SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

FACTORS AFFECTING PREGNANCY COMPLICATIONS AMONG ANTENATAL MOTHERS AT MAMPROBI HOSPITAL

BY

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A DISSERTATION SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH (MPH) DEGREE

MARCH, 2022

DECLARATION

I, Yaw Korankye Wiafe, hereby declare that with the exception of referenced works of other people, which have been cited and duly acknowledged, this work is an output of my own initiative. This research work has neither in whole nor in part been presented for an award or a degree elsewhere.

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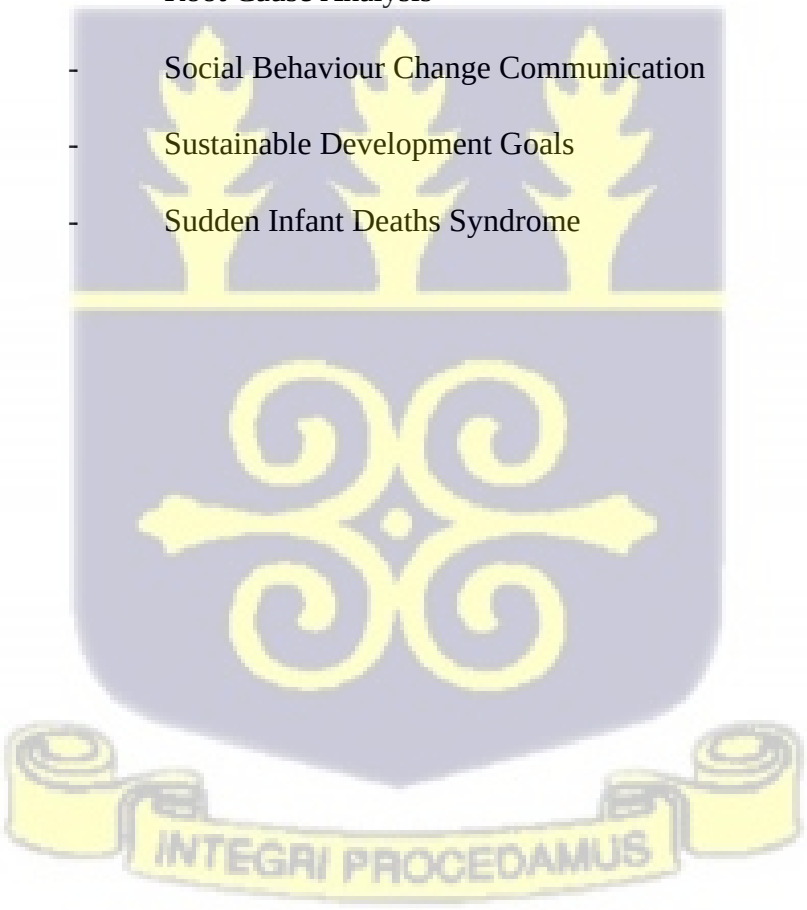
LIST OF ABBREVIATIONS

ANC	-	Antenatal Care
BMI	-	Body Mass Index
GDHS	-	Ghana Demographic and Health Survey
GSS	-	Ghana Statistical Service
MCH	-	Maternal and Child Health
MMR	-	Maternal Mortality Ratio
NHIS	-	National Health Insurance Scheme
RCA	-	Root Cause Analysis
SBCC	-	Social Behaviour Change Communication
SDG	-	Sustainable Development Goals
SIDS	-	Sudden Infant Deaths Syndrome



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ABSTRACT

Background: The prevalence of maternal mortality continues to be a major health concern across the world. In Ghana, pregnancy related causes of death in the previous 5-years was 12% of all deaths among women 15-49 years. Further assessment of the pregnancy-related deaths showed that more than half of these deaths are as a result of pregnancy-related complications. However, assessment of the pooled prevalence of pregnancy-related complications among pregnant women to inform policy is limited.

Objective: This study therefore sought to determine the factors that contribute to pregnancy complications and to assess the knowledge levels of pregnant women on pregnancy-related danger signs.

Methods: A facility-based cross-sectional study was conducted among 415 pregnant women who attended antenatal care services at Mamprobi Hospital using a systematic sampling technique. Data analysis was done using STATA v.17.0 and the results presented in percentages and proportions. Regression analysis was conducted to determine the predictors of pregnancy complication at 95% confidence interval. Results of regression analysis is reported in odds ratio.

Results: All the targeted women participated in the study giving a response rate of 100%. The study observed a mean age of 31.6 ± 6.6. More than 80% of the women had completed secondary education with 65% being salary workers/employees. More than half of the women were multiparous with nearly 65% starting their ANC at second trimester. Average ANC attendance among the women was 6 ANC visits. Almost all the women (97.5%) had ever heard about obstetric danger signs with 75% of the women having adequate knowledge about maternal and obstetric danger signs. About 52% of the women had ever had abortion in the past. The study observed

pregnancy complication prevalence of 51.8%. The prevalence of pregnancy complication among the women was significantly determined by age (AOR: 6.1; CI: 1.19-30.76), past record of pregnancy complications (AOR: 2.5; CI: 1.35-4.49), time of ANC visit (AOR: 6.1; CI: 2.14-17.70) and family history of pregnancy complications (AOR: 3.6; CI: 1.25-10.40). Other significant factors included past record of abortion (AOR: 7.8; CI: 4.21-14.32), knowledge about obstetric danger signs (AOR: 2.4; CI: 1.21-4.88) and experiencing at least one obstetric danger sign during pregnancy (AOR: 6.6; CI: 3.30-13.29).

Conclusion: The prevalence of pregnancy complications was comparatively high among the women who utilised ANC services at Mamprobi hospital. Early initiation of antenatal care services for pregnant women is an important tool for addressing some of the challenges of early onset of some pregnancy complication including anaemia in pregnancy and preeclampsia. Midwives as well as other health workers who engage pregnant women should encourage their clients to always initiate antenatal care visits at early stage.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Worldwide, childbearing poses a major risk to the life of a woman (Olonade et al., 2019). Although childbearing is considered to be healthy in developed countries, this is not the case for the majority of women around the world. Two percent of women would die during their pregnancy due to complications if they do not have access to any kind of healthcare (Kenny, 2018). According to World Health Organisation estimates from 2001, complications during pregnancy and childbirth claim the lives of 515 000 people per year (WHO, 2019). It is estimated that every year, more than half a million people die as a result of complications during pregnancy and childbirth even though the overwhelming majority of these deaths can be avoided (WHO, 2019). Nations agreed at the Millennium Summit in 2000 to reduce maternal-related deaths by three-quarters around 2015 (WHO, 2002). After 15 years of implementation of the Millennium Development Goals (MDGs), it was observed that many countries lagged behind the targets set for various indicators. Despite long-standing international efforts to reduce maternal mortality, there has been a slow improvement so far. In 2015, there were about 303 000 deaths in pregnancy and birth (UN, 2015). Following this delay in achieving expected targets, member states within the UN unanimously adopted a revised goals and targets under the Sustainable Development Goals where some of the goals were merged with diverse targets. Goal 3 of the Sustainable Development Goal (SDG) seeks to '*ensure healthy lives and promote wellbeing for all at all ages'* (McArthur et al., 2018). Maternal health outcome is an integral part of Goal 3 of SDG where member countries are to reduce maternal mortalities ratios to 70 per 100 000 live births and child mortality to 25 per 1000 live births (McArthur et al., 2018). An assessment of maternal mortality conditions

globally after the 2015 SDGs resolution showed that maternal mortality was the second leading cause of death among women of reproductive age in 2016, behind only HIV/AIDS, and was the leading cause for women aged 15–29 years (WHO, 2019).

Another major concern linked to maternal complications and maternal health is stillbirths. Every year, it is estimated that 2.6 million births are stillborn around the world, and 3.2 million live-born children die in their first month (Kochar et al., 2014). Hailemichael et al. (2020) report that growth-restricted and premature children can face challenges during birth, as well as childhood disorders, educational, social and health issues later in life. Because of the emotional toll on households, as well as the related medical and social costs, research into the early detection of these conditions is more important than ever. Several studies conducted across different WHO regions have shown that screening women regularly during birth improves the identification of the tiniest babies from 32% to 77% (Hailemichael et al., 2020; Tolefac et al., 2017; Athanasakis et al., 2011). According to Smith as cited in Athanasakis et al. (2011), the case of stillbirth is similar to that of sudden infant death syndrome (SIDS): In the 1980s, one out of every 500 babies died from SIDS. When a study revealed that sleeping on the front was a risk factor for the child, a public health initiative was launched in early 2000, which lowered it by 80–90 % (Young et al., 2018). While a straightforward approach to mitigate stillbirth is unlikely, one can investigate whether biomarkers for the antecedents of stillbirth can be developed and used for population-based screening (Athanasakis et al., 2011).

Almost all maternal and child-related deaths (95 %) occur in low-income and lower-middle-income nations, with nearly two-thirds (65 %) occurring in the region of Africa which includes Ghana (WHO, 2019). Women who live in poverty or rural areas, as well as women who belong to ethnic minorities or indigenous peoples, are especially vulnerable (WHO, 2019). In middle

income countries like Ghana, pregnancy and abortion complications are the leading cause of death for 15-19-year-old women and adolescent girls (Piane, 2019). The risk of death from maternal causes is linked to the risk of becoming pregnant as well as the obstetric risk of contracting a complication and dying during pregnancy, labour or within 42 days after delivery. Fertility rates are also higher in resource-poor conditions and the chance of dying in labour is higher, so the lifetime risk of dying from maternal causes is significantly increased. Besides, it is estimated that 1 in every 41 women die from maternal complications in low-income countries (Tessema et al., 2017). The Ghana Maternal Health Survey making references from different sources classifies maternal deaths into three; direct maternal death, non-obstetric maternal death and unspecified maternal deaths (GSS, 2018). Direct maternal deaths are described as deaths that occur as a result of obstetric complications during conception, labour or 42 days after birth or the end of the pregnancy. Non-obstetric complications exacerbated by pregnancy trigger indirect maternal deaths, while unspecified maternal deaths have an unexplained cause and occurred during pregnancy, labour or 42 days after delivery. Direct maternal deaths accounted for two-thirds of all deaths while indirect maternal deaths accounted for more than a quarter of all deaths (27%) and unspecified maternal causes accounted for 6% in Ghana. Other diseases, such as those of the immune, digestive and respiratory systems (45 %), as well as infectious and parasitic disease (24%), were the leading causes of maternal death in Ghana.

These startling figures and facts expose long-standing and systemic health disparities. Firstly, many of the middle-income countries like Ghana and other developing countries bear a large share of the brunt of maternal mortality (Der et al., 2013). Again, the level of vulnerability to maternal mortality among women increases among women who are poor, in minority groups or are of indigenous sect in rural communities (Hunt & Mesquita, 2012). Besides low-income countries being at risk of maternal-related deaths, low education, a lack of prenatal visits,

caesarean delivery, haemorrhage and hypertension were all linked to a higher rate of maternal mortality (WHO, 2019b). Maternal deaths from complications however are expected to reduce as early detection of pregnancy complications increases. Diana et al., 2020 report that maternal mortality could be prevented through early detection including the period preceding pregnancy. Cameron et al., (2020) in a discourse on early detection pregnancy complications explained that the main essence of early pregnancy assessment is to help detect any warning signs that may arise at early stage and coming with a possible solution to address the situation before escalating into serious complications. Quality antenatal care (ANC) is widely recognized as an important opportunity for screening and early detection of pregnancy-related complications such as preeclampsia, anaemia and gestational diabetes. These disorders will result in extreme morbidity and mortality if detected late or not at all. Haemorrhage, which is often associated with anaemia and preeclampsia, respectively, are thought to account for approximately 27 and 14% of all maternal deaths worldwide (WHO, 2016). In Ghana, the maternal mortality ratio (MMR) was estimated at 319 per 100,000 live births in 2015 (Apanga & Awoonor-Williams, 2018) and reduced slightly to 310 per 100 000 live births in 2017 as estimated in the 2017 Ghana Maternal Health Survey (GSS & GHS, 2018). Abejirinde et al., (2018) in an analysis of the MMR situation in Ghana noted that majority of these deaths are caused directly by haemorrhage (39%) and hypertensive diseases (35%) as well as unsafe abortions (7%). The analysis further indicated that indirect causes constitute about 26% and mainly through extreme anaemia, diabetes and malaria.

Screening is another important tool for assessing the various abnormal conditions that may arise during the pregnancy (Stahel, 2020). Even though the relevance of screening for pregnancy complications is widely known, staff shortages, a lack of medical facilities and supplies and inadequate referral links are all hindrances to pregnant women from detecting

pregnancy complications at early stage especially among rural areas in Ghana (Abejirinde et al., 2018). For routine diagnostics, pregnant women are often referred to remote health centres, laboratories or private facilities. Women may be demotivated to attend ANC and comply with referrals as a result of the time and resources spent visiting these services, which often result in late detection and treatment of pregnancy-related complications.

1.2 Problem statement

The study by Der et al., (2013) on pregnancy related causes of death in Ghana in the previous 5-years revealed that about 12% of all death among women 15-49 years were related to pregnancy. Further assessment of the pregnancy-related deaths showed that more than half of these deaths were as a result of pregnancy-related complications. The 2017 Maternal Health Survey estimates Ghana's pregnancy-related mortality ration at 343 deaths per 100 000 live births (GSS & GHS, 2018). The survey further indicates that majority (about 62%) of these deaths are as a result of complications that were not either identified at early stage or was poorly managed when identified. The Government of Ghana with the quest to reduce the rate of maternal mortality and limit the rates of pregnancy-related deaths introduced the Free Maternal Healthcare Policy in 2008 across the country (Ministry of Health, 2008). As explained by Dalinjong et al., (2018), the focus of the maternal health care policy was to increase access to maternal health care as a means of addressing all maternal health problems and reducing at a higher rate the number of maternal deaths among pregnant women. While the policy seeks to reduce both financial and geographical access, it also seeks to increase the use of skilled personnel at all levels (prenatal, intra-natal and postnatal) to facilitate easy identification of complications and addressing them accordingly. However, with more than a decade of implementation of the policy, the rate of pregnancy-related deaths remains relatively higher and lagging behind the SDGs.

With the numerous benefits of having adequate knowledge about pregnancy complications and how it can be managed, it is expected that pregnant women would seek to know more about their pregnancy status and its related conditions. However, different studies have suggested that general knowledge about pregnancy complications is relatively low (Hibstu & Siyoum, 2017; Jewaro et al., 2020). Assessment of previous reports of the Mamprobi Hospital shows that more than 35% of all pregnant women initiate their ANC attendance at second to third trimester. It is well noted that when ANC visit is initiated early, it helps in identifying early complications which helps in managing it before getting out of hands. In all, a total of 5,962 antenatal visits were done at least once in both 2018 and 2019 and later increased to 7,111 in 2020. However, in 2018, 61.3% of the women who attended ANC services had at four antenatal visits. The four or more antenatal visits in the facility decreased from 61.3% 2018 to 38.4% in 2019 and 21.3% in 2020 (GHS/Ayawaso East Municipal, 2021). The annual report further noted that most of the women who did less than four visits started relatively late. For this reason, the rate of pregnancy related complications mostly at delivery increased by 5.2%. Furthermore, the report showed that the facility recorded institutional maternal mortality ratio of 112 deaths per 100 000 live births in 2018 and all these were because of pregnancy-related complications. The causes of these pregnancy related complications are however not clearly defined. Similarly, there is limited information on the estimated knowledge levels of pregnant women on pregnancy-related complications and other danger signs. This study is therefore seeking to provide some relevant answers to these know gaps which may help in defining appropriate interventions towards it.

1.3 Justification of the study

Late start of antenatal services affects effective introduction of appropriate interventions that seeks to reduce the risk of maternal complications. Raising awareness of pregnant women on

the danger signs may improve early detection of problems and reduces the delay in deciding to seek obstetric care. It may further help create awareness among stakeholders of the health care facility on factors affecting early detection of complications in pregnancy among antenatal mothers for proper measures and interventions to be put in place. In the quest to reduce pregnancy complications among women, it is important to understand whether women in general have adequate knowledge about pregnancy complications and its effect. Studies on knowledge level among pregnant women on pregnancy complications is limited in the Ablekuma South District of Greater Accra region. This study will therefore bridge the knowledge assessment gap in the district and further provide a platform for similar studies to replicated in other districts.

1.4 Research Questions

1. What proportion of pregnant women who attend antenatal care services report pregnancy complications?
2. What is the knowledge level of pregnant women attending antenatal care services on obstetric danger signs?
3. What is the socio-demographic factors associated with pregnancy complications among antenatal mothers at Mamprobi Hospital?
4. What are the maternal and obstetric factors associated with pregnancy complications among antenatal mothers at Mamprobi Hospital?

1.5 General Objective and Specific Objectives

1.5.1 General Objective

The main objective of this study is to determine the factors affecting pregnancy complications among antenatal mothers in Mamprobi Hospital.

1.5.2 Specific objectives

1. To estimate the proportion of pregnant women attending antenatal care services who report pregnancy complications.
2. To determine the level of knowledge of pregnant women attending antenatal care services on obstetric danger signs.
3. To determine the socio-demographic factors associated with pregnancy complications among antenatal mothers at Mamprobi hospital.
4. To determine the maternal and obstetric factors associated with pregnancy complications among antenatal mothers at Mamprobi Hospital

1.6 Conceptual framework

The conceptual framework (Figure 1) of this study is developed from the Root Causes Analysis (RCA) model as per the revised framework for health interventions and studies (UNC Medical Centre, 2020). The Root Cause Analysis Model which was originally developed by Brennan et al, (1991) indicates that the need for the application of the root causes analysis arise with increasing complexity of health issues within the global context. Global and local health dynamics and the frequent occurrence of mortalities and morbidities is cause for an immediate effort to understand why the frequent occurrence of these health challenges. The assessment by UNC Medical Centre shows that the RCA helps organizations and institutions to identify main health problems and strategically design an intervention that focuses and addresses the root problem rather than proposing a solution to the outcomes. Deming (2002) reiterates that "*to find problems is not enough. It is necessary to find the cause behind the problem and build a system that minimises future mistakes*". Deming further describes the RCA as a tool that helps to answer critical questions on why a particular health problem keeps occurring in a particular location. It is evident from various applications of this model that the model addresses three

main issues; what happened, why it happened and the consequences. The RCA further assumes that systems and events are interrelated. An action in one area triggers an action in another, and another, and so on.

In the application of RCA model in this study, it is important to understand why pregnancy complications continue to occur among antenatal women who visit Mamprobi Hospital. The framework describes three levels of the problem by applying the three-prong stages; what happened (the main problem), why it happened (the root cause) and the consequences of the problem (effect). In this study, what happened is denoted by pregnancy complications. In analysing the concept of why the problem happened, this study outlines four key potential causes of pregnancy complications. First, the study identifies demographic characteristics of the antenatal women as one major root cause of pregnancy complications among the women. The demographic factors that are being studied and linked to pregnancy complications are age, religion, occupation, marital status, education etc. Another expected root cause to pregnancy complication is socio-cultural and community factors. These factors are determined by either a belief system in the community that affects utilization of antenatal care services at early stage of pregnancy or other factors that influence the uptake of maternal health services. The prevalence of pregnancy complications can also be attributed to some health-service factors that may be related to health workers or systems or logistics in the health facility that either increases or decreases access and quality of care. The final root cause that is linked directly to the problem of pregnancy complication is the maternal health factors that seek to assess how a woman's parity, attendance to ANC service and knowledge about obstetric danger signs.

