SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

FACTORS AFFECTING UNDER – FIVE MORTALITY IN THE MFANTSIMAN MUNICIPALITY OF THE CENTRAL REGION GHANA.

BY

WILLIAM EKOW SPIO DONKOR

(10551459)

THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

JULY, 2016

DECLARATION

I, William Ekow Spio Donkor do declare that, this work is the result of my own original research, except for the review of articles by other researchers, which has been duly acknowledged, and that this dissertation proposal, either in whole or in part has not been presented elsewhere for the award of another degree.

Student's name: William Ekow Spio Donkor

Student's signature: ……

Date: ……

Supervisor's name: Dr. Reuben .K. Esena

Supervisor's signature: ……

Date: ……

DEDICATION

I dedicate this work to my late mother Madam Agnes Aba Osapa Yawson.

ACKNOWLEDGEMENT

I thank God for his grace that has brought me this far in my academics.

I wish to express my sincere gratitude to my academic supervisor, Dr. Reuben K. Esena of School of Public Health for his guidance, contribution and mentorship.

My sincere thanks go to Stephen and the field staff for their help, support and encouragement during the whole project period.

I thank my parents and siblings for their support during this period.

May God richly bless you all, I would not have come this far without you.

ABSTRACT

Introduction: Under – five mortality is a major problem in the world with millions of children not surviving to celebrate their fifth birthday. It is the fourth millennium development goal of which all countries were tasked to reduce by two thirds by the end of 2015. A further reduction to 25 or fewer deaths by 2030 as stipulated in the sustainable development goals. Ghana has made some strides towards achieving its target of reducing under – five mortality by two thirds but it is unlikely the target will be attained. There is the need to identify factors that influence under –five mortality to enable the right targeting of where, when and how public health resources should be channeled to address child health issues, improve health and avoid untimely deaths.

Objective: The study sought to identify factors that affect under – five mortality in the municipality and describe the mortality trends within the area.

Methods: A retrospective review of medical records of children aged 0 – 59 months who died in the Saltpond Municipal Hospital between 1st January, 2011 and 31st December, 2015. Both maternal and key informant interviews were conducted to identify the causes of under – five mortality and to explore the trends and all factors that will explain the observable trends. A data abstraction form designed for this study was used to retrieve data from 156 medical records on age, sex, duration of stay, diagnosis, cause of death and type of death. A structured questionnaire was used to gather information on demographic characteristics of 65 mothers, and 5 key informant interviews conducted to gather information on institutional predictors of under – five mortality. Data was entered into Microsoft Excel 2013 and STATA version 13 was used to perform the univariate and bivariate analysis.

Results: Of the 156 records reviewed, 31.4% were neonates, 30.8% were infants and 37.8% were children. There is a steady rise in under five mortality in the hospital from 2011 to 2015 with a death rate of 1.7%. The major causes of death in neonates, infants and children are neonatal infections, acute respiratory infections and malaria respectively. The top five causes of death in children under five years are severe infections, neonatal infections, malaria, anaemia and acute respiratory infections. Neither maternal educational level nor any other factors in the study was found to be significantly associated with the type of death. However, the relationship between the type of death and child's weight at admission and the cause of death were significant ($p < 0.001$).

Conclusion: The major cause of under-five mortality are infectious diseases. Maternal and child health care needs to be re-structured focusing on disease prevention with more emphasis on environmental sanitation, health education and promotion and good nutrition.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

DEFINITION OF TERMS

Under – five mortality: The number of children dying between birth and exactly 5 years of age expressed per 1,000 live births.

Neonatal Mortality: The number of children dying within the first 28 days (from birth to 28 days) of life.

Infant Mortality: The number of children dying between 29 days and 11 months (exactly 1 year).

Child Mortality: The number of children dying between 1 year and exactly 5 years.

Under – five: A child between the ages of 0 – 59 months

LIST OF ABBREVIATIONS

GHS	-	Ghana Health Service
GSS	-	Ghana Statistical Service
WHO	-	World Health Organisation
U5MR	-	Under – five mortality rate
U5M	-	Under – five mortality
NDPC	-	National Development Planning Commission
GOG	-	Government of Ghana
UNICEF	-	United Nations Children's Fund
UNDP	-	United Nations Development Programme
GDHS	-	Ghana Demographic and Health Survey
MDG	-	Millennium Development Goals
SDG	-	Sustainable Development Goals

CHAPTER ONE

INTRODUCTION

1.1 Background

Under – five mortality rate (U5MR) is the probability of a new born baby dying between birth and exactly five years of age and it is normally expressed per 1,000 live births. Under – five mortality is a key indicator of a country's socioeconomic development and a measure of the impact of child survival interventions manifested in totality in child well –being (UN IGME, 2014). The number of deaths among children under – five is estimated at 5.9 million and Sub – Saharan Africa, of which Ghana is part, contributes almost half (3 million in 2015) to these deaths (UN MDG report, 2015).

The levels and trends in child mortality worldwide shows that, most causes of under – five mortality are preventable through proven and readily available interventions (World Bank, 2015). Some of the causes of mortality in under – five children include pneumonia, complications during labour and delivery, diarrhoea, sepsis, and malaria with about 50% of these deaths associated with undernutrition (World Bank, 2015). Global estimates show a decline in mortality rates worldwide, but developing countries continue to record higher rates of under – five mortality as 1 in 12 children die before their fifth birthday in Sub – Saharan Africa as compared to the 1 in 147 under – five deaths in high – income countries (World Bank, 2015).

According to Mosley and Chen (1984), socioeconomic determinants, environmental determinants, nutritional status, personal illness control and growth faltering are some of the risk factors known to have a strong relation to child mortality.

Child mortality is a major public health concern in Ghana as it represents the nation's socioeconomic development and the quality of life of the inhabitants. Ghana has recorded a steady decline in under – five mortality rates in the past 25 years, 155 per 1000 live births to 60 per 1,000 live births from 1988 to 2014, with the past decade in particular presenting a rapid decline from 111 per 1,000 live births to 60 per 1,000 live births from 2003 to 2014 (GDHS, 2014). This can be attributed to the implementation of the Child health policy and the Child health Strategy interventions (UNDP/NDPC, 2015). Ghana was not able to achieve the MDG 4 target by the end of 2015 due to the rate of decline (UNDP/NDPC, 2015).

The Saltpond Municipal Hospital is the largest government hospital in the Mfantsiman district serving as the main referral point for the municipality and some other neighbouring districts. It is the last contact point in the district, therefore most cases and mortalities that are district specific are recorded here before critical cases are referred to the Cape Coast regional hospital.

The periodic assessment of the factors associated with mortality provides a better understanding of the mortality patterns and provides information for decision – making in developing strategies with a preventive focus. Studying mortality trends helps in assessing the impact and effectiveness of interventions and informs the decisions of health partners concerning funding support for achieving the new Sustainable Development Goal on under five mortality.

1.2 Problem Statement

Child mortality is a sensitive indicator of a country's development and a representation of its priorities and values (Nasejje et al., 2015; Mdala & Mash, 2015; UNDP/NDPC, 2015;

GSS/GHS, 2014; Bryce et al., 2005). Globally, health issues concerning children, especially those under the age of five, are of great interest. Trends in childhood mortality are analyzed globally, nationally and institutionally.

The World Health Organization's 2015 report on levels and trends of child mortality, estimates 16,000 childhood deaths everyday worldwide and about 49.6% of these deaths occur in sub – Saharan Africa where 1 child in 12 die before their 5th birthday.

Under – five mortality in Ghana is 60 deaths per 1000 live births in 2015. At these levels, 1 child in 17 does not survive to his or her 5th birthday (GSS/GHS, 2014). Ghana has made some strides towards reducing infant and under five mortality rates but the MDG 4 target of reducing child mortality was not attained (GDHS, 2014).

The under – five mortality rate of the Mfantsiman municipality in the central region where the Mfantsiman municipal hospital is located is 98/1000 live births (GSS, 2013). This rate was above the national average of 71 deaths per 1000 live births in that same year. Most of these deaths are as a result of diseases that are preventable and treatable through proven interventions that are cost effective (GSS/GHS, 2014). The figures indicate the need for regular assessment to ascertain the true nature of the problem at hand and inform proactive interventions and measures for health strengthening. Analysing the factors that affect under – five mortality will help in targeting where, when and how public health resources should be channeled to address these issues, improve health and avoid untimely deaths.

1.3 Conceptual Framework on factors affecting under – five mortality

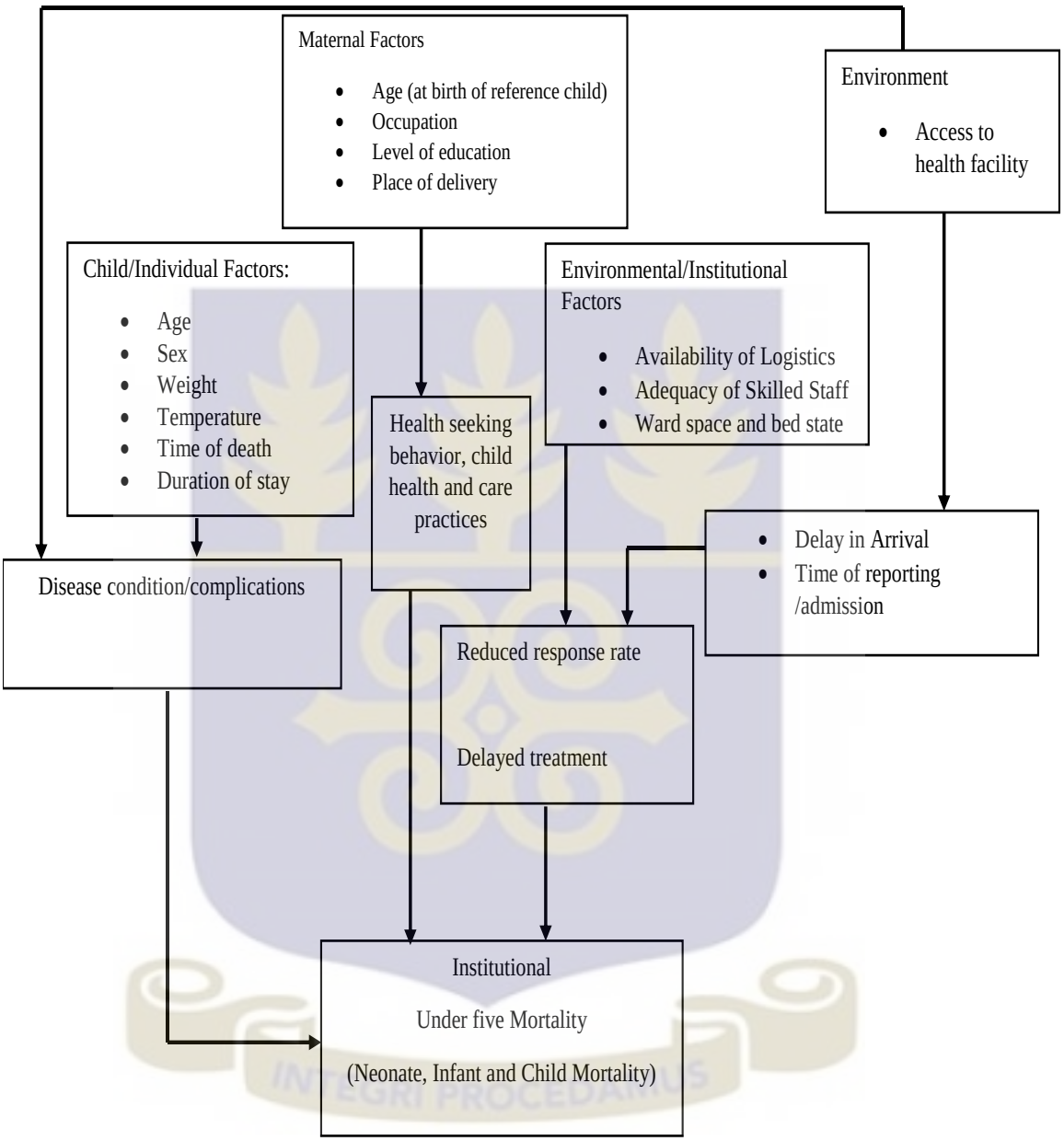

Fig 1: Conceptual framework on factors affecting under-five mortality (Adopted from Mosley and Chen, 2003)

1.3.1 Conceptual framework explained:

According to Miles and Huberman (1994), a conceptual framework is a visual or written product that explains either graphical or in narrative form the main things to be studied; the key factors, concepts, or variables, and the presumed relationship among them.

The concept of the above framework (Fig. 1) was adopted from the Mosley and Chen framework for the determinants of child survival (Mosley & Chen, 2003). It depicts the interrelatedness of all factors and highlights the need for quality of services at all levels.

Figure 1 describes how the individual, maternal, institutional and environmental factors contribute to institutional child mortality (under 5) and how they are interrelated. Child/individual factors such as age, sex, weight, temperature, duration of stay and time of death may determine a child's susceptibility to disease infection, the severity of a disease condition or the effect of a condition on the onset. This is manifested in the disease condition or the development of complications. If health care seeking is not prompt, these disease condition or complications may end in death. Also the ability to access health care by the caregiver will affect the promptness in disease reporting and treatment. A delay in arrival to a facility due to environmental factors such as access to health facility, may complicate the disease condition of the child and lead to death.

