

**SCHOOL OF PUBLIC HEALTH  
COLLEGE OF HEALTH SCIENCES  
UNIVERSITY OF GHANA**



**FACTORS INFLUENCING THE TIMING OF MATERNAL MORTALITY  
AT THE GREATER ACCRA REGIONAL HOSPITAL, 2014-2018**

BY

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**DECLARATION**

I Amanda Jessie Naa Korkoi Gordon hereby declare that this work is the result of my own research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged.

Any shortfalls therein are my sole responsibility.

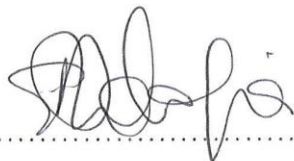


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## **DEDICATION**

This work is dedicated to the Almighty God for making it possible for me to successfully complete this study and then to my family for their support and encouragement throughout this period. I made it because of you.

## **ACKNOWLEDGEMENT**

I give thanks to the almighty God for his unchanging grace and absolute sustenance in my life.

I am extremely thankful to my supervisor Dr. Emilia.A.Udofia for her assistance, guidance and constructive criticism. I also acknowledge with deep appreciation Mr Juapim from the public health department of the Greater Accra Regional Hospital, all the lecturers and course mates for their valuable comments and contributions whenever I called upon them.

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## ABSTRACT

**Background:** Ghana grapples with high maternal mortality ratios in spite of interventions to accelerate the reduction of maternal mortality. A substantial number of studies have been done to determine the causes of maternal mortality at the national and institutional levels. In Ghana, fewer studies have addressed the factors associated with maternal deaths.

**Aim:** The aim of the present study was to ascertain the demographic factors and obstetric factors associated with the timing of maternal deaths at the Greater Accra Regional Hospital.

**Methods:** A retrospective study was conducted using data abstracted from hospital records spanning 1<sup>st</sup> January 2014 to 31<sup>st</sup> December 2018. A total of 216 records of maternal deaths were analyzed. Descriptive and inferential statistics were generated using STATA 15. Statistical significance was assumed at  $p < 0.05$ .

**Results:** A fluctuating trend was observed in institutional maternal mortality ratios recorded over the five-year period. Majority of deaths were due to direct causes such as hypertensive states of pregnancy, disorders of the placenta and haemorrhage. The single greatest cause of indirect maternal death was due to cardiovascular disease. In addition, most of these deaths occurred during the postpartum period followed by the intrapartum period. After applying Fischer's exact test, marital status and recommended Antenatal care attendance were found to be associated with the timing of maternal deaths ( $p = 0.044$ ) and ( $p=0.000$ ) respectively. Further analysis with logistic regression after controlling for confounding variables showed that being married (AOR= 3.916, 1.401-10.944 ) and not attaining the recommended number of ANC visits (AOR.2.361, 1.177-4.736) were significantly associated with the timing of maternal mortality.

**Conclusion:** Close monitoring of women in the intra-partum and post-partum periods might be critical to their survival. Hypertensive states as both direct and indirect causes of maternal mortality should be prioritized for healthcare interventions during pregnancy and postpartum.

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**LIST OF ABBREVIATIONS**

ANC-	Antenatal care
GHS-	Ghana health service
GDHS-	Ghana demographic and health survey
MMR-	Maternal mortality ratio
MDG-	Millennium development goals
SBA-	Skilled birth attendant
SDG-	Sustainable development goals
WHO-	World health organization

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## CHAPTER ONE

### 1.0 Introduction

#### 1.1 Background

According to the WHO, over 800 women die globally each day from preventable maternal deaths. Ninety-nine percent of these deaths have been found to occur within developing nations with about half of these deaths happening in sub Saharan Africa alone and nearly one-third occurring in South Asia (World Health Organization, 2018a).

Causes of maternal mortality have been put into 2 groups, direct and indirect causes. Direct causes of maternal deaths result from abortion, haemorrhage, sepsis, hypertensive disorders, obstructed labour, and ruptured uterus. Indirect causes of maternal mortality on the other hand result from HIV, malaria, severe anaemia, sickle cell disease, and embolism (World Health Organization, 2018a). Regional variations in the causes of maternal deaths have been found to exist. Additionally, variations in the timing of maternal mortality with respect to the 3 partum periods have also been identified amongst different regions (Merdad & Ali, 2018).

Maternal mortality is the principal cause of death amongst females within the age ranges of 15-49 all over the world. Maternal mortality was not globally accepted as an issue of public health concern until the latter part of the 20<sup>th</sup> century. In 1985, a thought provoking article published by Allan Rosenfield and Deborah Maine revealed that although attention had been given to maternal and child health in general, little attention had been given to the issue of maternal mortality by politicians, policy makers and health care professionals hence, little had been done to reduce maternal mortality in developing nations (Allan & Maine, 1985).

In 1987, an international conference dubbed “Safe Motherhood Conference” was launched in Kenya. This conference was aimed at creating awareness about the magnitude of maternal deaths. Statistics presented at the conference revealed that out of 500,000 maternal deaths that occurred yearly, one percent of them occurred in the developed world while the remaining ninety nine percent occurred in developing regions. Maternal mortality ratio(MMR) was calculated to be between 300 to 1000 or more per 100,000 live births in developing countries, a clear contrast to the maternal mortality ratios of 2 to 9 per 100,000 live births in developed countries (Starrs, 1987). There was therefore a 50 to 100 times higher risk of women in less developed countries dying from complications of pregnancy and child birth compared to a woman in a more developed country. This led to the inception of “The safe motherhood initiative”, a global crusade to reduce maternal mortality.

In 2000, eight goals dubbed Millennium development goals (MDG’s) were set in New York by 189 presidents and governments at the millennium summit to encourage countries to focus on global problems associated with human development. Because of the importance of maternal health, MDG 5 was developed with an objective of reducing maternal mortality by 3/4 (190 maternal deaths per 100,000 live births) between the years of 1990 and 2015. However by the end of 2015, most countries ,particularly those in the sub Saharan African region were unable able to achieve this goal although there had been reductions in the maternal mortality ratios of various African countries as compared to what was recorded prior to 2015.In 2016, there was a global change from millennium development goals(MDG) to Sustainable development goals(SDG) (Starrs, 1987, 2006).

The SDG 3 which seeks to “ensure healthy lives and promote wellbeing for everyone at all ages” has one of its sub goals (SDG 3.1) targeted at reducing the global MMRs to a value less than 70 per 100,000 live births by the year 2030 (World Health Organization, 2018b).Poverty, low educational

levels, residence in rural areas, inadequate health care facilities, absence of skilled birth attendance (SBA) and sociocultural practices among others continue to remain major determinants of maternal death in Sub-Saharan Africa and other developing nations (World Health Organization, 2018a). In order to achieve SDG goal 3.1, it is important to identify the causes of maternal mortality and understand its trends and variations across regions. It is also essential to recognize and comprehend the timing of maternal mortality with respect to the three partum periods and how it varies across regions to aid in the planning, development and implementation of effective programs to target the problems that are peculiar to the various regions. This will help improve maternal health outcomes and decrease preventable maternal mortality globally, especially in Ghana.

## **1.2 Problem Statement**

A total of 10.7 million females have died globally from causes stemming from pregnancy and child birth between 1990 and 2015. Global measures were put in place from 1990 to reduce MMRs. Progress has been made in the developed world to lessen the magnitude of maternal mortality. In Sub-Saharan Africa and the rest of the developing world however, reduction of MMR has been rather slow. Maternal mortality continues to remain an issue. As at 2010, the MMR in sub Saharan Africa was 500 per 100,000 live births. Women aged 15-49 continue to die daily from preventable maternal deaths.