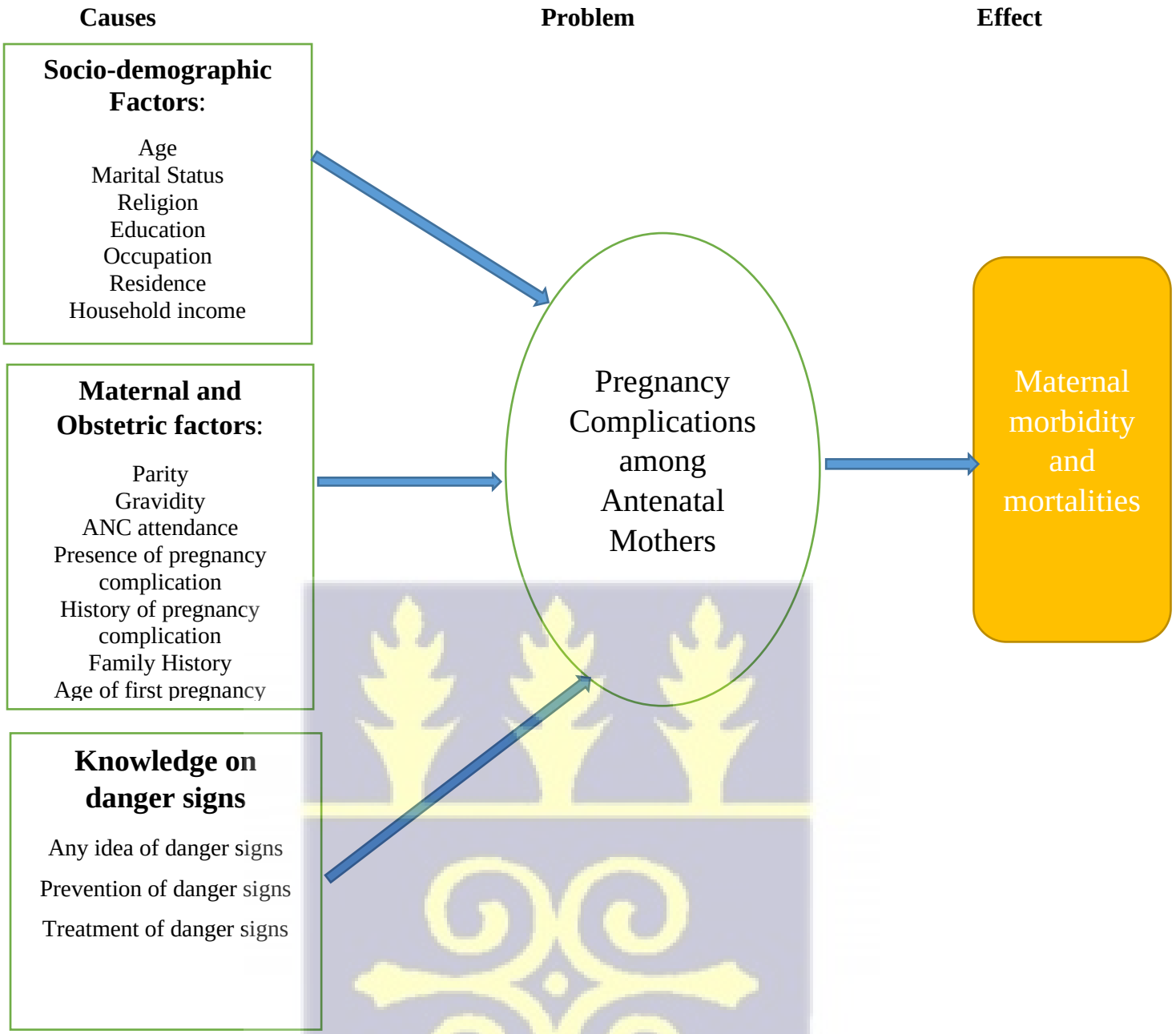

Figure 1: Conceptual Framework on possible factors that may cause the prevalence of pregnancy complications.

Source: Author's own construct

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter presents the various concepts and literature about study. In this chapter**,** the study discusses the general concept on pregnancy and the various types or forms of complications identified in pregnancy. Further discussions on the three main objectives of the study are done with focus on various literature on each section. The chapter is therefore divided into four parts with the first two parts focusing on definition of concepts and the prevalence of pregnancy complications in general (from global perspective through Ghana's context). The third and fourth component discusses the knowledge level of women on pregnancy complications and the factors that influence the prevalence of pregnancy complications among pregnant women. The chapter concludes with a summary of key highlights of the literature discussed and the gaps that have been identified in each of the key sections discussed. The main source of information for this literature included PubMed, Google Scholar, African Journal online and other reports of development partners.

2.2 Definition and discussions on Concepts

The various concepts on pregnancy are discussed under this section of the study. The definition and types of pregnancy is first discussed in this section and later followed by discussions on pregnancy complication's definition and types.

2.2.1 Definition and types of Pregnancy

Pregnancy, also known as gestation, is the period when one or more children develop in the womb of a woman. Multiple pregnancies produce more than one child, such as twins (Kelly & Dennis, 2019). Bašić-Kes, (2019) explains that the outcome of any pregnancy may either be a

live birth, a still birth or sometimes either a spontaneous miscarriage or induced abortion. However, for live births and/or still births, it is expected that the pregnancy may last for a period of 37-40 weeks before the delivery of the baby (Dines & Kattah, 2020). The development of the baby in the womb goes through a number of processes which mostly starts with the fertilization of the embryo. At week ten (10), the developed embryo is now considered as foetus until delivery. Pregnancy in general is associated with a number of signs and symptoms which mostly causes a lot of changes in the life of the pregnant woman. Kelly & Dennis, (2019) highlight some of the key changes as tender breast, early morning sickness which mostly comes in the form of nausea and vomiting, frequent urination and hunger.

Pregnancy is divided into three trimesters, each of which lasts about three months. According to Sotiriadis et al. (2019), the risk of miscarriage (the natural death of an embryo or foetus) is greatest during the first trimester. They added that movement of the foetus may be felt around the middle of the second trimester. If high-quality medical care is provided at 28 weeks, more than 90% of babies can survive outside of the uterus (Mei et al., 2019). Prenatal care has been shown to improve pregnancy outcomes (Aziz et al., 2020). Prenatal care may include taking extra folic acid, abstaining from drugs such as tobacco and alcohol, exercising regularly, having blood tests and having regular physical examinations. Pregnancy complications can include high blood pressure, gestational diabetes, iron deficiency anaemia, severe nausea and vomiting (Aziz et al., 2020). Labour starts on its own when a woman is "at the term" in the ideal childbirth. Babies born before 37 weeks are considered "preterm" and are at a higher risk of developing health issues such as cerebral palsy. Babies born between weeks 37 and 39 are referred to as "early term", while those born between weeks 39 and 41 are referred to as "full term". Babies born between weeks 41 and 42 are considered "late-term", while those born after 42 weeks are considered "post-term". It is not recommended to induce labour or perform a

caesarean section before 39 weeks unless it is necessary for medical reasons (Triay & Lambert, 2010).

The complexity of pregnancy and its uniqueness has resulted in different discussions into the various types that are classified under it. Different authors have explained in different terms what pregnancy is all about. However, not all of these types may have a direct link with pregnancy complications. One of the major types of pregnancy that may directly linked to pregnancy complications as discussed by Ross et al., (2018) is the molar type of pregnancy. With molar pregnancy, it is established that there is an abnormal development of both the placenta and embryo. In most cases, the molar type results in serious complications because of the deformity of the placenta and sometimes the embryo. When the abnormally is the pregnancy is only detected in placenta with the absence of an embryo, it is classified as complete molar pregnancy, however, when the abnormality is in both the placenta and the embryo, it is termed as partial molar. In most cases, molar pregnancies results in either miscarriages or induced abortion. Layden & Madhra, (2020) also discussed another form of pregnancy which is the ectopic or tubal pregnancy. Ectopic or tubal pregnancy is another complicated form of pregnancy that may lead to the death of both the mother and the baby if not managed well. In this case, the pregnancy is formed outside the main cavity of the uterus with the embryo surrounding the fallopian tube. The development of the baby in such pregnancies is affected which has the potential of causing serious harm to the mother. Similar to the molar type, this pregnancy mostly end-up in miscarriage or induced abortion. The ectopic or tubal pregnancy can further be categorised as intra-abnormal pregnancy especially when the embryo in the fallopian tube causes tear or rupture (Kirkpatrick et al., 2017).

Multiple pregnancies have also been explained by Ochsenbein-Kölble, (2019) as another important type that, though not directly linked, may lead to complications. Ochsenbein-Kölble

explains that even though multiple pregnancies especially twins are mostly received as good news, it comes with a lot complications especially when dieting is not well managed.

Another type of pregnancy that has a higher risk of causing pregnancy complications is the breech pregnancy. Kaul & Rami, (2020) explain that the breech pregnancy occurs when the head of the foetus is at the top of the uterus rather than facing down. In this situation, the feet of the foetus which is expected to be pointing down faces up as against the normal position of any foetus. At the point of delivery, the foetus or the baby is expected to have the head facing down to the cervix to facilitate smooth and safe delivery. The presence of a breech pregnancy automatically defiles the natural system of delivery which is mostly called spontaneous vaginal delivery (SVD). However, unless there is a change at the final stage, all breech pregnancies result in caesarean sections if the pregnancy is detected early and reported at the hospital. The caesarean section is a measure of averting any possible mortality related to the condition. Nonetheless, if a woman does not report to the facility for antenatal care services or report once and does not continue for effective monitoring, there is the possibility of the mother making an attempt to deliver through the normal SVD and may result in serious complications which may eventually end up as a referred case to a facility or probably death. It is therefore important all these forms of pregnancies are reported to appropriate facilities for proper monitoring by gynaecologist.

2.2.2 Definition and Types of Pregnancy Complications

Ellfolk et al., (2020) in discussing pregnancy complications indicates that major health problems that pregnant women face or go through during the period of pregnancy is classified as pregnancy complications. Ellfolk et al., (2020) further indicated that the term pregnancy complication is not limited to the occurrence of health problem to only the mother but to the

baby as well or sometimes the two (both mother and unborn child) may suffer some health problems. It is again explained that the occurrence of pregnancy complications may manifest in different forms. Additionally, the prevalence of a health problem which is used to define pregnancy complication may either occur prior to pregnancy or occur in the course of the pregnancy. In each case, it is the effect of the health problem to both the mother and the baby is analysed. Several studies have looked at different forms of pregnancy complications and how they affect the wellbeing of the pregnant mother and her unborn child.

Preeclampsia is classified as one of the major pregnancy complications that affects women in general especially in the third world countries (Brown & Al., 2018). The existence of preeclampsia has been dated back since 2200 BC with first incidence reported to be in Egypt (Chesley, 2015). However, the existence of preeclampsia is recognised for only a little over 100 years now (Roberts & Bell, 2013). Roberts & Bell, (2013) further explains that the increase in preeclampsia cases and the rate of impact on maternal health conditions necessitated a number of research into the problem. Brown. et al,, (2018) in their study on preeclampsia explained that preeclampsia is one of the commonest maternal challenges associated with pregnancy disorder, which occurs as a result of the onset of proteinuria and hypertension during pregnancy. Preeclampsia continues to remain a major maternal health challenge in pregnancy globally among all pregnancy-related risk conditions and increases the risk of mortality among mothers (Eiland et al., 2012). The incidence rate and burden of health is significantly high in developing countries compared to developed countries (Bilano et al., 2014). Say et al., (2014) explains that nearly 14% of all maternal morbidities and 27.1% of all maternal mortalities are as a result of preeclampsia. Though different studies have shown different results of preeclampsia prevalence, largely, most of the studies have put preeclampsia prevalence between 2-14% (Ghulmiyyah & Sibai, 2012; Wagnew et al., 2016; Macedoa et al., 2020).

However, in Ghana, studies conducted have shown relatively higher prevalence of preeclampsia among pregnant women. Adu-Bonsaffoh et al., (2017) in a study in Korle-Bu observed a preeclampsia prevalence of 21.4% while Ahenkorah et al., (2019) in a similar study in Bolgatanga recorded a preeclampsia prevalence of 25.4%.

Another pregnancy complication that is common among women in developing countries is miscarriages. Rowe & Hawkey, (2019) in discussing miscarriages in pregnancy as a complication explained that miscarriages normally occurs when there is an abrupt end or unexpected end of any pregnancy and this may even be termed as premature abortion. Rowe & Hawkey explain that more than a quarter of all pregnacies mostly result in miscarriages. Most often, these miscarriages occur at the point when the woman has no idea of her pregnancy status. Rowe & Hawkey further indicated that between 10-20% of all pregnancies that women are mostly aware of end in miscarriage and that nearly 90% of all these miscarriages occur before week 12 of the pregnancy. However, Martin et al., (2019) further indicates there are some extreme cases where less than 2% of those who experience miscarriage may have late miscarriage which mostly occur between 16-20 weeks of gestation. Wahabi et al., (2018) in a study on how to use progestogen as a means of treating miscarriages explained that between 15-20% of all pregnancies result in spontaneous miscarriage. The study discussed some of the signs of miscarriages to include vaginal bleeding which may not come with any abdominal pain, closure of the cervix and rising temparature in some cases. Women who experience miscarriages are largely affected psychologically expecially when they have waited for quite some time to have a child.

Hypertensive disorder (high blood pressure) is another pregnancy complication that is increasingly affecting women. Berhe et al., (2020) noted that when chronic high blood pressure

is not well managed, the risk of maternal and child morbidity and mortality increases over time. Hypertensive disorders (high blood pressure) is prevalent in about 10% of all pregnancies in the United States and about 13% in all pregnancies globally (Leeman et al., 2016). It is known as one of the most common complications in pregnancy and has been the root cause of about 7% of all maternal mortalities (Centers for Disease Control and Prevention., 2019). An assessment of hypertensive disorders among women within reproductive age by Bateman et al., (2012) shows that about 7.7% of all women who get pregnant develop severe hypertensive disorder. Bello et al., (2021) discussed hypertensive disorder under chronic hypertension and gestation hypertension. An assessment of the two types of hypertension among 139,389 pregnant women showed that 14.3% of the women developed chronic hypertension while the prevalence for gestational hypertension was 13.8% (Bello et al., 2021).

Anaemia in pregnancy is another equally observed pregnancy complication that continues to threaten the life of women. Berhan & Berhan, (2014) in a study on anaemia among pregnant women noted that in developing countries, it is one of the commonest three major pregnancy complications among antenatal women. An assessment by the World Health Organization, (2011) on global estimates on conditions among pregnant women indicates that nearly 56% of all women in less developed countries develop anaemia during the last trimester of pregnancy. Wemakor, (2019) in a study on anaemia in pregnancy in Northern Ghana stated that the prevalence of anaemia in pregnancy is becoming a burden for both antenatal women and health workers who assist in managing anaemia conditions. Wemakor in his study observed that as high as 50.8% of all the pregnant women who participated in the study had anaemic conditions. The study further noted that anaemia condition increases with an increase in gestation week of the pregnancy and that more than two-thirds of the conditions occur in the final trimester. McClure et al., (2014) in analysing why anaemia conditions in pregnancy continues to rise in

sub-Saharan Africa noted that the level of iron intake is very limited among pregnant women. Most women tend to depend largely on carbohydrate foods with little or no iron rich foods. Beatty et al., (2017) argues that in places where animal protein, fruits and vegetables are common and easily accessible, cultural practices and other belief systems prevent pregnant women from utilising these products to boost their iron content and consequently increase their blood level.

2.3 Prevalence of pregnancy complications among antenatal women

The prevalence of pregnancy complications or danger signs is discussed in this section at two different levels. First, this review looks at the pooled prevalence of all complications in different studies while the second part discusses pregnancy complication specific prevalence.

Law et al., (2015) conducted a retrospective comparative study among pregnant women aged 15-49 years to determine the prevalence of pregnancy complications and its effect on healthcare cost in developed countries. The study which utilised secondary data (maternal records of pregnant women) of 322,141 pregnant women observed a pooled prevalence (number of pregnant women with at least one complication) of 46.9%. Further analysis was done in the study to determine which pregnant complication is more predominant among the pregnant women. The study observed that foetal abnormality was the most predominant complication with 24.7% of the women experiencing this complication. Additionally, about 16% of the women had early or threatened labour while 10.6% and 7.2% of the women had haemorrhage and diabetes or abnormal glucose tolerance respectively. Mwilike et al., (2018) in another study in Tanzania using urban women observed that 17.4% of the women who visited the facility for antenatal care services had pregnancy complications. Those with pregnancy complications, majority (91%) were diagnosed in health facilities while the other 9% were seen by the women themselves.

Paul Jean Sengoma et al., (2017) also conducted a facility-based cross-sectional study in Uganda to determine the prevalence of pregnancy-related complications among pregnant women. The study was conducted between 2014 – 2015 and recruited 817 pregnant women who were utilising antenatal care services in selected facilities within the northern province of Kampala. The study observed almost a similar prevalence as in the case of Law et al., (2015) with a prevalence of 43.1%. However, unlike the study by Law et al., (2015) in the USA where specific complications prevalence was relatively higher in foetal abnormality and threatened labour, the study in Rwanda observed different types of pregnancy complications. Among the reported cases of pregnancy complications in the study areas were anaemia, severe vaginal bleeding, hypertensive disorder and diabetes. Specifically, the study noted that 14.9% of the women had anaemia which was mostly detected in the last trimester, 5.6% with severe vaginal bleeding and 5.3% diagnosed of diabetes. Rulisa et al., (2015) in a study in Rwanda looked at the prevalence and factors that contribute to maternal near miss among pregnant women who utilise tertiary health facilities. In the definition of the maternal near miss, the study concluded that pregnancy complications are generally the contributing factors to maternal near-miss among the women. These levels of complications generally increased the rate of caesarean utilization among the women. The prevalence of maternal complications as observed in the study by Rulisa et al., (2015) was 41.3% while the rate of caesarean utilization was 45%. More than 85% of the women with maternal complications resulted in caesarean section. On specific complications (measured as severe maternal morbidity), the study observed that peritonitis, hypertensive disorder, haemorrhage and cardiomyopathy were top complications among pregnant women with observed prevalence at 30.2%, 28.6%, 19.3% and 5.2% respectively.