The mother plays a very important role in the care of the child due to the mother's responsibility as the primary care giver. The mother can affect the health status of the child due to her age at first birth and that of the time of birth of the reference child. The mother's knowledge on child health practices also affects the child's health status. The mother's occupation also affects child health in the same vain. Inadequate skilled staff and unavailability/inadequate logistics (equipment and supplies) may affect the response time

in service delivery in emergency situations and this affects the health outcome of the child. Child factors may negatively affect the growth of the child leading to growth faltering and its outcome maybe death.

Most of these factors can be managed if the right interventions and its protocols are followed and service delivery improved.

1.4 Justification

Under – five mortality is a major public health issue globally and locally as a lot of children are unable to survive to their fifth birthday plagued with diseases that are hitherto preventable and treatable with proven and cost effective interventions (World Bank, 2015). Despite the progress made in Ghana towards reducing under – five mortality by two – thirds by the end of 2015, the rate of reduction needs to be scaled up to achieve the SDG target of 25 or fewer deaths per 1000 live births by 2030 (UNDP/NDPC, 2015). There seem to be a gap in strategies of combating this problem and the interventions already in place to improve the health of children who are less than 5 years, and therefore the need to explore the determinants of mortality in under – five children through analyzing the trends over time and identifying the factors contributing to child deaths to enable the strengthening of already existing efforts.

This study is important as it seeks to examine and analyse the impact and effectiveness of child health interventions and strategies by studying one of the key indicators of a country's development and health status of its people; under – five mortality in one of the health institutions in the country. As the MDGs ended and SDGs kicked – off, this study hopes to provide findings on the changing trends in under –five mortality and the factors that explain such trends which will be useful in directing efforts to improve child health services in the

institution and inform policy planning and decision in re-strategizing interventions to improve child health services in Ghana.

1.5 Objectives

1.5.1 General Objective

The goal is to identify factors that affect childhood mortality in Saltpond Municipal Hospital at different sub – periods of the first 59 months.

1.5.2 Specific Objectives

The specific objectives are to:

a. Determine the yearly deaths in children under – five at the hospital in the Mfantsiman municipality.
b. Describe the trends in institutional under – five mortality.
c. Explore the factors that explain the observed trends in childhood mortality.
d. Determine the causes of mortality in children under five in Saltpond Municipal Hospital.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Under – five mortality rate is the probability of a child born in a specific year or period dying before reaching the age of five, if subjected to age specific mortality rates of that period (UN IGME, 2014). As a result of the devastating effect of under – five deaths in developing countries, the United Nations member states unanimously agreed to a reduction of two - thirds of under – five mortality between 1990 and 2015 as the fourth Millennium Development Goal. Although there has been progress, yet child mortality remains a major problem in the world with studies being conducted frequently to address this issue (Alkema & You, 2012). The Sustainable Development Goal on under five mortality sets an even ambitious target of reducing under five deaths to 25 or fewer deaths per 1000. In spite of all these efforts, 16,000 children who are yet to celebrate their fifth birthday die every day from preventable causes (World Bank, 2015).

2.2 Trends in under – five mortality

It has been noted that, there has been a 53% drop in under – five mortality rates globally since 1990 (World Bank, 2015). The under – five mortality rate at 1990 was 91 deaths per 1000 live births which has declined to 43 deaths per 1000 live births translating into 5.9 million deaths in 2015. This decline places the number of children under – five who die every day at 16,000. Under – five mortality is noted to be highest in developing regions that is 47 deaths per 1000 livebirths whilst the developed regions recorded 6 deaths per 1000 live births. Sub – Saharan Africa contributes 49.6% of the worlds under – five deaths even though the regions rate of reducing these mortalities has improved from 1.6 to 4.1 in 2000 – 2015 (World Bank, 2015).

There has been some progress in the reduction of under – five mortality in Ghana over the years (GDHS, 2014). This progress, however, is insufficient and needs scaling up if the SDG ambitious target of 20 or less deaths per 1000 live births by 2030 is to be attained (UNDP/GOG, 2015). About 68% of all under – five deaths occurs before the child's first birthday (GSS, 2014). Under – five mortality in Ghana was 155 deaths per 1000 live births in 1988 and has shown considerable decline in the past two and a half decades to 60 deaths per 1000 live births in 2014 (GSS, 2014). Although the MDG 4 target on child mortality, which is a measure of the probability of a child dying between the first and fifth (1-4) birthday has been attained, the neonatal and infant mortality need scaling up of interventions (UNDP/GOG, 2015). The high proportions of neonatal contributions to the overall under – five mortality in Ghana is alarming and this prompted the implementation of a policy on newborns aimed at integrating all existing interventions employing a "child centered approach" in improving the health of all newborns and their mothers in the continuum of care (UNICEF, MOH, GHS, 2014).

2.2.1 Monitoring and assessing mortality trends

Information on causes of deaths in children less than 5 years old which is timely and accurate helps in guiding the efforts made to improve child health by providing data from which details of an individual's characteristics can be constructed and important health policies, interventions and strategies formulated (Ntuli, Malangu, & Alberts, 2013). Most mortality information of a country, a region, a community or a facility are readily available in demographic and health surveys, censuses, hospital medical records among others (World Bank, 2015). Retrospective reviews of these data sources has being the trend as most studies employ these method (Rashid et al., 2010; George et al., 2009; Mdala & Mash, 2015; Siakwa et al., 2015).

A study conducted in Finland employed the method of analyzing mortality data from the official cause of death statistics of Finland with an aim of evaluating childhood mortality trends from 1969 to 2004 in Finland to ascertain whether mortality decline in the country were continuous and also investigate whether there are still preventable deaths (Lantto, Renko, & Uhari, 2008). Mortality declined as suspected over the years with congenital malformations being the leading cause of death within the perinatal stages (Lantto et al., 2008).

A five year study conducted in Ghana at the Okonfo Anokye Teaching hospital to examine the impact of the implementation of the MDG 4 strategies to improve child health and reduce under –five mortality by two thirds, employed a retrospective review of the medical folders of all children under 1 month who died between 2008 and 2012. Most neonates died within 24 hours of birth with prematurity, birth asphyxia, neonatal sepsis, neonatal jaundice and respiratory distress identified as the five topmost causes of these deaths (Siakwa et al., 2015).

Under – five mortality in Nigeria has not shown much decline over the years with inequality in outcomes within the sub groups; neonates, infants and child deaths (G. A. Kayode, Adekanmbi, & Uthman, 2015). A study was conducted with an aim of developing a predictive model and identify risk factors associated with under- five mortality in Nigeria. The 2008 Nigerian demographic and health survey was used as a data source for review. Maternal, child, family and other factors were identified as risk factors for under – five mortality in Nigeria (Kayode et al., 2015).

2.4 Causes and risk factors in institutional under – five mortality

Child mortality is an important indicator of the health and well – being of children and a measure of the health status of a nation(World Bank, 2015). Most deaths in children under – five are due to causes/factors that are readily preventable and treatable using proven quality delivered interventions that are cost effective (World Bank, 2015). The leading three causes of death in children under – five are preterm birth complications, pneumonia and intrapartum – related complications (Liu et al., 2015). In 2011, there were 44393 pneumonia cases in children under – five showing an 11.3% increase in reported cases between 2010 - 2011 with 170 deaths(Ghana Health Service, 2011). According to the (UNDP/NDPC/GOG, 2015) report, one of the leading causes of under – five morbidity and mortality in Ghana is pneumonia, accounting for 20 percent of the deaths in this category.

A study in South Africa examined the causes of institution based under – five deaths in a tertiary institution in the Limpopo province. Death certificates of children younger than 5 years were obtained from the hospital, between January 1, 2008 through December 31, 2010 and retrospectively reviewed (Ntuli et al., 2013). The findings showed leading causes of deaths in neonates were prematurity/low birth weight, birth asphyxia and pneumonia. For that of infants were pneumonia, diarrhea and HIV/AIDS and that of the children were injuries, diarrhea and pneumonia. Majority of the deaths in the under – five children (26.8%) was due to prematurity/low birth weight. Conclusions were that, congenital conditions, malnutrition and unintentional injuries contribute significantly to the deaths of children under – five of which most of these causes are preventable using a mix of multi – faceted interventions such as providing specialized care through the establishment of intensive care units together with highly trained personnel to manage neonatal conditions,

strengthening of health care aspects relating to children, improving safe and secure playgrounds and the support to home caregivers to children (Ntuli et al., 2013).

A hospital based study was conducted in Nigeria based on their high under – five mortality rate (George, Alex-Hart, 2009). The aim of the study was to evaluate the mortality pattern from January 2007 to December 2008 of children admitted into the children's medical wards of the University of Port – Harcourt Teaching Hospital. It was a retrospective study where case files of all patients, aged 1 -16 years, admitted into the pediatric wards excluding neonatal and surgical cases between the 2 year period were reviewed. A total of 2,174 admissions were recorded with 61 deaths observed of which 52 (80.3%) were under 5 years. The commonest causes of deaths in the children under – five group were HIV/AIDS and bronchopneumonia with most of these deaths occurring between April and September, the wet season in the region, which provides breeding conditions for mosquitoes and chilling environment for micro – organisms that cause pneumonia. In conclusion; it was proposed that to significantly reduce child mortality in communities, effective HIV/AIDS control measures need scaling up and intervention programmes such as integrated management of childhood illnesses and primary health care. These measures are known to reduce childhood mortality and should be intensified with periodic reviews of hospital data/records. The latter are beneficial in re-evaluating existing services and interventions and in improving facilities and patient care (I. O. George et al., 2009).

According to (Rashid et al., 2010), preterm with low birth weight is the major cause of mortality in neonates in a tertiary institution in Bangladesh accounting for 67.12% of all neonatal deaths. This was a retrospective study conducted in a pediatric department of Khulna Medical College Hospital in Bangladesh where all records of neonatal admissions

in the year 2008 were reviewed. Causes of neonatal deaths and factors related to the cause of death were analysed. Out of 942 neonatal admissions, 146 (15.5%) resulted in deaths as compared to 114 deaths in 2252 non – neonatal admissions. Findings also listed no antenatal follow up and early marriage and child bearing age as having a negative effect on both neonatal health and maternal health. They stated in their findings among others that, lack of skilled and trained staff in nursing care in hospitals in developing countries led to some preventable deaths. As stated in the article "the neonatal ward had no specialized trained neonatal care nurses, 4 nurses in total are on duty at each shift and they both looked after neonatal and non – neonatal wards and lastly 5 pediatric consultants were there for both wards" (Rashid et al., 2010).

A study on the causes of mortality and associated modifiable health care factors for children under – five years was conducted in Namibia at the Onandjokwe hospital. This study employed a descriptive retrospective review of the medical records of all children below 5 years who died within 12 months in 2013. A total of 185 perinatal and post – natal deaths were recorded with prematurity being the top cause of death for perinatal babies and bacterial pneumonia being the top cause of death in postnatal babies. Late presentation to a health care facility and long distance referral were some modifiable factors identified as contributors to under – five mortality in the hospital. Most of these deaths in children under – five could have being avoided by paying attentions to the modifiable factors identified in the study (Mdala & Mash, 2015).

A study was conducted in Ghana specifically the Kassena – Nankana district in the northern region (Baiden et al., 2006). The objective of the study was to describe the trend and causes of neonatal deaths in a rural district in northern Ghana. The study period was 8 years and

data was collected from the Navrongo Demographic Surveillance System and verbal autopsy on all neonatal deaths from 1995 – 2002 and analysed. A total of 1068 neonatal deaths out of 1118 recorded deaths were analysed with 62.7% of the deaths occurring in the early neonatal period having prematurity (38%) and birth injuries (19%) as leading causes of death (Baiden et al., 2006). Generally, neonatal mortality declined by nearly 50% within the 8 year period due to the various health interventions undertaken in the district and further reduction can be observed if neonatal infections are prevented and treated, having skilled attendance at deliveries and elimination of infanticide (Baiden et al., 2006).

A retrospective analysis of hospital records on perinatal mortality in the Holy Guild Hospital in Nigeria revealed that the high incidence of unbooked patients, multiple pregnancies and low birth weight babies are the main explanations for the rising perinatal mortalities in the environment. The study identified asphyxia, immaturity and macerated stillbirth as the most common causes of perinatal deaths (Kuti et al, 2003).

A case control study was conducted in the Builsa district in the Upper East Region to identify the determinants of under – five mortality in the Builsa District Hospital from January 2003 to June 2005. A total of 60 cases and 120 controls were matched for age, sex and place of residence. It was observed with mothers who had previous history of child death that their children were 8 times more likely to die whiles children who had not had vitamin A supplementation were 10 times more likely to die (Osei-Kwakye, Otupiri, Dabo, Browne, & Adjuik, 2010). Risk factors observed that were protective included exclusive breastfeeding, insecticide treated net usage and the number of children alive a mother had. In conclusion, it is possible to improve child health in areas where poverty is evident and

health staff should be trained and well equipped to prevent further under – five deaths among mothers who have had previous child death (Osei-Kwakye et al., 2010).