In Ghana, there was a decline in the numbers of maternal death recorded in the country from approximately 1000 deaths in 2013 to 925 in 2015 during the implementation of the MDG Acceleration Framework (MAF) program .However in 2016, there were subsequent increases in the numbers of maternal deaths recorded in Ghana from 925 to 955 deaths. Reasons for the increase were not clearly evident. According to (GHS, 2017), the national MMR was 319 per 100,000 live births in 2015. However, according to WHO, UNICEF, UNFPA, & World Bank (2012), an MMR

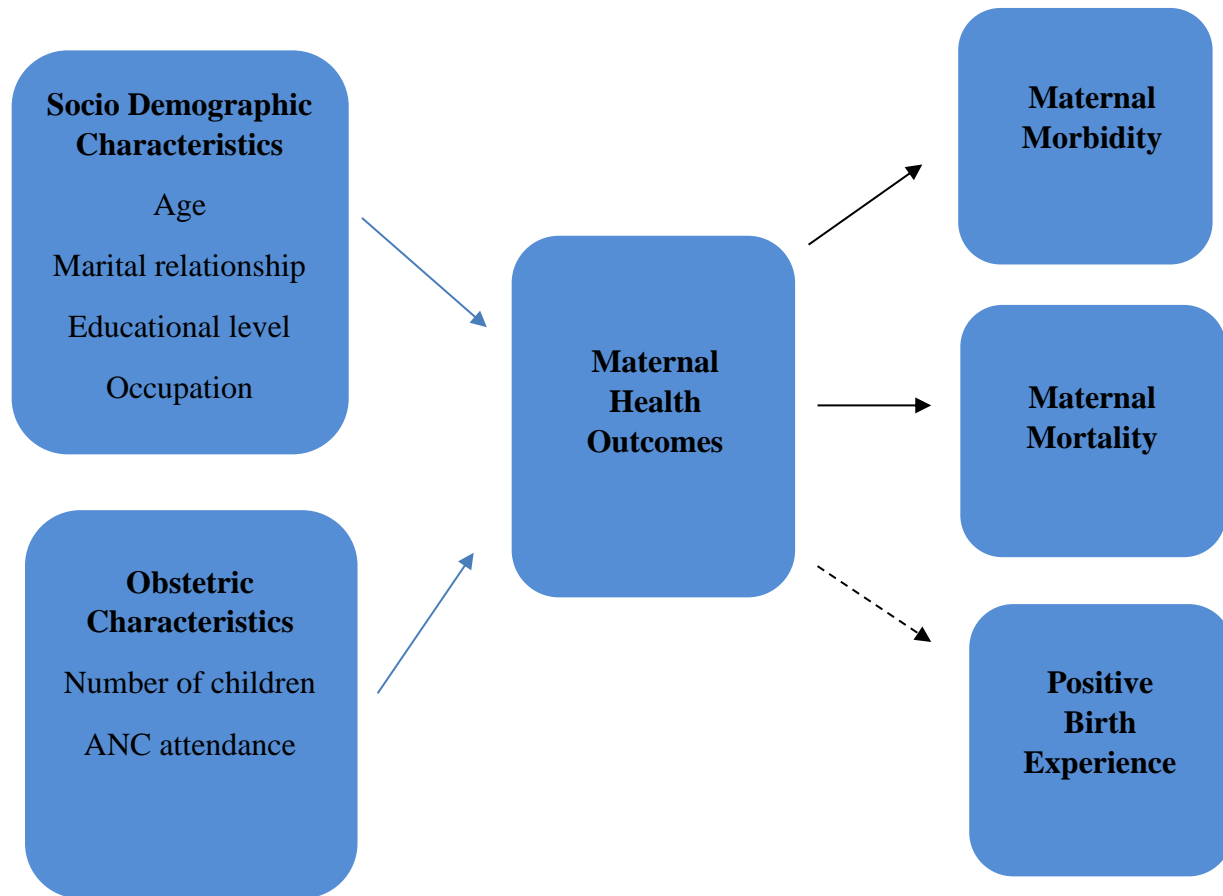
of 300 deaths per 100,00 live births or more is considered to be high . A regional breakdown of maternal deaths from the GHS report in 2016 revealed that the Greater Accra region recorded the highest institutional maternal mortality (13%) compared to the Eastern region(10%),the Western region (9%),the Volta region (6%),the Upper West region(2%),the Upper East region (3%),the Northern region 5%,the Central region (4%),the Brong Ahafo region(4%) and the Ashanti region (5%) (GHS, 2017).

Research has shown that increased patronage of health services such as family planning methods, antenatal care(ANC), skilled attendance at birth and emergency obstetric care reduces the magnitude of maternal mortality (Dickson, Darteh, & Kumi-Kyeremeh, 2017). According to the GDHS in 2014, 97.3 % women received antenatal care ,73.7 % of births were delivered by a skilled healthcare provider, while 26.7% of women used contraceptives(Ghana Statistical service, Ghana Health service, & ICF International, 2015). In spite of tremendous efforts made by the country to improve access and utilization of these services, maternal mortality still remains an issue of public health concern.

A study carried out by Asamoah and co-authors using data from the 2007 Ghana Maternal Survey revealed that socio demographic characteristics of the deceased influenced causes of maternal deaths (Asamoah, Moussa, Stafström, & Musinguzi, 2011).It has therefore become imperative to identify the causes, trends and regional variations in maternal mortality. It is also imperative to study the timing of maternal deaths to identify the partum periods during which there is a greater likelihood of suffering maternal mortality so more attention can be paid to expectant mothers in those partum periods. This study is therefore aimed at doing the above using data from the Greater Accra Regional Hospital.

### 1.3 Conceptual Framework

This research adopted the theory of the WHO framework on the social determinants of maternal health to explain the link between maternal deaths and socio demographic and obstetric characteristics as depicted below:



**Key:** —————> Negative maternal health outcome  
 - - - - -> Positive maternal health outcome

**Figure 1.1: Conceptual framework on the relationship between obstetric, sociodemographic characteristics and maternal health outcomes**

Adapted from: WHO (2011) Closing the Gap: Policy into Practice on Social Determinants of Health.

According to (Bauserman et al., 2015; Edie et al., 2014) attributes such as age have effects on maternal mortality. They found out that as women turned 30 and above, their risk of suffering maternal death increased. Individual attributes such as number of children, otherwise translated as parity was found to have significant effects on a woman's chance of passing away from maternal causes according to (Sonneveldt, Plosky, & Stover, 2013). The more women give birth, the less they seek health care during pregnancy because of the notion that they have prior experience at childbirth. Complications often go undetected and unmanaged in such women and the consequence of this is maternal death.

In addition marital relationship was identified to be connected to adverse maternal health outcomes including maternal mortality (Asamoah et al., 2011; Karlsen et al., 2011). Some studies have identified single women to have higher risk of suffering maternal death while others have identified married women to have a greater risk of passing away from maternal causes. Income levels which are affected by employment status and captioned under family and peer influences was identified to be related to maternal deaths. It has been demonstrated the unemployment was associated with maternal deaths (Edie et al., 2014), unemployment was associated with maternal deaths. When women do not have the income they need, they are unable to have access to health care because of associated costs that come with visiting the health facility such as transportation and other costs not covered by the National Health Insurance Scheme.

ANC attendance was identified to be linked to maternal death in earlier studies (Bauserman et al., 2015; Merdad & Ali, 2018). The more women receive ANC care, the higher chances of complications are promptly identified and dealt with thereby reducing the likelihood of suffering maternal mortality.

As women receive more formal education, they develop better health seeking behaviours because they are empowered to take health related decisions for themselves. Additionally, they develop a better understanding to health directives they are given and comply more with their health care providers. (Karlsen et al., 2011; Tunclap et al., 2014).

## **1.4 Research Objectives**

### **1.4.1 General Objectives**

To ascertain the timing of maternal deaths and the factors associated with the timing of maternal deaths at a regional hospital in Greater Accra, Ghana.

### **1.4.2 Specific Objectives**

1. To ascertain the magnitude of maternal deaths at Greater Accra Regional Hospital.
2. To identify the timing of maternal deaths during the period under study.
3. To determine the factors associated with the timing of maternal deaths at Greater Accra Regional Hospital.

## **1.5 Research Questions**

1. What is the magnitude of maternal deaths recorded at Greater Accra Regional Hospital?
2. At what time during the course of pregnancy do the deaths occur?
3. Is there a relationship between the timing of maternal death and recorded socio demographic characteristics?
4. Is there a relationship between the timing of maternal death and recorded obstetric characteristics?

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Search Strategy**

Search engines used to isolate articles for the literature review were Google scholar, PubMed and Science direct. In Science Direct, the search terms ‘Maternal mortality’ AND ‘Ghana’ generated 2,580 results. Preliminary screening of abstracts resulted in the selection of three peer reviewed articles which were selected based on their relevance to the study. Articles deemed relevant were those that were found to contain information on maternal mortality trends, causes of maternal mortality and the relationships that exist between demographic as well as obstetric characteristics and maternal deaths. Additionally, relevance was also determined based on articles that had information pertaining to partum periods of pregnancy and their relation to maternal deaths, effects of maternal deaths and steps that have been under taken to decrease maternal mortality. In Google scholar, the same search terms were used and results generated were filtered using “since 2014” which yielded 17900 articles. Four peer reviewed articles deemed relevant were included in the literature review. The search was repeated using “Predictors of Maternal Mortality in Ghana” which generated 17,300 results. Out of these, six relevant peer reviewed journals were selected. When the search terms were applied in PubMed, a yield of thirteen journal articles was obtained from which three were selected. The rest of the 29 articles reviewed were drawn from 24 journals and 5 reports that were hand searched from peer reviewed articles and student dissertations.

## 2.1 Definition and Terms

According to the WHO, “maternal mortality refers to the death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes” (World Health Organization, 2018a).