In general, majority of the studies on pregnancy complications have looked at specific complications and their respective prevalence and associated factors. Studies on preeclampsia

have extensively been done at different levels especially in Ghana and Africa in general. Ngwenya, (2017) in a study in Mpilo Central Hospital in Zimbabwean city of Bulawayo observed that only 1.3% of the women who utilise the facility had preeclampsia. The study however limited its focus on severe type of preeclampsia without considering the mild one. Vata et al., (2015) also analysed the prevalence of preeclampsia in Dilla region of Ethiopia and observed a lower preeclampsia prevalence of 2.2%. When further analysis was done to determine only severe preeclampsia cases, the study observed similar rate of 1% as in the case of Ngwenya, (2017). Ngwenya, (2017) used about 7,700 maternal records of pregnant women and arrived at that conclusion. Another study in Ethiopia by Belay & Wudad, (2019) using antenatal records of women who utilised some selected facilities over a period of a year however observed relatively higher prevalence. While Vata et al., (2015) focused on urban facilities, Belay & Wudad, (2019) looked at both urban and rural women who utilise antenatal care services. Belay & Wudad, (2019) observed a prevalence of 12.4%, about 10% more than the observed rate in the earlier study by Vata et al (2015). The size of the sample may play a role in the observed prevalence of the preeclampsia. While Vata et al. used over 7,700 maternal health records and recorded relatively lower rate (2.2%), Belay & Wudad, (2019) only sampled 129 pregnant women for face to face and observed relatively higher prevalence (12.4%).

Musa et al., (2018) in a study in Nigeria in the Jos Teaching Hospital observed a preeclampsia prevalence of 8.8%. Onoh et al., (2020) in another study in Nigeria focusing on severe preeclampsia observed that 3.4% of the women had severe preeclampsia while 0.6% experienced eclampsia. In an earlier study in the Calabar Teaching Hospital, Kooffreh et al., (2014) estimated the prevalence of preeclampsia and discussed the factors that influence the prevalence of preeclampsia. In that study, it was observed that only 1.2% of 8,525 women had records of preeclampsia. Studies in Ghana on preeclampsia have shown relatively higher

prevalence as compared to that in Nigeria within similar teaching hospitals. While the studies in the two Nigerian teaching hospitals as reviewed were lower than 10%, the rate in Ghana was higher than 20%. Adu-Bonsaffoh et al., (2017) in their study in Korle-Bu Teaching Hospital observed that 21.4% of the women who utilised maternal health services in the facility had preeclampsia. Ahenkorah et al., (2019) in a different in the Bolgatanga Regional Hospital of Ghana noted that 25.4% of the women who utilised antenatal care services in the year 2017 reported preeclampsia. Notwithstanding these high prevalences, a study by Fondjo et al., (2019) in Kwame Nkrumah University of Science and Technology hospital observed a prevalence of 4.0%.

Anaemia in pregnancy is another major pregnancy complication women face. In Ghana, the prevalence of anaemia in pregnancy differs from one study to the other. Anlaakuu & Anto, (2017) in a study in Sunyani Regional Hospital among antenatal women observed different levels of anaemia conditions. The study categorised anaemia prevalence into severe, moderate and mild as per the definition of Ghana Health Service, (2016). For severe anaemia, the study observed a prevalence of 1.6% while a prevalence of 16.1% was observed for moderate anaemia and 40.2% for mild anaemia. Wemakor, (2019) also conducted a study in Tamale Teaching Hospital among women who access antenatal care services. Using analytical cross-sectional design of 400 pregnant women, the study observed that 50.8% of the women were anaemic. The study further noted that the prevalence of anaemia increases with increase in gestation period. Anaemia prevalence in the first trimester was 32.2% and further increased to 53.7% and 77.5% in the second and third trimesters respectively.

Hypertensive disorder continues to be another challenge in Ghana and other developing countries with relatively high prevalence. In an earlier study by Obed & Patience, (2006), it

was noted that the general hypertensive disorder prevalence among pregnant women in Ghana ranges between 6% to 7.5%. However, over a period of time, different studies have shown higher prevalence. Adu-Bonsaffoh et al., (2017) analysed the prevalence of hypertensive disorder among pregnant women who visited antenatal care services in Korle-Bu Teaching Hospital. Among the 1856 pregnant women who were sampled for the study in Korle-Bu Teaching Hospital, 398 women representing 21.4% were diagnosed with hypertensive disorder. Gemechu et al., (2020) also did a study on the prevalence of hypertensive disorder of pregnancy and its associated outcomes in sub-Saharan Africa including Ghana. The study observed a pooled prevalence of 8% of all hypertensive disorder across the study countries. Awuah et al., (2020) in a study in Komfo Anokye Teaching Hospital noted that 39.25% of the pregnant women who participated in the study were diagnosed of hypertensive disorder. Further analysis of the results showed that 33.3% of the women had gestational hypertension while 4.8% had chronic hypertension.

Other pregnancy complications in Ghana show different results and outcomes. Ahinkorah et al., (2021) conducted a desk review of the 2017 Ghana Maternal Health Survey focusing on induced abortion, miscarriages and still births. Miscarriage was higher among the three pregnancy complications analysed in this study. The prevalence of miscarriage among pregnant women in Ghana was 10.8% while induced abortion among the pregnant women was 10.4%. Polis et al., (2020) also conducted a stratified sampling study using data from 598 facilities across the country. The study noted that the rate of induced abortion was relatively high among pregnant women with a rate of 26.8%.

2.4 Knowledge of antenatal women on pregnancy complications/danger signs

General assessment of knowledge levels among antenatal women on pregnancy complications is crucial in the study of complications in pregnancy. Different studies have assessed the level of knowledge among pregnant women on pregnancy complications in developing countries. Hoque & Hoque, (2011) conducted a study in KwaZulu-Natal province in South Africa among pregnant women on their knowledge levels on danger signs for major obstetric complications. The study focused largely on urban women who were relatively younger with a mean age of 26 years. The study noted that 52% of the women knew about some dangers of major obstetric complications. Ameyaw et al., (2020) tried to find out whether knowledge on pregnancy complications affects the utilization of skilled delivery. The study analysed the 2014 Demographic and Health Survey of Bangladesh. The study noted that about 53% of the women who utilise antenatal care services in the health facilities indicated that they had been told of danger signs in pregnancy. The study however did not estimate the degree of knowledge whether it is adequate or inadequate. Awareness about danger signs may not be enough to influence skilled delivery as the study sought to do. Mwilike et al., (2018) did an extensive analysis of knowledge levels of pregnant women on pregnancy complications. The study which was conducted in Tanzania enrolled 384 antenatal women in two different health facilities. General awareness levels of women on danger signs were relatively high with a rate of 57.8%. However, when detailed assessment of knowledge was done, it was observed that only 31% of the women had adequate knowledge of danger signs in pregnancy.

Different studies on knowledge about obstetric danger signs have been conducted in Ethiopia from different regions and with diverse results. Maseresha et al., (2016) conducted their study in Somali region of Ethiopia using 632 women. The study results showed that only 15.5% of the women had adequate knowledge about obstetric danger signs. In the Oromia region of

Ethiopia, Wassihun et al., (2020) also conducted a study to assess the knowledge of antenatal women. Among the 422 women who participated in this study, 64.7% were able to mention at least one of the danger signs, however, women with good knowledge were relatively lower (40.5%) compared to those who were aware of danger signs. Another study by Damme, (2016) in the Gedo region of Ethiopia looked at knowledge levels of pregnant women who were attending antenatal care services in some health facilities within the region. The observed knowledge level in Gedo was relatively higher among the studies that were done in Ethiopia which have been reviewed. Among the 198 women who participated in the study, 57.5% of the women had adequate knowledge about dangers signs in pregnancy. The high knowledge levels observed in this study is largely influenced by the level of educational status of women. Other key determinants to the knowledge levels included occupational status and access to social media. Majority (78%) of the women had access to social media and were actively using it.

In Uganda, Kabakyenga et al., (2011) conducted a study on knowledge about danger signs and bed preparedness practice among 764 rural women who had recently delivered. Through retrospective approach, the study asked the women to mention at least one of the danger signs in pregnancy as a means of assessing awareness. The study noted that 72% of the women were aware of at least one of the danger signs in pregnancy. However, when further assessment was done to test the knowledge of at least any three of the danger signs, the knowledge score was far lower than expected with only 19% of the women reporting adequate knowledge on three or more of the danger signs. Woldeamanuel et al., (2019) also assessed the knowledge levels of pregnant women and its associated factors in the Tera district of Northern Ethiopia. The study sampled 563 women and tested their knowledge on key danger signs in pregnancy. The results of the study analysis showed that 37.5% of the women were more knowledgeable about obstetric danger signs. Unlike the study by Kabakyenga et al., (2011) which focused on rural

women, the study by Woldeamanuel et al., (2019) combined both rural and urban women. Significantly, the rate of knowledge among the pregnant women on obstetric danger signs was influenced by place of residence (urban) and educational status. Despite involving urban women in their study, Hibstu & Siyoum, (2017) observed a lower rate compared to Woldeamanuel et al., (2019). Hibstu & Siyoum, (2017) noted that women who had adequate knowledge about obstetric danger signs were 21.9%, a rate which is almost the same as the knowledge rate observed in Kabakyenga et al., study.

A study by Ossai & Uzochukwu, (2015) also had a differnet prespective about knowledge levels of women on obstetric danger signs. Comparative assessment was done between rural women and urban women on their level of knowledge about obstetric danger signs. The study observed that women who were in rural communities had higher knowlegde rates (24.4%) compared to urban women (16.7%). The determining factors of obstetric danger signs do not remain at times. In Ghana, an assessment of knowledge levels of pregnant women on pregnancy danger signs show different results from each other. Aborigo et al., (2014) conducted a similar study to assess the knowledge levels of women on obstetric danger signs and the factors that influenced the health seeking behaviour of women in the Kassena-Nankana District of Northern Ghana. Unlike the others so far reviewed, this study used qualitative method to solicit information from women who have had at least one delivery. Through focus group discussions, the women demonstrated good knowledge about dangers signs by mentioning most of the obstetric danger signs that are commonly known. Some of the dangers signs that were commonly mentioned are excesive bleeding, waist pains, stomach ache, frequent vomiting and fever. Generally, source of information from these women was mainly through health workers. Saaka et al., (2017) also conducted another study on knowledge about dangers signs and how social behaviour change communication (SBCC) can influence the

knowledge levels among pregnant women. The study which was conducted in East Mamprusi District of Northern Ghana sampled 521 antenatal women. Assessment of adequate knowledge was done using least three obstetric danger signs as indicators for adequate knowledge. The study therefore observed that 51.2% of the women had adequate knowledge about obstetric danger signs. However, when further assessment was done to ascertain the difference in knowledge among those who received SBCC intervention, the study noted that knowledge levels changed by 2.1 times. Women who received social behaviour change communication scored 2.1 times more in knowledge score than those who did not receive any SBCC.

2.5 Factors Affecting the prevalence of pregnancy complications

The discussion on the prevalence of pregnancy complications have shown that while there are lower pregnancy complication rates in some areas, other countries have recorded higher pregnancy complication rates. Some of the studies on the prevalence tried to look at the reasons that have caused these variations in rates across the study areas. In some cases, the prevalence within a given country differs and therefore require further discussions to know why the difference in prevalence rates among different studies. The discussion on the factors have been segregated into three: 1). socio-demographic factors, 2). clinical and health service factors; and 3) socio-cultural and community factors. Most of these discussions are done in relation to a particular pregnancy complication as studies on general complications are limited.

2.5.1 Socio-demographic factors associated with prevalence of pregnancy complication

Different studies have linked several socio-demographic factors to pregnancy complications in general while other studies have looked at specific pregnancy complications rather than general assessment. Studies by Luo et al., (2020), Jones et al., (2017) and Rulisa et al., (2015) have all done a pooled analysis of most of the pregnancy complications in a single study. Luo et al.,

(2020) in a study in China analysed the rate of pregnancy complications among nulliparous and multiparous women in a prospective cohort study. Among the nulliparous women, the study noted that women with advance maternal age (≥ 35 years) were more likely to develop maternal complications such as preeclampsia, gestational hypertension and premature rupture of the membrane as compared to women aged 20-29 years. However, among the multiparous women, the study noted that an increase in the maternal age of the women resulted in high occurrence of gestational diabetes mellitus, anaemia, preterm labour and premature rupture membrane by 3.29, 1.85, 1.89 and 5.14 times respectively. The study by Jones et al., (2017) in the Hohoe Municipality in Ghana as in the case of Luo et al. also observed only maternal age as the only demographic factor influencing pregnancy complications. The study observed that women with age between 35-39 years were more likely to develop pregnancy complications compared to women aged 20-25 years. Depending on the type of the pregnancy complications, the rate of risk of complications increased with an increase in maternal age.

Rulisa et al., (2015) also analysed maternal complications and described it within the context of near miss cases among pregnant women in Rwanda. The study which identified sepsis, hypertensive disorder and haemorrhage as the main pregnancy complications noted that the rate of maternal near miss was relatively higher among women who belonged to the lower socio-economic status/class as well as women who resided in the eastern part of the country. Specifically, those in the eastern part were noted to be among the rural poor. Sengoma et al., (2017) in a study in Rwanda analysed pregnancy-related complications and its effect on the survival of a woman. The study noted that the prevalence of pregnancy-related complications was predominant among women who live far from a health facility as well as women belonging to poor households.

Beyond the assessment on general pregnancy complications, specific pregnancy complications and danger signs risk factors have been discussed at different levels. Studies on preeclampsia have also looked at socio-demographic factors that increases the risk of its occurrence. Bilano et al., (2014) in their study on preeclampsia risk factors stated that educational status of the pregnant mother is critical in determining the outcome of preeclampsia. The study observed that women with secondary or tertiary level education were less likely to develop preeclampsia as compared to women with no education. A study by Stitterich et al., (2021) which was conducted in Freetown, Sierra Leone analysed the risk factors that are associated with preeclampsia and eclampsia among women who are referred for maternal health care services in the main hospital in Freetown. The study was a case-control with 214 women with preeclampsia and eclampsia and 458 women within the control group. The study observed that a number of obstetric and maternal health factors, however, the only socio-demographic factor that predicted the prevalence of preeclampsia at univariate level was marital status of the women and the occupation of the women. Women who were in a relationship or married were 56% more likely to experience preeclampsia or eclampsia relative to women who are in no relationship. Similarly, women who were traders had 29% chances of experiencing preeclampsia more than women who were not employed. Morikawa et al., (2013) in a study among pregnant women on preeclampsia noted that women aged 35+ have higher risk of developing preeclampsia compared to women who are below 25 years. Morikawa et al. study noted that as a woman's age increases, the risk of preeclampsia also increases.

Another pregnancy complication that has further reviewed is anaemia as discussed earlier. Li et al., (2018) also analysed the prevalence and risk factors associated with adverse anaemia in pregnancy. The study noted that women aged 35 years or more had higher odds of developing anaemia in pregnancy than women with relatively lower maternal age. With an overall anaemia

prevalence of 23.5%, Li et al., noted that women with lower monthy incomes levels have higher risk of having anaemia in pregnancy compared to women with higer income levels. Additionally, women who reside in rural communities were more likely to have anaemia in pregnancy compared to their colleagues who reside in urban communities. Wemakor, (2019) in a study in Northern Ghana analysed factors that influence the prevalence of anaemia among women. Univariate analysis of the results showed that pregnant women who were Muslims were more likely to develop anaemic conditions during pregnancy compared to Christians. Again, the risk of anaemia was relatively higher among women who belong to lower quartile of household wealth group than women belonging to household with higher wealth.

The study by Ahinkorah et al., (2021) on analysis of the Ghana Maternal Health survey showed that some socio-demographic factors were significantly dominating the causes of induced abortion, still births and miscarriages in Ghana. The study observed socio-demographic factors such education, religion and residence to influence the general study outcome. Under education, the study noted that women with higher education had higher odds of experiencing miscarriages than women who have not had any education. The findings on religion were relatively different at various outcomes. Christian women were observed to have higher odds of having induced abortion as compared to Muslim, however, in the analysis of miscarriages, Muslim women were observed to have higher odds of miscarriages than Christian women. Both induced abortion and miscarriages were found to be relatively higher among women in residing in urban communities than women who reside in rural communities. Further noted that, women who are aged 25-34 years experienced more miscarriages as compared to women with lower age 15-24 years. Baruwa et al., (2021) also looked at the prevalence of induced abortion and its related factors among women in Ghana. The study observed that the prevalence of induced abortion was significantly associated with women who had secondary level of

education, who live in urban communities especially in the cities, who belong to non-Catholic denominations and those who were single. In general, the rate of induced abortion was higher among Akans as compared to the other ethnic groups.

In an earlier study by Mote et al., (2010) in Hohoe Municipality, it was noted that some of the outcome were relatively different from what had been observed in later studies. Mote et al., observed that the risk of induced abortion was relatively higher among women who were married as opposed to the observed result in the study by Baruwa et al., (2021). Mote et al., further observed that women who have secondary education were less likely to have induced abortion, a result that also opposite the finding by Baruwa et al., (2021). However, three results of this study conformed to most of the studies revealed. Mote et al., noted that the rate of induced abortion was significantly higher among women who live in urban and peri-urban communities, women who were married and women in formal employment. Klutsey & Ankomah, (2014) also did a similar study in the Volta region of Ghana and noted that the odds of induced abortion among married women reduced by 4% compared to women who were single while the odds of induced abortion among women with more than two pregnancies were relatively higher as compared to nulliparous women.

Discussions on hypertensive disorder in pregnancy has also been reviewed in a number of studies. Tebeu et al., (2011) in a study in Cameroun realised that, the risk of hypertensive disorder in pregnant among women were significantly associated with two socio-demographic factors: educational status and occupation. The study noted that women who were illiterates had 60% chances of having hypertensive disorder compared to women with higher level of education, i.e., secondary or tertiary. On occupation, it was further noted that the risk of hypertensive disorder was about 2.8 times higher among housewives compared to women who

were employed either in the formal sector or self-employed. Meazaw et al., (2020) in a study on hypertensive disorder in pregnancy among women in sub-Saharan Africa observed that women with lower educational level (no education or primary level) have higher odds of developing hypertensive disorders compared to women with tertiary education. The meta-analysis by Meazaw et al., further concluded that women with advanced maternal age had higher risk of developing hypertensive disorder compared those with lower maternal age. Mwanri et al., (2015) also in a similar study in Tanzania noted that the odds of hypertensive disorder increases with an increase in maternal age and that women above the age 35 years had higer risk of hypertensive disorder. The study noted that the risk of hypertensive disorder was higher among urban women than in rural communities. Mekonen et al., (2018) in a study on pregnancy-induced hypetension in Ethiopia observed that maternal age and education were significantly associated with the risk of hypertension in pregnancy. The study noted that women with advanced maternal age were more likely to have hypertension in pregnancy compared with women with lower maternal age while women with lower educational status had higher risk of hypertensive disorder compared with women with higher level of education. Another study in Nigeria by Azubuike & Danjuma, (2017) on hypertension in pregnancy found age and socio-economic status as the demographic significant factors that are associated with the study outcome.

