on the part of mothers/caregivers and the entire district health system and to identify key strategies to improve service coverage.

1.3 Objectives of the Study

1.3.1 Main objective

To determine factors contributing to low routine immunization uptake in the Assin north municipality

1.3.2 Specific objectives

1. To determine the proportion of children aged 12-23 months who had been fully immunized in the municipality by June, 2017.
2. To assess the maternal and child factors associated with immunization status.
3. To describe the reasons for partial or non-immunization uptake of routine immunization in Assin north municipality.

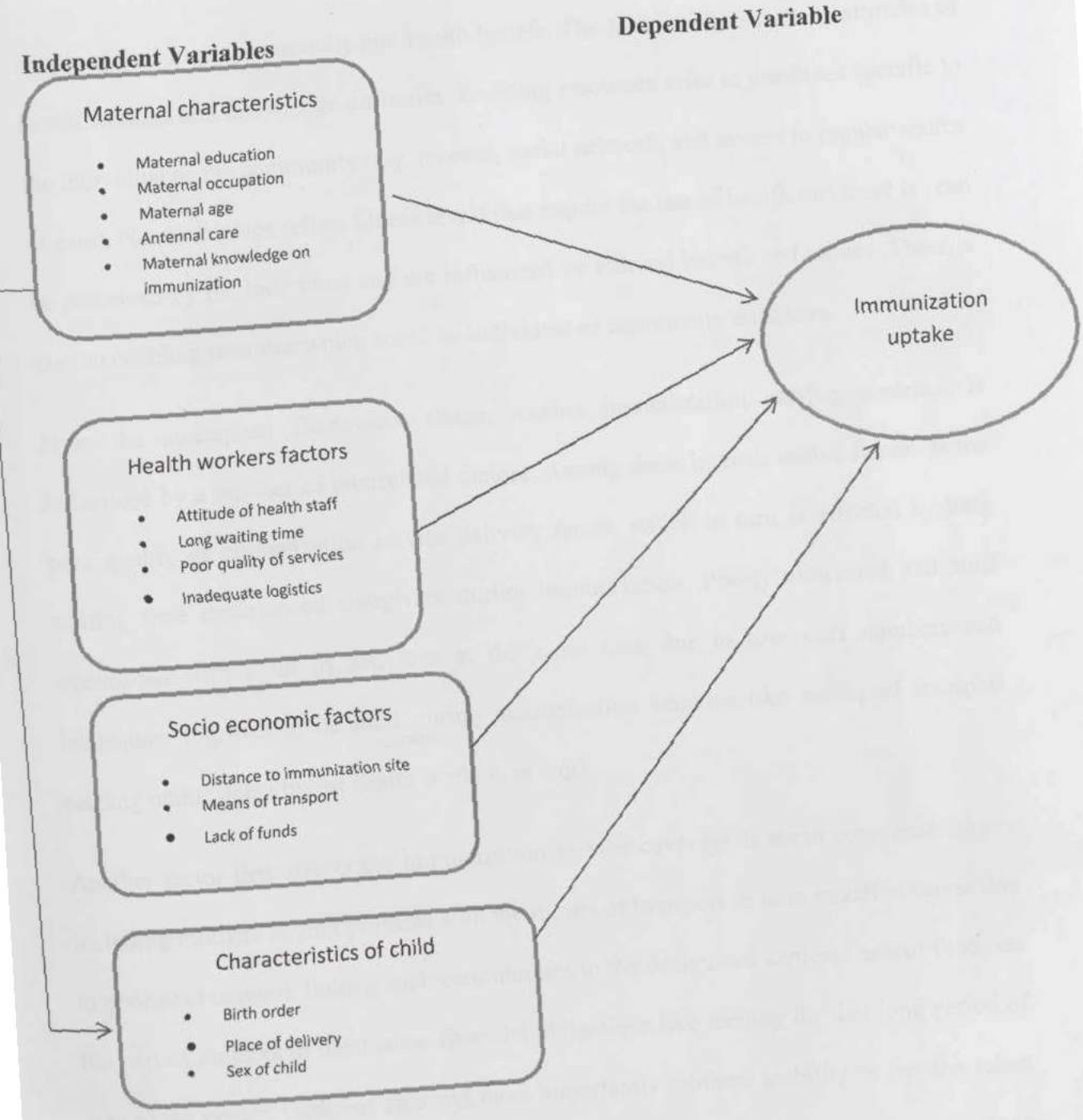

Figure 1 : Conceptual Framework on immunisation coverage

1.4 Explanation of Conceptual Framework

In 1973, Andersen and Newman proposed a framework for evaluating the utilization of health care ((Petrovic & Blank, 2015)). The model assumes that, utilization of health services is a function of predisposing, enabling and need factors. Predisposing characteristics include gender, marital status, and educational status, and occupation,

length of time in the community and health beliefs. The health beliefs include attitudes of health workers and knowledge on health. Enabling resources refer to attributes specific to the individual or the community (e.g. income, social network, and access to regular source of care). Need variables reflect illness levels that require the use of health services? It can be perceived by the individual and are influenced by cultural beliefs and values. There is also an enabling resource which could be individual or community attributes.

From the conceptual framework above, routine immunization service coverage is influenced by a number of interrelated factors. Among these interconnected factors is the poor quality of immunization service delivery factor, which in turn is affected by long waiting time experienced caregivers during immunization. Poorly motivated and staff overloaded with a lot of activities at the same time due to low staff numbers and inadequate logistics to be used during immunization sessions like means of transport causing undue delay by the health workers to work.

Another factor that affects the immunization service coverage is socio economic factors including mothers having problem with the means of transport to immunization center due to poor road network linking such communities to the designated centers, lack of funds on the part of mothers to meet some financial obligations like feeding for that long period of stay at the center, transport fare and most importantly mothers inability to pay the token fees collected by staff at the center and this one at times will not be too encouraging for a mother whose child is not sick to come for immunization service.

Immunization strategy chosen by the staff will surely, affects the utilization because strategy determines the distance between the caregiver and the service to be delivered. For instance home visits gets services closer to the client than static strategy whereby the staff

are at one point where the caregiver will have to travel to utilize the service being provided at the facility.

Caregiver's knowledge and understanding of importance of immunization and the EPI schedule play an indispensable role in EPI service utilization because if caregivers are aware of the dates, time and place for the various categories of the vaccines, they will follow diligently. Coverage also worsens when the DHA's educational campaign on EPI does not reach a greater section of the mothers in the hinterland or hard-to-reach areas. Therefore the utilization of the EPI coverage by caregivers is highly dependent on these inevitable enumerated factors.

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1.5 Justification

The commonest childhood diseases namely; Measles, Diarrhea, Pneumonia, Poliomyelitis, Tuberculosis, Tetanus, Yellow Fever, Whooping Cough which were mainly responsible for the mortality in Ghana are now less reported at our facilities dues to the introduction of immunization. Therefore an effort towards achieving healthier childhood is very critical to all stakeholders or health partners. An assessment of the activities of the program therefore, is vital in realizing the extent to which survival intervention is being utilized by the target population in the respective districts.

This research seeks to assess factors contributing to immunization uptake by children and caregivers, find out possible reasons that might account for low coverage by caregivers. Again the findings of the study would be used as confirmatory evidence to linked previous reports given by the District Health Directorate on EPI or identify difference and suggest corrective measures accordingly.

The study will inform the DHMT, policy makers, funding agencies and other stakeholders on management tools to employ to increase EPI service utilization and reduce defaulter rates, increase coverage levels for of immunization and finally reduce the incidence of vaccine preventable diseases in the Assin north municipality .The research will set the platform for which studies can be conducted for improving EPI service utilization in Ghana.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Vaccination is the administration of a vaccine to stimulate an individual's immune system in order to develop specific immunity to a disease causing organism; and immunization is the process by which an individual's immune system becomes stimulated against an agent of disease. Immunization can be achieved in an active or passive manner: vaccination is an active form of immunization, and the two terms are used interchangeably (Owino, Irimu, Olenja, & Meme, 2009)

Vaccine preventable infections includes diphtheria, *Haemophilus influenzae* type B, hepatitis A, hepatitis B, human papilloma virus, influenza, measles, meningococcus, mumps, pertussis, pneumococcus, polio, rotavirus, rubella, smallpox, and tetanus. However, with the exception of smallpox, which was declared globally eradicated in 1980, preventable morbidity from these infections persists. Immunization is essential to the attainment of the Millennium Development Goal (MDG) 4 and reducing childhood mortality by two-thirds during period of 1990 and 2015 (Rahman & Obaida-nasrin, 2010)

Vaccines keep children alive and healthy by protecting them against disease. Immunization is especially important for the hardest to reach families as it can also be a bridge to other life-saving care for mothers and children in isolated communities (Shengelia, Tandon, Adams, & Murray, 2005)

2.2 Immunization coverage

Immunisation coverage determines the proportion of children who are vaccinated against a particular antigen compared to the number of children expected to be vaccinated. Immunisation coverage is a key measure of the health system performance and output.it is measured at national, regional, district and sub-district levels(Tim, Braa, & Bjune, 2006)

Administrative coverage data are collected by monitoring the numbers of doses of the antigen administered to the target population divided by the total estimated number of target population to the estimate the percentage coverage (Martinez et al., 2014).This indicate the status of the vaccinations performed by service providers.