Maternal mortality is expressed either as a ratio or a rate. Maternal mortality ratio refers to the number of deaths per 100,000 live births whilst maternal mortality rate is in reference to the number of maternal deaths within a period over the number of women in their reproductive age during the same period expressed per 100,000 women. Mathematically, the two are expressed as;

$$\text{Maternal mortality ratio} = \frac{\text{Total number of maternal deaths} \times 100,000}{\text{Total number of live births}}$$

$$\text{Maternal mortality rate} = \frac{\text{Total deaths of mothers due to maternal causes in a year} \times 100,000}{\text{Total number of women in their reproductive age}}$$

## 2.2 Public Health Relevance of Maternal Mortality

Studying maternal mortality shows the quality of obstetric care available on a national or community level. Maternal mortality rates provide a yardstick for measuring the level of development in a nation. The well-being of societies is intricately linked to the survival of its women and children. Maternal mortality has been found to be linked to infant and child mortality. According to Finlay, Moucheraud, Goshev, Levira, & Canning (2015), children whose mothers died while bringing them into the world or shortly after pregnancy were more likely to pass away before age 1 compared to those children whose mothers were living. Complications during the intra

partum period such as sepsis, obstructed labor and haemorrhage which lead to maternal deaths were identified to be associated with neonatal mortality as well.

## **2.3 Trends of Maternal Mortality**

### **2.3.1 Global Trends of Maternal Mortality**

Strides have been made globally to curb maternal mortality since the latter part of the 1980's when it was globally recognized as a public health priority issue. Globally, MMR reduced from 385 per 100,000 live births to 216 per 100,000 live births between 1990 and 2015 (Alkema et al., 2016). Maternal mortality is however more predominant in developing countries as a result of inadequate medical care, high fertility rates, high infectious disease rates and differences in the health care system (Girum & Wasie, 2017). The rate at which maternal mortality declined globally varied across regions. The highest rates of decline were recorded in Eastern Asia and the lowest rates of decline in sub Saharan Africa and western Asia (Alkema et al., 2016; Fillipi, Ronsmans, Chou, Graham, & Say, 2016). Regional MMRs were "590 per 100,000 live births in Africa, 230 per 100,000 live births in Oceania, 190 per 100,000 births in Asia, 85 per 100,000 live births in Latin America and the Caribbean's and 14 per 100,000 live births within the developed regions" according to a 2010 WHO report (Broek & Falconer, 2011). The adult risk of suffering maternal mortality in the lifetime of women has been calculated to be 1 in 36 in sub-Saharan Africa as opposed to 1 in 4900 in developed countries (Fillipi et al., 2016).

### **2.3.2 Trends of Maternal Mortality in Africa**

Africa is one of the continents that continues to struggle with the problem of maternal mortality. Maternal mortality is considerably high in Sub Saharan Africa and has been declining at a rather slow pace. Since 1990, efforts have been made to lower maternal mortality ratios in the continent.

As at 2015, only Rwanda and Cape Verde had been able to reduce their maternal mortality ratios by more than 75 percent to meet the MDG 5 target of “reducing the MMR by three quarters between the years of 1990 to 2015” (Ghana statistical service, 2016; Girum & Wasie, 2017)(Alkema et al., 2016). As at 2015, Uganda, South Sudan, Madagascar, Sudan, Angola, Tanzania, Zambia, Morocco, Eritrea, Egypt, Ethiopia and Equatorial Guinea had reduced their maternal mortality rates to 50% of what their individual maternal mortality ratios were as at 1990. Sierra Leone, Burkina Faso, Ghana, Botswana, Mali, Senegal, Burundi, Chad, Somalia, Togo, Guinea Bissau, Guinea and Niger on the contrary only succeeded in reducing their mortality rates by 25% between 1990 and 2015(Alkema et al., 2016).

### **2.3.3 Trends of Maternal Mortality in Ghana**

Deaths from pregnancy and child related causes have seen a gradual reduction in Ghana. According to the 2016 Ghana Health Service report (GHS, 2017), the MMR reduced from 634 to 380 deaths per 100,000 live births between 1990 to 2013. In 2015, the MMR further declined to 319 per 100,000 live births (GHS, 2017). Between 1990 and 2000, there was an annual maternal mortality rate reduction of 3.1% in the country. Subsequently, there was a 2.5% annual maternal mortality reduction rate between 2000 and 2015. Although there have been marked improvements in the MMR recorded in the country, the 2015 rate of 319 per 100,000 live births was still considerably higher than the target of 190 per 100,000 live births that was to have been achieved by that same year as part of the MDG’s. According to WHO, (2012), MMR is considered to be high if it is higher than or equal to 300 maternal deaths per 100,000 live births.

According to the Ghana Statistical Service (2010), more maternal deaths were recorded in the rural parts of Ghana compared to the urban zones. Regional differences in maternal mortality were also recorded according to the report. Higher levels of maternal mortality were recorded in the Upper

east and Volta regions whilst the Greater Accra, Ashanti, Brong Ahafo and Upper West regions recorded maternal mortality ratios beneath national levels. Conversely according to GHS (2017), Greater Accra, Eastern and Western regions recorded higher numbers of institutional maternal mortality between 2014 and 2016. In spite of national reductions in overall maternal mortality ratios in Ghana, maternal mortality trends continue to vary across the 10 regions. Maternal mortality ratios have not remained constant in Ghana but have undergone fluctuations over the course of time. The reasons for these fluctuating rates and trends are however not clear.

## **2.4 Causes of Maternal Mortality**

Causes of maternal mortality have been put into two main groups. These are direct causes and indirect causes of maternal mortality. Globally, there are variations in the causes of maternal mortality. Causes of maternal deaths in more developed regions have been established to include haemorrhage, embolism, unsafe abortion, haemorrhage, sepsis, obstructed labour, hypertensive disorders, Anaemia, Sickle cell and HIV/AIDS.

### **2.4.1 Direct Causes of Maternal Mortality**

According to the “WHO multi country survey” by Say et al., (2014) direct causes of maternal mortality were attributed to haemorrhage, infection, hypertensive disorders of pregnancy, abortion and ectopic pregnancy. On the global scale, maternal mortality is caused by haemorrhage, sepsis, abortion and embolism. In the developed countries, haemorrhage was the most frequent cause of maternal death. This was followed by embolism, hypertension, abortion and sepsis respectively. In developing regions however embolism was discovered to be the least frequent cause of maternal mortality with the most frequent causes being haemorrhage, hypertensive disorders of pregnancy and sepsis (Say *et al.*, 2014;Broek & Falconer, 2011).According to Der et al., (2013),studies carried

out at the Korle-Bu teaching hospital revealed that the three leading causes of maternal mortality between 2004 to 2008 were haemorrhage, abortion and hypertensive disorders. A similar study carried out using hospital records from 2008 to 2010 at the Komfo Anokye teaching hospital also revealed that hypertensive disorders, haemorrhage and sepsis of the genital tract were the leading direct causes of maternal mortality at the institution within that period (Lee, Odoi, Opare-Addo, & Dassah, 2011).

#### **2.4.2 Indirect Causes of Maternal Mortality**

According to the “WHO multi country survey”, by Say and co-authors in 2011, indirect causes of maternal mortality were found to include HIV, severe anaemia, malaria, different cancers, cardiovascular disease, lung disease, kidney disease and hepatic disease (Souza, Gülmezoglu, Carroli, Lumbiganon, & Qureshi, 2011). According to Say et al., (2014), most causes of indirect deaths were due to preexisting diseases and disorders. The greatest cause of maternal mortality from indirect causes was HIV/AIDS. The leading indirect causes of maternal deaths at the Korle- Bu teaching hospital from 2004 to 2008 were due to infections and anaemia. The infections were from pneumonia, meningitis, HIV/AIDS, urinary tract infections and pulmonary tuberculosis.(Der *et al.*, 2013). Between January 2008 to June 2010 also, infection and sickle cell disease were found to be responsible for majority of the indirect maternal mortality cases reviewed at the Komfo Anokye teaching hospital (Lee *et al.*, 2011).

### **2.5 Factors Associated With Maternal Mortality**

#### **2.5.1 Age**

Maternal age is associated with maternal mortality according to literature. A study conducted by Bauserman *et al.*, (2015),found an association between age and maternal mortality. According to

the study, the risk of dying from maternal causes was found to be greater in women who were aged 35 and above (Bauserman et al., 2015). Research carried out by Restrepo-Mendez & Victora, (2014) reported similar findings. In their study, they found out that women aged 35 and above suffered the most from maternal mortality. The risk of maternal mortality in addition was greater in all the older age groups studied from 38 surveys. According to these authors, maternal mortality ratios were higher within this age group because of higher poverty, lower educational levels and higher parity that was predominant. The women within this age group were also found to patronize antenatal care, postpartum care and having skilled attendants at birth at a rate that was less than that of their younger counterparts (Blanc, Winfrey, & Ross, 2013). Furthermore, according to a WHO multi country survey, women who were aged 35 years and older suffered more severe maternal outcomes where severe maternal outcomes was in reference to maternal mortality or near miss deaths (Souza *et al.*, 2011). Finally according to Amoakoh-Coleman *et al.*, (2015), younger women tended to have better maternal outcomes because they attended ANC and used skilled attendants at birth compared to the older women who used these less because they felt they had enough prior experience at giving birth.