2.4.1 Maternal Factors

The relationship between maternal factors and mortality in children is very important in assessing the causes of death in children younger than five (5) years (Akinyemi, Bamgboye, & Ayeni, 2013; Chowdhury, 2013; Darkwah, Boachie-yiadom, & Tawiah, 2014; Abir, Agho, Page, Milton, & Dibley, 2015). Afolabi et al (2012), in a study estimating the causes of death among under – five children from a health facility revealed the need to look into maternal educational status as one of the hidden causes of death in children less than 5 years. The relationship between maternal educational background and under – five mortality appears to have increased over time and investigating on girls' education will be a very good strategy towards addressing under – five mortality in developing countries (Akter et al., 2015). Contrary to this, Osei Kwakye et al (2010), revealed in his findings that, the educational level of mothers did not have any influence on the risk of death of the child. Furthermore, children of mothers who had experienced a previous death of a child were 8 times more likely to die (Osei-Kwakye et al., 2010).

Mothers who married before the age of 15 years are likely to experience under – five mortality as compared to those who married between the ages of 20 – 24 years (Kayode et al., 2015; Ezeh et al., 2014). Maternal factors identified in a study in Nigeria that reduced the likelihood of under – five mortality included health seeking behavior, breastfeeding children for over 18 months, contraceptive use, small family size, normal birth weight and child spacing (Kayode et al., 2015; Osei-Kwakye et al., 2010).

A study conducted in Ghana revealed that infants of grand multiparous mothers and those whose mothers did not breastfeed were more likely to die during neonatal life. The study further revealed that maternal health seeking behavior manifested in the adequate utilization of antenatal, delivery and postnatal health services reduced neonatal mortality (Kayode et al., 2014).

A study in Bangladesh assessing the risk factors of under – five mortality using data from the Bangladesh demographic and health survey showed that the likelihood of neonatal, post neonatal, infant, child and under – five deaths decreased significantly among mothers who use contraception and mothers who had other children aged 3 years and older (Abir T. et al., 2015). Akinyemi et al (2015) reveals that antenatal care, facility delivery, birth intervals less than 24 months and small birth size are significantly associated with neonatal deaths. Thus the mother cannot be overlooked when determining factors which may lead to mortality in children below 5 years of age.

2.5 Institution based child health interventions

Under – five mortality has been on a decline in Ghana since 1990 but this reduction has been faster since the year 2000 and this can be attributed to the several maternal and child health interventions in the country (MOH, 2015). Since the adaptation of the MDGs into the country's health implementation framework there has been policies and strategies to improve child survival thereby reducing child mortality. Ghana developed the Under – Five's Child Health Policy 2007 – 2015 and the Under 5 Child Health Strategy 2007 – 2015 to help in integrating and scaling up interventions using the "child centered approach" organized along the continuum of care for mother and child from pregnancy, birth, immediate newborn period, neonatal period, infants and children (MOH, 2015). The policy

spells out certain technical interventions that goes along the continuum of care from Antenatal care during pregnancy, Delivery care, Postnatal care, Immunisation, Nutrition, Treatment of childhood illnesses and Prevention of malaria(MOH, 2015). Most of these interventions; antenatal care, delivery care, postnatal care, immunization and others occur within Health facilities and the evidence of implementation is by monitoring and evaluating and basically by observation.

The decline of under – five mortality has seen child mortality (1-4 years), one of the indicators for MGD 4 achieved (UNDP/NDPC, 2015). This decrease has not been evident in infant and neonatal mortalities as decline in neonatal mortality has been slower as compared to the whole under – five mortality. To achieve the MDG 4 goal and the ambitious SDG goal of at least 25 deaths per 1000 live births, there is the need to reduce neonatal mortality as it contributes about half of all deaths of under - fives' (GSS, 2014). This makes the development and operationalization of the Ghana National Newborn Strategy in 2014, which has an implementation period between 2014 and 2018, a proactive strategy. This is to integrate and converge all interventions and gear them towards improving newborn health organized along the continuum of care of mother and child (UNICEF, MOH, GHS, 2014).

CHAPTER THREE

METHODOLOGY

3.1 Study Design

This is a retrospective study, where 156 medical records, registers and case files of deceased children under five years were retrospectively reviewed for the period between 2011 and 2015 to ascertain the number and causes of deaths. An interview with 65 mothers, sampled from the 156 mortality data, to explain certain observable trends from the reviewed records was conducted using semi – structured questionnaires. Views of selected key informants were solicited to explore the reasons for the observed trends. Qualitative interviews were used to obtain explanatory factors on the trends in under – five mortality and the predictors that accounts for it during the study period. Providers were all professionals who came into contact with clients or clients' data.

3.2 Study Area

The Mfantsiman municipality (Fig. 2) is along the coastline of the Central Region and has a total population of 144,332 representing 6.6% of the regional figure with 20,062 being children who are less than 5 years (GSS, 2013). Saltpond is the municipal capital and it houses the municipal hospital where the study will be conducted. The hospital is the biggest in the municipality and it is where all related critical conditions in the municipality and other neighbouring districts are first referred to. The Saltpond Municipal Hospital was established in 1920 and has been a forerunner in the provision of heath care services to the municipality. There are five wards in the hospital; maternity, male surgical, female surgical, pediatric and emergency ward. The hospital has approximately 180 beds including cots.

The other departments or units in the hospital include the Central OPD which functions in a capacity as the gateway of the hospital. In here, the patients are directed to the various consultants for consultation and treatment. The hospital also has a laboratory, x-ray, injection and dressing room, chest clinic, stores, records and statistics office, catering and a laundry service. Mortality cases recorded in the facility gives a good representation of the trends in under five mortality in the municipality.

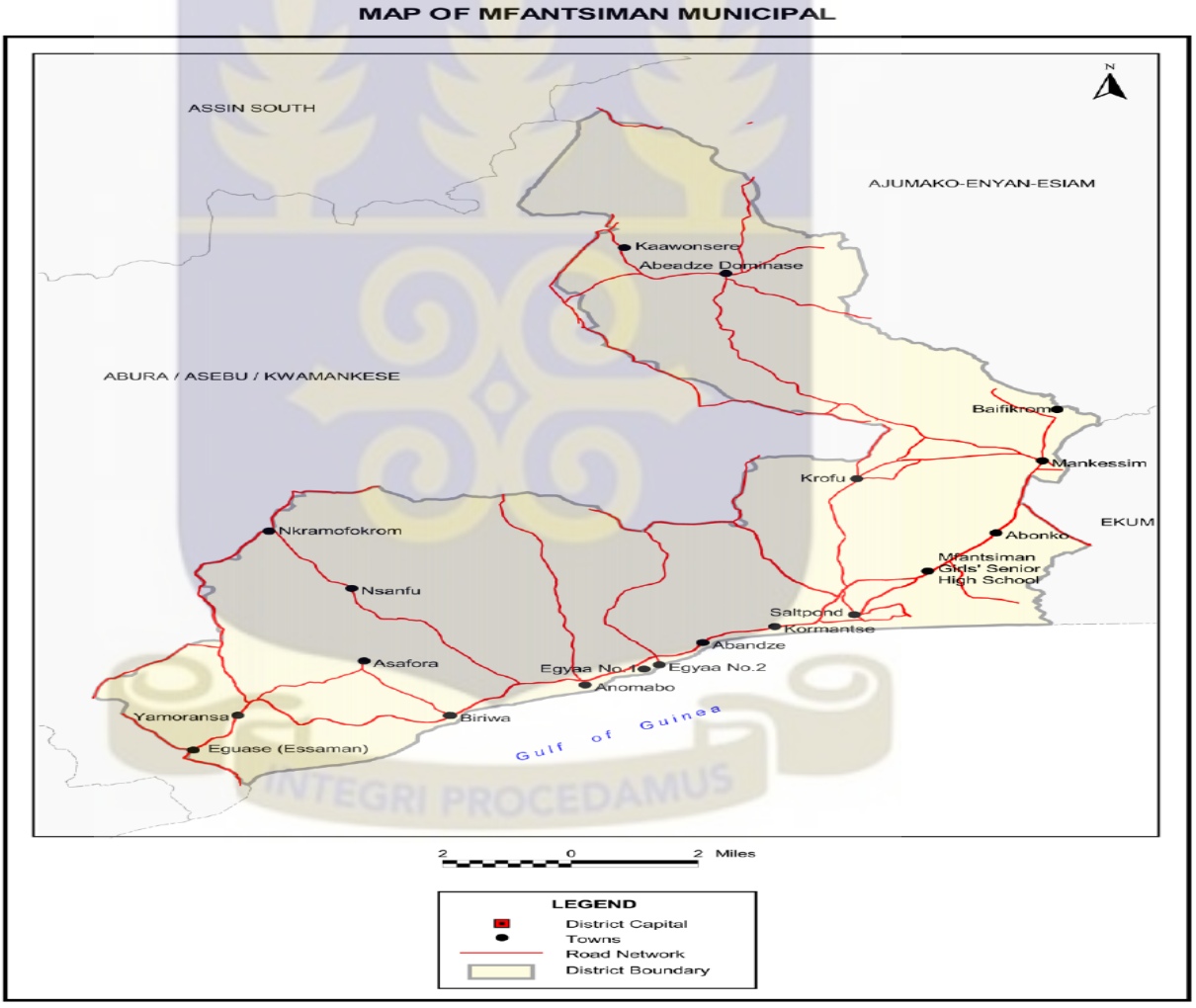

Fig 2: Map of Mfantsiman Municipality

Source: Ghana Statistical Service, GIS

3.3 Variables

The following variables/factors were identified and explored to understand their relationship to the sub periods of the dependent/ outcome variable under – five mortality. The sub periods included neonatal mortality (death occurring between birth to 28 days), infant mortality (death occurring between 29 days – 11 months of life), child mortality (death occurring between 12 – 59 months of life) and under – five mortality (defined as death after birth to 59 months of life).

3.3.1 Dependent Variable

Type of under – five mortality in the hospital (neonatal, infant, child mortality).

3.3.2 Independent Variable

Child factors (Age of child, sex of child, time of death, weight at admission, temperature at admission, duration of admission, place of residence and cause of death).

Maternal Factors (age of mother at birth of reference child, level of education, occupation, marital status, religion, place of delivery and place of residence)

Institutional factors:

i. Provider factors (Staff adequacy; skills and numbers)

ii. Availability and adequacy of logistics (equipment and resources, availability of medical supplies and equipment, adequacy of beds in the ward (bed state).

3.4 Study population

All 156 medical records of children under – five (0 – 5 years) who died in the Saltpond Municipal Hospital starting 1st January, 2011 to 31st December, 2015 were reviewed. Sixty five mothers who have an experience of death of a child under five years old in the hospital between 1st January, 2011 to 31st December, 2015.

3.4.1 Inclusion criteria

- All recorded deaths of children under – five (0 to exactly 5 years) occurring in the hospital.
- All available medical records, case files and folders of children under – five (0 to exactly 5 years) who died in the Saltpond municipal hospital.
- Mothers who have experienced at least one death of a child under – five occurring in the Saltpond municipal hospital.
- A doctor or a nurse who has worked in the pediatric department of the saltpond municipal hospital for at least 2 years.

3.4.2 Exclusion criteria

- Medical records of children above 5 years who died in the Saltpond municipal hospital.
- All deaths confirmed and recorded upon arrival at the facility.
- All stillbirths occurring in the hospital.
- Mothers who have never experienced a death of a child under – five at the hospital

3.5 Sampling method and Sample size

This is a retrospective study therefore all available data on children below 5 years who died (n = 156) in the Saltpond hospital from 2011 – 2015 were reviewed.

3.5.1 Sample size for medical records

A total of 65 under – five death records were randomly sampled from the total available records (n = 156) and these sampled records were used to identify mothers of the children who died in the hospital and a structured questionnaire was administered to collect data on maternal factors and other explanatory factors that was observed from the records. Mothers

who were not available or had relocated, were contacted through a phone call and the questionnaire administered on the phone.

Sample size was determined using the formula:

$$n = \frac{z^2 pqN}{e^2(N-1) + z^2 pq} \qquad \text{(Kothari, 2004)}$$

Where n: is the sample size for a finite population

N= size of population

p= % mortality rate for children under – five

q= % survival rate for children under – five

e= estimator (acceptable error): 5%

$Z_{a/2}$= value standard variant: 1.96 (as per area under normal curve for a given confidence level of 95%)

Number of available under – five mortality records = 156

If 6.9% die, then 93.1% survive

$$Sample\ size(n) = \frac{(1.96)^2 \times 0.069 \times 0.931 \times 156}{(0.05)^2 \times 155 + (1.96)^2 \times 0.069 \times 0.931}$$

= 61

To account for non – response the sample size was increased to 65 using an upward adjustment of 10%.

3.5.2 Sampling method

All medical records of children under – five who died in the hospital were grouped into 3 categories; neonate (0 – 28 days), infants (29days – 11months) and child (12 – 59 months). The total number of records belonging to each category, that is, 49 neonatal records, 48 infant records and 59 child records were stratified to determine a 31% proportion of records each to be assigned to both neonates and infants respectively and a 38% proportion of records assigned to children within the sample size. The records included in each category was determined using the simple random sampling method till each apportioned total records (20 records each for both neonates and infants and 25 records for children) was gotten making up the total sample size of 65 records giving a total number of 65 mothers who were interviewed. The location and contact details available on the records were used to locate mothers either at their homes or on phone. If any participant who could not be located, contacted or contacted but did not wish to participate, the next on the list was contacted or located until the apportioned number is attained.