Surveys are conducted periodically by reviewing children vaccination histories to identify coverage levels. Surveys are frequently used in conjunction with administrative data. Immunisation coverage surveys are also recommended by W.H.O to be used periodically to verify administrative coverage data(Ngure, 2015)

Immunisation coverage rates based on administration data are mainly subject to numerator (children vaccinated) and denominator (target population) biases. This can lead to an overestimation and underestimation when children vaccinated outside the target age group are erroneously included in the numerator or when vaccinations are not reported by lower administrative levels such as private sector (burton et.al, 2009).

Immunisation coverage levels are useful in the following areas;

- To monitor the performance of immunisation services locally, nationally and internationally
- To guide strategies for the eradication, elimination and control of vaccine preventable diseases.

- To identify areas of immunisation systems that may require additional resources and focused attention
- To access the need to introduce new vaccines into the immunisation system (burton et al,2009)

During 2015, about 86% (116 million) of infants worldwide received 3 doses of diphtheria-tetanus-pertussis (DTP3) vaccine, protecting them against infectious diseases that can cause serious illness and disability or be fatal. By 2015, 126 countries had reached at least 90% coverage of DTP3 vaccine

In 2015, an estimated 19.4 million infants worldwide were not reached with routine immunization services such as DTP3 vaccine. Around 60% of these children live in 10 countries: Angola, the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Iraq, Nigeria, Pakistan, the Philippines, and Ukraine(WHO/UNICEF, 2016)

Approximately 17% of deaths in children under five are vaccine preventable. An estimated 1.5 million children die annually from diseases that can be prevented by immunization. If all children were immunized with existing vaccines, we could save nearly 25 million lives between 2011and 2020 .In 2014, an estimated 86 per cent of infants worldwide were vaccinated with three doses of the vaccine required to fully immunize them against diphtheria, tetanus and pertussis (DTP3 vaccine) up from 20% in 1980

Globally, it has been estimated that immunization programs prevent approximately 2.5 million deaths each year. The global eradication of smallpox in 1980, near elimination of poliomyelitis and global reduction in other vaccine-preventable diseases, are model examples of disease control through immunization (Town & Ayano, 2015)

2.2.1 The Global Vaccine Action Plan

The Global Vaccine Action Plan (GVAP) is a roadmap to prevent millions of deaths through more equitable access to vaccines. Countries are aiming to achieve vaccination coverage of at least 90% nationally and at least 80% in every district by 2020. While the GVAP should accelerate control of all vaccine-preventable diseases, polio eradication is set as the first milestone. It also aims to spur research and development for the next generation of vaccines(UNICEF, 2009)

WHO is leading efforts to support regions and countries as they adapt the GVAP for implementation. In April 2016, WHO warned that 5 out of the 6 GVAP targets were off-track, with only 1 target on the introduction of underutilized vaccines showing sufficient progress. This finding was based on the independent assessment report by SAGE.

The GVAP recommends 3 key steps for closing the immunization gap:

- integrating immunization with other health services, such as postnatal care for mothers and babies;
- strengthening health systems so that vaccines continue to be given even in times of crisis; and
- Ensuring that everyone can access vaccines and afford to pay for them.

Key challenges

Last year, the Strategic Advisory Group of Experts on immunization (SAGE) identified 5 factors to achieving results in immunization coverage; quality and use of data, community involvement, better access to immunization services for marginalized and displaced populations, and strong health systems(UNICEF, 2009)

2.2.2 Immunisation in Ghana

The Ghana Immunization Programme was established in June 1978 with six (6) antigens - BCG, measles, diphtheria-pertussis-tetanus (DPT) and oral polio vaccine for infants and tetanus toxoid (TT) vaccination for pregnant women to protect against maternal and neonatal tetanus.

The establishment of the immunization programme was in response to the National Health Policy to reduce morbidity and mortality due to vaccine preventable diseases (VPDs) which then contributed significantly to both infant and child mortality in the country. Immunization performance has become a strategic health performance indicator for the entire health sector and is monitored at all levels(Vision, 2014)

The goal of the EPI Programme is to reduce child morbidity, mortality and disability associated with vaccine preventable diseases through the provision of high quality immunization services. Specifically, the program aims to Achieve 95% coverage for all antigens by 2019; maintain a polio free status, Achieve measles/Rubella elimination, and Sustain MNT elimination

In the year 2011, Ghana was recognized as one of the countries to have eliminated maternal and neonatal tetanus. In 2015, the country entered the elimination phase for measles and rubella

Penta-3 has been used as the proxy to measure the improvement in childhood immunization. The national average of Penta-3 coverage increased from 90% in 2014 to 95.4% in 2015, however 29% (63) of the 216 districts in Ghana, could not achieve the 80% coverage target for Penta 3 coverage in 2015. The Greater Accra region recorded the highest number (44,487) of unimmunized children(Ministry of health, 2016)

2.3 Factors contributing to immunization coverage

Improving immunization coverage is vital to promoting child health and reducing childhood diseases and deaths. According to WHO, there is a problem with immunization services when the coverage is below 80% with a dropout rate of above 10%. There are so many factors contributing immunization coverage. Attendance to immunization services are mainly due to; poor knowledge about immunization, lack of suitable venues and furniture at outreach clinics, financial difficulties, long waiting times, transport difficulties, poorly motivated service providers and weak intersectoral collaboration, the timing of immunization sessions, attitude of service providers and fear of side-effects are the major factors contributing to immunization coverage(WHO, 2014).

Also, a number of studies have been carried out across the world to find out the significant factors that hinder or increase the likelihood of immunization. Factors that have been found to be significantly associated with vaccination uptake include maternal education and age, socio- economic status, religion, health services utilization and exposure to the media. Research has revealed that children in urban areas are more likely to be fully vaccinated than children in rural areas. Accessibility to health facilities in rural areas is poor as compared to urban areas. Studies by Ibnouf et al (2007) and Rup et al (2008) revealed that immunization was significantly higher where distance to a health facility was lower as the case with urban areas.

Studies have also shown that maternal factors accounted for a high likelihood of child vaccination. Mothers with secondary education and higher are better informed and more empowered hence are more likely than their counterparts with primary or no education to have their children immunized. Other studies have revealed that Immunization compliance increased with mother's economic status. Mothers with high economic status are more likely to immunize their children than mothers with a poor economic standing.

Immunization compliance is also higher when mothers previously utilized antenatal care services during pregnancy as well as delivered in health facilities.

In a study carried out by Becker et al (1993) possession of a radio and a television was found to be important determinants of immunization. Possession of these gadgets increased the likelihood of immunization. Dwumoh et al (2014) in a study in Ghana to find the social determinants of immunization concurred with these results and concluded that radio and television enhanced access to health information.

2.3 Reasons for immunisation failure

Studies by kumar et al (2017) revealed that the reasons were lack of transport, fear of side effects and misconception (development of autism) . Other studies also found that inadequate knowledge about immunization and subsequent dose, belief that vaccine causes side-effects, lack of faith in immunization , The major obstacles were busy schedule of mother, illness of child on the day of immunization and also due to lack of information respectively

With the high under-five mortality in Ghana, full childhood immunization can mitigate morbidity and mortality through prevention of a vaccine-preventable infection. In an effort to improve immunization in Ghana therefore, it is imperative to carry out a study of the factors contributing to full immunization of children in order to provide recommendations for policy formulation and designing implementation programs geared at increasing immunization coverage in the country(Nana & Liverpool, 2000)

CHAPTER THREE

3.0 METHODS

3.1 Study Design

The study was a cross sectional study. Data were randomly collected from mothers or caregivers with children 12-23 months of age from 30 randomly selected communities in the Assin North Municipality.

3.2 Profile of the Study Area

3.2.1 Geographical location

Assin North Municipality is one of the largest districts of the Central Region, and has estimated population of 187,949 for the year under review (2015). It shares boundaries with Adansi East district (Ashanti Region) to the north, Assin South to the south, Birim South district (Eastern Region), to the east, Upper Denkyira East, and Twifo-Heman-Lower-Denkyira to the west. Assin Foso is its capital town.

The map below shows the geographical locations of communities and Health facilities in the Municipality.