### **2.5.2 Educational Level**

Research shows that the amount of formal education a woman has received is a factor that influences her susceptibility to die from pregnancy related and childbearing causes. According to Karlsen *et al.*, (2011), women who have never received any formal education and those with one to six years of formal education were at a greater risk of suffering maternal mortality as opposed to those who had twelve or more years of formal education. A study carried out by Tunclap and co-authors using data from 29 countries across Africa, Asia, Latin America and the Middle East found a link between low educational levels and severe maternal outcomes (Tunclap *et al.*, 2014).

According to the authors, the odds that a woman would present to the hospital in critical condition increased with reduced educational levels.

A multi country study conducted by the WHO also found a correlation between educational levels and severe maternal outcomes (Souza *et al.*, 2011). According to that study, women who had less than 5 years of education suffered more severe maternal outcomes. Research conducted by Asamoah and co-authors also showed that in Ghana, women who had never attended school and those who had received only basic education died more from pregnancy related causes and child birth in comparison to their counterparts who had attained high school or tertiary education (Asamoah *et al.*, 2011).

### **2.5.3 Marital Status**

Some studies have found a correlation between marital status and maternal mortality. One such study conducted by Karlsen *et al.*, (2011) led to the discovery that women who were cohabiting at the time of death and were not married had a risk of dying from maternal and child bearing causes that was two times higher than those who were married. Conversely, a multi country survey conducted by WHO reported more severe maternal outcomes among women who were living with partners (Souza *et al.*, 2011). Also according to Asamoah *et al.*, (2011), Ghanaian women who were married tended to suffer more maternal deaths compared to single Ghanaian women without marriage partners.

### **2.5.4 Parity**

Parity is another factor that has been found to be linked with maternal mortality. According to studies carried out by Sonneveldt *et al.*, (2013) and Ntiomo *et al.*, (2018), women with higher parities had a higher likelihood of suffering maternal death (Ntiomo *et al.*, 2018; Sonneveldt *et al.*,

2013). Results from the WHO multi country survey also showed an association between high parity and maternal outcomes. Multiparous women were found to be victims to severe maternal outcomes compared to those with lower parity or fewer children (Souza et al., 2011).

This was attributed to women who had a higher number of children hardly utilizing health services available to pregnant women hence increasing their susceptibility of suffering severe maternal outcomes. In addition according to (Amoakoh-Coleman et al., 2015), women with lower parity opt for ANC attendance and the engagement of skilled birth attendants which helps improve maternal outcomes compared to their multiparous counterparts who feel they have more experience at child bearing and so refuse to attend ANC or have skilled attendants at birth.

#### **2.5.5 Utilization of Maternal Health Care Services**

ANC attendance was discovered to be linked with maternal mortality. Women who attend the antenatal clinic were found to be at a lower risk of suffering adverse outcomes such as death compared to their counterparts who patronize maternal healthcare services and ANC visits (Bauserman *et al.*, 2015; Magadi, Diamond, & Madise, 2001; Merdad & Ali, 2018). This is often attributed to the early detection of complications and early intervention afforded women who attend antenatal care regularly.

#### **2.6 Impacts of Maternal Mortality**

Research has shown that maternal deaths have various effects on the family, community the nation and on the global scale as well. A study conducted by (Molla, Mitiku, Worku, & Yamin, 2015) revealed that in Ethiopia, children whose mothers die from pregnancy/childbirth tend to have nutritional deficits. These children suffer from malnourishment and in addition, they do not get access to healthcare compared to children whose mothers were living. The researchers also found

that children whose mothers died from complications of pregnancy and childbirth dropped out of school and had to engage in farm work and house chores that was inappropriate for children their age to engage in. Family fragmentation was another common phenomenon that was observed in this study where family fragmentation refers to a breaking apart of the family. A study conducted by Pande and co-authors showed similar findings. In this study, the researchers found that infant survival rate was low in children who had lost their mothers due to maternal mortality. At the household level, a loss of economic activity was discovered in addition to a dysfunction of the household (Pande *et al.*, 2015). In Malawi, research findings were no different. Bazile and co-authors found out that children whose mothers had died from maternal causes to be malnourished, febrile, school drop outs and victims of child labour (Bazile *et al.*, 2015). In South Africa, it was discovered that children whose mothers were victims to maternal mortality tended to be school drop outs, suffered social and sexual risks and experienced difficulty in transitioning from adolescence to adulthood especially for the female children (Knight & Yamin, 2015).

Maternal deaths have detrimental effects on the nation and families of the deceased with the children survived by these deceased mothers being the most affected. It has been established that maternal deaths have negative consequences of the health as well as nutrition of children left behind. The education of these children is negatively affected and most of them face challenges in their emotional, mental and social development.

## **2.7 Steps Taken To Reduce Maternal Mortality**

Steps that have been undertaken to reduce maternal mortality on a global and national level include the employment of skilled attendance during child birth, the provision of emergency obstetric care during complications, antenatal care, and introduction of the free maternal care policy.

### **2.7.1 Skilled Attendance at Birth**

Skilled attendance is the “sum of the presence of a skilled attendant and an enabling environment” (Adegoke & Broek, 2009). Skilled attendance has been advocated to be an important and effective measure that can curb maternal deaths. It has been projected that thirty three percent of all maternal deaths can be prevented by employing skilled attendance during delivery. As a result of the importance of this and the role it plays in reducing maternal mortality, the United Nations made a global call on countries to increase skilled attendance presence at birth to a coverage of 90% by 2015 (Adegoke & Broek, 2009). Results from the GDHS in 2014, showed that 73.7 % of births were delivered by skilled provider’s (Ghana Statistical Service, Ghana Health Service, ICF International, 2015; Ghana statistical service, 2016) .According to Adu, Tenkorang, Banchani, Allison, & Mulay, (2018), low rates of skilled attendance at birth contributes to maternal mortality.

### **2.7.2 Emergency Obstetric Care**

This type of care focuses on the provision of interventions during the three partum periods to handle complications especially resulting from haemorrhage, pregnancy induced hypertension, infection and ectopic pregnancy which are the main causes of maternal death (Bullough *et al.*, 2005). Emergency obstetric care includes the provision of parenteral antibiotics to control sepsis, oxytocin and anticonvulsants to control fits, assisted vaginal delivery, the manual removal of retained biological products such as the placenta, transfusion of blood and emergency caesarian section (Bhandari & Dungal, 2014). The timely administration of these interventions makes a difference and saves the lives of women.

### **2.7.3 ANC Attendance**

Antenatal care has been reported to be a useful measure in the early detection and treatment of complications in the antepartum period. Through ANC visits, a woman can be cautioned about the risks associated with her pregnancy, taken through warning signs to look out for and educated on the need to have skilled delivery at birth (Bullough et al., 2005). According to the 2014 GDHS, 97.3 % of pregnant Ghanaian women had received antenatal care at the time of the survey. The percentage of Ghanaian women who had achieved the recommended WHO requirements of at least 4 ANC visits was 87.3% (Ghana Statistical Service, 2016).

As of 2016 the WHO now recommends 8 rather than 4 visits with the “first visit at 12 weeks of gestation, and subsequent contacts taking place at 20, 26, 30, 34, 36, 38 and 40 weeks of gestation”. This is because regular contact of the pregnant women with the ANC provider enables any complications arising during the course of pregnancy to be detected early (Tunclap, Pena-rosas, Lawrie, & Oladapo, 2017).

### **2.7.4 Free Maternal Health Services**

The adoption of free maternal care services reduces maternal mortality according to literature. The introduction of this intervention improves equity and access to quality health care services for women who otherwise could not afford to pay for maternal healthcare. This in turn improves the patronage of antenatal care services, increases the number of women who employ skilled delivery at birth and receive postnatal care as well as gain access to emergency obstetric care. This consequently improves maternal outcomes and reduces maternal mortality (Azubike & Odagwe, 2015 ; Adu *et al.*, 2018).

## **CHAPTER THREE**

### **METHODS**

#### **3.0 Introduction**

This chapter deals with the approach that was employed for the maternal death record review study. It includes the study design, data collection techniques and tools as well as the statistical methods that were employed in the data analysis.

#### **3.1 Study Type**

Due to the nature of the study, which focuses on the causes and factors associated with maternal mortalities, a descriptive retrospective study was employed. Medical records of maternal deaths was collected from the Greater Accra Regional Hospital for thorough examination to determine the cause(s) of deaths and the association of the maternal deaths with socio demographic and obstetric factors.

#### **3.2 Study Area**

The study site was the Greater Accra Regional hospital located in Accra, the capital city of Ghana. The hospital was built in the 1900's to cater for the health needs of British citizens during the pre-colonial era. The hospital now has a 420 bed capacity and provides healthcare for an estimated population of about 4,283,322 inhabitants of Greater Accra region. The immediate catchment areas of the hospital include Nima, Mamobi, Kanda, Accra new town, Kotkobabi, Osu, La, Adabraka, Achimota, Airport residential area and Accra Central. The Greater Accra Regional hospital is therefore one of the leading hospitals in the country. It was selected due to the significant number of referral cases it receives sporadically. On average, the Greater Accra Regional Hospital registers

35 births daily. The hospital on its own also takes care of over one thousand maternity cases monthly.