Key informants were purposively sampled to include key health care providers and management members such as the Head of Department/Hospital, the head nurse in – charge, doctors and others. A total of five interviews were conducted with 2 resident doctors, 1 midwife and 2 nurses to provide an in depth understanding and explanation on the observed trends, causes and risk factors related to institutional under – five mortality.

Themes that focus on quality issues on adequacy of staff, availability of logistics among others, on the contributors of under – five mortality, were inculcated into the interview guides and these discussions were facilitated by the principal investigator and a field assistant.

3.6 Data collection Techniques/ Methods & Tools

Data on age of child, time of admission, weight, temperature, provisional diagnosis, final diagnosis, time of death, cause of death, duration of stay, place of residence and type of death were abstracted from the medical records using a data abstraction form designed for this study. The hospital medical superintendent clarified the cause of death if data abstractors had difficulty in abstracting these information. For the purposes of this study, neonatal death is death occurring between birth to 28 days, infant death is death occurring between 28 days – 11 months of life, child death is death occurring between 12 – 59 months of life and under – five death is defined as death after birth to 59 months of life and the records were categorized as such. The hospital register was the set off point in collating the total number of under – five admissions and deaths that had happened in the hospital within the study period. Based on the number, the individual records of death/death notification forms were retrieved from the records department. The individual medical case folders were also consulted in order to increase reliability.

The mothers of the children selected from the records were interviewed on maternal and household characteristics and child health status. This was conducted using a semi-structured questionnaire with privacy and confidentiality addressed.

3.7 Quality Control

1. A research assistant with the requisite background was recruited and trained on data abstraction using the data management tools developed for the study.
2. The medical superintendent of the hospital clarified and rectified any challenges faced during the data abstraction process based on recorded information.
3. Data collected was checked daily to ensure that all information has been properly collected and the questionnaires properly filled.

4. Data cleaning was conducted and the procedure adhered to, to ensure accuracy of data.
5. Double data entry was done to ensure that the right information is entered from questionnaires and the resulting data sets marched for differences.

3.8 Data analysis

Data abstracted and collected from the records and questionnaires respectively were entered into Microsoft office excel 2013 and imported into STATA version 13 statistical analysis software. All analysis were done using the STATA software version 13. Data entry checks, cleaning and integrity checks were conducted prior to data analysis. Appropriate tables and figures were used as aids for descriptive statistics and trend analysis was done to explore differences in trends over time. A general description of the population was done using percentages (marital status, occupation, religion, place of delivery, residence), mean and standard deviations (age) from basic demographic data. Medical and clinical data was described using percentages.

The outcome variable was categorized into three groups and its association with the independent variables was determined using the Fisher's exact test and the corresponding p-values obtained at an alpha level of 0.05.

Qualitative data collected from the key informant interviews were analysed using Nvivo version 7.0 management software. Listings and categorization of responses and key points on a data entry sheet was done for easy interpretation. Dominant and emergent themes were noted from data analysis and grouped for easy analysis of factors that explain such themes.

3.9 Ethical considerations

Ethical clearance was sought from the Ghana Health Service Ethics Review Committee to ensure that the research is ethically sound and the rights and dignity of study participants duly safeguarded. At the regional and municipal level, permission was sought from the Cape Coast regional health directorate and Mfantsiman health directorate, the management of the Saltpond hospital and that of the pediatric departments.

An official letter from the school of public health was obtained to seek permission from the various heads to enable the study to be carried out in the facility.

A structured consent form was used to seek the consent of participants. The study was explained to the mothers/care givers and key informants and both verbal and written consents were obtained. Privacy was ensured during the interview and respondents were assured of confidentiality. Subject codes were used to hide respondents' identity. Personnel involved in data collection were cautioned during training to ensure confidentiality throughout the study. Data collected was stored in locked cabinets and only accessed by the principal investigator when the need arises. The informed consent administered to the respondents also explained confidentiality, voluntary participation, withdrawal and risk/benefits to them. (Appendix 1).

The content of the form was given or read out to participants to inform them about the nature of the study, why it is being carried out and how the results could inform decision making on improvement of service delivery and health care strengthening for all patronizes of the facility.

3.10 Training

A one day training session for the research assistant was organised. The aim of the training was to equip the assistant with the pre-requisite skills needed to perform their task. The training was organised by the researcher. The content of the training included a discussion of the purpose of the study, ethical issues and questionnaire administration. The researcher was also trained on the abstraction of data from medical records.

3.11 Pre-test

The data collection tools and techniques was pre-tested in the catholic hospital at Mankessim and on mothers with an experience of under – five death at Baafikrom, a suburb of Mankessim in the Mfantsiman municipality in the central region which has similar characteristics like the study areas. Issues with the data collection tools and techniques were corrected and restructured.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics

A total of 156 deaths was reported in the hospital during the five year study period. Out of the deaths, 49.36% were males and 50.64% were females with a male to female ratio of 1.94:2. Table 4.1 shows that, the highest number of deaths among under five year old children which stood at 50 deaths (32.1%) was recorded in 2011, with the lowest number of deaths of 20 (12.8%) recorded in the following year (2012). There was a steady increase in childhood deaths from 2013 to 2015 accounting for 21 (13.5%), 28 (18%) and 37 (23.7%) deaths. The weight of most of the children (87.2%) were within 2.5kg to 10kg with 1.9% below 2.5kg. More than half of the children (53.2%) reported with temperatures within 37.5-38.9 ºC with 7.7% with temperatures above 39 ºC. Majority of under five deaths (68.6%) occurred within the first twenty four hours after admission. Among children under five deaths recorded, 62.8% were deaths of children with caregivers who are rural settlers and 37.2% been urban settlers.

Major causes of deaths in the municipality among children under five include severe infections notably diarrhea, septicaemia and meningitis, neonatal infection, malaria, anaemia and acute respiratory infection notably pneumonia.

Table 4.1: Socio-demographic characteristics of children under five years in Mfantsiman municipality

Variable name	Type of death (n = 156)				
	Neonatal (<29days)	Infant (1-11months)	Child (12-59 days)	Total	
				N	%
Sex					
Male	28	23	26	77	(49.4)
Female	21	25	33	79	(50.6)
Time of death					
2011	16	16	18	50	(32.1)
2012	5	7	8	20	(12.8)
2013	10	1	10	21	(13.5)
2014	10	7	11	28	(18)
2015	8	17	12	37	(23.7)
Weight					
<2.5	2	1	0	3	(1.9)
2.5-5	46	16	5	67	(42.9)
5.1-10	1	30	38	69	(44.2)
10.1-15	0	1	15	16	(10.3)
>15	0	0	1	1	(0.6)
Temperature					
<35.8	3	1	4	8	(5.1)
35.9-37.4	12	23	18	53	(33.0)
37.5-38.9	28	22	33	83	(53.2)
>39.0	6	2	4	12	(7.7)
Duration of stay					
<24 hours	34	34	39	107	(68.6)
>24 hours	15	14	20	49	(31.4)
Place of residence					
Rural	33	26	39	98	(62.8)
Urban	16	22	20	58	(37.2)
Cause of death					
Malaria	2	10	21	33	(21.2)
Anaemia	6	12	13	31	(19.9)
ARI	3	11	10	24	(15.4)
Neonatal infection	32	1	0	33	(21.1)
Severe infections	6	14	15	35	(22.4)

ARI: *acute respiratory infection*

As shown in Table 4.2, neonatal and infant deaths were 31.41% and 30.77% with child deaths being the highest (37.82). There was no significant difference (p-value=0.387) in the type of death based on sex of children under five years.

Table 4.2: Deaths by age and sex among under-five year old children in Mfantsiman municipality 2011-2015

Type of death	Male		Female		Total	
(Age category)	N	%	N	%	N	%
Neonatal (0-28 days)	28	57.14	21	42.86	49	31.41
Infant (1-11 months)	23	47.92	25	52.08	48	30.77
Children (12-59 months)	26	44.07	33	55.93	59	37.82
Total	77	100	79	100	156	100

In Table 4.3, majority of the mothers had no formal education (41.54%) whiles 36.9% had primary education. None of the mothers had any form of tertiary education. Among all mothers, 78.5% have had at least primary education. Most of the mothers are either fishmongers (43.1%) or traders (40%) with only 3.1% being public or private workers. Most mothers were married (69.2%) with 24.6% single and 6.2% cohabiting. All mothers were Christians with 61.5% of them living in rural communities in the municipality. Close to a half of the mothers (49.2%) delivered at home with deliveries at a hospital accounting for 50.2%.

Table 4.3 : Socio-Demographic Characteristics of mothers of children under five years in Mfantsiman municipality

Variable name	Frequency n=(65)	Percentage (%)	Type of death (n = 65)			
			Neonate N (%)	Infant N (%)	Child N (%)	Under five N (%)
Age						
<15	3	4.62	1 (33.3)	-	2 (66.7)	3 (100)
15-19	10	15.38	4 (40)	3 (30)	3 (30)	10 (100)
20-24	14	21.54	7 (50)	1 (7.1)	6 (42.9)	14 (100)
25-29	16	24.62	4 (25)	6 (37.5)	6 (37.5)	16 (100)
30-34	13	20.00	2 (15.4)	5 (38.5)	6 (46.1)	13 (100)
35-39	5	7.69	1 (20)	2 (40)	2 (40)	5 (100)
≥40	4	6.15	1 (25)	3 (75)	-	4 (100)
Educational status						
No education	27	41.54	10 (37)	8 (29.6)	9 (33.3)	27 (100)
Primary	24	36.92	6 (25)	8 (33.3)	10 (41.7)	24 (100)
JHS/Middle	10	15.58	3 (30)	4 (40)	3 (30)	10 (100)
SHS	4	6.15	1 (25)	-	3 (75)	4 (100)
Tertiary	-	-	-	-	-	-
Occupational status						
Public/Private worker	2	3.08	-	-	2 (100)	2 (100)
Fishmonger	28	43.08	9 (32.1)	8 (28.6)	11 (39.3)	28 (100)
Trader	26	40.00	7 (26.9)	9 (34.6)	10 (38.5)	26 (100)
Farmer	4	6.15	1 (25)	1 (25)	2 (50)	4 (100)
Hairdresser	2	3.08	1 (50)	1 (50)	-	2 (100)
Unemployed	3	4.62	2 (66.7)	1 (33.3)	-	3 (100)
Marital status						
Single	16	24.62	8 (50)	3 (18.6)	5 (31.3)	16 (100)
Married	45	69.23	11 (24.4)	15 (33.3)	19 (42.2)	45 (100)
Cohabiting	4	6.15	1 (25)	2 (50)	1 (25)	4 (100)
Religious status						
Christian	65	100.00	20 (30.8)	20 (30.8)	25 (38.5)	65 (100)
Muslim	-	-	-	-	-	-
Traditionalist	-	-	-	-	-	-
Place of delivery						
Hospital	33	50.77	11 (33.3)	9 (27.3)	13 (39.4)	33 (100)
Home (with TBA)	30	46.15	7 (23.3)	11 (36.7)	12 (40)	30 (100)
Home (no TBA)	2	3.08	2 (100)	-	-	2 (100)
Place of residence						
Rural	40	61.54	7 (28)	8 (32)	10 (40)	25 (100)
Urban	25	38.46	13 (32.5)	12 (30)	15 (37.5)	40 (100)

JHS: Junior High School; SHS: Senior Secondary School

4.2 Annual deaths and trends in under five mortality (2011-2015)

Under five mortality was highest in 2011 (Fig. 4.1) with a death toll of 50 children (32.1%) yet to celebrate their fifth birthday. There was a sharp drop in this figure in 2012 as the number of deaths reduced to the lowest, 20 deaths (12.8%), recorded within the 5 year study period. There was a steady increase in the number of deaths from 2013 to 2015 as 21 (13.5%), 28 (17.9%) and 37 (23.7%) under five deaths were recorded respectively.

Figure 4.1: Trends in under five mortality over the 5 year period (2011-2015)

A similar trend was observed among children (12-59 months) with the highest number of deaths in 2011 and the lowest in 2012, then a steady rise from 2013 to 2015 as shown in Figure 4.2. Neonates (0-28 days) showed similar trends in 2011 to 2014 with 16,5,10, 10 deaths recorded respectively but differed in 2015 as there was a reduction in neonatal deaths (8). Only one infant death was recorded in 2013 with the highest of 17 deaths in 2015.