A review of the socio-demographic factors have shown that limited analysis has been done on the factors that looked at general complications and danger signs in pregnancy. Nonetheless, specific studies in relation to specific pregnancy complications and danger signs have identified similar results that may apply in most of cases and can equally be applied in this study.

2.5.2 Obstetric and maternal factors complications

Similar review as was in the case of the socio-demographic factors have been done for obstetric and maternal conditions that influence the prevalence of pregnancy complications. In this discussion, a review is first done for general studies that have looked at pregnancy complications in general and later focused on specific complications as outlined earlier in this study. The study by Jones et al., (2017) in the Hohoe municipality observed that women with family history of hypertension and past record of preterm delivery have higher odds of experiencing some major pregnancy complications than women with no family history of hypertension and no past record of preterm delivery. Habtei & Wondimu, (2021) in a study on factors that influence maternal complications and near miss observed that history of pre-existing medical disorders increases the risk of pregnancy complications and maternal near miss cases. Additionally, the study noted that women who have had poor preparedness practice towards birth and complications have higher risk of maternal complications. Terefe et al., (2020) in their study on factors that contribute to danger signs and complications in pregnancy observed that the risk of prevalence of obstetric danger signs and complication are associated with antenatal attendants and parity. The study noted that women who have had less than four antenatal visits had higher risk of experiencing obstetric danger signs than women with four or more antenatal visits. Similarly, women who are primigravida had higher risk of experiencing obstetric danger signs than women who are multigravida.

The discussions on maternal and obstetric factors in the next sessions discusses specific pregnancy complications and their respective factors. In most cases, the factors from various studies and different pregnancy complication outcomes are similar, nonetheless, there are few results that have been differently observed. Wagnew et al., (2020) in a meta-analysis of a number of studies on preeclampsia observed that primiparous is a high-risk factor to

preeclampsia. The study noted that women who are pregnant for the first time have higher risk of developing preeclampsia and subsequently eclampsia compared to multiparous women. The analysis of series of studies further showed a significant relationship of previous history of hypertension and preeclampsia. Wagnew et al., (2020) argued that the risk of preeclampsia is higher among women who have history of hypertension in their previous pregnancy as compared to those without any history. Earlier studies in different context have all observed same results (Duckitt & Harrington, 2015; Tessema et al., 2021). Tessema et al., (2021) further noted that the outcome of a body mass index has a greater influence on the outcome of preeclampsia diagnosis. Women who are obese with BMI of more than 24.9 kg per meter square have higher risk developing preeclampsia than those with lower BMI. O'Brien,.et al., (2013) asserted that the BMI factor may be explained by the resistance of insulin which increases the risk of autoimmune disease, urinal tract infection, hypertension and consequently preeclampsia.

Stitterich et al., (2021) also in their study on preeclampsia factors observed that women with family predisposition for preeclampsia had higher odds of having preeclampsia compared to women with no family predisposition. Similarly, women with past records of hypertension had higher odds of experiencing preeclampsia in pregnancy relative to women with no past record. Other significant factors that the study observed a having an association with preeclampsia include urinary tract infection during pregnancy, presence of prolonged diarrhoea during pregnancy and inadequate food intake. Gabbe et al., (2016) in their study identified family history of preeclampsia, obesity, gestational diabetes, pre-existing chronic hypertension and multifetal gestation as significant factors that are associated with preeclampsia. Fox et al., (2019) also in a different study on preeclampsia risk factors noted that women with family

history of preeclampsia, multifetal pregnancy and with pregnancy intervals of more than 10 years have higher risk of experiencing preeclampsia than their counterpart women.

Different studies have also shown significant results on hypertensive disorders in pregnancy. Mwanri et al., (2015) in their study noted that women with minimum dietary diversity score were more likely to develop hypertensive disorder. Again, the study noted with women who are HIV positive have higher risk of experiencing hypertensive disorder. Tebeu et al., (2011) in their multiple analysis of risk factors noted that the odds of experiencing hypertensive disorder was significantly higher among nulliparous women compared to multiparous women. Additionally, the risk of hypertensive disorder increases among women with family history of hypertension and history of hypertension in the woman compared to women with no family history or history of hypertension. Meazaw et al., (2020) in their study also observed similar results as other studies on factors influencing the prevalence of hypertensive disorders. The study noted that primiparous women and those with a family history of hypertension had higher risk of experiencing hypertensive disorder compared to nulliparous women and women with no family history of hypertension. Mekonen et al., (2018) also observed the same results as all studies that, women with family history of hypertension and preeclampsia have higher risk of pregnancy-induced hypertension. Azubuike & Danjuma, (2017) and Brown et al., (2018) have all confirmed similar results in hypertensive disorder risk analysis studies. The existence of family history and past records of hypertension in the woman play a major role in hypertensive disorder prevalence.

Anaemia studies have also been looked at from different perspectives. The results in these studies are relatively similar to each other (Li et al., 2018; Fondjo et al., 2019; Wemakor, 2019). Fondjo et al., (2019) in their study in Ghana also discussed some of the significant factors that

contribute to the prevalence of anaemia in pregnancy. The study noted that the risk of anaemia increases with gestational age in that as the gestational age of the pregnancy increases, the risk of anaemia also increases. The study noted that the higher risk of anaemia was observed in the third trimester. Additionally, the study noted that women who use tap water rather than purified water had higher risk of anaemia in pregnancy. Wemakor, (2019) in their anaemia study in northern Ghana observed that the risk of anaemia is higher among women who are in the third trimester compared to women in their first and second trimester. The study by Li et al., (2018) on anaemia observed that the body mass index of pregnant women even prior to pregnancy possess a lot of risk in developing pregnancy complications especially anaemia.

2.5.3 Other related factors on pregnancy complications

Knowledge about danger signs and other specific complications play significant role in limiting the occurrence of pregnancy complications among pregnant women. Wensing & Grol, (2019) have argued that knowledge is the main thrust of every health intervention and that science cannot thrive without knowledge. They further argue that for any intervention to achieve its ultimate objective, it is important to situate the intervention within the knowledge cycle of the people for which the intervention is implemented. Wensing & Grol, (2019) concludes that in areas where there exists an increased knowledge about a health condition, adherence and support for such intervention is relatively high. Acknowledging the importance of knowledge on uptake of health services, Almomani et al., (2021) recommends for a consented effort to ensure increased knowledge in any health service to facilitate smooth and increased uptake of the service.

Knowledge studies on pregnancy dangers signs and its relationship on the occurrence of pregnancy complications have all confirmed the assertion by Wensing & Grol, (2019) and Almomani et al., (2021). Terefe et al., (2020) also did an extensive assessment of knowledge

levels of pregnant women on dangers signs and its implication on pregnancy complications. The study's main focus was to identify factors that influence the occurrence of pregnancy complications. Multiple analysis of the results showed that knowledge about pregnancy danger signs was a major contributing factor in the prevalence of pregnancy complications. The knowledge result showed that women who had adequate knowledge about pregnancy danger signs had a reduced risk of experiencing pregnancy complications compared to women with limited or no knowledge about danger signs. In their analysis, Terefe et al., further elaborated that women with adequate knowledge were cautious about certain behaviours and lifestyle that could lead into risk dactors. Adherence to recommended preventive measures were relatively higher among those with adequate knowledge about danger signs. Fathy & Eittah, (2017) also did a similar study in Egypt to ascertain whether knowledge about pregnancy danger signs have any effect on the prevalence of pregnancy complications among pregnant women. The study noted that knowledge levels among prgnant women were relatively high and that reduced the risk of pregnancy infection in general.

Other studies have also been done to ascertain the relationship that exist between knowledge levels on anaemia and the prevalence of anaemia in pregnancy. The study by Wemakor, (2019) in the northern Ghana also analysed the levels of knowledge and its effect on anaemia. The study noted that knowledge levels on anaemia was relatively low among the pregnant women. The study observed that women who had little or no knowledge about anaemia had higher odds of experiencing anaemia in pregnancy especially during the third trimester compared to women who had higher knowledge about anaemia and how it occurs. Knowledge on anaemia focused basically on prevention and management. In northern Ghana, the study noted that intake of folic acid was relatively low among women with little knowledge since they did not know

about the importance of the intake of folic acid. In India, Prabhu & Balakrishanan, (2015) also looked at how an increase in knowledge can improve anaemia conditions in pregnancy.

Appiah et al., (2020) assessed the knowledge of and the adherence to anaemia prevention among pregnant women in Juaboso in the Western North region of Ghana. The study observed very low knowledge rate of 13.5% on anaemia among the pregnant women with a high anaemia prevalence of 43.3%. The study observed that the low levels in knowledge affected the rate of adherence to preventive measures with only 39.1% showing good practice to anaemia prevention. The study further noted that the rate of anaemia was significantly higher among women with low knowledge about anaemia in pregnancy compared to women who had higher knowledge about anaemia. Augustina et al., (2021) also tried to assess the knowledge levels of pregnant teenagers and how their knowledge levels affected their adherence and prevalence of anaemia in pregnancy in some selected health facilities in Indonesia. The study observed anaemia prevalence of 44% among the teenage pregnant women, a result which was noted as one of the highest within the country and across several studies. The result of anaemia prevalence was relatively in line with the knowledge score. Less than half of the teenage women had adequate knowledge about anaemia. The study observed that, more than 60% of the pregnant teenagers with anaemia were those who had little or inadequate knowledge about anaemia. It is evident from these discussions that having adequate knowledge about a particular pregnancy complication or its related danger signs reduces the risk of the occurrence of that particular complication in pregnancy.

2.6 Summary of Literature

The literature on the prevalence of pregnancy complications was extensively reviewed and the results showed that nearly all the studies on complications were limited to specific

complications. Prevalence studies for pregnancy complications like preeclampsia, anaemia in pregnancy, hypertensive disorders, etc were easily accessible from various journal cites. Both meta-analysis and cross-sectional studies discussed prevalence results of a prevailing pregnancy complication within a given geographical area. However, studies on pooled pregnancy complications are limited. A scan through various journals showed that only a few studies have been conducted to assess the general pregnancy complications in pregnant women. This remains a major gap which this study seeks to address. This study therefore seeks estimate the proportion of women within the study area who have exhibited at least one of pregnancy complications.

Similarly, a review of literature has shown that studies on factors influencing pregnancy complications have been limited to specific pregnancy complication rather than discussing general factors of pregnancy complications irrespective of the type of complications. The only two studies that were observed during a review of literature were conducted outside Ghana. There has not been any general study so far in Ghana and especially in Greater Accra that have considered general factors influencing pregnancy complications.

CHARPTER THREE

METHODOLOGY

3.1 Introduction

The method employed in this study was explained in this chapter. The discussion on the methods starts with the study design employed for this study, the study area, target populations, sample size estimation and sampling techniques. Other sections discussed in this chapter include methods of data collection and tools, pre-testing, quality control, variables and analysis of data. The chapter concludes with highlights of the key ethical issues that are been addressed in this study.

3.2 Study design

The study employed a facility-based analytical cross-sectional design among pregnant women attending antenatal care services in Mamprobi Hospital. The study used quantitative method to collect the data from October – November, 2021. The quantitative data was to estimate the prevalence of pregnancy complications among the pregnant women and further estimate the knowledge levels as well as the significant factors for the prevalence of pregnancy complications.

3.3 Study area

The study was conducted at the Mamprobi Hospital within Ablekuma South District of Greater Accra region.

3.4 Target and study population

The study population were pregnant women who attended antenatal care services at Mamprobi Hospital.

3.5 Inclusion Criteria

Participants for this study included:

a. Pregnant women who were utilising antenatal care services at Mamprobi Hospital irrespective of the gestation period.
b. Pregnant women who had been referred to the facility for maternal health services
c. Women who were able to provide their antenatal cards

However, the following pregnant women will be excluded from the study:

a. Pregnant women who were due for labour
b. Pregnant women who were indisposed and could not participate in the study.
c. Pregnant women who were not willing to participate in the study.

3.6 Sample Size determination

The study sample size was derived using the Cochran formula (Cochran, 1977) which is:

$$N = \frac{Z^2 p (1-p)}{e^2}$$

Where:

N = sample size,

Z= confidence level of 95% (standard value of 1.96),

e = margin of error = 0.05 and

p = prevalence of pregnancy complication = 43.1%; i.e., proportion of pregnant women presenting with pregnancy complications at antenatal care service in a study by Rulisa et al., (2015).

$$N = \frac{(1.96)^2 \times 0.431 (1-0.431)}{0.05^2} \approx 377$$

Adjusting for a 10% non-response rate gives, *0.1 * 377= 37.7 ≈38*

Therefore, the desired sample size for the quantitative study was 377+38 = 415

3.7 Sampling Techniques

The study employed simple random sampling method to select participants for the study. With a total of 415 women surveyed, the study divided the study participants into ten (10) groups, each group for a day which gave an average of 42 women per day. Averagely, 100 pregnant women attend ANC services per day in the facility. For each group, 42 women were randomly sampled from among the estimated 100 attendees for ANC services. Pieces of papers were numbered 1-100 and the attendees were asked to randomly pick from the list. Participants who selected from 1 – 42 were sampled for the study for each day until the final participant is interviewed.

3.8 Study variables

The variables for this study included the dependent and independent variables. Details of the each of the variables is presented in Table 1.

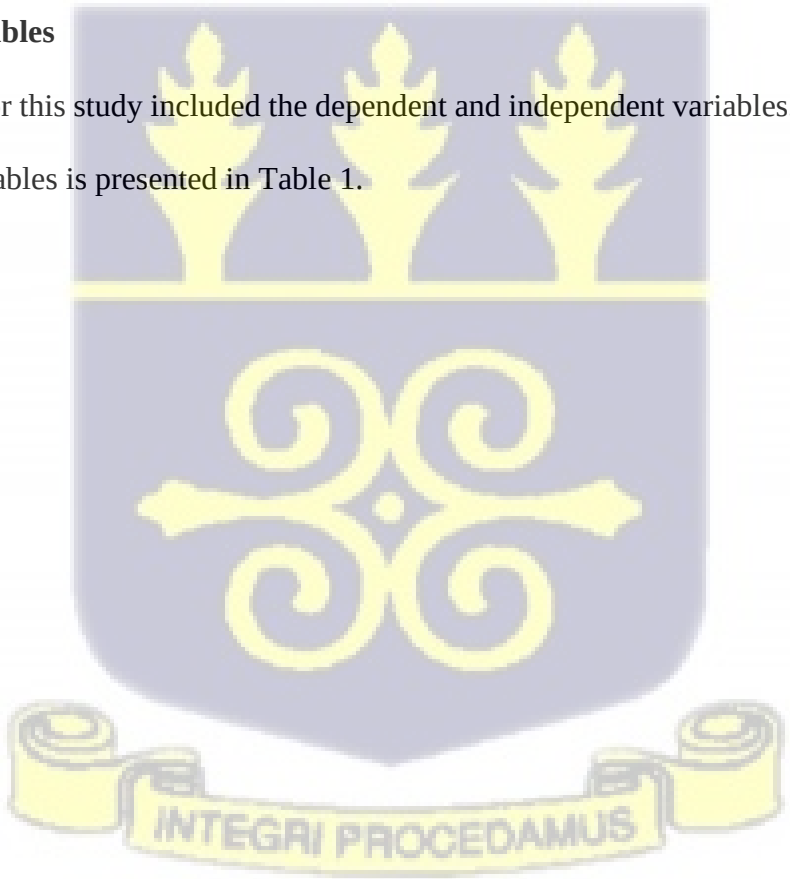

Table 1**: Description variables for the study**

Variable	Operational Definition	Source	Measurement
Outcome Variable			
Prevalence of pregnancy complications	Proportion of pregnant women who are diagnosed of at least one pregnancy complications at ANC	Antenatal care records	Numerical
Independent Variables			
Age	Age in completed years	Respondent	Continuous
Marital Status	Whether married, never married or divorced	Respondent	Categorical
Educational Status	Level of education attained	Respondent	Categorical
Parity	Number of births	Respondent	Numerical
Residence	Place of residence	Respondent	Categorical
Occupation	Type of work of the woman	Respondent	Categorical
Religion	Type of religion	Respondent	Categorical
Type of Marriage	Type of marriage	Respondent	Categorical
NHIA Member	NHIA card holders who access health facility with the card	Respondent	Categorical
Gestation	Gestation period; first trimester, second and third trimester	Antenatal care record	Numerical
Age at first pregnancy	Age in completed years	Respondent	Numerical
History of pregnancy complication	Yes or No to at least any one past record of pregnancy complication	Respondent	Categorical
Family history of pregnancy complication	Yes or No to family history	Respondent	Categorical
Knowledge on danger signs	Knowledge measured in low, moderate and high. Knowledge was determined based on whether pregnancy complication have been heard and knows the signs and symptoms	Respondent	Numerical
Distance to health facility	Distance in kilometres from the woman residence to nearest health facility	Respondent	Numerical
Gravidity	Number of pregnancies a woman has had in absolute numbers	Respondent	Numerical

Wealth index	Type and number of assets owned by the household. Index computed using PCA method, measured in five quantiles of poor	Respondent	Numerical

3.9 Data Collection Instruments and Data Collection

The study used a structured questionnaire to gather data from pregnant women who met the inclusion criteria. The structured questionnaire was designed according to the objectives of the study and grouped into four sections. Section 1 of the questionnaire solicited information on the demographic characteristics of the pregnant women such as age, marital status, religion, educational status, etc. The Section 2 of the questionnaire gathered information on maternal and obstetric factors. Section 3 focused on the questions in the knowledge assessment of pregnant women on pregnancy complications. The final section of the questionnaire was targeted towards household wealth assessment. Some of the key information that were collected for this section included availability of pregnancy complications or danger signs, parity, number of ANC attendances, gestational age of pregnancy at the time of interview, etc

Data collection for this study was led by the researcher with support from two research assistants. The research assistants were trained on the data collection tools, data collection techniques and ethical requirements. During the data collection process, all Covid-19 protocols were strictly adhered to. Details of Covid-19 protocols have been discussed in the Ethical section of this study.

3.10 Pre-Testing

The structured questionnaire was tested in a facility that had similar characteristics as the facilities that had been sampled. A total of 10 pregnant women who were attending ANC services in another facility in the adjoining district were interviewed to test the quality of the

questionnaire. The results from the piloting were used to shape the main questionnaire and finalised for main survey.

3.11 Quality control

During the data collection process, the investigator ensured that the responses provided by the pregnant women corresponded to the questions asked by pre-testing the questionnaire to eliminate ambiguity. For each questionnaire, different codes were assigned to distinguish each questionnaire. Each questionnaire was validated by the researcher after the interview to ensure that data gaps were filled prior to data entries. Data entries was done into an Excel file and password-protected on a computer file. The password to this file was only accessible to the lead investigator. Questionnaires that were used for the data collection have been kept in a cabinet under lock and key. The completed questionnaires are being kept for at least two years before disposing them.