### **3.3 Variables**

#### **3.3.1 Dependent variable**

The dependent variable in this study was the timing of maternal death. This was put into three categories namely antepartum, intrapartum and postpartum maternal deaths.

#### **3.3.2 Independent variables**

Independent variables include age, educational background, employment status, marital status, parity and recommended ANC attendance.

### **3.4 Data Source**

All records of maternal deaths that occurred between 1<sup>st</sup> January 2014 and 31<sup>st</sup> December 2018 were reviewed .Records containing information on the variables of interest were included in the study. The records were then sorted based on different criteria such as year, cause of death, age etc for data capture and analysis

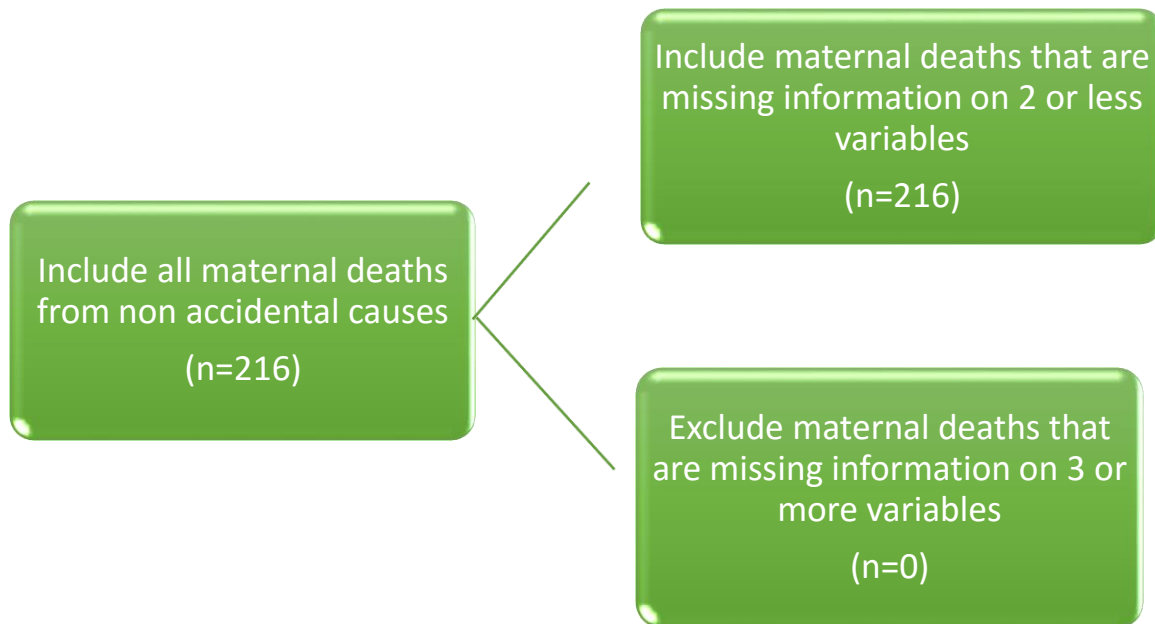
### **3.5 Data Collection Tools**

A data extraction tool which was designed using information from the maternal death notification and audit report form from the Ministry of Health, Ghana in addition to an adapted data extraction form from the Centers For Disease Control and Prevention, Bureau, Association of Maternal and Child Health Programs, & Gynecologists, (2006). Contents of the form underwent modifications to suit the national context. This tool aided the extraction of data on variables that are relevant to the

study. The data extraction tool was populated with all relevant information from the hospital records.

### 3.6 Inclusion and Exclusion Criteria

Out of the total number of reviewed records on maternal deaths which occurred from 2014 to 2018, all maternal deaths resulting from non-accidental causes were included in the study. Records that were however missing information on three or more of the variables of interest were excluded from the study.



**Figure 3.1: Selection criteria for maternal death records**

### **3.7 Data Analysis and Management**

The Microsoft Excel 13 and Stata Statistical Software IC 15 was used to capture the data and analyze it. The Microsoft Excel software was used to develop a template to capture data from the extraction forms. The data was cleaned and validated, after which data analysis was done using Stata software. A Fisher's exact test and ordered logistic regression was used to test statistics for associations between the timing of maternal mortality and sociodemographic and obstetric factors.

### **3.8 Quality Assurance**

To determine the applicability of the data extraction sheet as a result of the modifications made to the original copy to suit the local context and study objectives, a pretesting of the form using maternal mortality data from 2011 at the Greater Accra Regional Hospital was done. Necessary modifications were made to the extraction sheet based on feedback and results.

### **3.9 Ethical Considerations**

Data was collected within the facility and handled with care to prevent effacement. The collected data was password protected and kept solely in the possession of the principal investigator. Research assistants were given training on the principles of ethics including confidentiality and data protection.

## CHAPTER FOUR

### RESULTS

#### 4.0 Introduction

The results presented are based on all maternal mortality records that met selection criteria (n = 216). Out of the total number of 216 records, 16 were missing information on the cause of death. One was missing information on educational level. None of the maternal mortality records was missing information on three or more variables of interest. All maternal deaths were recorded from 2014 to 2018 at the Greater Accra Regional Hospital.

#### 4.1 Trends in Maternal Mortality

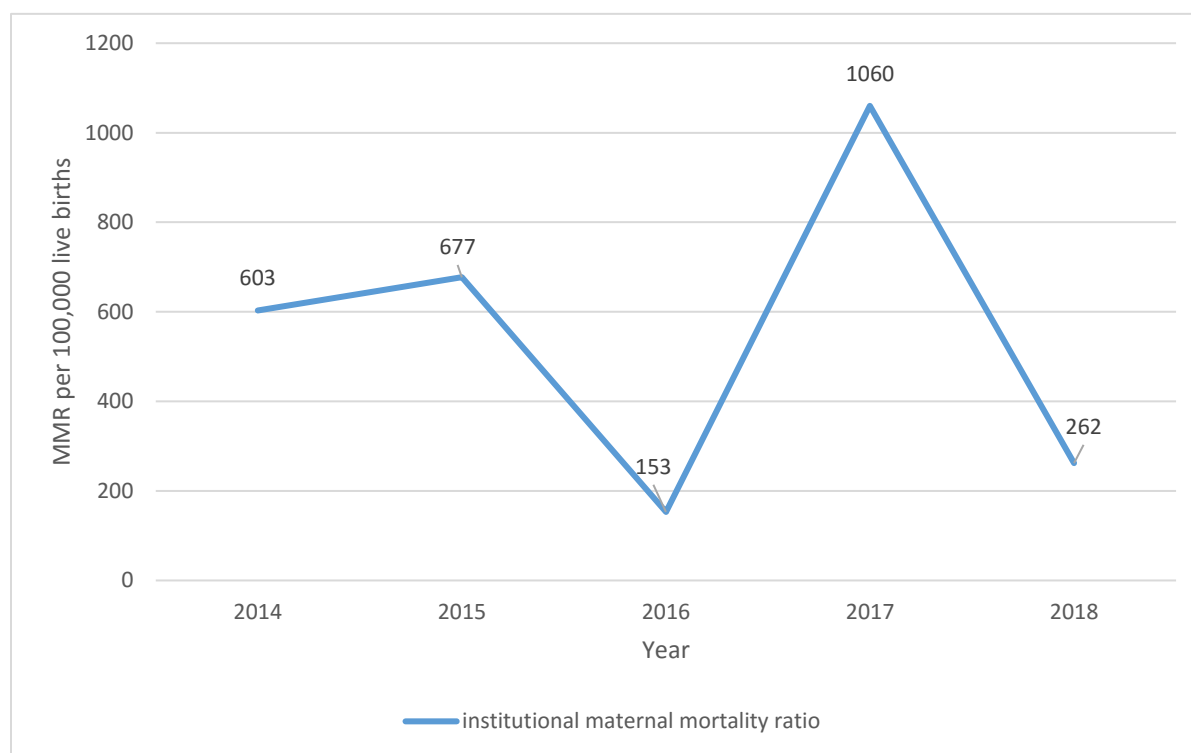
Out of 216 records reviewed, the majority of maternal deaths was reported in 2017, 71 maternal deaths (32.9%) and the least number of maternal deaths was recorded in 2016, 12 maternal deaths (5.5%) (Table 4.1).