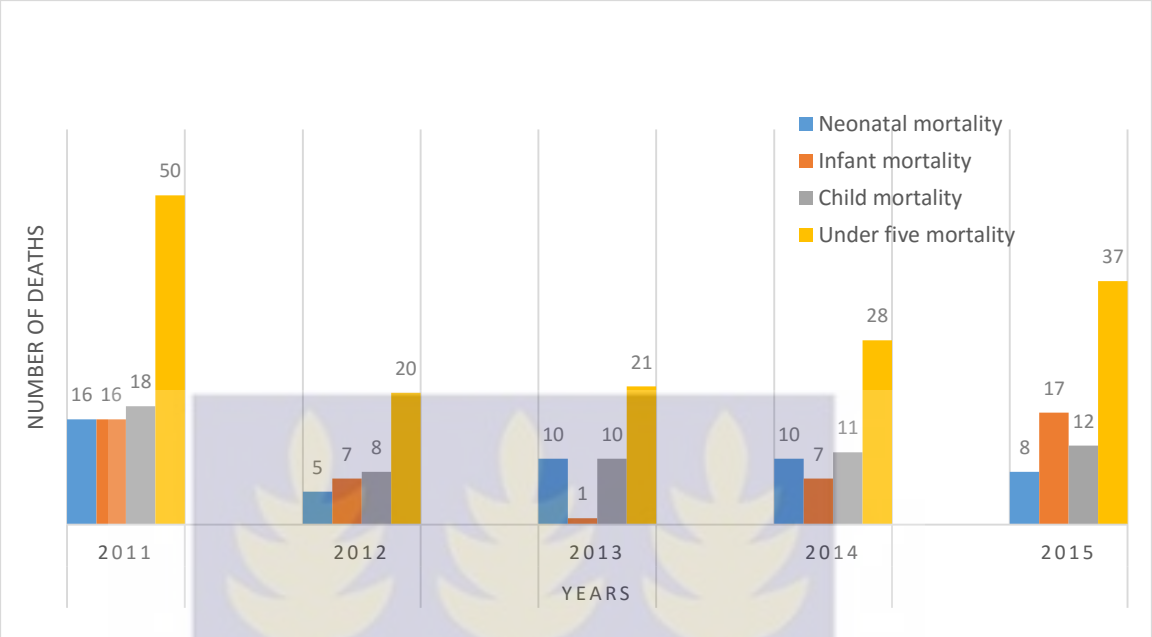

Figure 4.2: Mortality of children under 5 years by age and time of death (year)

4.2.1 Age distribution of under five deaths over the 5 year period

Figure 4.3 shows that, most deaths within the five year period occurred among children (12-59 months) accounting for 37.8% of all deaths. The proportion of death in neonates (49 deaths) and infants (48 deaths) were similar accounting for 31.4% and 30.8% respectively giving a 62.2% death in children who don't get to celebrate their first birthday.

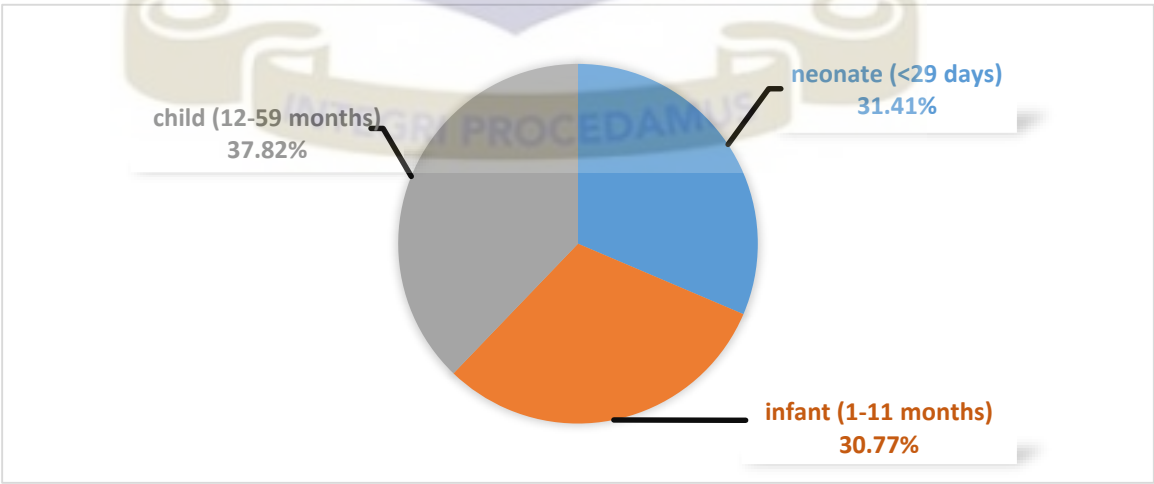

Figure 4.3: Age distribution of deaths among children under five years

4.2.2 Monthly under five deaths in Mfantsiman from 2011 to 2015

Under five deaths was highest (9 deaths) for the month of January in 2015 and lowest for the month of October in 2011, August and November in 2012, September and December in 2013, January in 2014 and July and October in 2015 respectively all of which recorded no deaths (Table 4.4).

Table 4.4 Monthly trends in under five deaths for the 5 year period

MONTH	2011	2012	2013	2014	2015	TOTAL	
						N	%
January	6	1	1	0	9	17	10.9
February	7	2	3	1	4	17	10.9
March	4	4	4	1	6	19	12.2
April	6	4	1	2	3	16	10.3
May	7	1	2	2	1	13	8.3
June	4	1	3	3	1	12	7.7
July	4	4	2	3	0	13	8.3
August	3	0	1	2	4	10	6.4
September	4	1	0	2	2	9	5.8
October	0	1	3	3	0	7	4.5
November	4	0	1	7	2	14	9
December	1	1	0	2	5	9	5.8
Total	**50**	**20**	**21**	**28**	**37**	**156**	**100**

There is generally an inconsistent trend of death within the months of each of the years but higher numbers of death were recorded during the two wet seasons of the area, March-June and September-November. Within the 5 year period, the highest number of deaths among children under five years; 19 deaths (12.2%), was recorded in March and the lowest, 7 deaths (4.5%) was recorded in the month of October. Under five deaths are high but stable in January and February and it peaks in March, the beginning of the first rainy season as shown in Figure 4.4. There is a general and gradual decrease in deaths from April to October (19 to 7 deaths) representing a 7.7% decrease in deaths. A late peak of 14 deaths (9%) is recorded in November, the end of the second rainy season, and a subsequent

decrease (9 deaths, 5.8%) in December. The monthly deaths in the five year period show a decreasing trend for 7 months in the deaths of under five year olds between March and November, a period within two distinct months under five death peaks.

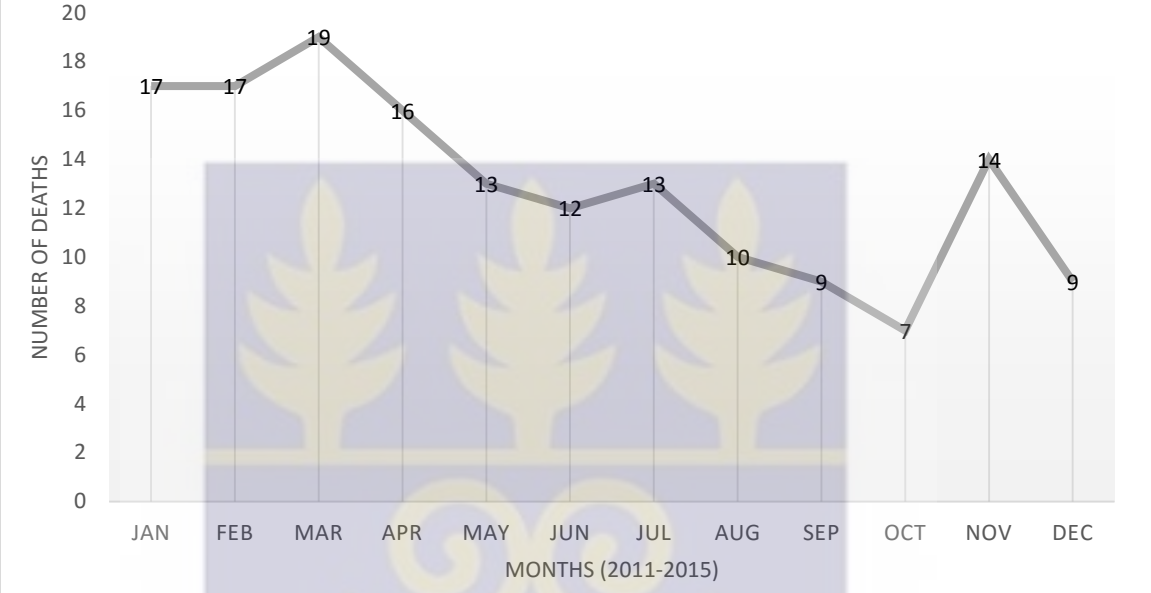

Figure 4.4: Monthly under five deaths for the 5 year period

4.2.3 Under five death rates for the period of 2011 to 2015 in Mfantsiman

A total of 9411 children under five admissions were recorded between 2011 and 2015 out of which 156 deaths occurred leading to a 1.7% death rate for the five years. The highest number of admissions in the paediatric ward was 3218 in 2014 and the lowest, 1501 in 2012. The year 2011 recorded a 2.6% of under five deaths with 2012 and 2014 recording a low of 1.2% respectively as shown in Figure 4.5. A 1.9% deaths from admissions was recorded in 2015 showing an increase in deaths. There is no specific trend in the annual death rates of children under five years due to the fluctuating nature of deaths.

Figure 4.5 Death rate of children under five from admissions (2011-2015)

4.2.4: Distribution of the cause of death from 2011 to 2015 in Mfantsiman

In Figure 4.6, the leading cause of death in neonates (<29 days) was neonatal infections, notably neonatal sepsis, causing 66% of all neonatal deaths followed by anaemia (12%). Acute respiratory infections, notably pneumonia, caused 25% of all deaths in infants followed closely by anaemia and malaria accounting for 23% and 21% of infant deaths respectively. Malaria was the major cause of death in children (12-59 months) accounting for 36% of deaths in this age category closely followed by anaemia (24%).

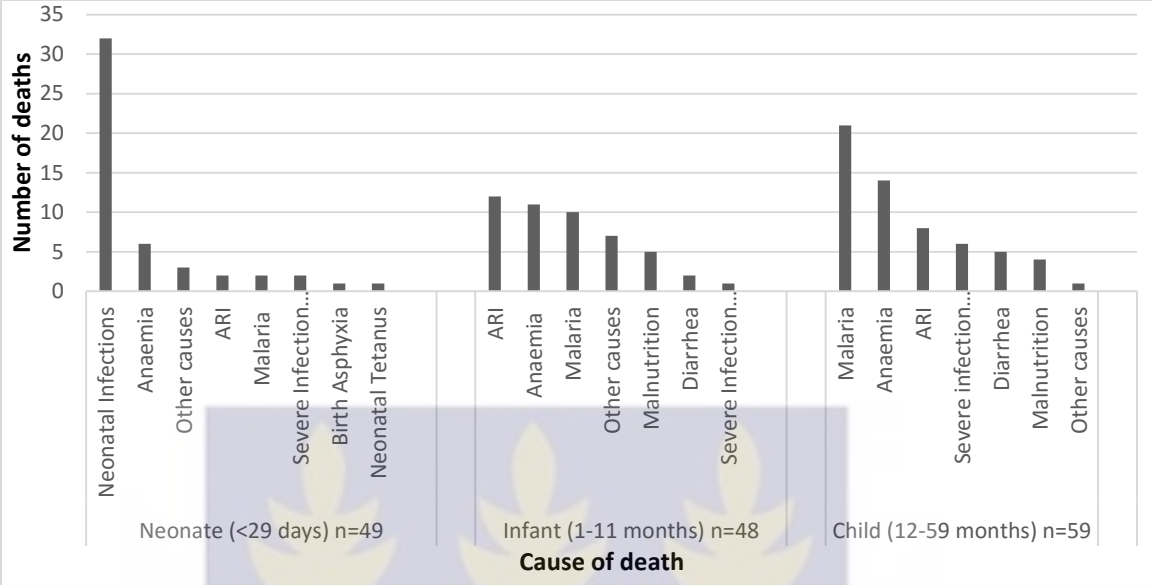

Figure 4.6: Causes of death among neonates, infants and children (2011-2015)

The top five causes of death (Fig. 4.7) in children under five years are severe infections (notably diarhoea, meningities and septicaemia), neonatal infection (notably sepsis), malaria, anaemia and acute respiratory infection (notably pneumonia). There was a statistically significant relationship between the type of death and the cause of death (p-value<0.001).

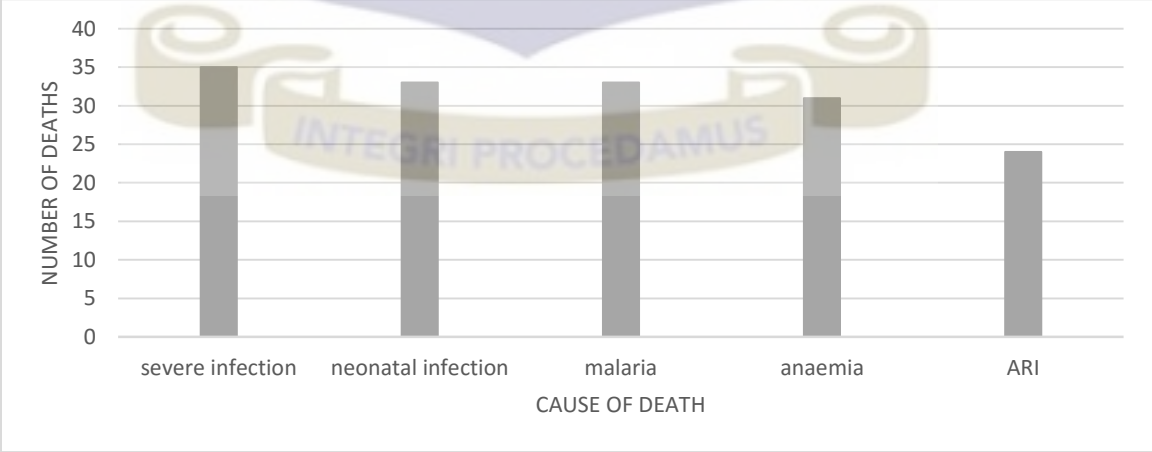

Figure 4.7: Top five causes of death among children under five years (2011-2015)

4.3: Child characteristics that influence under five death

4.3.1: Sex-Age

Deaths in females (51%) was slightly higher (Table 4.5) than their male counterparts (49%). Infantile deaths was the same in both sexes (10vs.10) but slightly different in neonates (11vs.9) and in children (11vs.14). There was no statistically significant relationship (p-value=0.780) between the type of death and the sex of children under the age of five years.