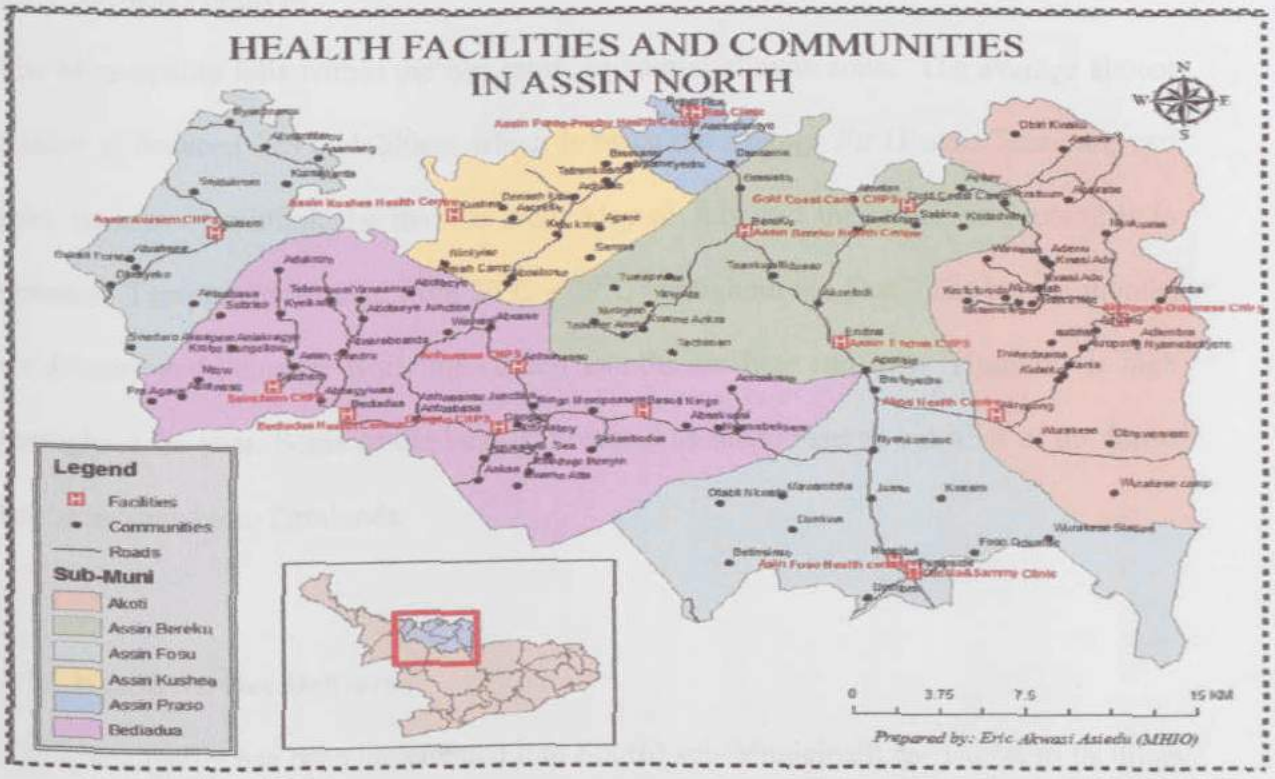

Figure 2 : Map of Assin North with Health Facilities and Communities

3.2.1 Demographic characteristics

The population is typical of the situation in a developing country. There are a number of ethnic groups in the Municipality. The major ethnic group is Akan. Other ethnic groups found in significant numbers in the Municipality are the Ewes and the Northern group (from within and outside Ghana). The common language spoken in the Municipality is Twi.

3.2.2 Topography

1.3.1 Natural Features

The Municipality falls within the wet semi- equatorial climate zone. The average annual rainfall is between 125 and 200cm which is twice the average for Ghana. There are two peak seasons of rainfall, the main is from May to July and the minor in September to October. Temperatures range from $20^0C - 29^0C$ throughout the year. The hottest months are January and February while the coolest months are June and July. Humidity is high throughout the year. Some of the land is protected as forest reserve but a lot of the forest has been turned into farmlands.

3.2.3 Health Service Delivery

The Municipality has been demarcated into Six (6) sub-Municipalities. This is to facilitate the efficient delivery of health services.

The inhabitants seek health services through the health facilities and Community-based Health Agents:

3.2.4 Socio- Economic Activities

The main occupations in the Municipality are Agriculture, Wood/ Timber processing, Commerce, Civil/Public Service and trading.Most people are engaged in farming. The abundant rainfall makes cocoa and palm nut cultivation attractive and the Municipality is one of the main producers. Citrus fruits, plantain, cassava and cocoyam are produced both in small scales and commercial quantities. Other economic activities include local gin (akpeteshie) distillation, lumbering and saw milling

3.3 Variables

Table 1. Study Variable

Study Variables	Operational Definition	Data Collection Technique
Dependent variables Complete immunization	This refers to a child who received all the antigens on EPI schedule as recommended	Questionnaire
Incomplete immunization	This refers to a child who did not received the completed set of antigens on the immunization schedule	Questionnaire
Independent variable Education of mother	This refers to mothers highest educational level	Questionnaire
Knowledge on immunization of mother or caregiver	This refers to the level of knowledge the mother or caregiver has on immunisation.it could be importance of vaccination, schedules of immunization.	Questionnaire
Occupation of mother or caregiver	This refers to the type of occupation of the mother or the caregivers.	Questionnaire
Sex of child	This refers to the biological makeup of the child	Questionnaire
Occupation of mother	The type of occupation of the mother	Questionnaire
Age of mother	Current age of mother at the time of interview	Questionnaire
Antennal care	The number of ANC visits to health facilities during pregnancy	Questionnaire
Assisted birth	The attendant at birth where mother delivered	Questionnaire
Birth order	Birth order of the child	

Factors affecting immunization Lack of information on education	No or inadequate information on immunization on part of mother Lack of , or inadequate motivation to force mothers to vaccinate their children	Questionnaire
Obstacles to immunization Lack of motivation	Various obstacles that come the way of the mother that prevent the child from being vaccinated	

3.4 Study Population

The study population included all mothers or caregivers whose children were 12 -23 months of age living within Assin North municipal.

3.5 Sample size

Using the sample size calculation methods presented in the WHO immunization coverage cluster survey manual (WHO, 2005), the sample size required was determined using the formula

$$Nmin = de*z^2*p*(1-P)/d^2$$

Where,

Nmi = minimum number of sample size

De = design effect =1.5

Z = confidence interval at 95% (standard value of 1.96)

P = estimated prevalence of coverage

D = with of confidence interval

Using coverage of 59.2% obtained in the year 2015 for Penta 3 in the Assin North municipality, a design effect of 1.5, a type 1 error of 5%, in the conformity with the standard WHO methodology, the calculated minimum number of children required would be

$Nmin=1.5*1.96^2*0.592*(1-0.592)/ (0.05)^2$

Nmin =556

Adjusting for a non-response rate of 10%, at least a total of 612 mothers with children 12-23 months were determined for the study as sample size.

3.6 Sampling method

Area: The Assin north municipality in the central region was purposely selected because it has recorded low routine immunisation coverage in all antigens according to the 2013, 2014, and 2015 district performance at the regional review meetings .The municipality has a coverage rate raging between 55% to 63%.the municipality has about 123 communities. Thirty communities out of the 123 were randomly selected for the study. The six sub-districts were divided into seven clusters and participants were selected as per the population with the community.

3.7 Sample selection

The study used cluster probability sampling technique to draw the respondents to represent the sample size. This was started by collecting information on the population for the major communities from the statistics department of the District Health Directorate. A sampling frame consisting of the list of all the towns, villages and communities in the district with 2016 projected figures using 2010 population and housing census data was used.

A cluster identification form was used to list all the cities, towns, communities etc. and listed the individual population of each community. In the cumulative column of the cluster identification form were written the cumulative populations as each community is added. A sampling interval, a number that was used to systematically select clusters from the sampling frame, was calculated by dividing the total population to be surveyed by the number of clusters, rounding off to the nearest whole number. A random number which was less than and had the same number of digits as the sampling interval was then selected.

The community in which cluster one was located was identified by locating the community listed in which the cumulative population equated or exceeded the random number. One was written beside the community in the column entitled cluster numbers. Cluster two (2) was identified by adding the sampling interval to the random number. This exercise continued systematically until all the thirty clusters had been gotten.

In selecting households and participants for the study, the geographical center of the community was located by spinning a pencil. The direction of the pencil tip was used to determine the direction in selecting the first house in the selected community. The number of houses in the direction of the pencil tip were counted and numbered from the community center to the end. The first house was selected randomly by simple random sampling of the numbers of the houses written on a piece of paper. Based on the number selected, the corresponding house was selected to be the starting point for the data collection. The next house nearest to the starting house was selected and subsequent ones until the expected number of participants in the community was attained.

In the selected house, one mother or caregiver whose child met the inclusion criteria and was willing to participate in the study was included in the study. In a selected house, when

there were more than one household, with more than one child who met the inclusion criteria, the household with the youngest child within the age limit was selected. If the parents or caregivers of the child in the household refused to partake in the study, the household with the next youngest child was selected. This was repeated until a total of 672 were sampled.

3.8 Inclusion criterion

A mother was included in the study if;

- She has a child between 12-23 months
- with or without a child health records
- The mother or caregiver must live in the community for the past one year.
- The mother with a child 12-23mm months who agreed to be part of the study filled the consent forms

3.9 Exclusion criteria

A mother was excluded from the study if;

1. Her child is less than one year or more than two years
2. She did not reside in the selected cluster
3. She declined to participate in the study

3.10 Data Collection

The WHO (2005) cluster survey tool adapted into a structured questionnaire was used to collect data from the participants. A copy is attached as Appendix 3.