**Table 4.1: Maternal mortality ratios at Greater Accra Regional Hospital, 2014-2018**

<b>Year</b>	<b>Maternal deaths n (%)</b>	<b>Live births n (%)</b>	<b>MMR/100,000 live births</b>
<b>2014</b>	55 (25.5)	9113 (22.9)	603
<b>2015</b>	58 (26.8)	8566 (21.5)	677
<b>2016</b>	12 (5.5)	7824 (19.7)	153
<b>2017</b>	71 (32.9)	6692 (16.8)	1060
<b>2018</b>	20 (9.3)	7622 (19.1)	262
<b>Total</b>	216 (100.0)	39817 (100.0)	

**Source: Hospital records of the Greater Accra Regional Hospital (2014-2018)**

Within the study period, a total of 39,817 live births were recorded, with majority of live births 9,113 live births (22.9%) recorded in 2014 and the least number of live births 6,692 live births (16.8%) recorded in 2017 (Table 4.1). There was a fluctuating trend in institutional maternal mortality ratios over the five-year period (Figure 4.1).

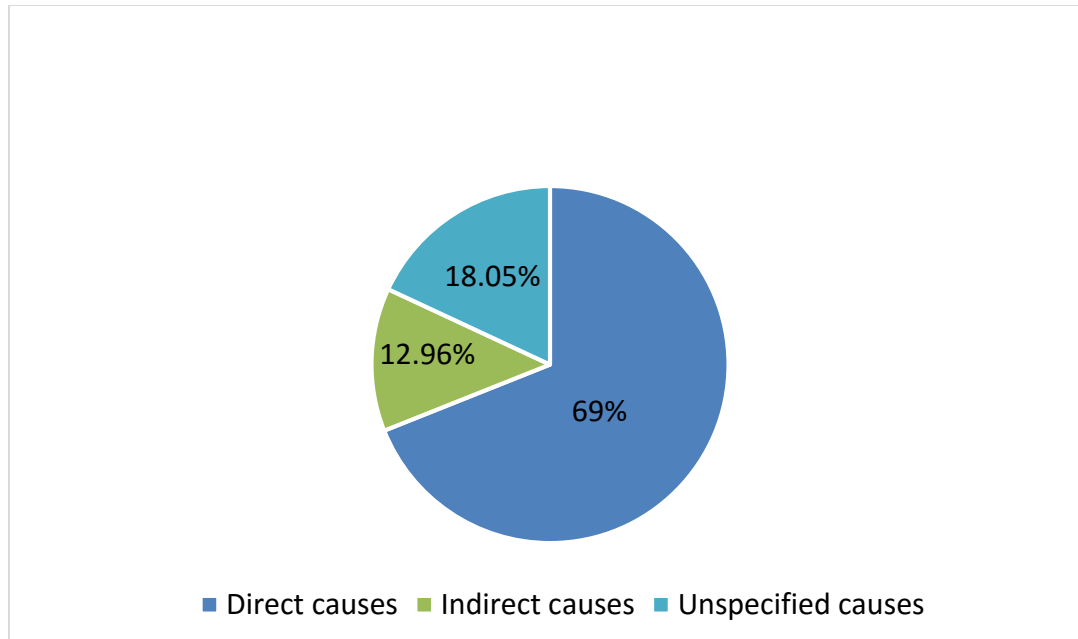


**Figure 4.1: Trends of institutional maternal mortality at the Greater Accra Regional Hospital, 2014-2018**

**Source: Researcher’s field data, 2019**

#### **4.2 Causes of Maternal Mortality**

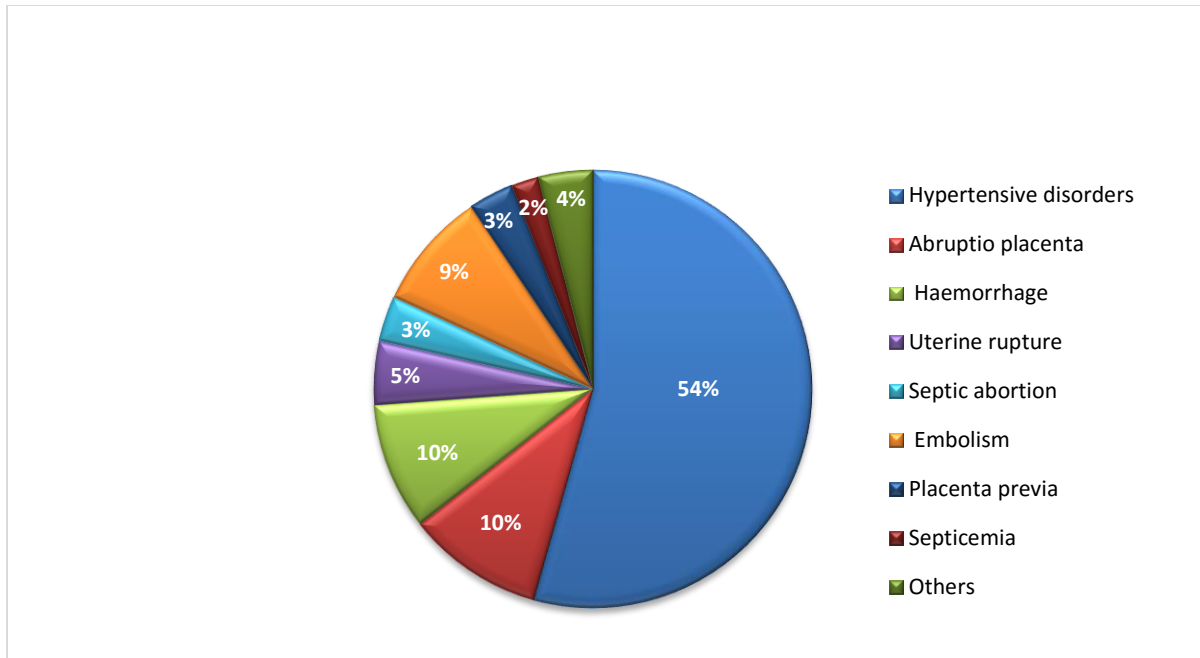
The causes of death over the five-year period were categorized as direct and indirect deaths (Figure 4.2). The remaining causes of maternal mortality were attributed to unspecified causes.



**Figure 4.2: Causes of maternal mortality at the Greater Accra Regional Hospital, 2014-2018**

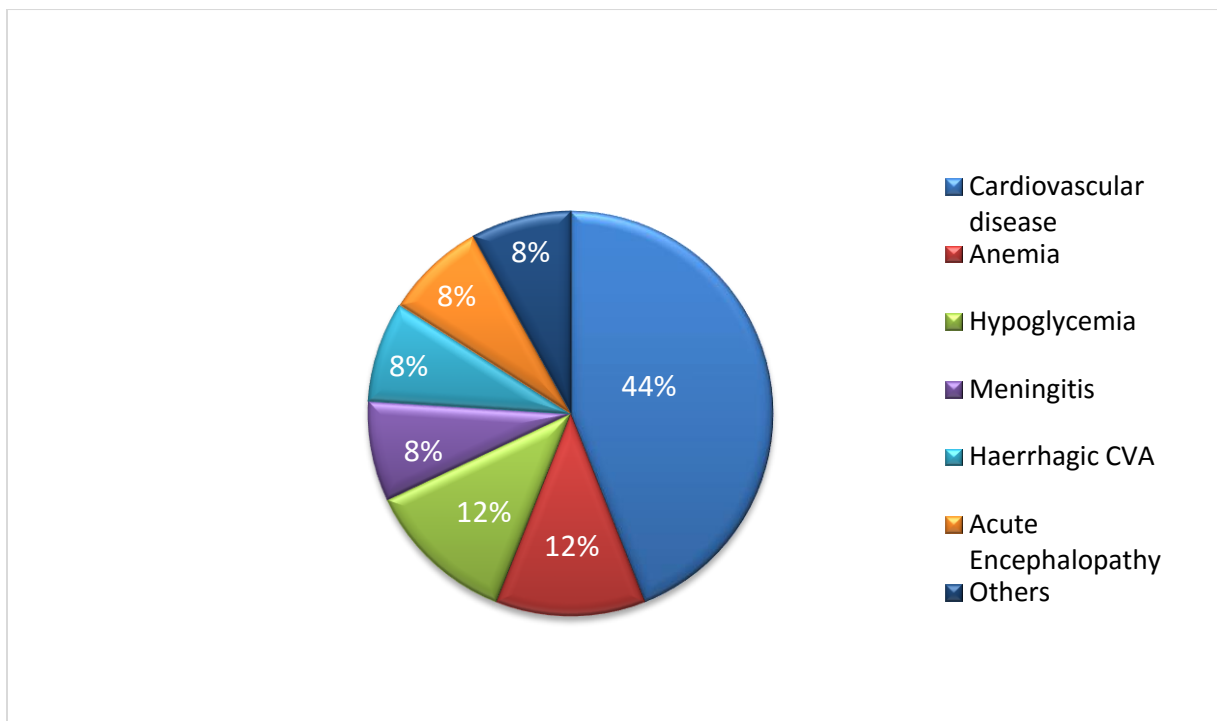
**Source: Researcher's field data, 2019**

One hundred and forty-nine maternal deaths (69%) reviewed were due to direct causes such as hypertensive disorders, abruptio placenta, hemorrhage, ruptured uterus, sepsis (Figure 4.3). The indirect causes of maternal death, 28 (12.96%) in the study were from cardiovascular disease, anemia, hypoglycemia, meningitis (Figure 4.4).