3.12 Analysis of Data

The data was analysed quantitatively. The analysed data was summarized using descriptive statistics such as frequency and percentages. Analysis of the data was done according to the study objectives and the results presented in tables. The prevalence of pregnancy complications was estimated as per the proportion of the women who were diagnosed of at least one of the pregnancy complications. The analysis of factors associated with the prevalence of pregnancy complications was done at two levels. At first level, inferential statistics using bivariate analysis was done and the results reported in chi square and p-values. All significant variables were further adjusted and analysed to test for second level of association between prevalence of pregnancy complications and the significant variables

using multiple regression analysis. The results of the multiple regression analysis were reported in odds ratios. All analysis of the test of association was done at 95% confidence interval with significance level at ≤ 0.005. The analysis of the data was done using STATA version 17.0.

10.13 Ethical Issues

Ethical clearance was sought from Ghana Health Service Ethics Review Committee with the code GHS-ERC: 028/11/21 as requirement for the conduct of this study. Consent for the study participation was sought from each of the study participant. Letters of introduction were obtained from University of Ghana School of Public Health to the study facility. All Covid-19 protocols were strictly adhered to during the interview sessions and at all times of the study.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the analysis of the results of the study. The descriptive statistics of the study results are presented for each of the study objectives. Results of the bivariate analysis of the study outcome is presented. Further analysis using multiple regression provides results on predictors of the outcome.

4.2 Socio-demographic characteristics

The result of the demographic characteristics is presented in Table 2. A total of 415 pregnant women from Mamprobi Hospital participated in the study giving a 100% response rate. The mean age of participants was 31.6 ± 6.6 with minimum and maximum ages of 15 and 46 years. Less than a quarter (n = 93; 22.4%) of the women were with the Islamic faith. On education, more than a-third (n = 162; 39.0%) of the women attained tertiary education with only 13% (54) of them without any formal education. Majority of the women were self-employed. Among the partners of the women, less than a quarter (n = 96, 23.1%) had completed tertiary education with less than 1% (3) who have never had any education. Majority of the partners of the women were self-employed (270; 65.1%).

Less than a-tenth (n = 30; 7.2%) of the women resided in rural communities along the coast of Ga East who frequently accessed health care services in the facility. More than half (n = 234; 56.4%) of the women were married while 95.7% (224) of the women who were married were in a monogamous marriage. About 41% (171) of the women who participated in the study were Gas and Akans constituted 28% (115). Almost all (n = 406; 97.8%) the women used health insurance cards (mainly National Health Insurance cards) to access maternal health services.

Nearly a third (n = 135; 30.0%) of the women earned less than the estimated monthly national minimum wage of GHS 340. Further comparative analysis was done to determine the income levels among the women in relation to educational and employment status. On education, more than half (n = 30; 55.5%) of the women who have attained tertiary education earned at least GHS 1,000 per month. Majority of the women in the other education categories earned less than GHS 1,000 per month. More than a quarter (n = 8; 29.6%) of the women who had never had any formal education earned below the minimum wage. Similarly, more than a third (n = 64; 37.2%) of the women who only had basic education earned less than the minimum wage. On employment, majority (n = 4; 57.1%) of the women who were housewives earned below the minimum wage. Similarly, 84% (21) of the women who had no work earned below the minimum wage. For women who were employees or were salary workers, majority (n = 57; 60.0%) earned at least GHS 1,000 per month. Nonetheless, 7.4% (7) of the women who were employees or salary workers earned below the minimum wage.

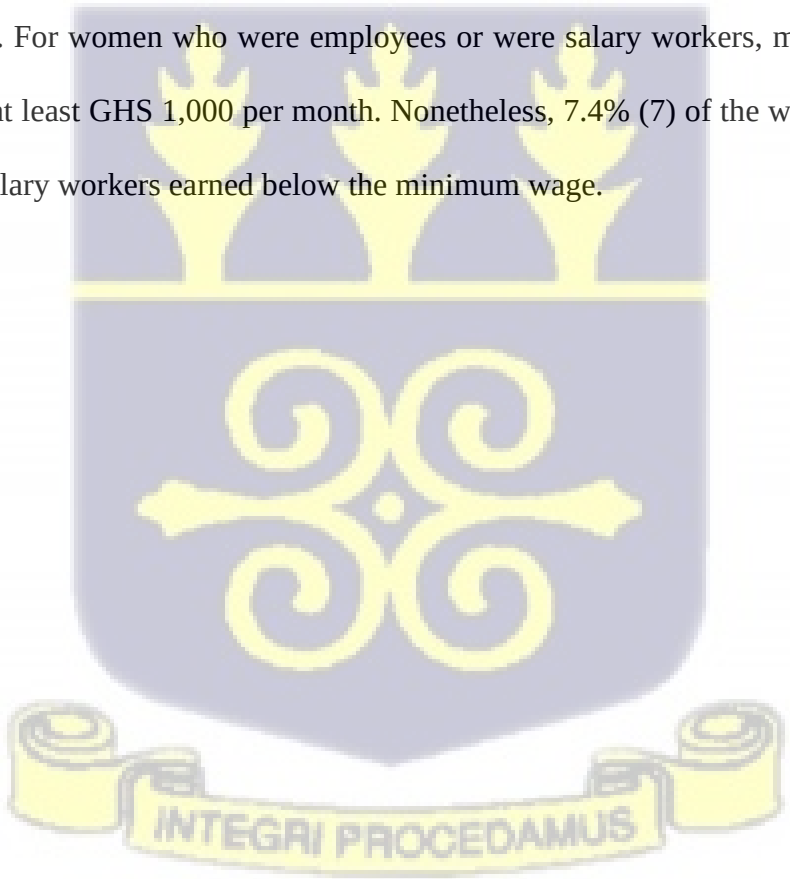

Table 2: **Socio-demographic characteristics of respondents (N = 415)**

Variables	Number	Percent (%)
Age in years (M ± SD)	31.6 ± 6.6	
15 – 19	20	4.8
20 – 24	50	12.1
25 – 29	92	22.2
30 – 34	88	21.2
35 – 39	99	23.8
40+	66	15.9
Total	415	100
Religion		
Christianity	322	77.6
Islam	93	22.4
Total	415	100
Level of Education		
No education	54	13.0
Basic	27	6.5
Secondary	172	41.5
Tertiary	162	39.0
Total	415	100
Employment		
Housewife	7	1.7
Employee/Salary worker	95	22.9
Self Employed	271	65.3
No work	17	4.1
Others	25	6.0
Total	415	100
Residence		
Rural (reside in coastal communities in Ga East)	30	7.2
Urban	385	92.8
Total	415	100
Marital status		
Single	82	19.8
Married	234	56.4
Cohabitating	99	23.8
Total	415	100
Type of Marriage		
Monogamous	224	95.7
Polygamous	10	4.3
Total	234	100
Ethnicity		
Akan	115	27.7
Ewe	64	15.4
Ga	171	41.2
Northern origin	65	15.7
Total	415	100
Insurance Users		
Use insurance	406	97.8
Does not use insurance	9	2.2
Total	415	100
Income Levels		

< GHS 340 (minimum wage)	**135**	**30.0**
GHS 340 – GHS 999	**228**	**50.7**
GHS 1,000+	**87**	**19.3**
Total	415	100
Partner's Education		
No Education	3	0.7
Basic	67	16.2
Secondary	249	60.0
Tertiary	96	23.1
Total	415	100
Partner's Employment		
Employee	120	28.9
Self Employed	270	65.1
Casual Worker	17	4.1
Other	8	1.9
Total	415	100

Table 2.b. Comparison between income levels and education and employment status

Variable	< GHS 340 (minimum wage)	GHS 340 – 999	GHS 1000+
Education Level			
No Education	8 (29.6)	10 (37.0)	9 (33.3)
Basic	64 (37.2)	88 (51.2)	20 (11.6)
Secondary	39 (24.1)	97 (59.9)	26 (16.1)
Tertiary	11 (20.4)	13 (24.1)	30 (55.5)
Employment Status			
Housewife	4 (57.1)	2 (28.6)	1 (14.3)
Employee/Salary worker	7 (7.4)	31 (32.6)	57 (60.0)
Self Employed	77 (28.4)	168 (62.0)	26 (9.6)
No work	21 (84.0)	4 (16.0)	-
Others	13 (76.5)	3 (17.6)	1 (5.9)

4.3 Household Asset Distribution and Wealth Index

The result of the analysis of distribution of household assets and possessions is presented in Table 3. Majority (n = 329; 79.3%) of the women used sachet water as their main source of drinking water. Most of the women (n = 248; 59.8%) used flush/pour flush toilet to manhole as their main toilet facility. Nonetheless, 10.6% (44) of the women depended on pit latrines without slab as their type of toilet facility. More than half (n = 227; 54.7%) of the women shared toilet facility with other households. Almost all the women had access to radio (n = 399;

96.1%) and television (n = 408; 98.3%) as well as mobile phone (n = 412; 99.3%). On refrigerator, only 14.2% (59) of the women did not own any refrigerator. More than two-thirds (n = 238; 68.2%) of the women had access to cupboard/kitchen cabinet. Majority of the women (n = 284; 68.4%) used LPG for cooking. More than half (n = 225; 54.2%) of the women lived in houses with cemented floors. Nearly two-thirds (n = 264; 63.6%) of the women had bank accounts. Almost two-thirds (n = 270; 65.1%) of the women did not own wristwatch.

Table 3: Distribution of Household Assets and Possession

Variables	Number (n)	Percent (%)
Main source of drinking water		
Piped into dwelling	78	18.8
Public tap/standpipe	8	1.9
Sachet water	329	79.3
Total	415	100
Type of Toilet Facility		
Flush/pour flush toilet to manhole	248	59.8
Ventilated improved pit latrine	67	16.1
Pit latrine with slab	56	13.5
Pit latrine without slab/open pit	44	10.6
Total	415	100
Share toilet with other households		
Shared	227	54.7
Not Shared	188	45.3
Total	415	100
Have access to radio		
Radio access	399	96.1
No radio	16	3.9
Total	415	100
Access to TV		
TV set	408	98.3
No TV set	7	1.7
Own a mobile phone		
Owns one	412	99.3
Owns none	3	0.7
Total	415	100
Own a refrigerator		
Owns one	356	85.8
Has none	59	14.2
Total	415	100
Access to cupboard/cabinet		
Owns one	283	68.2
Has none	132	31.8
Main type of fuel for cooking		
LPG	284	68.4
Natural gas	2	0.5
Charcoal	119	28.7
Wood	10	2.4
Total	415	100
Main material for floor		
Earth/sand	8	1.9
Ceramic tiles	182	43.9
Cement	225	54.2
Holds bank account		
Holds an account	264	63.6
Holds none	151	36.4
Total	415	100
Any member owns wristwatch		
Owns Wristwatch	120	28.9
Owns none	270	65.1
Total	415	100

Further analysis of the household assets and possessions using Principal Component Analysis (PCA) was conducted (Table 4). The household wealth index was categorised into five quantiles, ranging from 1 – 5, where 1 represented extreme poor and 5, least poor. More than a fifth (n = 89; 21.4%) of the women were extremely poor while more than a third (n = 143; 34.5%) of the women were less poor. The mean/average wealth score was 2.8 ± 1.25. The result also showed that majority of the women were within the lower quantile of the household wealth index.

Table 4: Household Wealth Index

Wealth Quantiles	Number	Percentage
Extreme poor	89	21.4
Very poor	77	18.5
Poor	85	20.5
Less poor	143	34.5
Least poor	21	5.1
Total	415	100

4.4 Maternal and Obstetric Factors

Table 5 presents a summary of the maternal and obstetric characteristics of the participants. The mean age of the women at first sex was 22 years. More than a tenth (n = 88; 21.2%) of the women had their first sex during their teenage stage. More than half (n = 236; 57.4%) of the women were multiparous; (had two or more births) prior to their last delivery, while 20% (83) of the women were yet to experience any delivery (nulliparous). About 6.0% (25) of the women were primigravida. More than a third (n = 147; 37.5%) of the women had past records of having pregnancy complications. All the women had at least one antenatal visit with less than a quarter (n = 94; 22.6%) of them having made less than four visits at the time of the study. However, majority (n = 314; 75.7%) of the women initiated their ANC visits after the first semester. Almost all (n = 399; 96.1%) the women were pregnant with single foetus.

At the time of the study, 51.8% (215) of the women had been diagnosed of having at least pregnancy complication. Majority (n = 371; 89.4%) of the women did not indicate any family history of pregnancy complication. For those who had pregnancy complication, more than half were related to pregnancy disorder. More than half (n = 214; 51.6%) of the women had ever had at least one abortion prior to their current pregnancy.

Table 5: Maternal and Obstetric characteristics among pregnant women utilising ANC services

Variables	Number	Percent (%)
Age at first sex		
15 – 19	88	21.2
20 – 24	232	55.9
25 – 29	83	20.0
30 – 34	12	2.9
Total	415	100
Parity		
Nulliparous	83	20.0
Primiparous	79	19.0
Multiparous	236	57.4
Grand Multiparous	15	3.6
Total	415	100
Gravidity		
Primigravida	25	6.0
Multigravida	390	94.0
Total	415	100
Past Record of pregnancy complication		
Past record of pregnancy complication	147	37.4
No past record of pregnancy complication	246	62.6
Total	393	100
Number of ANC visits		
< 4 visits	94	22.6
4 – 7 visits	317	76.4
8+ visits	4	1.0
Total	415	100
Time ANC was initiated		
First trimester	101	24.3
Second trimester	268	64.6
Third Trimester	46	11.1
Status of foetus at interview		
Single	399	96.1
Multiple (twins or more)	16	3.9
Total	415	100
Currently diagnosed of pregnancy complication		
Available pregnancy complication	215	51.8
No pregnancy complication	200	48.2
Total	415	100
Family history of pregnancy complication		
Existence of family history	44	10.6
No existence of family history	371	89.4
Total	415	100
Ever had an abortion		
Had abortion in the past	214	51.6
Never had abortion	201	48.4
Total	415	100

Among the women (51.8%) who had pregnancy complication, 18% (38) of them had multiple pregnancy complications while 82% (177) of the women had only one complication as depicted in Figure 2.

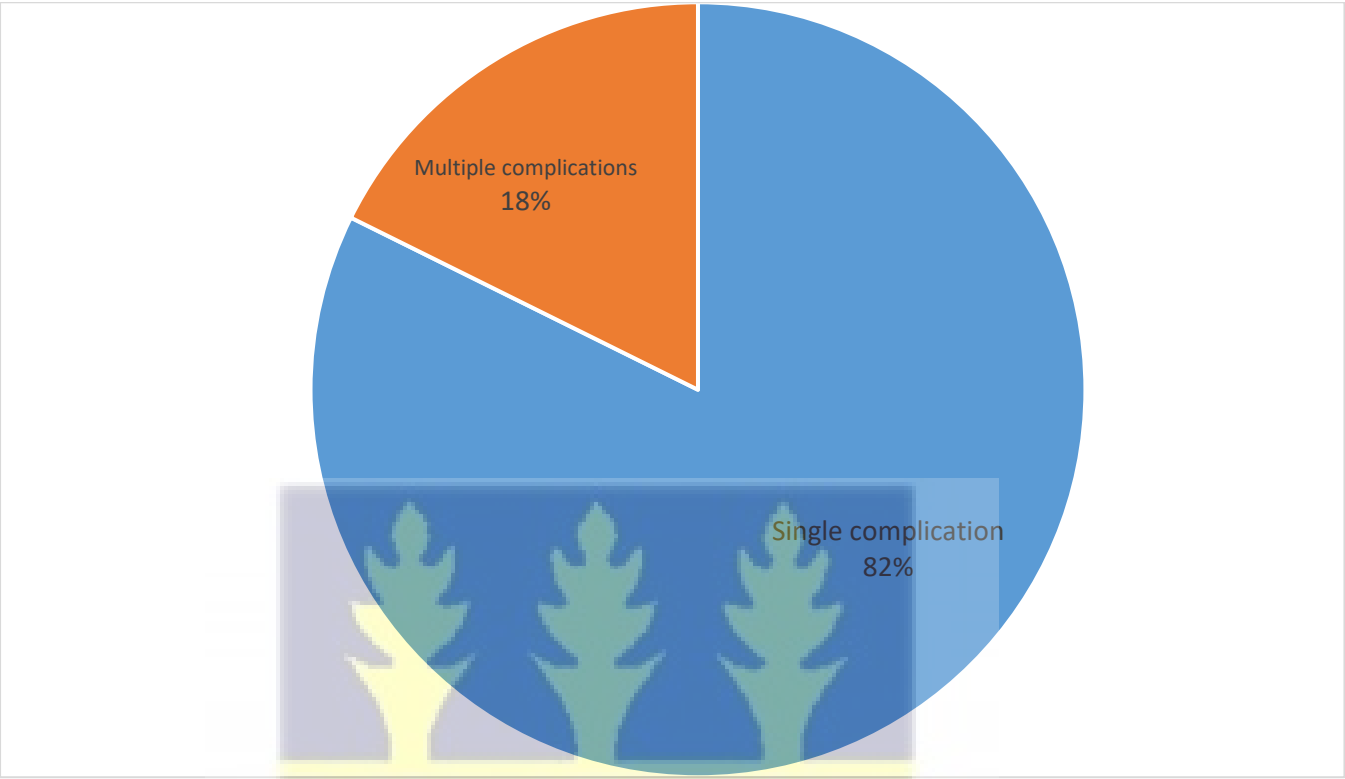

Figure 2: Women with pregnancy complications

Figure 3 presents the types of pregnancy complications observed. Among the pregnancy complications observed in the women, anaemia in pregnancy (n = 168; 40.6%), preeclampsia (n = 66; 15.8%) and infectious disease (n = 62; 15.0%) were the predominant pregnancy complications. Frequent vaginal bleeding recorded a prevalence of 4.5% (19). Other pregnancy complications such as fibroid (n = 6; 1.4%) and weight loss (n = 3; 0.8%) were the least observed pregnancy complications among the pregnant women recording prevalence below 2%. However, hyperemesis gravidarum (n = 9; 2.3%) recorded a prevalence of more 2%.