Strategies used to administer the questionnaires included one –on-one question and answer technique.

3.11 Quality control

Three field supervisors and 15 interviewers were recruited and trained to supervise and collected from the field. Questionnaire was explained in Twi to those who could not read. The questionnaire was tested in one of the communities in the municipality to ensure the study participants and those who would be pretested will have the same characteristics. Mistake that were identified in the questions were rectified.

3.12 Data Handling and Analysis

3.12.1 Data Processing and Analysis

Data generated were coded, cleaned and entered into a computer for analysis. Analysis was done using STATA version 14.

3.12.2 Data Processing and Analysis

Data that was generated was coded and entered into the computer for analysis. Data analysis was done using STATA 14 software.

The outcome of interest which is the immunizations status was considered to be fully immunized or partially immunized. The independent variables which included individual factors of the mother, like age, education, occupation antenatal visit, birth order of the child, knowledge of mother on immunization were looked at. Age of mother was modeled as a categorical variables with categories defined as 0(15-24), 1(25-35), 2(35+) years. Antenatal and visit and birth order were modeled as categorical variables with categories

defined as 0 (none),1(once), 3 (thrice), 4 (four or more) and 1 (first child), 2 (2^{nd} or 3^{rd} child), 3 (4^{th} child and above) respectively.

The data collected was explored using box plot and other descriptive statistics to check the distribution of the data and missing data. Univariate analysis in form of frequencies and percentage was performed on the demographic characteristics of the mother and child.

Bivariate and multivariable comparisons were made between immunisation status and independent variables using chi square and logistic regression respectively. Chi square was used to determine the association between immunization status and each of the factors or independent variables. Logistics regression was used to find the association between the independent variables that show association in the chi square and the child's immunisation status independently. This was used to determine which of the variables were strongly associated with child's immunization status. The odd ratio and P values were recorded. A logistics model was considered for the independent variables. An independent variable was included in the model when it had p –value of < 0.05.This tested the association between the dependent and independent variables. Associations were considered significant at 95% confidence intervals with a p –value of less than 0.05.

3.13 Ethical Clearance

Ethical clearance for this research was obtained first from the Ghana Health Service Ethical Review Committee (Appendix 5). In the central region, permission was sought from the Regional Director of Health Services.at Assin North municipality; permission was sought from the Municipality Health Directorate to conduct the research. The participants that were recruited in the study were fully informed of the purpose of the research. The participants were assured of their privacy and confidentially of the

information given. Data files were protected with a password which was only be known by the researcher. Electronic and hard copy data was stored and locked in a file cabinet which was only accessible to the researcher and the supervisors.

Verbal consents were obtained from the chiefs of the communities as well as individuals involved in the research. There was not any compensation for households participating in the study. The researcher had no conflict of interest in the study and the study was self-financed.

a. Pre-Testing

Pre-testing of the questionnaire was done at Assin Anyinabrem, one of the communities in the Assin north municipality. This was to ensure that, the participants in the study have the same characteristics as the participants in the pretesting community.

CHAPTER FOUR

4.0 RESULTS

A total of 672 mothers or caregivers were interviewed and immunisation records on 672 children were reviewed from the 30 clusters in the Assin North municipality. The data also had complete records on reasons immunization failure.

4.1 Demographic Characteristics of Mothers

The ages of the respondents ranged from 15 to 45 years with a mean of 28.3± 5.2. Majority of the respondents, 273(40.6%) were within the ages of 25-34 years. The majority ethnic group of the respondents was Akan constituting about 77.5%. A large proportion of mothers or care givers that's 459(68.3%) had primary education .The major occupation of the mothers involved in the study was trading representing 289(43.0%). About 615(5%) of the respondents had four or more antennal visit during pregnancy period. The table 4 below shows the complete distribution of the demographic characteristics of the mother or caregiver.

Table 2 : Demographic Characteristics of Mothers in the Study

Characteristics	Mothers (N=672) Frequency	Percentage (%)
Age (years)		
15-24	247	36.8
25-34	273	40.6
35 and above	152	22.6
Ethnicity		
Akan	521	77.3
Ga	42	6.5
Ewe	66	9.8
Hausa	15	2.2
Others	28	4.2
Educational level		
No formal education	76	11.8
Primary	459	68.3
Secondary	110	16.4
Tertiary	24	3.6
Occupation		
Unemployed	90	13.4
Farming	154	22.9
Trading	289	43.0
Public servant	40	6.0
Others	99	14.7
Number of prenatal visits		
None	13	1.9
Once	7	1.0
Twice	13	1.9
Thrice	24	3.6
Four and above	615	91.5

4.2 Demographic characteristics of children

A total of 672 children between the ages of 12-23 months were studied. Out of the 672 children, 52.8% were males. Children between the 2nd and 3rd birth order constituted the majority with a population of 268 (39.9%).A large proportion of mothers or caregivers 411(61.1%) had a midwife or nurse to attend to them during delivery .Most mothers or caregivers 646 (96.1%) had their cards intact. Majority of the children, 574(85.4%) were fully immunized, 90(13.4%) were partially immunized, and 8(1.2%) were not immunized at all. The table below shows

Table 3 : characteristics of children

Variable	Number of children (N=672)	Percentage (%)
Gender		
Male	355	52.8
Female	317	47.2
Birth order		
First	223	33.2
2nd and 3rd	268	39.9
4th and above	181	26.9
Attendance at birth		
None	5	0.7
Doctor	70	10.4
TBA	186	27.7
Nurse/midwife	411	61.2
Immunization card		
Yes	646	96.1
No	26	3.9

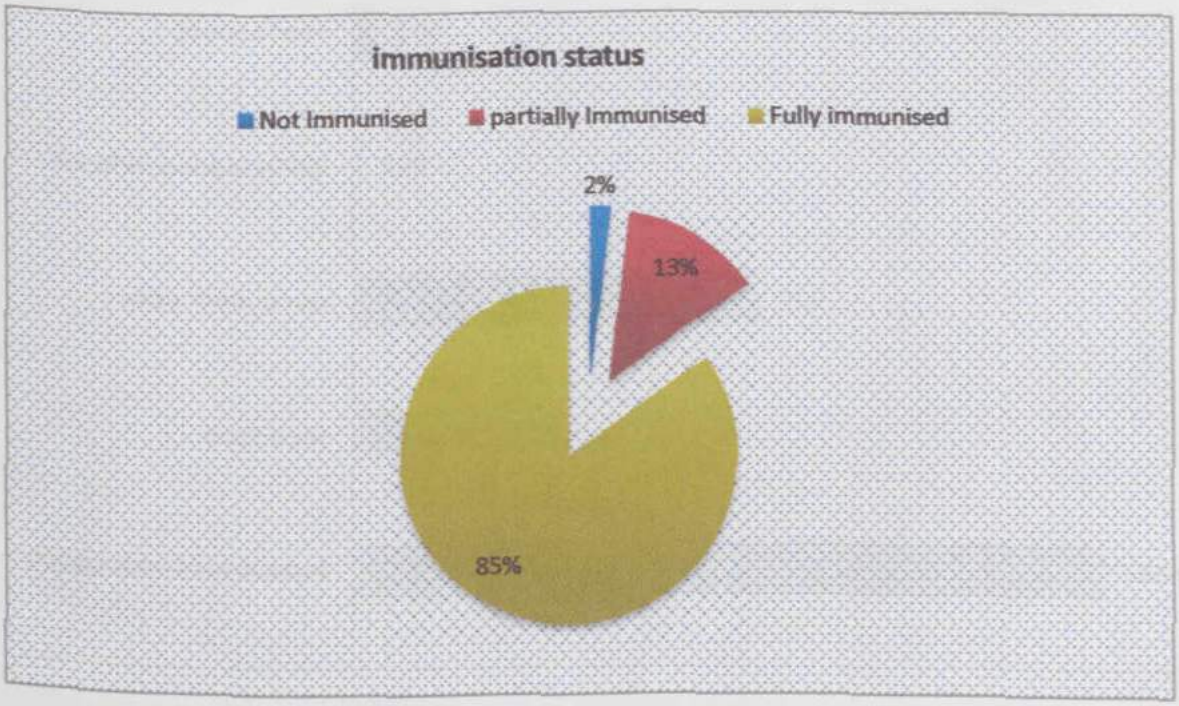

Figure 3: Immunisation Status

4.3 Maternal knowledge on immunization and vaccine preventable diseases

In assessing knowledge on immunization and vaccine preventable diseases, participants were asked to mention the various diseases that are prevented by vaccination.81 (12.5%) could not mention any disease and 84(12%) were able to mention five diseases and above.

In the participants response to reasons why children are vaccinated, 390 (58.0%) were able to mention it prevents them from vaccine preventable diseases, 213(31.7%) knew it makes the strong whiles 27(4.0%) did not know the reasons for vaccination.