4.3.2: Time of Death

The year 2011 recorded 21 under five deaths representing 32.3% of all deaths of children under the age of five years within the five year period with 2013 recording 7 deaths, which is the lowest (10.8%) within the five year period (Table 4.5). There was no statistically significant relationship (p-value=0.377) between the type of death and the time of death.

4.3.3: Weight on Admission

A total of 65 children under five years admitted had weight ranges between 2.5 kg – 14.3 kg with a mean weight of 5.8 ±2.75 kilograms which is low. Most of the children were within the 5.1-10 kg group representing 47.7%, followed by the 2.5-5 kg weight group (44.6%) with only 9.2% of children been between 10.1-15 kg weight groups (Table 4.5). None of the children were below 2.5 kg and above 15 kg respectively. There was a statistically significant relationship (p-value <0.001) between the type of death and child's weight at admission.

Table 4.5: Relationship between child socio - demographics and type of death (Fisher's exact)

Variable name	Type of death (n = 65)				
	Neonatal N (%)	Infant N (%)	Child N (%)	Under five N (%)	p-value
Sex					
Male	11 (34.4)	10 (31.2)	11 (34.4)	32 (100)	0.780
Female	9 (27.3)	10 (30.3)	14 (42.4)	33 (100)	
Time of death					
2011	5 (23.8)	7 (33.3)	9 (42.9)	21 (100)	0.377
2012	1 (12.5)	4 (50)	3 (37.5)	8 (100)	
2013	3 (42.9)	1 (14.3)	3 (42.9)	7 (100)	
2014	6 (46.1)	1 (7.8)	6 (46.1)	13 (100)	
2015	5 (31.3)	7 (43.8)	4 (25)	16 (100)	
Weight on Admission					
<2.5	-	-	-	-	0.001
2.5-5	19 (65.5)	8 (27.6)	2 (6.9)	29 (100)	
5.1-10	1 (3.2)	12 (38.7)	18 (58)	31 (100)	
10.1-15	-	-	5 (100)	6 (100)	
>15	-	-	-	-	
Temperature					
<35.8	-	1 (33.3)	2 (66.7)	3 (100)	0.149
35.0-37.4	4 (22.2)	7 (38.9)	7 (38.9	18 (100)	
37.5-38.9	11 (28.9)	12 (31.6)	15 (39.5)	38 (100)	
>39.0	5 (83.3)	-	1 (16.7)	6 (100)	
Duration of stay					
<24 hours	17 (34)	13 (26)	20 (40)	50 (100)	0.325
>24 hours	3 (20)	7 (46.7)	5 (33.3)	15 (100)	
Place of residence					
Urban	7 (28)	8 (32)	10 (40)	25 (100)	0.950
Rural	13 (32.5)	12 (30)	15 (37.5)	40 (100)	
Cause of death					
Malaria	1 (9.1)	2 (18.2)	8 (72.7)	11 (100)	0.001
Anaemia	2 (14.3)	4 (28.6)	8 (57)	14 (100)	
ARI	1 (10)	5 (50)	4 (40)	10 (100)	
Neonatal infection	14 (93.3)	1 (6.7)	-	15 (100)	
Severe infections	2 (13.3)	8 (53.3)	5 (33.3)	15 (100)	

ARI: acute respiratory infection

4.3.4: Temperature

Majority of the children (Table 4.5) reported with temperature ranges between 35.9-37.4 ºC and 37.5-38.9 ºC respectively with 58.5% of them reporting with high temperatures (37.5-38.9 ºC). Recorded temperatures ranged between 35ºC to 39.8ºC respectively with a mean temperature of 37.6 ±1.04 ºC. There was no statistically significant relationship between the type of death and temperature (p-value=0.149).

4.3.5: Duration of Stay

Most of the deaths of children under five years admitted died within 24 hours after admission (76.9%) with 23.1% of the deaths occurring beyond 24 hours after admission (Table 4.5). Children (40%) represented the highest casualty of deaths within 24 hours of admission followed by neonates (34%) and infants (26%). There was no statistically significant relationship between the type of death and the duration of stay (p-value=0.325).

4.3.6: Place of Residence

Out of a total of 65 deaths, 61.5% were deaths from children who reside in rural communities with their caregivers and 38.5% are within urban centers (Table 4.5). Children having caregivers residing outside the municipality, notably Ekumfi and Abura Asebu Kwamankese districts, accounted for 21.5% of under five deaths with 78.5% residing within the Mfantsiman municipality. There was no statistically significant relationship between the type of death and place of residence (p-valus=0.950).

4.3.6: Cause of Death

Neonatal infections (23.1%), notably neonatal sepsis, and severe infections (notably diarrhea and septicaemia) are the two leading causes of death in children under the age of five years in the municipality (Table 4.5) closely followed by anaemia (21.5%), malaria (16.9%) and acute respiratory infections (15.4%). 72.7% of deaths caused by malaria and

57.1% death caused by anaemia were among children (12-59 months). 50% and 53.3% of deaths caused by acute respiratory infections and severe infections respectively are among infants (1-11 months) with 93.3% of neonatal deaths are as a result of neonatal infections. There was a statistically significant relationship between the type of death and cause of death (p-value <0.001).

4.4: Maternal characteristics that influence under five death

Majority of the respondents interviewed are the mothers of the deceased children (96.9%) with 3.1% being grandmothers and 1.5% being a close relative (sister).

4.4.1: Age of Mother

Majority of the deaths (61.5%) in children under five years have mothers between 15 and 29 years old (Table 4.6) with 13.8% belonging to mothers above 34 years old, all of which are known risk factors for mortality in the early stages of life (WHO, 2015). There was no statistically significant relationship between the type of death and age of mother (p-value=0.368).

4.4.2: Educational Level

Forty two percent of the deaths of children under five belonged to mothers with no education and approximately 79% of the under five deaths had mothers having at least some primary level education (Table 4.6). None of the deceased children had a mother who had a tertiary level education. There was no statistically significant relationship between the type of death and educational level of the mother (p-value=0.756).

Table 4.6: Relationship between maternal socio – demographics and type of death (Fisher's exact)

Variable name	Type of death (n =65)				p-value
	Neonate N (%)	Infant N (%)	Child N (%)	Under five N (%)	
Age					
<15	1 (33.3)	-	2 (66.7)	3 (100)	0.368
15-19	4 (40)	3 (30)	3 (30)	10 (100)	
20-24	7 (50)	1 (7.1)	6 (42.9)	14 (100)	
25-29	4 (25)	6 (37.5)	6 (37.5)	16 (100)	
30-34	2 (15.4)	5 (38.5)	6 (46.1)	13 (100)	
35-39	1 (20)	2 (40)	2 (40)	5 (100)	
≥40	1 (25)	3 (75)	-	4 (100)	
Educational status					
No education	10 (37)	8 (29.6)	9 (33.3)	27 (100)	0.756
Primary	6 (25)	8 (33.3)	10 (41.7)	24 (100)	
JHS/Middle	3 (30)	4 (40)	3 (30)	10 (100)	
SHS	1 (25)	-	3 (75)	4 (100)	
Tertiary	-	-	-	-	
Occupational status					
Public/Private worker	-	-	2 (100)	2 (100)	0.820
Fishmonger	9 (32.1)	8 (28.6)	11 (39.3)	28 (100)	
Trader	7 (26.9)	9 (34.6)	10 (38.5)	26 (100)	
Farmer	1 (25)	1 (25)	2 (50)	4 (100)	
Hairdresser	1 (50)	1 (50)	-	2 (100)	
Unemployed	2 (66.7)	1 (33.3)	-	3 (100)	
Marital status					
Single	8 (50)	3 (18.6)	5 (31.3)	16 (100)	0.341
Married	11 (24.4)	15 (33.3)	19 (42.2)	45 (100)	
Cohabiting	1 (25)	2 (50)	1 (25)	4 (100)	
Place of delivery					
Hospital	11 (33.3)	9 (27.3)	13 (39.4)	33 (100)	0.360
Home (with TBA)	7 (23.3)	11 (36.7)	12 (40)	30 (100)	
Home (no TBA)	2 (100)	-	-	2 (100)	
Place of residence					
Rural	7 (28)	8 (32)	10 (40)	25 (100)	0.950
Urban	13 (32.5)	12 (30)	15 (37.5)	40 (100)	

TBA: traditional birth attendant;

JHS: junior high school;

SHS: senior high school

4.4.3: Occupation

Mothers who were fishmongers contributed 43.1% of under five deaths, closely followed by mothers who were traders with mothers who were private/public workers (3.1%) or hairdressers (3.1%) contributing the least deaths in children under the age of five years (Table 4.6). There was no statistically significant relationship between the type of death and occupation of mother (p-value=0.820).

4.4.4: Marital Status

All three sub-periods constituting under five mortality recorded high numbers of deaths in children who had mothers who were married; 11, 15 and 19 deaths in neonates, infants and children respectively making up 69.2% of death (Table 4.6). There was no statistically significant relationship between the type of death and marital status of mother (p-value=0.341).

4.4.5: Place of Delivery

About half (50.8%) of the deaths recorded were children who were delivered in a hospital with nearly a half (49.2%) delivered at home (Table 4.6). This is directly link to health seeking behavior. The proportion of deaths of children whose birth at home was assisted by a traditional birth attendant was 46.2%. There was no statistically significant relationship between the type of death and place of delivery (p-value=0.360).

4.4.6: Place of Residence

Most of the deaths (69.2%) in children under five years old had mothers who lived in rural areas within and outside the municipality (Table 4.6). Most of the under five deaths whose mothers lived in urban centers (38.1%) where concentrated in the two big towns in the municipality, notably Saltpond and Mankessim. There was no statistically significant relationship between the type of death and place of residence (p-value=0.950).

4.5: Key informant interviews

The aim of the interview was to explore various areas and factors that may be behind the trend in institutional mortality of children under five years old. It focused on five key areas that may be connected to an observed trend in mortality at the hospital. The interviews sought to seek the perception of key health care providers on the trends in institutional under five mortality, institutional factors that may be contributory to the observed trends and the way forward in the post MDG and now SDG era.

4.5.1: Trends in institutional under five mortality

Respondents generally agreed on their perception of the trend in institutional mortality. There is an increasing trend in institutional mortality in the past couple of years and this increasing trend has been steady.

K1: "*Generally, I will say, the trend in the deaths of children less than five years old has been rising steadily after a drop four years ago"*

K2: *"We've been observing increases in deaths and this is yet to drop. It was low some few years ago. It's been rising since that time"*

K5: *"The deaths is not very high but the number of deaths has been rising for three years now".*

The perceptions on the trend of institutional mortality and the reasons that account for these observed trends were explained into detail recounting from what they've observed or experienced in terms of the steady rise in under five mortality.

K5: *"There are mechanisms in place to reduce these deaths but people don't seek health at the appropriate time. Conditions are brought in very late and at critical stages. There*

are seasonal spikes in deaths and the rains may be a contributory factor but most death cases are not malaria. Neonatal sepsis and anaemia cases are likely factors".

K3: *"We get a lot of cases as a result of severe infections such as neonatal sepsis due to a lot of home deliveries and septicaemia. We have little time here to save a child due to late arrivals and inadequate medical equipment".*

K1: *"Generally, there is preference for bigger facilities but delay in reporting has been a major reason for deaths of these children".*

K2: *"Saltpond hospital is a referral center for the municipality and the cases that get here are usually delayed in the periphery facilities and the come in bad states. Neonatal cases is on the rise".*

4.5.2: Institutional factors influencing under five death

Majority of the respondents perceived institutional factors as playing important roles in the observed trend in the mortality rates of children under the age of five.

K1: *"There are no monitoring machines to observe and treat these patients. The workload increases even at no spike times due to inadequate staff".*

K4: *"There is no pediatric doctor and it makes diagnosis of critical conditions difficult, usually the beds and cots are enough, 19 cots and 6 beds but during seasonal spikes patients are transferred to the female ward".*

K5: *"We only have one oxygen apparatus and one concentrator and we experience a lot of deaths when two children need the equipment".*

K3: *"The staff not adequate and this is evident during spikes. Often, rotational nurses ease the workload. No single pediatrician".*

4.5.3: Meeting Goals in the post MDG era and the new SDG

Most of the respondents agreed in their perception that achieving the new SDG goal on under five mortality will be challenging with some stating MDGs as a good learning opportunity that can serve in making some strides towards achieving the sustainable development goals.