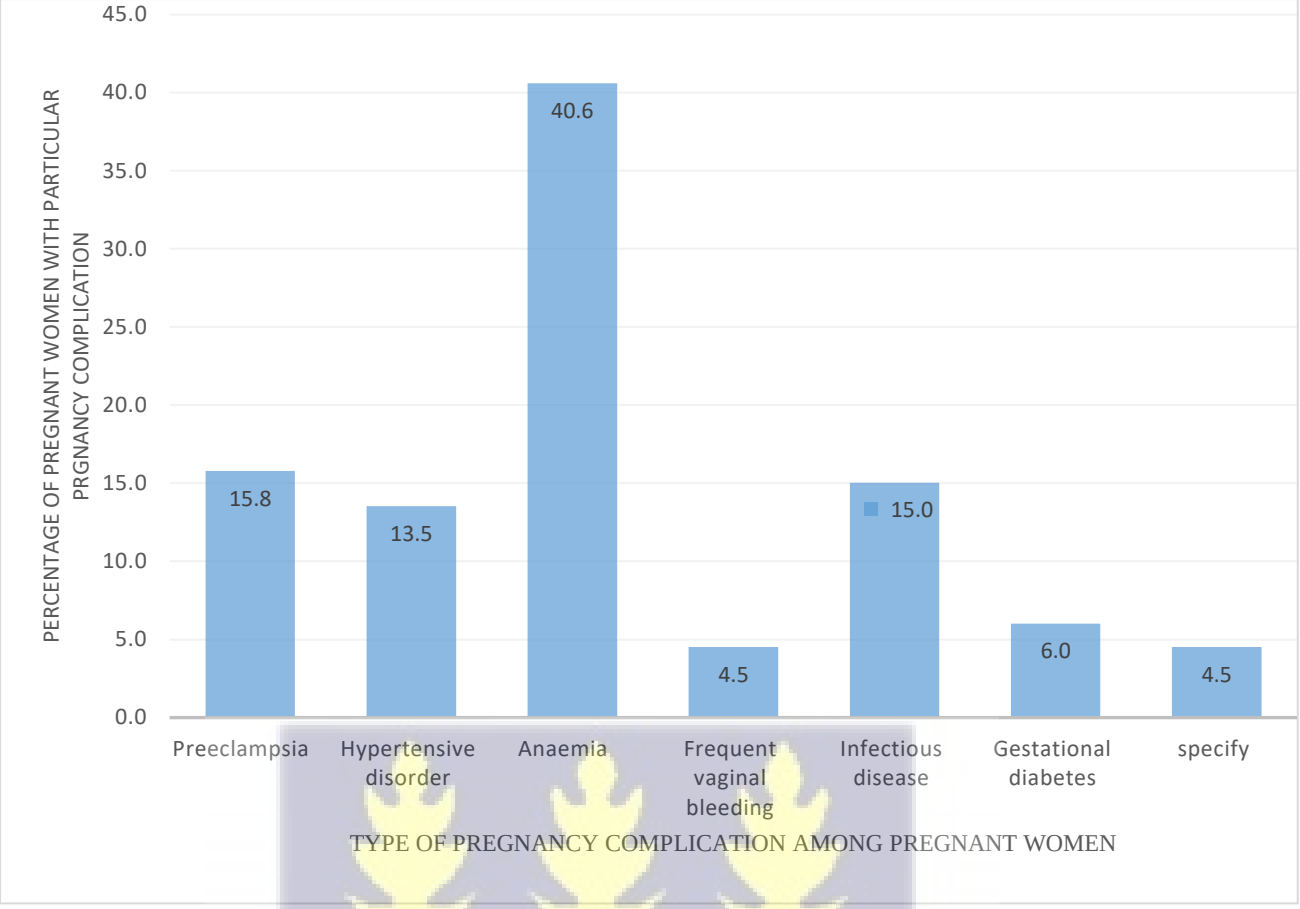

Figure 3: Types of pregnancy complications observed among the women

4.5 Knowledge on Obstetric Danger Signs

Table 6 summarises the results on the knowledge levels of the women on obstetric danger signs. Almost all (n = 405; 97.6%) the women had heard about obstetric danger signs. However, not all of them were able to explain what exactly obstetric danger signs meant. About 89% (369) of the women were able to explain in detail what obstetric danger signs are. The women were further asked to give at least three danger signs they knew. Majority (n = 341; 82.2%) of the women were able to mention at least three obstetric danger signs. Using the two main indicators, meaning of obstetric danger signs and ability to mention at least three danger signs, the knowledge levels of the women were measured as adequate and inadequate. Women who were able to correctly respond to both questions were classified as having adequate knowledge. Knowledge score showed that 75.4% (313) of the women had adequate knowledge of obstetric

danger signs. About 44% (183) of the women had multiple sources of receiving information on obstetric danger signs. The main source of information about danger signs were from health workers (n = 409, 98.5%) at the facility level. All the pregnant women who participated in the study indicated that they first heard about obstetric and maternal health danger signs during their visit to the facility. Beyond the health workers as the main source of information, 146 (35.2%) of the pregnant women also indicated that they got information on obstetric danger signs through radio/television.

About 96% (398) of the women indicated that they were given education on obstetric and maternal health services and its importance during ANC sessions. Some of the key areas for the education included importance of skilled delivery and ANC services, nutrition and management of danger signs. Majority (n = 302; 72.8%) of the women had experienced danger signs. For those who experienced danger signs, 2.3% (7) of them indicated that they consulted traditional healers for care. All the women with the exception 3 (0.7%) indicated that women should visit health facilities when they experienced any danger sign. However, majority (n = 256; 84.8%) of the women consulted either midwives or medical doctors when they experienced any danger sign or complication.

Table 6: Knowledge about Obstetric Danger Signs in Pregnancy

Variables	Number (n)	Percent (%)
Ever heard about obstetric danger signs		
Have heard about obstetric danger signs	405	97.6
Not heard about obstetric danger signs	10	2.4
Total	415	100
Meaning of obstetric danger signs		
Incorrect response	46	11.1
Correct response	369	88.9
Total	415	100
Any 3 danger signs you know		
Incorrect response	74	17.8
Correct response	341	82.2
Total	415	100
Knowledge levels on obstetric danger signs		
Inadequate response	102	24.6
Adequate response	313	75.4
Total	415	100
Sources of information		
Single source	232	55.9
Multiple sources	183	44.1
Total	415	100
Main source of information (multiple responses)		
Health facility	409	98.5
Radio/Television	146	35,2
Family/Friends	76	18.3
Received any education on ODS during ANC		
Received education	398	95.9
Did not receive any education	17	4.1
Total	415	100
What did you do when you experienced danger sign		
Nothing	39	12.9
Went to the nearest facility/pharmacy	256	84.8
Went to a traditional healer/other	7	2.3
Total	302	100
What should be done when one experience danger sign		
Visit the health facility	412	99.3
Consult friends/family	3	0.7
Total	415	100

From Figure 4, majority (n = 302; 73.2%) of the women indicated that they had experienced maternal and obstetric danger signs during their last pregnancy.

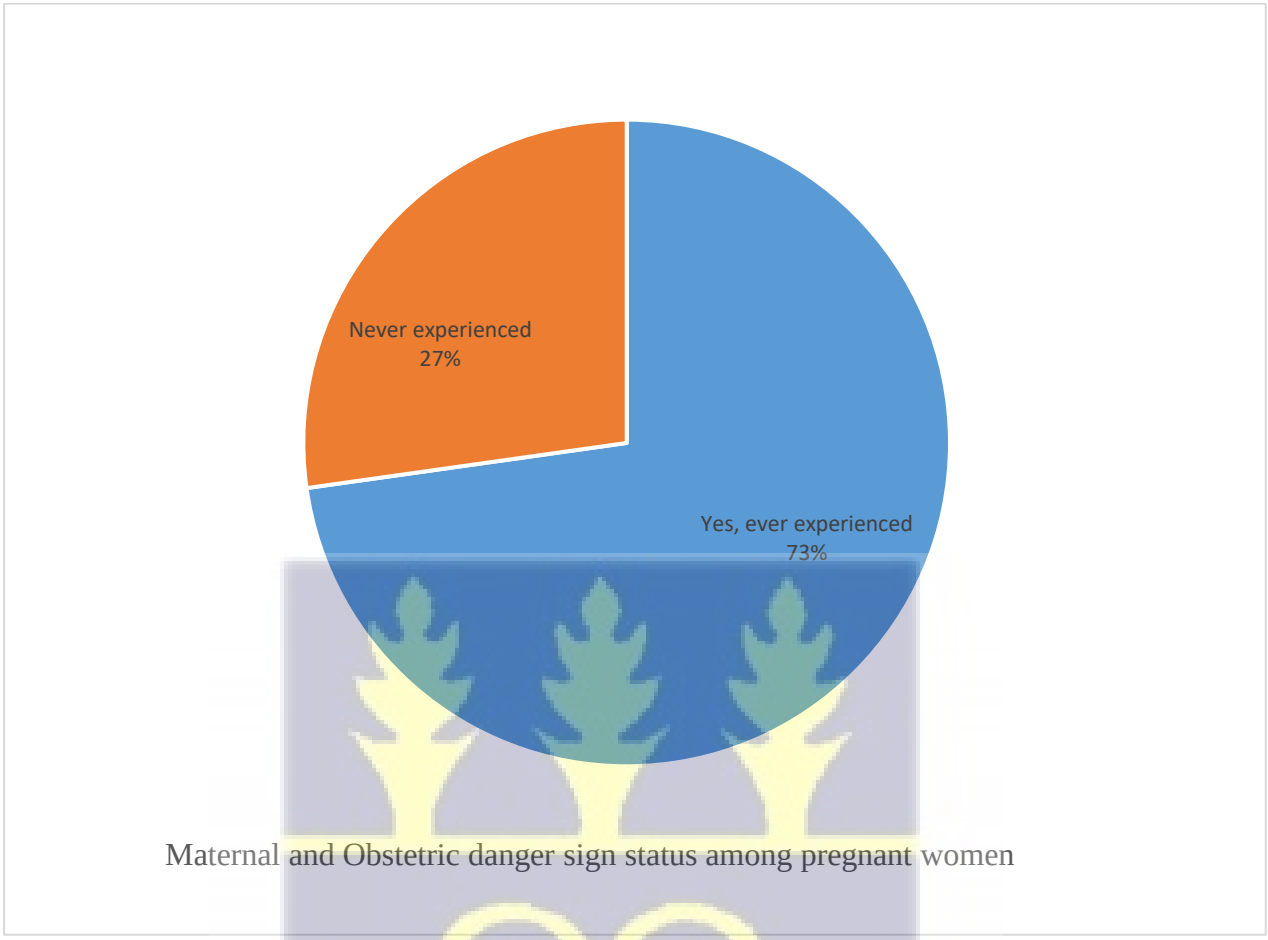

Figure 4: Maternal and Obstetric danger signs status among pregnant women

4.6 Bivariate analysis of socio-demographic factors associated with prevalence of pregnancy complications

Analysis of factors associated with prevalence of pregnancy complications was conducted at individual variable level (Table 7). For socio-demographic characteristics, four factors, age, level of education, residence and income levels had significant association with prevalence of pregnancy complications. Age of the women had significant association with prevalence of pregnancy complication (χ = 66.55; p-value < 0.001). The prevalence of pregnancy complication was relatively higher among women aged 40+ compared to other age groups. Among women aged 40+ years, about 84% (56) had pregnancy complication. The level of education of the women also had significant association with pregnancy complication prevalence (χ = 10.05; p-value – 0.018). The prevalence of pregnancy complication was higher among women who had only basic education. The place of residence of the women had significant association with pregnancy complication (χ = 4.29; 0.038).

Table 7: Relationship Between Demographic Characteristics and Prevalence of Pregnancy Complication

Variable	Prevalence of Pregnancy Complication			
	Number (row)	Percentage (row)	Chi-square	P-value
Age			**66.55**	**0.000**
15 – 19	8	40.0		
20 – 24	9	18.0		
25 – 29	34	36.9		
30 – 34	45	51.1		
35 – 39	63	63.6		
40+	56	84.5		
Religion			2.12	0.145
Christianity	173	53.7		
Islam	42	45.2		
Level of Education			**10.05**	**0.018**
No education	19	35.2		
Basic	19	70.4		
Secondary	93	54.1		
Tertiary	84	51.8		
Employment			0.63	0.960
Housewife	4	57.1		
Employee	51	53.7		
Self Employed	138	50.9		
No work	14	56.0		
Others	8	47.1		
Residence			**4.29**	**0.038**
Rural	21	70.0		
Urban	194	50.4		
Marital status			1.36	0.507
Single	46	56.1		
Married	122	52.1		
Cohabitating	47	47.5		
Type of Marriage			1.33	0.248
Monogamous	115	51.3		
Polygamous	7	70		
Ethnicity			7.69	0.053
Akan	57	49.6		
Ewe	39	60.9		
Ga	94	55.0		
Northern origin	25	38.5		
Insurance Users			2.48	0.115
Use insurance	208	51.2		
Does not use insurance	7	77.8		
Income Levels			0.99	0.609
< GHS 340 (minimum wage)	**64**	**52.5**		
GHS 340 – GHS 999	**111**	**53.4**		
GHS 1,000+	**40**	**47.1**		
Partner's Education			1.01	0.799
No Education	2	66.7		
Basic	33	49.2		
Secondary	133	53.4		
Tertiary	47	49.0		
Partner's Employment			5.56	0.135
Employee	65	54.2		
Self Employed	139	51.5		
Casual Worker	10	58.8		
Other	1	12.5		

4.7 Bivariate analysis of household wealth index and maternal/obstetric health factors

Bivariate analysis of household wealth index and maternal and obstetric factors were analysed to determine the level of association between these variables. The result of the analysis is presented in Table 8. The result of the analysis showed that there was a significant association between parity and household wealth index ($\chi = 100.6$; p-value < 0.001). Among women who had grand multiparous, more than half (53.0%) were in less poor**.** There was significant association between household wealth index and the number of ANC visits made by the pregnant women ($\chi = 31.05$; p-value < 0.001). Nearly two-thirds (n = 59; 62.7%) of the women who were within the least wealth quantiles made less than four antenatal visits. The timing of the start of antenatal care visit was significantly associated with household wealth index (χ = 26.89; p-value = 0.001). The results showed that women who were at least very poor were more likely to initiate antenatal care visits in the second semester. There was no significant association between household wealth index and the outcome variable for this study, pregnancy complication. However, the status of abortion in the past was significantly associated with the household wealth income ($\chi = 43.74$; p-value < 0.001). Majority (n = 116; 54.2%) of the women who had ever had an abortion were among the least two wealth quantile groups.

Table 8: Relationship between Household Wealth Index and Maternal Factors

Variable	Household Wealth Index Row: n (%)						
	1	2	3	4	5	Chi-square	P-value
Parity						**100.6**	**0.000**
Nulliparous	38(45.8)	14(16.9)	19(22.9)	12(14.5)	-		
Primiparous	26(32.9)	24(30.4)	17(21.5)	12(15.2)	-		
Multiparous	24(10.1)	34(14.3)	49(20.6)	111(46.6)	20(8.4)		
Grand Multiparous	1(6.7)	5(33.3)	-	8(53.3)	1(6.7)		
Gravidity						7.96	0.093
Primigravida	5(20.0)	2(8.0)	10(40.0)	8(32.0)	-		
Multigravida	89(21.4)	75(19.2)	75(19.2)	135(34.6)	21(5.4)		
Number of ANC visits						**31.05**	**0.000**
< 4 visits	32(34.0)	27(28.7)	8(8.5)	26(27.7)	1(1.1)		
4 – 7 visits	57(18.0)	49(15.5)	76(24.0)	115(36.3)	20(6.3)		
8+ visits	-	1(25.0)	1(25.0)	2(50.0)	-		
Time ANC was initiated						26.89	0.001
First trimester	19(18.8)	17(16.8)	21(20.8)	40(39.6)	4(4.0)		
Second trimester	68(25.4)	56(20.9)	51(19.0)	83(31.0)	10(3.7)		
Third Trimester	2(4.3)	4(8.7)	13(28.3)	20(43.5)	7(15.2)		
Currently diagnosed of pregnancy complication						2.0	0.73
Available pregnancy complication	50(23.4)	40(18.6)	45(20.9)	68(31.6)	12(5.6)		
No pregnancy complication	39(19.5)	37(18.5)	40(20.0)	75(37.5)	9(4.5)		
Ever had an abortion						43.74	0.000
Had abortion in the past	67(31.3)	49(22.9)	40(18.7)	53(24.8)	5(2.3)		
Never had abortion	22(10.9)	28(13.9)	45(22.4)	90(44.8)	16(8.0)		

NB: Household Wealth Index scale: 1 – extreme poor, 2 – very poor, 3 – poor, 4 – less poor and 5 – least poor

4.8 Bivariate analysis of obstetric and maternal factors associated with prevalence of pregnancy complications

The results of the analysis of the relationship between maternal and obstetric factors and pregnancy complication is presented in Table 9. Analysis of the relationship showed that five of the maternal and obstetric factors had significant association with pregnancy complication. The level of gravidity among the women showed significant relationship with pregnancy complication (χ =13.66; p-value < 0.001). Further significant association was observed between past record of pregnancy complication and current pregnancy complication (χ = 18.93; p-value < 0.001). Pregnancy complication was relatively associated among women with a past record of pregnancy complication compared to women with no past record of pregnancy complication. The gestation period within which ANC visit began by the women was significantly associated with pregnancy complications (χ = 31.89; p-value < 0.001).

Pregnancy complication increased significantly with an increase in the period within which ANC attendance was initiated. Family history of pregnancy complication (χ = 15.17; p-value < 0.001) and previous records of abortion (χ = 75.26; p-value < 0.001) were associated with pregnancy complication. Similarly, women who had ever had an abortion was associated with pregnancy complications compared to women who have never had an abortion.

Table 9: Relationship between maternal and obstetric factors and pregnancy complication prevalence

Variable	Prevalence of Pregnancy Complication			
	Frequency (row)	Percentage (row)	Chi-square	P-value
Age at first sex			3.82	0.281
15 – 19	49	55.7		
20 – 24	111	47.8		
25 – 29	47	56.6		
30 – 34	8	66.7		
Parity			1.03	0.793
Nulliparous	45	55.2		
Primiparous	38	48.1		
Multiparous	123	51.7		
Grand Multiparous	9	60.0		
Gravidity			13.66	**0.000**
Primigravida	4	16.0		
Multigravida	211	54.1		
Past Record of pregnancy complication			18.93	**0.000**
Past record of pregnancy complication	99	67.3		
No past record of pregnancy complication	110	44.7		
Number of ANC visits			1.81	0.405
< 4 visits	43	45.7		
4 – 7 visits	170	53.6		
8+ visits	2	50.0		
Time ANC was initiated			31.89	**0.000**
First trimester	29	28.7		
Second trimester	153	57.1		
Third Trimester	33	71.7		
Status of foetus at interview			0.02	0.883
Single	207	51.9		
Multiple (twins or more)	8	50.0		
Family history of pregnancy complication			15.17	**0.000**
Existence of family history	35	79.5		
No existence of family history	180	48.5		
Ever had an abortion			75.26	**0.000**
Had abortion in the past	155	72.4		
Never had abortion	60	29.8		

4.9 Bivariate analysis of the relationship between knowledge levels on danger signs and pregnancy complications

Results of the bivariate analysis of the relationship between knowledge about pregnancy danger signs and pregnancy complications is presented in Table 10. The knowledge levels of the pregnant women about obstetric danger signs showed significant association with pregnancy complication (χ = 15.32; p-value < 0.001). Pregnancy complications were associated with inadequate knowledge. Similarly, women who had experienced at least one danger sign showed association with pregnancy complication (χ = 72.35; p-value < 0.001).