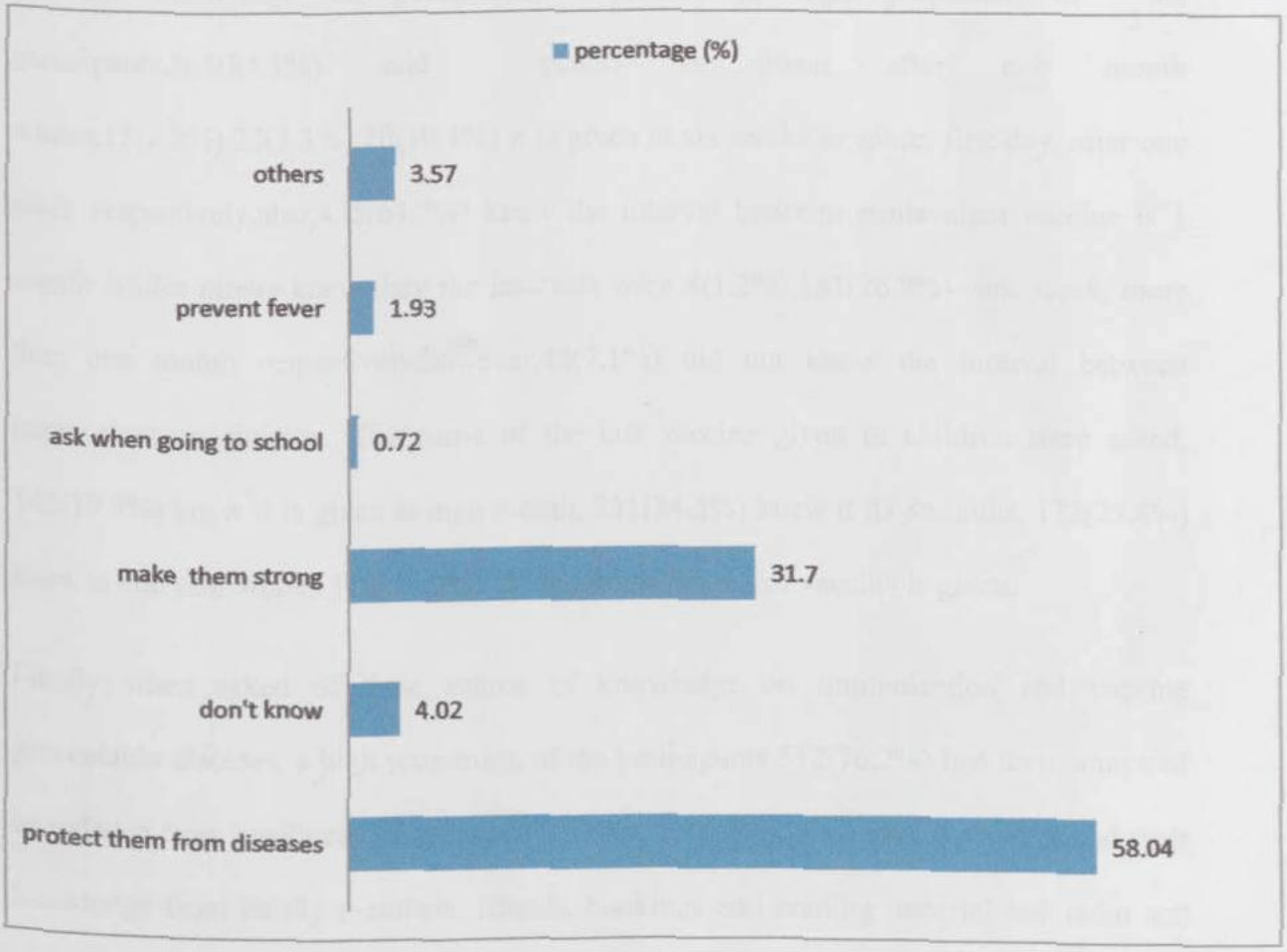

Figure 4: Reasons for Childhood Immunization

When participants were asked to mention the various vaccines administered to children during vaccination, 201 (29.9%) mentioned measles, 40(6%), tetanus, 126(18.9%) yellow

fever, 11(1.6%) hepatitis B, 92(1.7%) Polio, and 81(12.1%) could not mention. Also, 504(75%) knew BCG was the first vaccine given whiles 50(7.4%) did not know the first vaccine given to the children.

When asked about the age at which the first vaccine is given, 255 (38%) mentioned it's given at first week, 167(24.9%), 71 (10.6%), 133(19.8%) mentioned after one week, first day, after one month respectively. However, 46(6.9%) did not know when it is given.

On the knowledge on pentavalent vaccine ,a high proportion of the participants,565(84.1%) said penta1 is given after one month whiles,15(2.2%),22(3.3%),70(10.4%) it is given at six weeks or more, first day, after one week respectively.also,435(64.7%) knew the interval between pentavalent vaccine is 1 month whiles others knew they the intervals were 8(1.2%),181(26.9%) one week, more than one month respectively.however,48(7.1%) did not know the interval between pentavalent vaccination. The name of the last vaccine given to children were asked, 143(19.9%) knew it is given at nigh month, 231(34.5%) knew it its 8months, 172(25.6%) knew is one year whiles 114(17.0%) did not know when last vaccine is given.

Finally when asked of their source of knowledge on immunization and vaccine preventable diseases, a high proportion of the participants 512(76.2%) had their source of knowledge from health centers whiles 51(7.6%), 13(1.9%), 30(4.5%), 32(4.8%), had their knowledge from family members, friends, bookings and reading material and radio and television respectively.

Table 4 : Knowledge of Mothers or Care Givers On Immunization

Variable	Frequency (N=672)	Percentage (%)
Reasons for immunization		
No of diseases prevented by immunization		
One(1)	134	19.9
Two(2)	155	23.1
Three(3)	126	18.6
Four(4)	71	10.6
Five and above	84	12.5
Diseases prevented by immunization		
Measles	201	30.0
Yellow fever	126	19.0
Hepatitis B	11	1.7
Polio	92	13.7
Tetanus	40	5.7
Don't know	81	12.1
Vaccines given under one year		
Penta(5 in one)	268	39.8
BCG	225	37.95
Don't know	87	13.0
Others	62	9.2
When First vaccine is given		
First day	71	10.6
First week	255	38.0
After one week	167	24.9
After one month	133	19.8
Don't know	46	6.9
When Penta 1 is given		
At six weeks or more	15	2.23
First day	22	3.3
First week	70	10.42
After one month	565	84.1
Last vaccine given		
Measles	7	1.1
Yellow fever	504	75.0
Penta	47	7.0
Don't know	68	10.1
Others	46	6.9
Source of knowledge		
Health center	512	76.2
Family member	51	7.6
Friends	13	2.0
Booking and reading	30	4.5
Radio and television	32	4.8
Others	34	5.1

4.4 Factors Influencing Immunization Status of a Child

Different variables assumed to be associated with immunization status of the child were included in the study. These variables include socio demographic characteristics of mothers or care givers of the child and characteristics of the child, the mother or care givers knowledge on immunization and vaccine preventable diseases .these factors associated with the child's immunization completion were analyzed using logistic regression.

4.4.1 Demographic characteristics of mothers or caregivers

The association of mother's demographic characteristics with immunization status of the children was assessed using bivariate and multivariate analysis by chi square and logistic regression analysis.

Mothers source of knowledge, and attendant at birth, were significantly associated with immunization status of the child in a bivariate analysis using chi square with a p- value of < 0.05

Table 5 : Comparison of Mothers' Characteristics and Immunisation Status

Characteristics	Partially immunized (%)	N	Fully immunized (%)	N	X^2(df)	p-value
*Age (years)	98(14.6)		574(85.4)		1.839	0.399
*Ethnicity	98(14.6)		574(85.4)		8.5804	0.072
*Educational level	98(14.6)		574(85.4)		1.6502	0.648
*Occupation	98 (14.6)		574(85.4)		7.4018	0.116
*Antenatal clinic	98 (14.6)		574(85.4)		4.0257	0.403

*Details can be seen in appendix 3

In a bivariate analysis using logistic regression, mothers between the ages of 25- 34 were 1.34(95% CI: 0.83-2.186) times more likely to fully immunized their children as compared to mothers with the age group 15-24.The odds of a child being immunized fully by

mothers within the age 35 and above is 1.35(95% ci: 0.76, 2.40) times compared to those within the reference group 15-24. However, when the other maternal characteristics were adjusted for in a multivariate analysis, mother's age was no more significant determinant of immunization status of the child.

The odd of a child being fully immunized by a mother, who is a Ga, Ewe, Hausa or any other ethnic group is 7.33(95%CI:99,54.01),0.66(95%CI:0.35,1.26),2.50(95% C,0.32,19.30),1.50(95% CI:0.44,5.05) times the of a mother who is a Akan respectively .When all the other maternal factors were adjusted for, ethnicity was not still significantly associated with immunization status. This can be seen in table 8.