**Figure 4.3: Direct causes of maternal mortality at the Greater Accra Regional Hospital, 2014-2018**

Source: Researcher’s field data, 2019

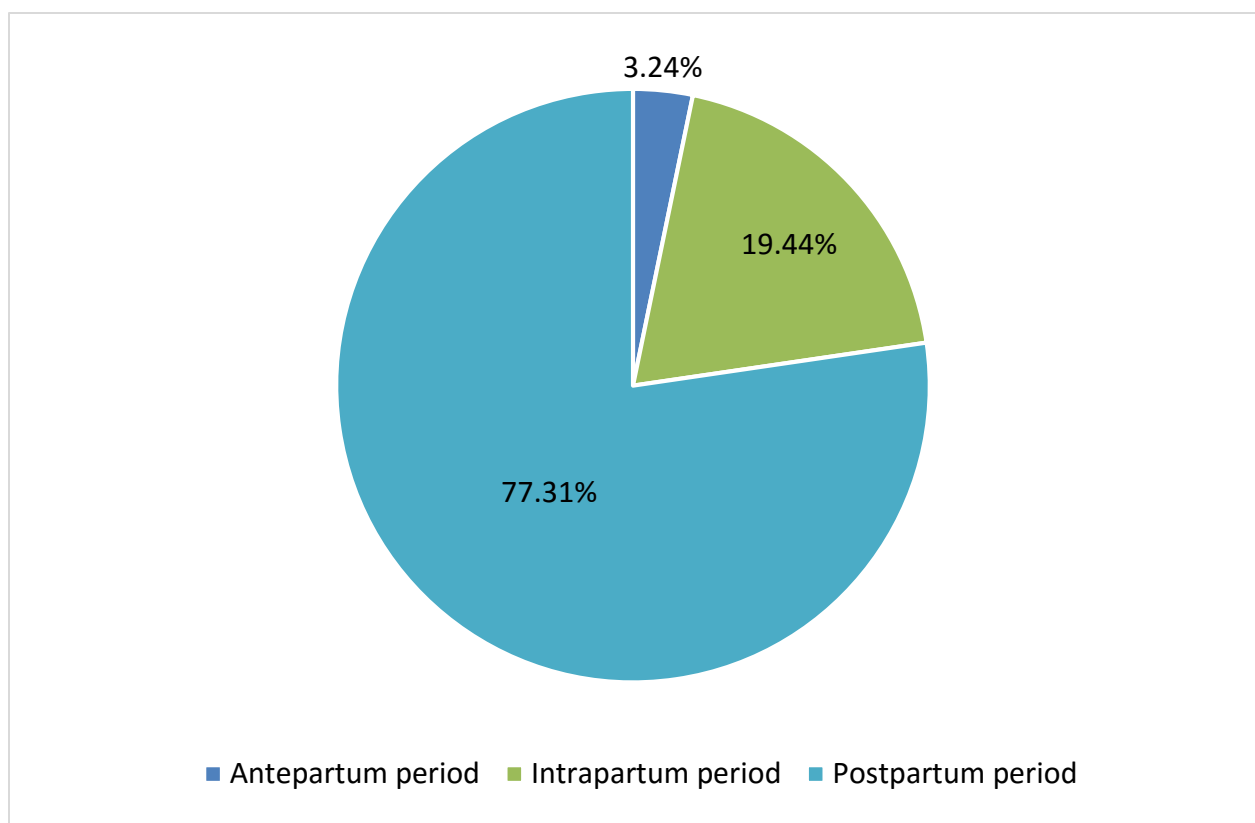


**Figure 4.4: Indirect causes of maternal mortality at the Greater Accra Regional Hospital, 2014-2018**

Source: Researcher’s field data, 2019

### 4.3 Timing of Maternal Mortality

The timing of maternal deaths was categorized as antepartum, intrapartum and postpartum deaths. Majority of the maternal deaths reviewed were postpartum deaths. Out of the total of 216 reviewed maternal deaths, 167 maternal deaths happened during the postpartum period, 42 maternal deaths occurred during the intrapartum period, while 7 maternal deaths happened during the antepartum period (Figure 4.5).



**Figure 4.5: Timing of maternal mortality at the Greater Accra Regional Hospital, 2014-2018**

**Source: Researcher's field data, 2019**

#### 4.4 Factors influencing the timing of maternal deaths at Greater Accra Regional Hospital

Table 4.2 shows the p-values in the analysis with Fisher's exact test. Marital status and recommended ANC attendance were found to be significantly associated with the timing of maternal mortality across all years under review.

**Table 4.2: Factors associated with the timing of maternal mortality at Greater Accra Regional Hospital, 2014-2018 using Fisher's exact test.**

Variable	Antepartum Deaths n (%)	Intrapartum Deaths n (%)	Postpartum Deaths n (%)	P value
<b>Age group</b>				
20-24	2 (29)	0 (0)	11 (7)	0.171
25-29	0 (0)	9 (21)	38 (23)	
30-34	3 (43)	15 (36)	63 (38)	
35-39	1 (14)	10 (24)	35 (21)	
40-44	1 (14)	8 (19)	19 (11)	
<b>Marital status</b>				
Never married	4 (57)	8 (19)	29 (17)	0.044*
Married	3 (43)	34 (81)	138 (83)	
<b>Employment status</b>				
Employed	4 (57)	35 (84)	122 (73)	0.386
Unemployed	3 (43)	6 (14)	40 (24)	
Student	0 (0)	1 (2)	5 (3)	
<b>Educational level</b>				
None	2 (29)	3 (7)	20 (12)	0.276
Primary	0 (0)	0 (0)	3 (2)	
JSS/JHS	5 (71)	21 (50)	66 (40)	
SSS/SHS	0 (0)	16 (38)	69 (41)	
Tertiary	0 (0)	2 (5)	9 (5)	
<b>Recommended ANC visit</b>				
Yes	2 (29)	33 (79)	114 (68)	0.000*
No	5 (71)	9 (21)	53 (32)	
<b>Parity</b>				
0-1	1 (14)	19 (45)	60 (36)	0.899
2-4	3 (43)	17 (40)	87 (52)	
5+	3 (43)	6 (14)	20 (12)	

\*p-value at 5% level of statistical significance obtained from Fisher's exact test

Table 4.3 shows results that were generated from the logistic regression analysis. Being married(AOR= 3.916, 1.401-10.944) and not attaining the recommended number of ANC visits (AOR.2.361, 1.177-4.736)were found to be significantly associated with the timing of maternal mortality after controlling for confounders.

**Table 4.3: Logistic regression model predicting the factors associated with the timing of maternal mortality at the Greater Accra Regional Hospital, 2014-2018.**

Variable	AOR	95% CI	P value
<b>Age group</b>	0.895	0.637-1.259	0.526
<b>Marital status</b>			
Married	3.916	1.401-10.944	0.009*
<b>Employment status</b>			
Unemployed	2.748	0.972-7.772	0.057
Student	1.136	0.082-15.623	0.924
<b>Educational level</b>			
Primary	216852.3	0 - .	0.987
Junior high	0.553	0.149-2.050	0.376
Senior high	1.637	0.406-6.598	0.488
Tertiary	3.057	0.339-27.588	0.319
<b>Parity</b>			
1-2	0.511	0.105-2.492	0.407
2-4	0.935	0.242-3.612	0.923
5+	1.436	0.270-7.649	0.671
<b>Recommended ANC attendance</b>			
No	2.361	1.177-4.736	0.016*

\**p value < 0.05*

## **CHAPTER 5**

### **DISCUSSION**

#### **5.0 Introduction**

This chapter explains the trends of institutional maternal mortality, timing of the maternal deaths and factors leading to the causes of maternal deaths. The discussion compares the findings in the present study with earlier studies.

#### **5.1 Trends in institutional maternal mortality at Greater Accra Regional Hospital, 2014-2018**

There was a fluctuating trend in institutional maternal mortality ratios occurring over the five year period. Maternal mortality ratios in 2014 and 2015 were above 600 deaths per 100,000 live births. This could be attributed to the large number of parturients that were referred to the facility when complications arise, in addition to the infrastructural challenges the hospital faced within that period. In 2016, the ‘no bed syndrome’ hit major health facilities in the country. Most referral cases could therefore not be admitted at the hospital during the period. Maternal mortality ratios reduced substantially because referrals of bad maternity cases were not admitted at the hospital during this year. Institutional maternal mortality was highest during 2017. This could be associated with challenges faced by the hospital in its transition from the old block to the new block, coupled with the high number of complicated cases that were referred to the hospital during that year. In 2018, maternal mortality ratios reduced substantially. This could be associated with completion of the transition of the maternity unit from the old block to the new block, coupled with an increase in the number of obstetricians in the facility so that in total, there was one consultant and seven obstetricians available at the facility in 2018. This could have enhanced the capacity of the hospital

to manage complications of pregnancy and childbirth promptly and alleviate cases of maternal mortality.