Table 10: Relationship between danger signs knowledge factors and pregnancy complication prevalence

Variable	Prevalence of Pregnancy Complication			
	Number(col)	Percentage (col)	Chi-square	P-value
Knowledge levels on obstetric danger signs			**15.32**	**0.000**
Inadequate response	145	67.4		
Total	215	100		
Sources of information			0.01	0.970
Single source	120	55.8		
Multiple sources	95	44.2		
Total	215	100		
Received any education on ODS during ANC			0.35	0.554
Received education	205	95.3		
Did not receive any education	10	4.7		
Total	215	100		
Ever experienced any danger sign			**72.35**	**0.000**
Yes, ever experienced	195	90.7		
Never experienced	20	9.3		
Total	215	100		
What did you do when you experienced danger sign			1.52	0.466
Nothing	24	12.3		
Went to the nearest facility/pharmacy	165	84.6		
Went to a traditional healer	6	3.1		
Total	215	100		
What should be done when one experience danger sign			0.41	0.520
Visit the health facility	214	99.5		
Consult friends/family	1	0.5		
Total	215	100		

4.10 Multivariate analysis of factors associated with Pregnancy complication among pregnant women

A second level of analysis was conducted to test the strength of the relationship between all the significant variables at first level with the presence of pregnancy complication. In this second level of analysis, a multiple regression analysis was conducted by controlling for all factors that showed significant association with pregnancy complication. The result of the analysis is presented in Table 11. The age of the women, past record of pregnancy complication, time ANC was initiated and family history of pregnancy complication were significantly associated with pregnancy complication. In addition, ever had an abortion, knowledge about obstetric danger signs and the presence of danger signs were significantly associated with pregnancy complication among the women. For age, the result showed that women aged 40+ had 6.1 chances of experiencing pregnancy complication during pregnancy compared to women who are aged 15-19 years (AOR: 6.1; CI: 1.19-30.76). Women who had ever experienced pregnancy complication in their previous pregnancy/pregnancies had 2.5 times the odds of developing complication during pregnancy compared to women with no past record of pregnancy complication (AOR: 2.5; CI: 1.35-4.49).

The odds of developing complications during pregnancy was 2.9 times higher among women who began their ANC visits in the second trimester compared to women who initiated their visits in the first trimester (AOR: 2.9; CI: 1.39-5.93). Furthermore, women who initiated ANC visits in the third trimester were 6.1 times more likely to experience pregnancy complication compared to women who initiated their visits in the first trimester (AOR: 6.1; CI: 2.14-17.70). The odds of experiencing pregnancy complication was 3.6 times higher among women who had family history pregnancy complication compared to women with no family history of pregnancy complication (AOR: 3.6; CI: 1.25-10.40). The odds of pregnancy complication was

7.8 times higher among women with past record of abortion compared to women with no past record of abortion (AOR: 7.8; CI: 4.21-14.32).

Women with inadequate knowledge about obstetric danger signs were 2.4 times more likely to experience pregnancy complication compared to women with adequate knowledge (AOR: 2.4; CI: 1.21-4.88). Women who were experiencing at least one obstetric danger sign were 6.6 times more likely to experience pregnancy complication compared to women with no obstetric danger sign (AOR: 6.6; CI: 3.30-13.29).

Table 11: Multivariate Analysis of factors associated with Pregnancy Complication among Pregnant women

	Pregnancy Complication prevalence		
Variables	Odds Ratio	Confidence Interval (95%)	p-value
Age			
15 – 19	1	-	-
20 – 24	0.2	0.04 – 1.18	0.078
25 – 29	0.8	0.18 – 4.00	0.835
30 – 34	1.1	0.24 – 5.04	0.898
35 – 39	2.4	0.53 – 11.29	0.251
40+	**6.1**	**1.19 – 30.76**	**0.030**
Level of Education			
No education	1	-	-
Basic	1.3	0.28 – 5.60	0.756
Secondary	0.7	0.26 – 2.05	0.551
Tertiary	0.5	0.19 – 1.49	0.231
Residence			
Rural	1	-	-
Urban	0.9	0.30 – 2.96	0.922
Income Levels			
< GHS 500	4.1	0.67 – 25.36	0.126
GHS 500 – 999	3.8	0.62 – 23.00	0.151
GHS 1,000 – 1,499	3.0	0.47 – 18.94	0.248
GHS 1,500+	1	-	-
Gravidity			
Primigravida	-	-	-
Multigravida	1	-	-
Past Record of pregnancy complication			
Past record of pregnancy complication	2.5	**1.35 – 4.49**	**0.003**
No past record of pregnancy complication	1	-	-
Time ANC was initiated			
First trimester	1	-	-
Second trimester	2.9	**1.39 – 5.93**	**0.004**
Third Trimester	6.1	**2.14 – 17.70**	**0.001**
Family history of pregnancy complication			
Existence of family history	3.6	**1.25 – 10.40**	**0.018**
No existence of family history	1	-	-
Ever had an abortion			
Had abortion in the past	7.8	**4.21 – 14.32**	**0.000**
Never had abortion	1	-	-
Knowledge levels on obstetric danger signs			
Inadequate response	2.4	**1.21 – 4.88**	**0.013**
Adequate response	1	-	-
Ever experienced any danger sign			
Yes, ever experienced	6.6	**3.30 – 13.29**	**0.000**
Never experienced	1	-	-

4.11 Summary of the chapter

The chapter has highlighted the relevant findings for the study with reference to the study objectives. The study's main objective was to determine the factors affecting the pregnancy complication among antenatal women and this has been well presented. A larger proportion of the women were within the ages of 25-39. More than half of the women were in households whose wealth index was ranked low. Additionally, more than half of the women who participated in the study were diagnosed with at least one pregnancy complication. The most dominant pregnancy complication was anaemia in pregnancy. The prevalence of pregnancy complication among the pregnant women was significantly influenced by the age of the women, past record of pregnancy complication, time ANC was initiated and family history of pregnancy complication.

The findings of the study have been discussed in the next chapter with reference to other observed results from other studies.

CHAPTER FIVE

DISCUSSIONS

5.1 Introduction

The study observed related results as per the objectives outlined for the study. The prevalence of pregnancy complication among pregnant women was observed to be 51.8%. While awareness on pregnancy complication among the women was nearly universal (97.6%). knowledge level of pregnancy complication was lower than awareness with a level of 75.4%. The age of the woman, past record of pregnancy complication, time ANC was initiated and family history of pregnancy complication were significantly associated with pregnancy complication. In addition, ever had an abortion, knowledge about obstetric danger signs and the presence of danger signs were significantly associated with pregnancy complication among the women. The observed result in this study is discussed in relationship to the context of the study while comparing it to other studies in the literature.

5.2 Proportion of pregnant women attending antenatal care services reporting pregnancy complications

The study observed a higher prevalence of pregnancy complication of 51.8% among pregnant women attending antenatal care services at the facility. The World Health Organization, (2020) explained that pregnancy complication has become a major health concern in most developing countries with rates exceeding 40% in most cases. The expectation of WHO in the 2020 maternal health updates was to limit the rate to below 25% in the global context. This study finding of pregnancy complication can be concluded to be relatively higher than the acceptable WHO rate and a number studies that have been reviewed in this study. Law et al., (2015) in a study in the United States of America observed pregnancy complication prevalence of 46.9%

among women within the reproductive age who had at least two outpatient claims. Similarly, a study by Sengoma et al., (2017) in Kampala also observed comparatively lower rate of 43.1% among women who were aged 15-49 years and were utilising maternal health services in some selected facilities in the city than the results observed in my study**.** A similar result was reported by Rulisa et al., (2015) where they observed a prevalence of 41.3%. Despite the higher rates observed in the studies reviewed in comparison to this study, the observed result in this study was comparatively higher than the results from these other studies. In reference to the anticipated WHO standard of 25% as the highest acceptable pregnancy complication prevalence, it can be concluded that the observed prevalence in this study is extremely high among the women who attended ANC at Mamprobi hospital.

Other studies showed even much lower prevalence rates of maternal complications. Mwilike et al., (2018) in a study in Tanzania among urban women observed a prevalence of 17.4% which is by far lower than the observed result in this study.

Despite the high pregnancy complication observed among the pregnant women, the major complication in pregnancy was anaemia (40.6%). Largely, studies on anaemia in pregnancy had recorded similar rates as observed in this study. Anlaakuu & Anto, (2017) in a study in Sunyani Regional Hospital among antenatal women observed a prevalence of over 50% when all category of anaemia is computed together. Anlaakuu & Anto, (2017) noted that about 40% of the women had mild anaemia with 1.6% having severe anaemia. Ghana Health Service in the recent 2020 annual performance report indicated that anaemia in pregnancy continuously remain one of the pregnancy complications that affects the overall performance of maternal indicators. It is reported that at least 1 in every 3 pregnant women have anaemia. While dietary intake plays a significant role in the blood count of every pregnant woman, this study did not try to assess anaemia specific factors to ascertain why there is relatively higher prevalence of

anaemia in pregnancy. The introduction of folic acid for women who attend antenatal care services is expected to improve the haemoglobin level of women. Nonetheless, the significant impact of folic may be realised if women begin antenatal care services in the first trimester. This indeed was observed in a study by Wemakor, (2019) which was conducted in Tamale Teaching Hospital among women who accessed antenatal care services. The study observed that 50.8% of the women were anaemic.

Preeclampsia was the second highest pregnancy complication recorded in my study with a prevalence of 15.8%. Comparatively, the finding in this study differed from other studies. Adu-Bonsaffoh et al., (2017) in their study in Korle-Bu Teaching Hospital observed that 21.4% of the women who utilised maternal health services in the facility had preeclampsia. Ahenkorah et al., (2019) in a study in the Bolgatanga Regional Hospital of Ghana noted that 25.4% of the women who utilised antenatal care services in the year 2017 reported preeclampsia. However, the study by Fondjo et al., (2019) in Kwame Nkrumah University of Science and Technology Hospital which observed preeclampsia of a prevalence of 4.0% was extremely lower than what was observed in this study. Comparing the results in this study and the regional and teaching hospitals studies in Ghana shows that preeclampsia is a major concern for maternal health care service in Ghana.

However, findings outside Ghana tend to report lower levels of preeclampsia. Ngwenya, (2017) in a study in Zimbabwe observed that only 1.3% of the women who utilise the facility had preeclampsia. Vata et al., (2015) also analysed the data prevalence of preeclampsia among pregnant women in Ethiopia and observed a lower preeclampsia prevalence of 2.2%. Belay & Wudad, (2019) in another study in South-eastern part of Ethiopia among pregnant women observed a prevalence of 12.4%. Musa et al., (2018) in a study in Nigeria also observed a preeclampsia prevalence of 8.8% while another study in Nigeria focusing on severe

preeclampsia observed a 3.4% prevalence (Onoh et al., (2020). In an earlier study in the Calabar Teaching Hospital in Nigeria, Kooffreh et al., (2014) estimated the prevalence of preeclampsia at 1.2% among 8,525 women. In most of these studies, prevalence had been relatively lower than 10%. Preeclampsia is noted as one of the major causes of maternal death in Ghana (GSS/GHS, 2018).

Another significant pregnancy complication this study observed was hypertensive disorder with a prevalence of 13.5%. In the last decade, hypertensive disorder has consistently remained one of the factors contributing maternal mortalities in Ghana (GSS/GHS, 2018). Hypertensive disorder continues to be another challenge in Ghana and other developing countries with relatively high prevalence. In an earlier study by Obed & Patience, (2006), it was noted that the general hypertensive disorder prevalence among pregnant women in Ghana ranges between 6% to 7.5%. However, over a period of time, different studies have shown higher prevalence. Adu-Bonsaffoh et al., (2017) in their study in Korle-Bu Teaching Hospital observed hypertensive disorder prevalence of 21.4%. Gemechu et al., (2020) also in another hypertensive disorder prevalence study in sub-Saharan Africa including Ghana observed a pooled prevalence of 8% of all hypertensive disorder across the study countries. Awuah et al., (2020) in a study in Komfo Anokye Teaching Hospital noted that 39.25% of the pregnant women who participated in the study were diagnosed of hypertensive disorder. The observed result from the study by Awuah et al., (2020) is considered one of the highest prevalence study on hypertensive disorder in Ghana.

5.3 Knowledge of pregnant women on obstetric danger signs

In Ghana, awareness on most of the maternal and reproductive health information has relatively been universal with almost all people having heard a health-related topic on danger signs.

However, knowledge levels have continually remained lower than level of awareness. Assessment of knowledge levels significantly go beyond just hearing the message of the study focus. In this study, awareness on pregnancy complication was near universal with 97.6% of the women having heard something about pregnancy complication. However, knowledge level was relatively lower than awareness with a rate of 75.4%. Aborigo et al., (2014) and Saaka et al., (2017) in different studies in northern Ghana observed relatively lower knowledge levels among pregnant women on obstetric danger signs compared to the observed knowledge level in this study. While Aborigo et al., (2014) noted that knowledge among pregnant women on obstetric danger signs was on the average with reported rate of 49%, Saaka et al., (2017) noted that about 51% of the women had adequate knowledge about obstetric danger signs. Ameyaw et al., (2020) in a similar study in Bangladesh noted that 53% of the women who utilised antenatal care services had adequate knowledge about obstetric danger signs. Mwilike et al., (2018) also in a study Southern Tanzania noted that only 31% of pregnant women had adequate knowledge of danger signs in pregnancy. In general, the observed knowledge result in this study were significantly higher than the observed results in all the studies in Ghana and other developing countries.

While knowledge assessment on this study was done using knowledge on three danger signs, studies like Maseresha et al., (2016) in Somali, Wassihun et al., (2020) and Woldeamanuel et al., (2019) in Ethiopia assessed the knowledge levels of pregnant women on obstetric danger signs using at least one knowledge on any of the danger signs. Despite this difference in the assessment of knowledge levels, this study at the Mamprobi hospital which used multiple knowledge levels recorded higher knowledge rate compared to all the studies that used only one knowledge of the danger signs (Maseresha et al., 2016; Wassihun et al., 2020; Shimpuku et al., 2021). It was observed that all the studies that used one knowledge level of measurement

were concentrated largely in rural communities. Another significant observation in most of the studies that used at least one knowledge level was inadequate number of staff at the facilities.

The study by Wassihun et al., (2020) was one of studies with the highest score among the reviewed studies with a rate of 64.7%, however, it was still lower than the observed result in this study. The study by Kabakyenga et al., (2011) in Uganda however assessed the women's knowledge on obstetric danger signs using at least three of the danger signs. This was similar to the measurement approach used in this study among the women in Mamprobi Hospital. Kabakyenga et al., (2011) in their study noted 72% of the women were aware of at least one of the danger signs in pregnancy. However, when further assessment was done to test the knowledge of at least any of the danger signs, the knowledge score was far lower than expected with only 19% of the women reporting adequate knowledge on three or more of the danger signs. Similar study by Hibstu & Siyoum, (2017) in a study in Uganda using the same approach by Kabakyenga et al., noted that women who had adequate knowledge about obstetric danger signs were 21.9%. It is evident from these studies that assessment of knowledge levels of women on obstetric danger signs can show very low score if the assessment is expanded to include other variables.

5.4 Factors associated with pregnancy complication among pregnant women

The prevalence of pregnancy complication as assessed in this study was significantly influenced by both socio-demographic and obstetric and maternal health factors as the study sought to ascertain. Under the socio-demographic characteristics, the study observed only age of the woman to be significantly associated with pregnancy complication. It was observed that women with age of 40 years or more significantly have higher chances of developing any of the pregnancy complications compared to women who were relatively young. As the age of a

woman increases, she gets exposed to key maternal health challenges because of the weak reproductive health system and hormonal changes (Fathalla, 1997; United Nations, 2009). As the age of a woman increases, her chances of increasing her blood pressure which is associated with old age may occur and this poses a lot of threat to the woman (Azubuike & Danjuma, 2017; Meazaw et al., 2020). A review of various literature have shown that the risk of a pregnant woman getting complications during pregnancy begins when the woman is over 30 years. Jones et al., (2017) in a study at Ho Municipal Hospital noted that women from 35 years and above had higher risk of developing pregnancy complications. Other studies such as Luo et al., (2020), Meazaw et al., (2020), Li et al., (2018), Mekonen et al., (2018), Azubuike & Danjuma, (2017), Mwanri et al., (2015) and Morikawa et al., (2013) in different studies across different developing countries have noted that as the maternal age of a woman increases, the risk of pregnancy complication also increases with an increasing rate. Most often, the complications are significantly seen when maternal age is 35 years and above.

Different obstetric and maternal health factors showed significant association with pregnancy complications. The results showed that pregnancy complication among the women were not influenced by just a factor, however, there were multiple maternal factors that determined the prevalence of pregnancy complication. The study observed that women with past record of any pregnancy complication or had family history of any prgnancy complication had signficnat risk of developing pregnancy complication. Family history of a particular health problem have had implication on medical outcome of the family members. Different studies have also confirmed signifcant association between prgnancy complications and family history of any pregnancy complication or past record of any pregnancy complication. Jones et al., (2017) in their study in Hohoe observed that women with family history of hypertension and past record of preterm have higher odds of experiencing some major pregnancy complications. Habtei & Wondimu, (2021) and Wagnew et al., (2020) in different studies have concluded that history of pre-

existing medical disorders increases the risk of pregnancy complications and maternal near miss cases among pregnant women. Others studies (Duckitt & Harrington, 2015; Tessema et al., 2021, Stitterich et al., 2021) on preeclampsia prevalence and factors observed that women with family predisposition for preeclampsia had higher odds of having preeclampsia. Similarly, women with past records of hypertension had higher odds of experiencing preeclampsia in pregnancy (Tebeu et al., 2011; Gabbe et al., 2016; Mekonen et al., 2018; Fox et al., 2019). Azubuike & Danjuma, (2017) and Brown et al., (2018) have all confirmed similar results in hypertensive disorder risk analysis studies. The existence of family history and past records of hypertension in the woman play a major role in hypertensive disorder pregnancy prevalence.

Another factor that was observed to have significant relationship with pregnancy complication was the timing of ANC initiation. The risk of pregnancy complication increased with an increase in gestational age at time of ANC initiation. The study noted that women who initiated ANC attendance at third trimester had significantly higher risk of developing pregnancy complication compared to women who begun ANC attendance at first trimester. Similar, women who had ANC attendance beginning in second trimester had relatively higher risk compared to women who begun ANC attendance at first trimester. The WHO organization have recommended a continuous attendance to ANC starting with first trimester through to the final delivery, with at least eight antenatal visits (WHO, 2018). Attendance to ANC has been described as the pivot for implementing comprehensive maternal health interventions. However, utilization of ANC services in most developing countries has been relatively not seen major improvement over time. Terefe et al., (2020) in their study noted that a substantial proportion of women begin ANC attendance at third trimester, and this significantly increases the risk of anaemia in pregnancy. Similar results were observed in other studies (Li et al., 2018; Fondjo et al., 2019; Wemakor, 2019).