Educational status of the mother was significantly associated with immunization status of the child. A child with a mother with a primary level education 1.15(95% CI: 0.60, 2.2) times more likely to be fully immunized as compared with an illiterate mother. A mother with a secondary education is also 1.47(95% CI: 0.64, 3.37) times more likely to be completely immunize their children while the odds of being fully immunized by a mother with tertiary education is 0.74(95%CI: 0.24, 2.37) times compared to the illiterate ones. Upon adjusting for all other maternal variables, maternal educational to levels, were not significantly associated with immunization status of the child .showed in table 8.

Mother's occupation was also significantly associated with a child's immunization status. The odds of completely immunizing a child by mothers who were traders, farmers, public servant or involved in other occupations is 1.21(95%CI:121,4.04), 1.83(95%CI:0.94,3.55) ,1.43(95%CI:0.55,3.71),and 2.01(95%CI:0.94,4.31) times compared to mothers who are not employed. After adjust for all other maternal characteristics ,mothers who are traders were 1.83(95%CI:0.89,3.75) times more likely to completely vaccinate their children as compared with the unemployed mothers while the mothers who are farmers, public

servants and other occupations were no more significantly associated with a child's immunization status(table).

Mothers with prenatal visits of twice and four or more were 2.44(95% CI: 0.36, 16.55) and 2.63(95% CI: 0.79, 8.70) times more likely to fully immunize their compared to mothers who do not have any antennal care visits during pregnancy .Those with antenatal visits of once or thrice had odds ratio that were not significant .When the other maternal characteristics were held constant, mothers with antennal visits of thrice or four or more were 3..9(95% CI:0.60,23.17), 2.70(95% CI 0.73,9.93) times more likely to completely vaccinate their children compared to their counterparts with no antenatal care visit ,as seen in table 8.

Mothers with at least moderate knowledge on immunisation and vaccine preventable diseases were 4.27.(95%CI 2.03,7.81) times more likely to fully immunized their children as compared to those with low knowledge .When adjusted for other variables, mothers' knowledge was still significantly associated with immunization status with odds of 2.74(95%CI :1.45,5.18) times those with low knowledge levels.

4.4.2 Childs characteristics

Appendix 3 shows the frequencies and percentages of the immunization status of the children between the ages of 12-23 months with respect to the child's characteristics. The table indicates that, out of 98 children who were partially immunized, 54% were females. About 62.0% of those who were fully immunized were males .About 33.2%, 39.9%, and 26.9% of the children who were fully immunized were within the birth orders, first, 2nd to 3rd, and 4th and above respectively .About 61% of children were partially immunized had a nurse or midwife to deliver the child while 61.1 % of those fully immunized were delivered by nurse or midwife. About 67% of those who were partially immunized

children had their vaccination cards while the rest do not have. On the other hand, about 98% of those fully immunized children had their immunization. Attendance at the birth and retention of cards were only characteristics that were significantly associated with immunization status.

Table 6 : Comparison of Child's Characteristics and Immunization Status of Child

Characteristics	Immunization status		X^2(df)	P-value
	Partially immunized N (%)	Fully immunized N (%)		
Gender			0.723(2)	0.435
Female	53(54.0)	218(38.0)		
Male	45(45.9)	356(62.0)		
Total	98(100)	574(100)		
Birth order			6.1125(2)	0.045
First	25(25.5)	198(34.5)		
2nd and 3rd	50(51.0)	218(38.0)		
4th and above	23(23.5)	158(27.5)		
Total	98(100.0)	574(100.0)		
Attendance at birth			10.79(3)	0.013
None	3(3.1)	2(0.3)		
TBA	32(32.7)	154(26.8)		
Nurse/midwife	56(57.1)	355(61.8)		
Doctor	7(7.1)	63(11.0)		
Total	98(100.0)	574(100.0)		
Immunization cards			0.0139(1)	0.906
No card	4(4.1)	22(3.8)		
Have a card	94(95.9)	552(96.2)		
Total	98(100.0)	574(100)		

From table 7, attendance at birth is a significant determinant of immunization status. However ,the adjusted odd ratio indicates that the odds of a child being fully immunized as a results of being delivered by a TBA is reduced by 21.8% as compared to those who did not have any health personnel to deliver the child. The odds of being fully immunized when the child was delivered by nurse/midwife or doctor is 9.51(95% CI: 1.55-58.18) or 3.5 (95% CI: 1.92, 95.09) times those who were not delivered by and health personnel respectively. Immunization card retention is significant determinant of immunization status. The odds of being fully immunized by a child who had an immunization a card is 1.07(95% CI .36, 3.12) times those who do not have immunization cards. When all other characteristics were held constant, the odds of a child being fully immunized 1.24 times than those without immunisation cards as shown in table 12 below.

Table 7: Unadjusted and adjusted odds ratio of child's characteristics on immunization status

Variable	Unadjusted odd ratio					Adjusted odd ratio		
	Partially immunized	Fully immunized	0R	95%CI	P – VALUE	OR	95%CI	P-VALUE
Attendance at birth								
None	3	2	*Ref			Ref		
TBA	32	154	7.21	1.16-44.97	0.034	8.54	1.35-54.15	0.0023
Nurse/ mid wife	56	355	0.95	1.55-58.18	0.015	10.97	1.76-3.74	0010
Doctor	7	53	13.5	1.92-95.09	0.009	17.05	2.37-122.79	0.005
Birth order								
First	25	198	Ref			Ref		
2nd and 3rd	50	218	0.55	0.33-0.93	0.024	0.53	0.31-0.91	0.20
4th and above	23	158	0.87	0.47-1.59	0.07	0.91	0.49-1.71	0.777
Immunization card								
No card	4	22	Ref			Ref		
Has a card	94	552	1.07	0.36-3.17	0.91	1.24	0.41-3.74	0.705

4.5 Reasons for Immunization Failure among Partially and Non-Immunized Children

The respondents who could not complete the routine immunization schedule for their children were asked for there their reasons for immunization failure. A lot of reasons were given as indicated as given in figure 8.out of 672 respondents ,about 33.5% could not complete the immunisation for their children because they were not aware of the need for immunization .the second reason given by 32.9% was that they were not aware of the need to return for the subsequent immunizations .Some 16.7% of the respondents did not know where to go for the next vaccination .About 56.3% were not motivated to come for immunization because their vaccinations were postponed until another time hence their inability to complete their immunization .place of immunization ,time of immunization inconvenient, vaccinator absent, family problems including child been sick were the reasons given by 17.6%,20.1%,15.3% and 18.5% of the respondents respectively.

Table 8 : Reasons for Immunization Failure

Lack of Information	Frequency	Percent
unaware on need for immunisation	225	33.48
unaware of the need to return for 2nd immunisation dose	221	32.89
place and/or time of immunization unknown	112	16.67
fear of side reactions of immunisation	50	7.44
Others	64	9.52
Total	672	100
Lack of motivation	Frequency	Percent
postponed until another time	378	56.25
others	294	43.75
Total	672	100
Obstacles	**Freq.**	**Percent**
place of immunisation not convenient	118	17.59
time of immunisation inconvenient	135	20.12
vaccinator absent	103	15.35
mother too busy	12	1.79
family problem ,including illness of mother	124	18.48
child ill-brought but not given immunisation	60	8.94
Other	119	17.73
Total	671	100

CHAPTER FIVE

5.0 DISCUSSION

5.1 Proportion of Children That Have Been Fully Immunized In the Municipality

The aim of the study was to find out factors contributing to low coverage immunisation in Assin North Municipality. Based on immunization card and recall, 85.8% children were fully vaccinated, and 14.6% were not fully vaccinated. The pentavalent3 coverage was 91.7% which is above the 2015 WHO/UNICEF coverage of 86% worldwide (WHO/UNICEF, 2014). The OPV3 vaccine coverage was the same as coverage of the Pentavalent3 vaccine. The Measles coverage was higher than the Yellow Fever vaccine coverage which under normal circumstance should be the same. The higher coverage of OPV3 and Pentavalent 3 is due to frequent mop ups and home visits by the community health nurses.

Beside this, the current finding is higher than the immunization coverage from 2013, 2014, and 2015 74.7%, 59.3%, and 59.2% coverage respectively. This difference may be due to the under reporting of health and health related indicators data from some areas. From the total interviewed mothers or care givers, 646 (96.1%) mothers showed the vaccination card of their children. From the card most children took BCG and OPV1 vaccines, but only 14.6% did not finished the immunization.

5.2: Knowledge of Mothers /Caregivers on Immunisation and Vaccine Preventable Diseases

The study also assessed mothers 'or caregivers knowledge on vaccination and vaccine preventable disease. About 90.1% mothers heard about childhood immunization and vaccine preventable diseases, but only 58.0% of them mentioned that vaccination is use to

prevent disease. However, 31% of the respondents had a misconception that vaccination makes their children strong. Even though the percentage with knowledge on the importance of vaccination was average, majority of the children had received some form of vaccination. This may be due to the fact that, immunisation is free in Ghana and health workers send vaccines to the doorsteps of the people in the municipality on outreaches and home visits for eligible children. The study also revealed few mothers (12.5%) were able to mention that vaccines prevent 5 or more diseases. The most frequently mentioned diseases were Measles and Poliomyelitis. This may be largely due to National Immunisation Days (NIDs) And Measles Supplemental Immunisation Activities (SIAs) Campaigns. Knowledge on various vaccines, when they are administered; the intervals between the various doses of each vaccine and the age at which vaccination should be completed was very low as in most cases more than 6.6% do not have any idea about the question. This contrast a study conducted by Belachew, 2011 that, mothers who had knowledge on vaccine and vaccine preventable diseases are more likely to fully immunize their children.