## **5.2 Causes of maternal mortality**

This study found similar results to the 2017 Ghana Maternal and Health Survey where direct causes of maternal mortality accounted for over half of the cases of maternal deaths identified (Ghana Statistical service & Ghana Health service, 2017). Majority of the direct causes of maternal mortality were from hypertensive disorders, hemorrhage, disorders of the placenta and uterine rupture. Indirect causes of maternal mortality stemmed from conditions such as cardiovascular disease, anemia, hypoglycemia and meningitis among other conditions. This was consistent with findings from Lee and co-authors who identified hypertensive states of pregnancy to be the leading cause of maternal deaths at the Komfo Anokye Teaching hospital (Lee *et al.*, 2011). In contrast, another study identified haemorrhage as the highest cause of maternal mortality (Asamoah *et al.*, 2011).

## **5.3 Timing of maternal mortality**

Maternal deaths occurred with the greatest frequency in the postpartum period followed by the intrapartum period. Antepartum maternal mortality was a rare occurrence in this study sample. This can be attributed to the fact that eclampsia and postpartum hemorrhage occurred after birth in this sample, both being major causes of maternal deaths. These findings are consistent with a study conducted by Merdad and co-authors using data from 34 countries (Merdad & Ali, 2018). In their study, they found out that maternal deaths occurred with the greatest frequency in the postpartum and intrapartum periods across most of the regions (Merdad & Ali, 2018). In West Africa however,

they found out that maternal deaths were highest during the intrapartum period followed by the postpartum period.

#### **5.4 Factors influencing maternal mortality at Greater Accra Regional Hospital, 2014-2018**

##### **5.4.1 Marital status**

Marital status tended to have an influence on maternal mortality. Women who were married had a higher likelihood of suffering maternal mortality compared to their single counterparts. Majority of the maternal deaths reviewed in this study occurred among women who were married. This is consistent with earlier studies conducted by Asamoah et al (2011) in Ghana and Souza et al (2011) in a WHO multi-country survey which showed that women who were married or living with partners faced a slightly higher risk of suffering maternal mortality compared to their younger counterparts (Asamoah *et al.*, 2011; Souza *et al.*, 2011).

##### **5.4.2 Recommended ANC attendance**

An inability to attain the recommended number of ANC visits tended to have an influence on the timing of maternal deaths in this study. Women who did not attain the recommended number of ANC visits were more likely to suffer maternal death compared to their counterparts who attained the recommended number of ANC visits. This is similar to studies carried out by other researchers. Bauserman and co-authors for instance identified an association between ANC attendance and maternal mortality as did Merdad and Ali (2018) (Bauserman *et al.*, 2015; Merdad & Ali, 2018) .

Other factors associated with maternal mortality in earlier studies such as age group, level of education, parity and employment status were not identified as risk factors in the present study. These findings are contrary to studies carried out by Bauserman et al (2015) , Souza et al (2011) as well as Restrepo-Mendez & Victora (2014) who identified an association between maternal

mortality and age group (Bauserman *et al.*, 2015; Restrepo-Mendez & Victora, 2014; Souza *et al.*, 2011). Regarding level of education, one study found that women with lower levels of education had a higher risk of suffering maternal mortality compared to their more educated counterparts among women from 29 countries across Africa, Middle East, Asia and Latin America (Tunclap *et al.*, 2014). In addition, other studies carried out by Souza and co-authors identified a similar trend where women's educational levels had a significant outcome on their maternal health outcomes (Souza *et al.*, 2011).

Although the majority of the women in the sample studied were mainly employed in trading, dressmaking and catering, employment status was not a risk factor in the present study. This contrasted with another study which found a significant relationship between unemployment and maternal mortality (Edie *et al.*, 2014).

Limitations in the present study include the use of secondary data as mortality records may omit essential information or lack complete information, thereby reducing eligibility for analysis. Although all eligible records were used, the sample size was small. This may partly account for the inability of the final model to identify some of the factors identified in literature. Nonetheless, the strength of the study lies in identifying proportions of death due to direct and indirect causes of maternal deaths in the setting and contributing to understanding about the timing of maternal deaths. The latter provides useful information to ensure that related programs are targeted appropriately and given priority.

## **CHAPTER SIX**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **6.0 Introduction**

This chapter summarizes the key findings from the five year record review of maternal mortality at the Greater Accra Regional Hospital and recommendations are made to prevent avoidable maternal death (s).

#### **6.1 Summary**

Most of the maternal deaths reviewed occurred during the postpartum period followed by the intrapartum period. Most of the causes of deaths were due to direct causes such as hypertensive states of pregnancy, disorders of the placenta and haemorrhage. The single greatest cause of indirect maternal death was due to cardiovascular disease. In addition, a fluctuating trend in institutional maternal mortality ratios was observed over the five year period. Being married and an inability to attain the recommended number of ANC visits were found to be significantly associated with the timing of maternal deaths during the period under study.

#### **6.2 Recommendations**

Based on the findings of the review, it is recommended that the following are done:

##### **Ghana Health Service, hospital management and academia**

- Institutional and patient factors that may hinder prompt detection and management of hypertensive disorders during pregnancy and postpartum haemorrhage should be identified through operational research and addressed.

## **Departments of Obstetrics & Gynecology, Internal Medicine, Family Medicine and Community Health**

- There should be increased efforts to detect and manage cardiovascular disease in pregnant women; the antenatal clinic should be seen as an entry point for other forms of specialized care.
- Monitoring women during the postpartum period should be intensified through home visits to “at risk” mothers by community health workers.

### **6.3 Future Research**

Since the research did not identify whether the postpartum maternal deaths occurred during the immediate post-partum period or late postpartum period, future research should be directed towards investigating this. Additional research with larger sample can inform program design and implementation to help curb maternal mortality in line with Sustainable Development Goal 3.1 which is to reduce global maternal mortality ratio to less than 70 per 100 000 live births.

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## APPENDICES

### APPENDIX A: DATA EXTRACTION SHEET

#### Factors associated with the timing of maternal mortality at the Greater Accra Regional Hospital, 2014-2018.

A. IDENTIFYING INFORMATION

1. Record ID Number.....
2. Date of death.....
3. Cause of death.....

B. DEMOGRAPHIC INFORMATION

1. Mothers date of birth /Age (years).....
2. District of residence .....
3. Marital status
  - a. Never married
  - b. Married
  - c. Divorced
  - d. Widow

3. i. Mothers Occupation

- a. Employed
- b. Unemployed

ii. If employed, state occupation.....

4. i. Mothers educational level

- a. None
- b. Primary
- c. Middle/Junior high
- d. Secondary/Senior high
- e. Tertiary

C. OBSTETRIC CHARECTERISTICS

1. Parity.....
  
2. i. Was there ANC Attendance?
  - a. Yes
  - b. Noii. If yes, how many ANC visits were there? .....
  
3. i. Partum period deceased died in
  - a. Ante- partum period
  - b. Intra- partum period
  - c. Post-partum periodii If patient died in the ante partum period, during which trimester did the death occur.....
  
4. i. State of fetus
  - a. Dead
  - b. Aliveii. Gestational age of fetus.....

## APPENDIX: B ETHICAL CLEARANCE

### GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

*MyRef:ghs/rd/erc/Admin/App/amend/19/123  
Your Ref. No.*



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**18<sup>th</sup> July, 2019**

Amanda Jessie Naa Korkoi Gordon  
University of Ghana  
School of Public Health  
Legon

#### **RE: REQUEST FOR AMENDMENT OF PROTOCOL**

Reference is made to your letter dated 16<sup>th</sup> July, 2019 on the above subject matter.

The Ghana Health Service Ethics Review Committee (GHS-ERC) has reviewed the documents submitted, and the rationale for the request for amendment. The GHS-ERC has given approval for the amendment to be implemented.

GHS-ERC Number	<b>GHSERC: 047/03/19</b>
Project Title	Predictors of maternal mortality at the Greater Accra Regional Hospital, 2014-2018
Effective Date for Approval of Amendment	17 <sup>th</sup> July, 2017
GHS-ERC Decision	<b>Amendment version 1, Dated 17<sup>th</sup> July, 2019 Approved</b>

#### **The approval covers the following only:**

- Change of Study Period from “2012-2017” to “**2014-2018**”
- Change of protocol title from “Predictors of maternal mortality at the Greater Accra Regional Hospital, 2012-2017 to “**Predictors of maternal mortality at the Greater Accra Regional Hospital, 2014-2018**”

#### **The following applies:**


- Submission of yearly progress report of the study to the Ethics Review Committee (ERC).
- Renewal of ethical approval if the study lasts for more than 12 months.
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.

- Submission of a final report **after completion** of the study.
- Informing ERC if study is discontinued and reasons why.
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

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

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

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

SIGNED.....  
Professor Moses Aikins  
(GHS-ERC Vice Chairperson)

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