Wensing & Grol, (2019) have argued that, knowledge is the main thrust of every health intervention, and that for any intervention to achieve its ultimate objective, it is important to situate the intervention within the knowledge cycle of the people for which the intervention is implemented. Wensing & Grol, (2019) concludes that in areas where there exists an increased knowledge about a health condition, adherence and support for such intervention is relatively high. In the context of this study, knowledge about obstetric danger signs showed significant relationship with prevalence of pregnancy complication. Women who had adequate knowledge about obstetric danger signs had lower risk of developing pregnancy complication. Knowledge about a particular health problem allows the woman to consciously plan to prevent the occurrence of such health problem. Women with adequate knowledge of the causes of anaemia in pregnancy consciously work towards increasing blood content immediately after conception. Terefe et al., (2020) opined that women with adequate knowledge about pregnancy danger signs are always cautious about certain behaviours and lifestyle that could lead into risk factors. Fathy & Eittah, (2017) and Wemakor, (2019) in different studies in Egypt and Ghana also concluded that higher knowledge levels among prgnant women significantly reduces the risk of pregnancy infection in general.

Appiah et al., (2020) in another study in Ghana argued that women with adequate knowledge about a particular health problem and its consequences are more likely to adhere to treatment prescribed by health workers. Augustina et al., (2021) in a study on anaemia in pregnancy noted that more than 60% of the teenage women who had anaemia were those who had little or inadequate knowledge about anaemia. It is evident from these discussions that having adequate knowledge about a particular pregnancy complication or its related danger signs reduces the risk of the occurrence of that complication in pregnancy.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6. 1 Major findings and Conclusion

The prevalence of pregnancy complication among the women who utilized antenatal care services at Mamprobi Hospital is significantly higher with prevalence above 51%. Predominantly, anaemia in pregnancy as well as preeclampsia are the common pregnancy complications that were present among the pregnant women during the pregnancy period. Assessing specific pregnancy complication among pregnant women is key in helping develop appropriate intervention that seeks to address the specific challenges. While awareness on pregnancy complication among the women was nearly universal (97.6%), knowledge level of pregnancy complication is lower than awareness with a level of 75.4%. Despite the high knowledge on obstetric danger signs, the presence of obstetric danger signs was relatively high.

The prevalence of the pregnancy complication in the study at Mamprobi Hospital is largely determined by socio-demographic and maternal health factors. The age of the woman, past record of pregnancy complication, time ANC is initiated and family history of pregnancy complication determined the prevalence of pregnancy complication. In addition, ever had an abortion, knowledge about obstetric danger signs and the presence of danger signs are significantly associated with pregnancy complication among the women. The critical analysis of the factors observed in this study determining the prevalence of pregnancy complication provides a platform for addressing some of the root cause.

6.2 Recommendations

Referencing from the outcome of this study, the study proposes the following recommendation in addressing the challenges associated with the prevalence of pregnancy complication.

Public Health/Clinical Practice:

1. Early initiation of antenatal care services for pregnant women is an important tool for addressing some of the challenges of early onset of some pregnancy complication including anaemia in pregnancy and preeclampsia. Midwives as well as other health workers who engage pregnant women should encourage their clients to always initiate antenatal care visits at early stage.
2. Reducing anaemia in pregnancy: Provision of calcium and folic acid supplements to pregnant women should be strengthened in the facility to ensure that women receive adequate supplements at early stage of the pregnancy to limit the risk of anaemia in pregnancy.
3. Early diagnosis of preeclampsia at gestational week 20 helps to provide appropriate intervention to prevent the complications of preeclampsia. Midwives are therefore encouraged to frequently conduct early screening for preeclampsia whiles providing the necessary supplements containing folic acid that reduces the risk of blood pressure and proteinuria.

Recommendation for Research:

1. The study at Mamprobi Hospital was generalised for all pregnancy complications. With anaemia and preeclampsia as the leading pregnancy complications observed in this study, it is recommended that specific studies on associated factors of anaemia or preeclampsia should be conducted to allow for appropriate design interventions on addressing the problem specifically.

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APPENDIX I: PARTICIPANT INFORMATION SHEET

Study Title: Factors Affecting Pregnancy Complications Among Antenatal Mothers in Mamprobi Hospital

Introduction: This study is been conducted by Yaw Korankye Wiafe (Principal Investigator) a Master of Public Health (MPH) student of School of Public Health, University of Ghana, Legon.

Address: Yaw Korankye Wiafe

Background and Purpose of Research:

This study is seeking to assess the factors that influence occurrence of pregnancy complications among antenatal mothers at Mamprobi Hospital. Maternal health care continues to pose a lot challenges to Ghana's quest to achieve desirable targets on the Sustainable Development Goals. One of the major hindrances to achieving maternal health goals are the frequent occurrence of complications in pregnancy. Various studies have shown that majority of maternal mortalities and neonatal mortalities are as a result of complications that occur in pregnancy. There is therefore the need to understand why some of these complications continue to occur among antenatal women.

Safety Protocol:

With the emergence of Covid-19 pandemic, data collectors will be provided with adequate Personal Protective Equipment (PPE). Each data collector recruited to participate in the data collection will be given face masks, hand gloves, hand sanitizers and liquid soup to be used if water is easily accessible. All data collectors will be required to observe social distancing protocols. For interviewees (study participants), face mask will be provided to each prior to the start of the interview. Additionally, each participant will be required to wash hand with soup and where appropriately, use hand sanitizers before the start of any interview.

Possible Risk and Discomfort

This study poses no risk and discomfort to you as a participant in this study. You will spend about 25 minutes in answering the questionnaires. You will be required to sign a consent form before we start the interview. You will be considered as volunteers and can opt out of the study or decline to answer any question.

Possible Benefits

There is no direct benefit to you as a participant, however, the outcome of the study will inform policy makers to formulate interventions that may indirectly benefit you. Also, the study will help health workers to understand the factors that contribute to the identified pregnancy complications and design interventions that will help limit the occurrence of these conditions to ensure smooth delivery for every woman.

Confidentiality

All the information collected from you will be kept strictly confidential and will be used for the intended purpose only. You will not be identified by name in any dissemination reports or publications resulting from this study.

Data Security and Record Keeping

Study materials (questionnaires and informed consent) will be stored in a locked file cabinet in the office of the principal investigator. Data will be entered STATA software package version 15 by the research assistants, and electronic files will be made accessible only to the research team. Study materials (questionnaires and informed consent) will be labelled and given a unique study identification number for the participants. The data storage will be done by the principal investigator.

My right to refuse or withdraw:

I have the right to take part in this research or not without losing any benefit. I may stop participating in this research any time I wish.

I have read the above information/ it has been read and well translated to me in my local language in the presence of a witness. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntary to participate as a subject in this study and understand that I have the right to withdraw from the study at any time.

Signed by:……

Name:……..Date:…….

Place……

If illiterate right thumb print Name of witness……

…… Signature……

Contact information:

Do you have any questions or clarifications?

If any of your questions were not satisfactorily answered by me, or you have further questions regarding this study, you may contact:

Yaw Korankye Wiafe

Tel:. 0260744620

Email: gynowiky@yahoo.com

Or

Dr. Patricia Akweongo
School of Public Health, University of Ghana, Legon

Department of Health Policy, Planning and Management

Tel: +233-243138376

If you have any concerns or need clarifications regarding ethical issues, please contact

Nana Abena Kwaa Ansah Apatu (Administrator)

Ghana Health Service, Ethics Review Committee, Accra

Tel: 0503539896.

APPENDIX II: CONSENT FORM

Study Title: Factors affecting pregnancy complications among antenatal mothers in Mamprobi Hospital.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (Twi or Ga). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant……..

Participants' Signature …… OR Thumb Print…… ……

Date:…….

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in (Twi or Ga) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter……

Signature of Interpreter……..

Date:……

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the Twi or Ga language, he/she understood.

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name: ……

Signature……. OR Thumb Print ……..... ……..

Date: ……

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name……

Signature ……

Date……

APPENDIX III: DATA COLLECTION TOOL

FACTORS AFFECTING PREGNANCY COMPLICATIONS AMONG ANTENATAL MOTHERS AT MAMPROBI HOSPITAL

Part A: Socio-demographic Factors

	Questionnaire Code: …… Date ……		Code
1.	Age (in years)		
2.	Religion	1. Christian 2. Muslim 3. Traditional 4. Other, Specify	
3.	Level of education	1. Never been to school 2. Primary/Basic 3. Secondary 4. Tertiary	
4.	Employment Status	1. Domestic employee (housewife) 2. Employee 3. Self employed 4. Apprentice 5. Casual worker 6. Contributing to family worker 7. Student 8. No work 9. Other, specify……	
5.	Residence	1. Rural 2. Urban	
6.	Marital Status	1. Single 2. Married 3. Divorced/Separated 4. Cohabitating 5. widow/widower	
7.	Ethnicity	1. Akan 2. Ewe 3. Ga 4. Northern origin 5. Others	
8.	If married, Type of Marriage	1. Monogamy 2. Polygamy	
9.	Insurance Holder	1. Yes 2. No	
10.	If yes (Q 9), type of insurance	1. NHIA 2. Private Insurance 3. Other, specify	
11.	Monthly income		Absolute figures

12.	Partner's educational status	1. Never been to school 2. Primary/Basic 3. Secondary 4. Tertiary	
13.	Partner's employment status same comment as above	2. Employee 3. Self employed 4. Apprentice 5. Casual worker 6. Contributing to family worker 7. Student 8. No work 9. Other, specify……	

Part B: Maternal and Obstetric factors

			Code
1.	Age at first pregnancy		
2.	Parity	1. Nulliparous (0) 2. Primiparous (1) 3. Multiparous (2-4) 4. Grand Multiparous (≥ 5)	
3.	Gravidity	1. Primigravida 2. Multigravida	
4.	Women with multigravida, any record of pregnancy complications in the last pregnancy?	1. Yes 2. No	
5.	What was the type of complication experienced in the previous pregnancy? (this can be verified from previous ANC records) (Multiple response, if applicable)	1. Preeclampsia 2. Hypertensive disorder 3. Anaemia in pregnancy 4. Miscarriage 5. Excessive vagina bleeding 6. Protein in urine 7. Infectious disease 8. Gestational diabetes 9. Others, specify	
6.	Attendance at ANC services	1. Yes 2. No	Confirm from ANC card
7.	Number of ANC visits at the time of survey		Confirm from ANC card
8.	Which trimester did you begin ANC attendance?	1. First 2. Second 3. Third	Confirm from ANC card
9.	Gestation period at time of interview	1. First trimester (1-3 months)	

		2. Second trimester (4-6 months) 3. Third trimester (7-9 months)	
10.	Foetal condition	1. Single 2. Twins 3. Triplets or more	
11.	Have you been diagnosed or informed of any pregnancy complication in your current pregnancy during ANC visit?	1. Yes 2. No	Confirm from ANC card
12.	If yes, what is the type of pregnancy complication? (Multiple responses allowed)	1. Preeclampsia 2. Hypertensive disorder 3. Anaemia 4. Frequent vaginal bleeding 5. Infectious disease 6. Gestational diabetes 7. Other, specify	
13.	Do you have any family history of any pregnancy complications (preeclampsia/eclampsia, hypertensive disorder, anaemia, diabetes, etc)?	1. Yes 2. No	
14.	If yes, please specify	1. Preeclampsia 2. Hypertensive disorder 3. Anaemia 4. Frequent vaginal bleeding 5. Infectious disease 6. Gestational diabetes 7. Other, specify	
15.	Ever had an abortion	1. Yes 2. No	
Part C: Knowledge about pregnancy danger signs			
16.	Have you ever heard about obstetric danger signs in pregnancy before?	1. Yes 2. No	
17.	If yes, what is the meaning? (choose one of the options based on the response given)	1. Signs that indicate that the pregnant woman or/and the pregnancy has an ailment manifested by such abnormal signs 2. Signs that show during pregnancy that helps the pregnant woman to eat more 3. Signs in pregnancy that makes the baby in the womb increase in weight 4. Don't know 5. Other, specify	
18.	If yes, can you mention at least three of the danger signs you have heard	1. Vaginal bleeding 2. Severe abdominal pain 3. Weakness 4. Reduced foetal movement 5. Swelling of hands, face or feet 6. Severe headache with blurred vision	

		7. Fever convulsion 8. Excessive bleeding 9. Convulsion 10. Fast and difficult breathing 11. Others, specify	
19.	What is your source of this information? (Allow for multiple responses)	1. Health facility 2. Family/Friends 3. Radio/TV 4. Other, specify	
20.	Were you given any education on danger signs on pregnancy during your ANC visits?	1. Yes 2. No 3. Don't know	
21.	In your opinion, is it important for women to know the danger signs in pregnancy?	1. Yes 1. No 2. Don't know	
22.	Give reason(s) to your answer in Q20		
23.	Have you experienced any danger sign/symptom in your previous or current pregnancy	1. Yes 2. No 3. Don't know	
24.	What type of pregnancy danger sign did you experience? (Multiple responses)	1. Vaginal bleeding 2. Severe abdominal pain 3. Weakness 3. Reduced foetal movement 4. Swelling of hands, face or feet 5. Severe headache with blurred vision 6. Fever 7. Excessive bleeding 8. Convulsion 9. Fast and difficult breathing 10. Painful urination 11. Others, specify	
25.	What did you do when you experienced danger signs?	1. Nothing 2. Went to the nearest facility/pharmacy 3. Went to a traditional healer 4. Called a friend for advice 5. Others, specify	
26.	When a pregnant women experience any of the danger signs, what should she do?	1. Visit the health facility 2. Consult friends/family 3. Apply self-medication 4. Nothing 5. Other, specify	

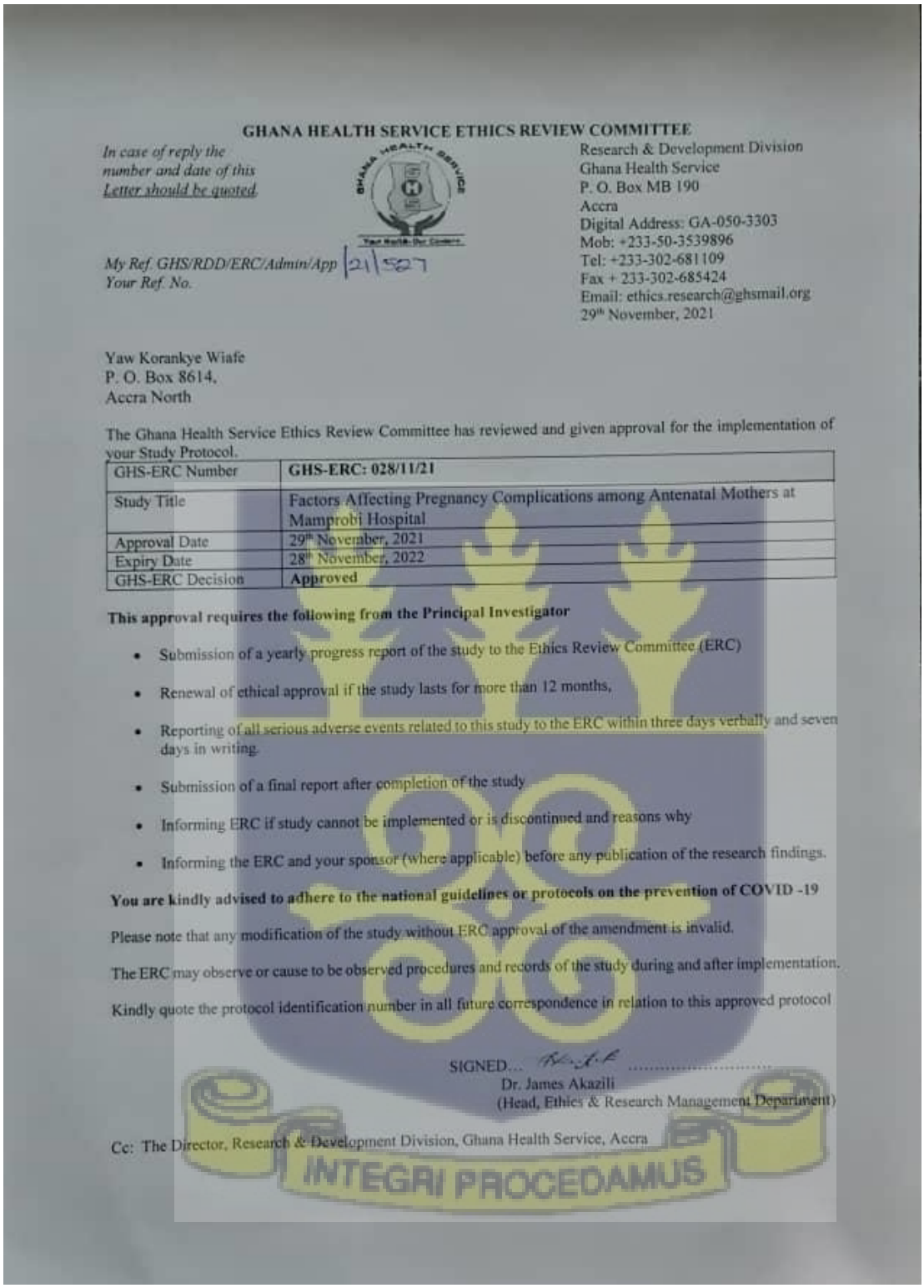
Part C: Household Wealth Assessment Questionnaire

1.	What is the main source of drinking water for members of your household?	1. Piped into dwelling 2. Piped into yard/plot	

		3. Public tap/standpipe 4. Tube well or borehole 5. Sachet water 6. Other Specify…….	
2.	What kind of toilet facility do members of your household usually use?	1. Flush/pour flush toilet to manhole 2. Ventilated improved pit latrine 3. Pit latrine with slab 4. Pit latrine without slab/open pit 5. no facility/bush/field 6. Other (specify)……..	
3.	Do you share this toilet facility with other households?	1. Yes 2. No	
4.	Does household have a radio?	1. Yes 2. No	
5.	Does household have a television?	1. Yes 2. No	
6.	Does household have mobile telephone?	1. Yes 2. No	
7.	Does household have a refrigerator?	1. Yes 2. No	
8.	Does household have a cupboard/cabinet?	1. Yes 2. No	
9.	What type of fuel does your household mainly use for cooking?	1. LPG 2. Natural gas 3. Charcoal 4. Wood 5. other (specify)……	
10.	Main material of the floor.	1. Earth/sand 2. Ceramic tiles 3. Cement 4. Other (specify)……..…	
11.	Does any household member own a bank account	1. Yes 2. No	
12.	Does any member of this household own wristwatch?	1. Yes 2. No	

THANK YOU FOR TAKING PART IN THIS STUDY.

APPENDIX IV: ETHICAL APPROVAL



GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

My Ref. GHS/RDD/ERC/Admin/App 121507
Your Ref. No.

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29th November, 2021

Yaw Korankye Wiafe
P. O. Box 8614,
Accra North

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

GHS-ERC Number	**GHS-ERC: 028/11/21**
Study Title	Factors Affecting Pregnancy Complications among Antenatal Mothers at Mamprobi Hospital
Approval Date	29th November, 2021
Expiry Date	28th November, 2022
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

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

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

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

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

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

SIGNED... .....
Dr. James Akazili
(Head, Ethics & Research Management Department)

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

INTEGRI PROCEDAMUS