Surprisingly, about 76.2% of the respondents received their education from health centers during immunisation sessions. This raises the question on the kind of education given to mothers during immunisation sessions. Though, radio and television role in educating the public on health, only 4.8% of the respondents had their source of knowledge from these sources. This may be due to the fact that education on immunisation and vaccine preventable diseases are less discuss on the radio and television.

5.3 Factors Affecting Immunisation Status of a Child

The study also assessed factors affecting immunisation status of children by grouping them into categories, partially immunized and fully immunized. Maternal and child

characteristics affecting immunisation status of the children were analyzed separately and factors associated to the immunisation status were identified by bivariate and multivariate analysis using chi square and logistics regression.

Based on the bivariate analysis, maternal age .ethnicity, education, occupation and antenatal clinics visits were the maternal characteristics that showed significant association with the immunisation status of the child. Older mothers were more likely to fully immunize their children than their younger counterparts. Maternal age and immunisation status of children has been a controversial issue for researchers. Some studies say middle age mothers are more likely to immunized their children(Rahman & Obaida-nasrin, 2010),while some say the younger ones are more likely to complete their immunisation(Mukungwa, 2015). Also mothers with higher educational status were more likely to complete their immunisation schedule of their children as compared to their counterparts who are illiterates. Studies conducted in the past (Etana & Deressa, 2012) show there is a significant association between maternal educational status and immunisation status of the child, Mothers or caregivers who have one beyond secondary education and higher are better informed and more empowered hence are more likely than their counterparts with primary or no education to have their children (Jani, Schacht, Jani, & Bjune, 2008)..In this study, mothers with primary education, secondary education and tertiary education level of education were 1.2,1.5,0.75 times respectively more likely to fully immunized their children as compared to their counterparts illiterates .Mothers who were farmers ,traders, and public servant and other occupations were 1.83,2.21,1.43,2.01 more likely to fully immunized their children than their unemployed counterparts. Also, mothers who had two or more ANC visits were more likely to fully immunized their children .Mothers with two, three, four or more were 2.44, 3.11, 2.6 times respectively are more likely to fully immunized their children than those who attended ANC once or not at

all. This is in contrast with the finding by (Ayano, 2015) who found ANC follow up have significant associated with the completion of vaccination by adjusted odds ratio of 1.621..however,this support the finding of Rahman and Obaida nasrin in Bangladesh who found that mothers with five or more visits were more likely to completely immunized their children(Rahman & Obaida-nasrin, 2010).

Furthermore, mothers with moderate knowledge on immunisation and vaccine preventable diseases were 5.27 times more likely to complete the immunisation schedule of their children .This is in agreement with a study conducted by Belachew in Addis Ababa and Oluwadare in Nigeria (Etana & Deressa, 2012)

In the Multivariate analysis where all the significant maternal characteristics were put together in a single model, knowledge and attendant at birth was significantly associated with immunisation status. Maternal age, ethnicity, occupation, antenatal care visits were no longer significant maternal factors for immunisation status. This confirms the findings of (Etana et al., 2012) who said, these factors were not significantly associated with immunisation status. Maternal knowledge and education were still significant his confirms Ibnouf et al studies that showed education to be significant after adjusting for other variables (Ah, 2007).

Bivariate analysis of the child's characteristics revealed that the only significant determinants of immunisation status are attendants at birth. Also, in the multivariate analysis, attendant at birth was significantly associated with immunisation status. .The sex of the child, birth order and retention of immunisation cards were not significantly associated with immunisation status. This is in contrast with a study that found that males are more likely to be immunized due to gender inequality (Tow & Ayno, 2015).

5.4 *Reasons for Immunisation Failure*

This research also tried to find out the reasons for immunisation failure. Ninety eight (98) out of 672 respondents could not fully immunize their children as scheduled for various reasons. The most frequent reason was mothers been too busy (33.5%).This may be due to the fact that most of the mothers are traders and farmers .About 33.5% of the participants attributed their inability to immunize their children to not aware of the need to return for subsequent immunisation .This may confirm the fact that radio and television are not educating people much on health and also health workers are not educating people enough during immunisation sessions. About 56.3% also attributed postponement till another time as their major challenge .This may make them forget or the rescheduled time may be inconvenient to them. The other reason which represents about 20.1% of the respondents was place and time not convenient. Sometimes it difficult to get money for transport and also walking through bad weather or forested areas are nightmares for mothers, therefore they will not come for immunisation. About 5.6% said their failure was due to family problems including the sickness of the mother. Fear of side reactions like swelling, fever, and headaches accounted for about 3.9% of the respondent's reason for failure to send their children for immunisation. Some of the mother's about 6.2% said the place and time for the immunisation was unknown to them while 3.1% said either the child was sick was brought for immunisation .a few ,about 2.9% claimed the vaccination center was too far from their homes or have heard of rumours of effects immunisation which put them off. Only 0.6% of the respondents attributed to their failure to unavailability of vaccines. This supported the findings of Ayano's study (Town & Ayano, 2015).

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Proportion of Children that are Fully Immunized

Fully immunized children between ages 12-23 months in the Assin north municipality was 85.4% which is far above the reported coverage for the years 2013,2014, and 2015.suprisingly,pentavenlent3 coverage which is use as proxy indicator was 91.7% which is also above the who and national target

Maternal knowledge on immunisation and vaccine preventable diseases were low as majority of the mothers or caregivers interviewed had a knowledge score below 34%.only 9% of them had a score above 67%.about 58.0% knew immunisation protect children against childhood immunizable diseases. Knowledge of the names prevented by vaccines was high about 88.0% as participants were able to mention at least one vaccine and the disease that it prevents. However, the names of the various vaccines administered in children, the interval between doses of each vaccine, the age at which the vaccine is given and when I ends were low as more than 40% of the respondents did not know the correct answers to the questions.

The maternal and caregivers characteristics that were significantly associated with immunisation status of the child age, educational level ,attendant at birth, occupation and knowledge and educational status .they were significant in the bivariate analysis.in the multivariate analysis ,only attendant at birth was significantly associated with childhood immunisation.

Reasons for immunisation failure

Reasons accounting for routine immunisation failure were;

- Mother too busy
- Unaware of the need to come for subsequent doses of vaccine
- Time and venue of immunisation not to convenient
- Postponement of vaccination until another time
- Wrong ideas of contraindications

6.2 Recommendations

6.2.1 Immunisation coverage

There is some data discrepancies in the reports generated from the field and what is entered into the dhims2.this in a way have accounted for low coverage. Therefore,

- The community health workers should reconcile all their data from the field before they submit to the next level
- The district director should constitute a data validation teams at the various levels so that the under reporting of data will be minimized

6.2.2 Knowledge on vaccine preventable diseases and immunisation

- Health education on immunisation should be intensified across all the health facilities in the municipalities. Community health nurses should always update their knowledge on immunisation and vaccine preventable diseases so that they can impart quality education to the mothers and caregivers.

6.2.3 Factors contributing to immunisation failure

- Education on immunisation and vaccine preventable diseases should be extended to the local FMs and radio stations as these are powerful media for health education.
- Community health nurses and other community health workers should make use of MNCHP funds by intensifying home visits and outreach services

- Further research should be conducted to assess health care providers view on factors contributing to immunisation coverage and reasons for immunisation failure in the municipality.

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APPENDICES

Appendix 1: Informed Consent Form

Project Title: Factors Contributing To Immunization Coverage in Assin North Municipality

Principal Investigator: *Samuel Kwabena Ofosu*

Address: Department Of Epidemiology and Disease Control, School Of Public Health, College Of Health Sciences, University Of Ghana, Legon

Background

I am A Master of Public Health student from the School Of Public Health, University Of Ghana. I am conducting a study on The Factors Contributing to Immunization Coverage in the Assin North Municipality.

The aim of the study is to investigate the factors that contribute to immunization coverage in the municipality.

Risk and benefits

The results of the study would help The Municipal Health Directorate and other stakeholders on formulating policies to improve on immunization activities. Also, it will help the nation to avoid most vaccine preventable diseases in Ghana. There no risks involved in this study.

Anonymity and confidentiality

I would like to assure you that whatever information you will provide will be handled with strict confidentiality and will be used purely for research process. Your responses will not be shared with anybody who is not part of the study team. Data analysis will be done at the aggregate level to ensure anonymity.

Costs/or payments to subject for participation in research

There will be no costs for participating in the research. Also, you will not be paid to participate in the research project.