K5: *"It will be a challenging as the MDGs have been. A lot of education should go to the masses to improve their health seeking behavior".*

K3: *"No, I don't think so and my worry is about the delay in reporting on the part of the caregivers and late referrals on the part of the periphery facilities. Cases are kept till they get to critical states before they are rushed to the facility or referred. A lot of education should be done".*

K2: *"There have been some interventions that contributed to reducing under five mortality and these must be developed. Triagen implementation and community health nurses following up on savere acute malnutrition must be encouraged.*

CHAPTER FIVE

DISCUSSION

5.1 Annual childhood deaths in Mfantsiman

Establishing the cause of death at the community level is hard in Africa. Hospital data are useful indicators of the health status of communities irrespective of its inadequacies and these data are useful particularly for childhood populations (Bukar, 2010). The study conducted at the Saltpond Municipal Hospital revealed a death rate of 1.65% from a total of 9411 admissions of which 156 deaths of children under the age of five years were recorded between January, 2011 and December, 2015. This is below the reported regional figure of 6.9% (GDHS, 2014) and from other studies in Nigeria and Bangladesh (Abir et al., 2015; Ezeh et al., 2015; Bi, 2012).

The study showed a steady rise in the death of children under the age of five years in the hospital after an earlier drop at the beginning of the study period. This steady rise is in contrast to the national and regional trend which indicates a decline in under five deaths over the past fifteen years (GDHS, 2014). However information gathered from key informants indicate an increase in the delay in reporting, home deliveries and insufficient emergency equipment that could be contributors to this trend. The highest incidence of under five deaths was 50 which occurred in 2011 and the lowest incidence of 20 deaths occurred in 2012. There was an increase from 2013 to 2015. Similarly, a study conducted in Ghana at the Okomfo Anokye Teaching hospital reported an increasing trend of 172 to 468 deaths in the later stages of the study period (Siakwa et al., 2015). The highest incidence of death for the five year period in months was in the month of March where 19 deaths were recorded. The month of March marks the beginning of the first raining season

of the region and the onset of several disease conditions which trigger spikes at health care centers as indicated by information from key informants. A decline in deaths is observed till November, the end of the second rainy season, where 14 deaths are recorded. Neonates recorded 31.4% of deaths and this is lower than what was observed in (Ayoola, Orimadegun, Akinsola, & Osinusi, 2005) and (Sun, Li, Tong, & Gao, 2013). The study revealed the highest number of mortality in children 37.8% (12-59 months). Females accounted for half of under five deaths and this is slightly higher than what was observed in Nigeria where 45.8% of the deaths were females (Mouneke, et al, 2012). Children under the age of five years who died within 24 hours accounted for 68.6% of all deaths and this is higher than the 48.8% reported by (Ayoola et al., 2005). This can be due to the delay in reporting of cases and the critical state and severity of conditions presented at the health facility as gathered from key informants. Also complications are likely to develop as higher proportions of mothers deliver at home (49.2%). However this was not significant in this study.

The common cause of neonatal death was neonatal infections (66%) notably neonatal sepsis and this was in contrast with earlier reports by Ntuli et al., (2013), where prematurity and low birth weight are linked to most deaths in the neonatal age group. However, acute respiratory infections notably pneumonia, were the major cause of death in infants and this was similar to findings in (Ntuli et al., 2013; Ayoola et al., 2005; Afolabi et al., 2012) in which pneumonia was responsible for most deaths in infants (1-11 months). Malaria (36%) was the leading cause of death in children and is closely followed by anaemia. This is similar to reports in (Osei-Kwakye et al., 2010) in which malaria was the leading cause of death in children. There was no statistically significant relationship between the type of

death and sex. However, there was a statistically significant relationship between the type of death and cause of death of children under five years old.

5.2: Factors explaining observed trends in childhood mortality

5.2.1: Individual (child) characteristics influencing under five death

The proportion of deaths in children under five years based on sex was not different as 50.8% were females and 49.2% were males. However, there were higher number of deaths in female children (56%) as against their male counterparts (44%). This is in contrast to various studies that relate high male admissions and mortality to their vulnerability at the early stages of their life (Saleem, Iqbal, Bokhari, Ali, & Khan, 2015). There were no statistically significant relationship between the type of death and child characteristics such as sex and age of child, time of death, temperature, duration of admission and place of residence. And this was consistent with reports from (Osei-Kwakye et al., 2010), (Afolabi et al., 2012), (Ayoola et al., 2005). The weight of children under five years and the type of death was significant (p-value <0.001). This study further stresses that low body weight which is normally as a result of poor nutrition is central in child mortality (World Bank, 2015). There was a statistically significant relationship between the type of death and the cause of death ($p < 0.001$). Neonatal infections notably sepsis and severe infections notably septicaemia are the cause of 46% of all deaths among children under five. A similar study in Nigeria also reported both septicaemia and sepsis as the cause of death for 56% of all under five deaths.

5.2.2: Maternal characteristics influencing under five death

Known socio-demographic and socio-economic factors such as mother's educational level and occupation did not have any significant influence on the type of death of children under five years in the municipality.

The age of the mother at the birth of the deceased child was not identified as significantly related to the type of death in children under five. Other maternal factors such as marital status, place of delivery and place of residence did not significantly influence the type of death. The small number of mothers interviewed and the errors in mothers' ability to recall previous information could account for this observation.

5.2.3: Institutional Factors influencing under five death

According to respondents, the number of beds and ward space is adequate but seasonal spikes, creates an overflow. The female ward serves as a support ward in accommodating the excess admissions. A key informant reported inadequate skilled staff in the pediatric ward to help in diagnosis and treatment of critical condition. This inadequacy in staff could contribute to the delay in treatment. The unavailability of logistics and medical equipment for the provision of quality health care as only one oxygen apparatus and one nebulizer are available in the entire department making the provision of a responsive health care inadequate. This study reports 68.6% of under five deaths occurring within 24 hours of admission which indicates the critical nature of conditions presented at the facility of which equipment are inadequate and insufficient to save lives.

5.3: Cause of Death

The top five causes of death in children under five are neonatal infections (notably sepsis) (22.4%), severe infections (notably septicaemia and diarrhea) (21.1%), malaria (21.2%), anaemia (19.9%) and acute respiratory infection (15.4%). This is consistent with a study in the Builsa district which reported malaria, ARI, anaemia, diarrhea and others (Osei-Kwakye et al., 2010). Infectious diseases are the main causes of deaths in children below the age of five years. This is similar to a study in Nigeria where 80% of deaths in children under five were as a result of infectious diseases (Bi, 2012). Among neonates, the top three (3) causes of death are neonatal infection, anaemia and other causes. The three leading causes of death in infants are acute respiratory infection, anaemia and malaria. Among children, malaria, anaemia and acute respiratory infection are the 3 leading causes of death. The relationship between the cause of death and the type of death of children under five years was significant. Anaemia accounts for 12%, 23% and 24% of all deaths in neonates, infants and children respectively.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

In conclusion, the first year of life is a critical stage in early life of which the focus of interventions must be concentrated to control and curtail further preventable mortalities.

6.1: Summary and Conclusion

Based on the study findings, the following conclusions were drawn:

- The annual under five deaths in the Saltpond Municipal Hospital seem to be rising for the past four years and the death rate is lower than reported rates.
- Generally, there is probably an increasing trend in under five mortality with seasonal spikes.
- Neonates and post-neonates (0-11 months) contributed the highest proportion of deaths in under five year olds.
- Infectious diseases are the main causes of under five deaths in the Mfantsiman municipality.
- The leading causes of death in the municipality are neonatal infection, severe infection, malaria, anaemia and acute respiratory infections.
- There are gaps in the adequacy of equipment and logistics that could contribute to under five mortality.
- Delay in reporting, late referrals from periphery facilities and home delivery related complications are indirect factors for under five mortality.
- Low weight at admission is related to under five mortality in this study.
- Maternal educational level, occupation, marital status, place of delivery, residence; and with child sex, temperature and duration of admission were all not risk factors for under five mortality in this study.

6.2: Recommendations

- ❖ Maternal and Child health care needs to be re-structured with more emphasis on environmental sanitation, health education and promotion and good nutrition.
- ❖ Adequate education on prompt reporting of disease conditions must be encouraged for early diagnosis and treatment.
- ❖ The municipal health directorate needs to implement measures to encourage hospital deliveries and provide trained traditional birth attendant services to mothers delivering at home.
- ❖ Management of the health facility must make available and accessible the necessary equipment and logistics capable of meeting the needs of the yearly admissions at the facility.
- ❖ Exclusive breastfeeding, continued breastfeeding and good complimentary feeding practices must be encouraged to improve the nutrition of children under the age of five years.

6.3: Limitations

- The incompleteness and quality of data used in arriving at the findings were limitations to this study as these information were not recorded purposely for this research. This was however reduced by the use of interviews.
- Not all deaths in the municipality are reported and captured at the facility level therefore deaths reported in this study maybe a portion of the true levels and trends in under five mortality in the municipality.
- The use of interviews may have introduced recall bias as study respondents may not correctly and specifically recollect past experiences pertaining to the study.

REFERENCES

Abir, T., Agho, K. E., Page, A. N., Milton, A. H., & Dibley, M. J. (2015a). Risk factors for under-5 mortality : evidence from Bangladesh Demographic and Health Survey , 2004 – 2011. *BMJ*, *5*(006722), 1–10. http://doi.org/10.1136/bmjopen-2014-006722

Abir, T., Agho, K. E., Page, A. N., Milton, A. H., & Dibley, M. J. (2015b). Risk factors for under-5 mortality : evidence from Bangladesh Demographic and Health Survey , 2004 – 2011. *BMJ Open*, *5*(006722), 1–10. http://doi.org/10.1136/bmjopen-2014-006722

Abir, T., Agho, K. E., Page, A. N., Milton, A. H., & Dibley, M. J. (2015c). Risk factors for under-5 mortality: evidence from Bangladesh Demographic and Health Survey, 2004–2011. *BMJ Open*, *5*(8), e006722. http://doi.org/10.1136/bmjopen-2014-006722

Afolabi, B. M., Clement, C. O., Ekundayo, A., & Dolapo, D. (2012). A hospital-based estimate of major causes of death among under-five children from a health facility in Lagos , Southwest Nigeria : possible indicators of health inequality. *International Journal for Equity in Health*, *11*(1), 1. http://doi.org/10.1186/1475-9276-11-39

Akinyemi, J. O., Bamgboye, E. A., & Ayeni, O. (2013). New trends in under-five mortality determinants and their effects on child survival in Nigeria : A review of childhood mortality data from 1990-2008. *African Population Studies*, *27*(1), 25–42.

Akinyemi, J. O., Bamgboye, E. A., & Ayeni, O. (2015). Trends in neonatal mortality in Nigeria and effects of bio-demographic and maternal characteristics. *BMC Pediatrics*, *15*(36), 1–12. http://doi.org/10.1186/s12887-015-0349-0

Akter, T., Hoque, D. M. E., Chowdhury, E. K., Rahman, M., Russell, M., & Arifeen, S. E. (2015). Is there any association between parental education and child mortality ? A study in a rural area of Bangladesh. *Public Health*, *08*(004), 1–8. http://doi.org/10.1016/j.puhe.2015.08.004

Alkema, L., & You, D. (2012). Child Mortality Estimation : A Comparison of UN IGME and IHME Estimates of Levels and Trends in Under-Five Mortality Rates and Deaths. *PLOS Medicine*, *9*(8). http://doi.org/10.1371/journal.pmed.1001288

Ayoola, O. O., Orimadegun, a. E., Akinsola, a. K., & Osinusi, K. (2005). A five-year review of childhood mortality at the University College Hospital, Ibadan. *West African Journal of Medicine*.

Baiden, F., Hodgson, a., Adjuik, M., Adongo, P., Ayaga, B., & Binka, F. (2006). Trend and causes of neonatal mortality in the Kassena-Nankana district of northern Ghana, 1995-2002. *Tropical Medicine & International Health*, *11*(4), 532–539. http://doi.org/10.1111/j.1365-3156.2006.01582.x

Bi, A. (2012). Morbidity and mortality of childhood illnesses at the emergency paediatric unit of the University of Benin Teaching Hospital , Benin City . *Niger J Paed*, *39*(2), 71–74.

Bryce, J., Boschi-pinto, C., Shibuya, K., Black, R. E., Health, C., & Reference, E. (2005). WHO estimates of the causes of death in children. *The Lancet*, *365*, 1147–1152.

Bukar, M. (2010). Trends In Maternal Mortality at University of Maiduguri Teaching Hospital , Maiduguri , Nigeria — A Five Year Review, *51*(4), 147–152.

Chen, mosley and. (2003). Extracted from : Population and Development Review 1984 ; 10 Suppl : 25 – 45 ., *81*(2), 25 – 45.

Chowdhury, A. H. (2013). Determinants of Under-Five Mortality in Bangladesh. *Open Journal of Statistics*, *2013*(3), 213–219.

Darkwah, K. F., Boachie-yiadom, S., & Tawiah, R. (2014). Analysis of Under-five Mortality in Ghana Using Logit Model. *International Journal of Statistics and Applications*, *4*(4), 192–197. http://doi.org/10.5923/j.statistics.20140404.03

Ezeh, O. K., Agho, K. E., Dibley, M. J., Hall, J. J., & Page, A. N. (2015). Risk factors for postneonatal, infant, child and under-5 mortality in Nigeria: a pooled cross-sectional analysis. *BMJ Open*, *5*(3), 1–9. http://doi.org/10.1136/bmjopen-2014-006779

Ezeh, O. K., Agho, K. E., Dibley, M. J., Hall, J., & Page, A. N. (2014). Determinants of neonatal mortality in Nigeria : evidence from the 2008 demographic and health survey. *BMC Public Health 2014*, *14*(521), 1–6. http://doi.org/10.1186/1471

Ghana Health Service. (2011). *GHS 2011 Annual Report*. Retrieved from http://www.ghanahealthservice.org/includes/upload/publications/GHS 2011 Annual Report Final 14-8-12.pdf\nhttps://www.pse.com/aboutpse/HydroLicensing/Documents/2011_Annual_Reports/300/BAK SA 303 Annual Report 2011.pdf

Ghana Statisical Service (GSS). (2013). *Mfantseman district*.

Ghana Statisical Service, Ghana Health Service. (2014). *Ghana Demographic and Health Survey 2014*.

Ghana Statistical Service. (2013). *Regional Analytical Report, Central Region*.

Ghana Statistical Service (GSS), G. H. S. (2014). *Ghana Demographic and Health Survey: Key Indicators*.

I. O. George, B. A. Alex-Hart, A. I. F.-B. (2009). Mortality Pattern in Children : A Hospital Based Study in Nigeria. *Int J Biomed Sci*, *5*(4), 369–372.

Kayode, G. a, Ansah, E., Agyepong, I., Amoakoh-Coleman, M., Grobbee, D. E., & Klipstein-Grobusch, K. (2014). Individual and community determinants of neonatal mortality in Ghana: a multilevel analysis. *BMC Pregnancy and Childbirth*, *14*(1), 165. http://doi.org/10.1186/1471-2393-14-165

Kayode, G. A., Adekanmbi, V. T., & Uthman, O. A. (2015). Risk factors and a predictive model for under-five mortality in Nigeria : evidence from Nigeria demographic and health survey. *BMC Pregnancy and Childbirth*, *12*(10), 1471 – 2393.

Kuti, O., Orji, E. O., & Ogunlola, I. O. (2003). Analysis of perinatal mortality in a Nigerian teaching hospital. *Journal of Obstetrics & Gynaecology*, *23*(5), 512–514. http://doi.org/10.1080/0144361031000153747

Lantto, M., Renko, M., & Uhari, M. (2008). Trends in childhood mortality from 1969 to 2004 in Finland, *97*, 1024–1029. http://doi.org/10.1111/j.1651-2227.2008.00856.x

Liu, L., Oza, S., Hogan, D., Perin, J., Rudan, I., Lawn, J. E., … Black, R. E. (2015). Global , regional , and national causes of child mortality in 2000 – 13 , with projections to inform post-2015 priorities : an updated systematic analysis. *The Lancet*, *385*(9966), 430–440. http://doi.org/10.1016/S0140-6736(14)61698-6

Mdala, J. F., & Mash, R. (2015). Causes of mortality and associated modifiable health care factors for children (< 5-years) admitted at Onandjokwe Hospital, Namibia. *African Journal of Primary Health Care & Family Medicine*, *7*(1), 1–8. http://doi.org/10.4102/phcfm.v7i1.840

Ministry of Health. (2015). *Under 5 Child Health Strategy : 2007-2015*.

Ministry Of Health. (2015). *Under Five ' s Child Health Policy : 2007-2015*.

Nasejje, J. B., Mwambi, H. G., & Achia, T. N. O. (2015). Understanding the determinants of under- five child mortality in Uganda including the estimation of unobserved household and community effects using both frequentist and Bayesian survival analysis approaches. *BMC Public Health*, *15*(1003), 1–12. http://doi.org/10.1186/s12889-015-2332-y

Ntuli, S. T., Malangu, N., & Alberts, M. (2013). Causes of Deaths in Children under-Five Years Old at a Tertiary Hospital in Limpopo Province of South Africa. *Global Journal of Health Science*, *5*(3), 95–100. http://doi.org/10.5539/gjhs.v5n3p95

Osei-Kwakye, K., Otupiri, E., Dabo, E. O., Browne, E. N. L., & Adjuik, M. (2010). Determinants ofunder-five mortality in Builsa district, Upper East Region, Ghana. *Journal of Science and Technology*, *30*(1), 45–53.

Rashid, M. a. K. M., Rasul, H. C. H., & Hafiz, M. S. (2010). Neonatal mortality: a scenario in a tertiary level hospital of a developing country. *Pediatric Reports*, *2*(1), 29–31. http://doi.org/10.4081/pr.2010.e9

Saleem, M., Iqbal, R., Bokhari, S., Ali, M., & Khan, Z. (2015). Pattern of Neonatal Admissions & its outcome in a tertiary care hospital of Southern Punjab (a 5 years study), 1–7.

Siakwa, M., Kpikpitse, D., Laryea, T., Ankobil, A., Dare, S., & Ebu, N. (2015). A five-year neonatal mortality trend in a Ghanaian Teaching Hospital after the implementation of strategies to achieve the Millenium Development Goal (MDG) 4. *Int. J. Pediatr. Child Health*, *2*(1), 43–49.

Sun, Y. C., Li, Y., Tong, J., & Gao, P. (2013). An interdisciplinary approach to treat crown root fractured tooth. *Nigerian Medical Journal*, *54*(4), 274–277. http://doi.org/10.4103/0300

UN IGME. (2014). *Levels and Trends in Child Mortality*.

UNDP/NDPC/GOG. (2015). *Ghana Millennium Development Goals Report*. *Accra: Republic of Ghana*. http://doi.org/10.1007/s13398-014-0173-7.2

UNICEF, MOH, GHS. (2014). *Ghana National Newborn Health Strategy and Action*.

United Nations. (2015). *The Millennium Development Goals Report 2015*.

Vivian U Mouneke, Roland C Ibekwe, H. U. N.-A. and B. C. I. (2012). Factors Associated with Mortality in Under-Five Children with Severe Anemia in Ebonyi, Nigeria. *Indian Pediatrics*, *49*(2012), 119–123.

World Bank. (2015). *Levels and trends in child mortality : estimates developed by the UN Inter-agency Group for Child Mortality Estimation (IGME) - report 2015*.

APPENDICES

Appendix 1: Informed Consent

Title: Factors affecting under – five mortality in the Mfantsiman Municipality of the Central Region, Ghana.

Principal Investigator: William Ekow Spio Donkor

Introduction

The School of Public Health, University of Ghana is conducting a research in this Municipality to examine the factors affecting under five mortality. I would like you to participate in this study. Kindly read the consent before deciding to whether or not to be part of the study.

Description of Procedure

You are being invited to participate because you have had a child between the ages of 0 to 59 months who died before his/her fifth birthday.

If you agree to participate, you would willingly sign or thumbprint the consent form. The study staff will ask you some sensitive questions about the factors that lead to the death of your child.

Risks and Benefit

There is no risk in participating in this survey. There would be a slight discomfort when the field staff visit you at home and engage you in the short interview. However, well trained field assistants will carry the procedure out in order to minimize time spent or any other discomfort.

There is no direct benefit. However, information obtained will be used to provide some recommendations to reduce the incidence of under – five mortality in your municipality and in Ghana as a whole.

Participant Rights

Your participation in the study is voluntary and you may choose to skip any of the questions you feel uncomfortable with or end your participation at any time. If you choose not to participate, it would not affect you in any way.

Confidentiality

Participants would be given unique codes for identification. These codes would be written on the questionnaires and used during data entry. Records identifying participants will be kept confidential to the extent permitted by laws and regulations and would not be made publicly available.

Subject's permission

The informed consent has been read to me and I understand all the conditions of this project. All my questions have been answered. I agree to take part in the study

Name of Mother_____

Name of child_____

Signature/thumbprint_____

Signature of witness _____

Date _____

Researcher's signature_____ Date_____

Contacts for additional information

If you have any further questions regarding clarification of the study, you can contact William Ekow Spio Donkor on 0249510256 / 0204836363. **Or ERC, administrator Hannah Frimpong on 0243235225 or 0507041223**

Appendix 2: Data Abstraction Form

Records reviewing checklist

DATA ABSTRACTOR_____

ABSTRACTOR ID_____

SUBJECT NUMBER/ID_____

DATE ENTERED_____

1. Subject medical record/form number_____
2. Subject name_____
3. Gender_____Male (0) ; Female (1)
4. Subject age in days/months_____
5. Time of Admission _____ Day of the week_____
6. Was the infant deceased upon arrival? _____ Yes (1); No (0)
7. Admission Vital Signs

   7.1 Temperature_____°C

   7.2 Weight_____kg
8. Date of diagnosis of disease (mm/dd/yyyy) _____/_____/_____
9. Admitting diagnosis

   1. _____

      _____

      _____

      _____

2. _____

_____

_____

_____

3. _____

_____

_____

_____

4. _____

_____

_____

10. Date of death _____/_____/_____

11. Day subject died _____

12. Time of death _____

13. Type of death _____

    1. Neonatal (0 – 28 days)

    2. Post neonatal (29 days - 59months)

14. Death caused by

    Immediate Cause_____

    As a consequence of_____

    As a consequence of_____

15. Abstractor's notes: (Add any information that will help you summarize this case.)

Appendix 3: Questionnaire on factors affecting under – five mortality

Subject code: …….. Interviewer code: …… Medical Form number…….

UNIVERSITY OF GHANA

SCHOOL OF PUBLIC HEALTH

Title: Questionnaire on mortality of children under-five

I am a student reading master of Public Health from the above school conducting a research into the factors affecting under – five mortality in the Mfantsiman municipality. This questionnaire is to gather information on your demographics and household characteristics, and child characteristics of your late child. Any information collected would be treated as confidential and would not take much of your time.

1. What is your relationship to the deceased (mention name of child)?

   1. Mother 2. Father 3. Grandparent 5. Other Relative (specify) ☐

   If mother, go to Q2, if not mother go to Q3;

2. Name of Mother: _____

3. Name of child: _____

4. Child's date of birth (dd/mm/yy) _____/_____/_____

5. Gender of child _____ a. Male [0] b. Female [1]

6. What is the age of the mother?

   a. At time of interview (completed age)? _____

   b. At time of first birth (completed age)? _____

   c. At time of birth of subject (mention name of child)? (Completed age)_____

7. Ethnicity 1. Akan 2. Ewe 3. Ga 4.Other (specify)_____

8. Primary occupation of mother: _____

9. What is the main religion of this household? 1. Christian 2. Islam

   3. Traditional 4. Other (specify) _____

10. Marital status at time of birth of (name) subject.

    1. Single 2. Married 3. Cohabiting 4.Other (specify)_____

11. Level of education. 1. None 2. Primary 3. Middle/JHS

    4. SHS/tech/commercial 5. Tertiary

12. Did you receive antenatal care when you were pregnant with subject?

    1. Yes 2. No

13. How many children have you given birth to? _____

14. How many have passed away? _____

15. Was the child (subject) a single or multiple birth?

    1. Singleton 2. Twin 3. Triplet or more 4. Don't know

16. What was the birth order of the child?

    1. First 2. Second 3. Third or higher 4. Don't know

17. Where was the child born?

    1. Hospital 2. Other health facility 3. Home (TBA) 4. Home (no TBA)

       4. Other (specify)_____

18. Was child ever immunized? _____ 1. Yes 2. No

19. Was the child (name) ever breastfed? _____ 1. Yes 2. No (if No skip 19)

    If yes, answer for those who died after 6 months

20. Did you exclusively breastfeed in the first six months? 1. Yes 2. No

Appendix 4: Key informant Interview Guide and Questions

Key Informant Interview Guide

KEY INFORMANT INTERVIEW GUIDE

Introduction

My name is William Ekow Spio Donkor, an MPH student of the School of Public Health, University of Ghana. As have been previously scheduled, I am here to interact with you for about thirty minutes in order to elicit information on my subject of study.

Title of study

Factors affecting under – five mortality in the Mfantsiman Municipality of the Central region.

Purpose of interview

The purpose of this interview is to tap from the rich experiences of professionals like you, on a very important health concern; under – five mortality. Having been at the helm of affairs in this department/unit, your views would contribute a great deal to the success of this interview and the study as a whole.

Interviewee's no.:	
Category/Cadre of staff:	
Position/Rank:	

KII Questions

Objective: Explore factors that explain observed trends in institutional under – five mortality.

1. What has been the trend in under – five mortality in this institution over the period 2011 to 2015? What in your views could explain these trends?

2. Do you think there are any institutional factors that contribute to under – five mortality in this hospital? Please can you explain with regards to the under listed, why or why not?

Availability of equipment and supplies:

Bed state:

Ward space and beds:

Staff adequacy:

Skilled staff:

3. In your view, has the implementation of the MDG 4 interventions and strategies had any impact on institutional under – five mortality in the hospital? What about the upcoming SDGs? Why and why not?

4. What do you suggest to be included in policy decisions, interventions and re – strategies towards reducing institutional under – five deaths?

5. Please do you have anything else that you may like to share?

Thank you very much for your time and contribution to this study.