Any questions concerning the research project should be directed to Dr. Priscilla Nortey, School Of Public Health, Samuel Kwabena Ofosu (0243437174) And Ms. Abena Addai-Donkor, Administrator, Ghana Health Service Review Committee (0244712919)

Consent

I,.....declare that the purpose, procedures as well as risks and benefits of the study have been thoroughly explained to me in (English and Twi) language and I have understood.

I hereby agree to answer the questionnaire

Signature/thumbprint of participant.....

Date...../...../.....

Address .....

Appendix 2 Sample Questionnaire

SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA, LEGON.

I am A Master of Public Health student from the School Of Public Health, University Of Ghana. I am conducting a study on The Factors Contributing to Immunization Coverage in the Assin North Municipality.

The aim of the study is to investigate the factors that contribute to immunization coverage in the municipality. The results of the study would help The Municipal Health Directorate and other stakeholders on formulating policies to improve on immunization activities. Also, it will help the nation to avoid most vaccine preventable diseases in Ghana. There are no risks involved in this study.

I would like to assure you that whatever information you will provide will be handled with strict confidentiality and will be used purely for research process. Your responses will not be shared with anybody who is not part of the study team. Data analysis will be done at the aggregate level to ensure anonymity

Mother's characteristics and knowledge on immunization

(1)		Community number
(2)		Date
(3)		Area

			PARTICIPANTS								
	Mothers/Caregivers number		1	2	3	4	5	6	7	8	Total
(4)	Age	15-24									
		25-34									
		35 and above									
(5)	Ethnicity	Fanti									
		Asante									
		Assin									
		Ewe									
		Hausa									
		Other									
(6)	Educational level	None									
		Primary									
		Secondary									
		Tertiary									
(7)	Occupation	*Unemployed*									
		Farming									

		Trading										
		Public servant										
		Others										
(8)	Prenatal visit(ANC)	None										
		Once										
		Twice										
		Thrice										
		Four or more										
(9)	Why are children vaccinated	Don't know										
		Protect them from disease										
		Make them strong										
		Prevent fever										
		Asked when going to school										
		Others										
(10)	How many disease are prevented by vaccination	Don't know										
		One (1)										
		Two (2)										
		Three (3)										
		Four (4)										
		Five (5) and above										
(11)	What are the diseases prevented by immunization	Don't know										
		H influenza type B										
		Measles										
		Tetanus										
		Yellow Fever										
		PCV13										
		BCG										
		Hepatitis B										
		Polio										
(12)	Name the vaccines given to children under one year	Don't know										
		Penta3 "Five –in-One"										
		BCG										
		Others										
(13)	Which vaccine is given first	Don't know										
		BCG/OPV0										
		Penta3										

		Measles										
		OPV										
(14)	When is the first vaccine given	Don't know										
		First day										
		First week										
		After one week										
		After one month										
(15)	When is the Penta (5-in 1) vaccine given											
		First day										
		First week										
		After one week										
		After one month										
(16)	What is the interval between penta3 (5-in-1) vaccines	Don't know										
		One week										
		One month										
		More than one month										
(17)	What is the last vaccine given	Don't know										
		Measles										
		Yellow fever										
		Penta (5-in 1)										
		Others										
(18)	At what age was the last vaccine given	Don't know										
		8 months										
		9 months										
		1 year										
		Others										
(19)	Where did you get your knowledge on immunization	Health center										
		Internet										
		Family members										
		Friends										
		Booking& Reading Mat										

		Radio and television										
		Others										

CHARACTERISTICS OF CHILD

			5) Name of Children							Total
1) Com No										
2) Date										
3) Area										
4) Child number			1	2	3	4	5	6	7	8
5) Date of birth/age										
6) Sex										
7) Birth order		First child								
		2nd-3rd Child								
		4th child & above								
8) Attendance at birth		None								
		Nurse/midwife								
		TBA								
		Doctor								
9) Immunization card		Yes/No								
10) BCG		Date/+/0								
		Scar: Yes/No								
		Source								
11	Penta 1 (5-in-1)	Date/+/0								
		Source								
	Penta 1 (5-in-1)	Date/+/0								
		Source								
	Penta 1 (5-in-1)	Date/+/0								
		Source								
12	OPV1 (Polio)	Date/+/0								
		Source								
	OPV2 (Polio)	Date/+/0								
		Source								
	OPV3 (Polio)	Date/+/0								
		Source								
13) Measles		Date/+/0								
		Source								
14) Yellow fever		Date/+/0								
		Source								
15) Immunization status		Not Imm.								
		Partially								
		Fully								
16) Fully immunized before 1 year of age (Supervisor)		Yes/No								

17) Tally of households visited..... 18) Name of interviewer.....

19) Name of supervisor.....

Signature : (Interviewer)..... (Supervisor)	
Key Date/+/0 Date= copy date of immunization from card += mother reports immunization was given 0= immunization not given	Source (example) OUT= Outreach HOS=Hospital HC= Health Center SIA= Supplementary immunization

REASONS FOR IMMUNIZATION

(1)	Community number											
(2)	Date											
(3)	Area											
		PARTICIPANT										
	Child/mother number		1	2	3	4	5	6	7	8		
(5)	Sex (*M or F*)											
(6)	Immunization status	Not immunized										
		Partially immunized										
		Fully immunized										
(7)	Lack of information	Unaware on need for immunization										
		Unaware of the need to return for 2nd or 3rd dose										
		Place and/or time of immunization unknown										
		Fear of side reactions										
		Wrong ideas about contraindications										
		Other										
	Lack of motivation	Postponed until another time										
		No faith in immunization										
		Rumours about immunization										
		Other										
	Obstacle	Place of immunization										
		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									
(8)	Tally of households visited										
(9)	Name of interviewer										
Signature											

Appendix 3: Unadjusted And Adjusted Odds Ratio of Mothers' Characteristics on Child's Immunization Status

	Unadjusted Odds Ratio			Adjusted Odds Ratio		
Variable	OR	95%CI	P-value	OR	95% CI	p-value
Age						
15-24	*ref					
25-34	1.34	0.83,2.19	0.225	1.45	0.80,2.65	0.29
35 and above	1.35	0.76,2.40	0.304	1.37	0.62,3.06	0.44
Ethnicity						
Akan	Ref			Ref		
Ga	7.33	0.99,54.05	0.51	9.37	1.20,73.07	0.03
Ewe	0.66	0.35,1.26	0.207	0.66	0.33,1.34	0.21
Hausa	2.50	0.32,19.30	0.379	1.94	0.24,15.44	0.531
Other	1.49	0.44,5.05	0.523	1.11	0.38,5.39	0.59
Educational level						
None	Ref			ref		
Primary	1.15	0.60,2.20	0.67	1.41	0.68,2.91	0.36
Secondary	1.47	0.64,3.37	0.36	1.88	0.73,4.88	0.19
Tertiary	0.75	0.24,2.37	2.37	1.17	0.24,5.58	0.85
Occupation						
Unemployed	ref			ref		
Farming	1.83	0.93,3.55	0.076	1.71	0.77,3.79	0.18
Trading	2.21	1.21,4.04	0.010	1.83	0.89,3.75	0.10
Public servant	1.42	0.55,3.71	0.46	1.51	0.42,5.34	0.53
Others	2.01	0.94,4.31	0.71	1.71	0.73,4.00	0.22
Antenatal visit						
Once	ref			ref		
Twice	2.44	0.36,16.55	0.360	2.38	0.30,18.61	0.184
Thrice	3.11	0.57,16.83	0.188	3.79	0.60,23.77	0.155
Four and above	2.63	0.79,8.71	0.144	2.70	0.73,9.93	0.14
Source of knowledge						
Health center	Ref			Ref		
Family members	0.81	0.36,1.80	0.603	1.20	0.50,2.90	0.69
Booking and reading	0.22	0.10,0.49	0.000	0.22	0.88,0.55	0.001
Radio and television	0.81	0.30,2.18	0.681	0.63	0.22,1.80	0.38
Others	0.70	0.28,1.76	0.45	0.88	0.31,2.46	0.80
Birth order						
1st	Ref			Ref		
2nd and 3rd	0.55	0.33,0.92	0.024	0.50	0.28,0.91	0.022
4th and above	0.87	0.47,1.59	0.64	0.76	0.34,1.73	0.525
Birth						

attendant						
None	Ref			Ref		
Nurse/midwife	9.57	1.55,58.18	0.015	12.04	1.79,81.17	0.011
TBA	7.22	1.16,44.97	0.034	8.25	1.19,56.96	0.32
Doctor	13.5	1.92,95.09	0.009	17.08	2.20,132.50	0.007
Mothers ' knowledge on immunization						
Low	Ref			Ref		
Medium/high	5.27	3.09-8.96	0.000	2.73	1.15-5.18	0.002

*ref: reference group

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

My Ref. GHS/RDD/ERC/Admin/App/17/522
Your Ref. No.

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Email: ghserc@gmail.com

Samuel Kwabena Ofosu
School of Public Health
University of the Ghana
Legon

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 34/12/2016**
Project Title	"Factors Contributing to Immunization Coverage in Assin North Municipality"
Approval Date	14th March, 2017
Expiry Date	13th March, 2018
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra