SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA

KNOWLEDGE AND PERCEPTION OF RISK OF ANAEMIA DURING PREGNANCY AMONG PREGNANT WOMEN IN ABLEKUMA SOUTH

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JULY, 2016
DECLARATION

I, Dickson Patience hereby declare that apart from the references to other people’s work, which have been dully acknowledged, this work is the result of my own independent work. I further declare that this dissertation either in whole or in part has not been submitted anywhere for the award of any degree.

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DEDICATION

I dedicate this research work to my loving and supportive husband Dr Maxwell K. Mensah for the encouragement, love and support. His support and companionship continuous to be an inspiration.
ACKNOWLEDGEMENT

My first appreciation goes to the almighty God for granting me the grace and strength and how far he has brought me.

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My special thanks goes to my research assistants and any other person who contributed to the success of the thesis and the people of Ablekuma south district especially the participants who sacrificed their time to take part in this research.

My very special thanks goes to my husband and two children Chanel Naa Aku Mensah and Jayden Kwabla Mensah for the loving environment they provided for me to pursue this course and to my siblings, in-laws and especially my mum for taking care of my children while I went through my programme.
# TABLE OF CONTENTS

DECLARATION ............................................................................................................................. i  
DEDICATION ............................................................................................................................. ii  
ACKNOWLEDGEMENT ............................................................................................................ iii 
TABLE OF CONTENTS .............................................................................................................. iv 
LIST OF TABLES ......................................................................................................................... vi 
LIST OF FIGURES ...................................................................................................................... vii 
LIST OF ABBREVIATIONS ..................................................................................................... viii 
ABSTRACT ................................................................................................................................... ix 

## CHAPTER ONE .......................................................................................................................... 1 
1.0. Introduction .......................................................................................................................... 1 
1.1. Background .......................................................................................................................... 1 
1.2. Problem statement ............................................................................................................... 3 
1.3. Conceptual frame work of Knowledge and Perception of risk of Anaemia in Pregnancy ......................................................................................................................... 4 
1.4. Justification .......................................................................................................................... 7 
1.5. Research question ................................................................................................................. 7 
1.6. Research objectives .............................................................................................................. 8 
1.6.1. Main objective .............................................................................................................. 8 
1.6.2. Specific objectives ........................................................................................................ 8 

## CHAPTER TWO .......................................................................................................................... 9 
LITERATURE REVIEW ............................................................................................................... 9 
2.1. Introduction .......................................................................................................................... 9 
2.2. Anaemia prevalence ............................................................................................................ 9 
2.3. Knowledge of anaemia in pregnancy ............................................................................... 11 
2.3.1. Causes and risk factors of anaemia ............................................................................ 11 
2.3.2. Effects of Anaemia ..................................................................................................... 12 
2.3.3. Prevention of anaemia ................................................................................................ 13 
2.3.4. Malaria and anaemia ................................................................................................... 14 
2.4. Perception of anaemia in pregnancy ................................................................................ 16 
2.5. Socio-demography and Anaemia ...................................................................................... 17 
2.6. Adherence to iron supplementation .................................................................................. 17 

## CHAPTER THREE ...................................................................................................................... 19 
METHODOLOGY ....................................................................................................................... 19 
3.1. Study area ........................................................................................................................... 19 
3.2. Study design ....................................................................................................................... 20 
3.3. Study population ............................................................................................................... 20 
3.4. Sample size calculation ..................................................................................................... 20
3.5. Sampling method ............................................................................................................... 21
3.6. Instrumentation .................................................................................................................. 21
3.7. Data processing and analysis ............................................................................................ 23

CHAPTER FOUR ........................................................................................................................ 24
RESULTS...................................................................................................................................... 24
4.1. Socio-demographic characteristics of the respondents ................................................... 25
4.2. Description of perception of risk of anaemia in pregnancy ........................................... 25
4.3. Relationship between socio-demographic characteristics and knowledge of risk of
anaemia in pregnancy ............................................................................................................... 26
4.4. Adherence to iron drugs .................................................................................................... 29
4.5. Relationship between knowledge and perception of risk of anaemia during pregnancy
and adherence to iron medication ............................................................................................ 30

CHAPTER FIVE .......................................................................................................................... 32
DISCUSSION ............................................................................................................................... 32
5.1. Introduction ........................................................................................................................ 32
5.2. Relationship between socio-demographic characteristics and knowledge of risk of
anaemia in pregnancy ............................................................................................................... 32
5.3. Relationship between Perception and risk of Anaemia in pregnancy ........................... 34
5.4. Association between knowledge, perception and adherence to iron supplements among
respondents ................................................................................................................................ 35
5.5. Respondents adherence to iron supplements ................................................................... 35

CHAPTER SIX ............................................................................................................................. 38
CONCLUSION AND RECOMMENDATIONS ....................................................................... 38
6.1. Conclusion ......................................................................................................................... 38
6.2. Recommendation ............................................................................................................... 39

REFERENCES ............................................................................................................................. 40
APPENDICES .............................................................................................................................. 45
Appendix 1: Ethical Issues........................................................................................................... 45
Appendix 2: Consent form ......................................................................................................... 47
Appendix 3: Questionnaire ......................................................................................................... 48
LIST OF TABLES

Table 4.1: Demographic characteristics of respondents ............................................................. 24

Table 4.2: Description of respondents and perception of risk of anaemia in pregnancy ........ 26

Table 4.3: Distribution of risk of anaemia in pregnancy by socio-demographic characteristics .................................................................................................................................... 29

Table 4.4: Descriptive results for iron adherence ....................................................................... 30

Table 4.5: Relationship between knowledge and perception of risk of anaemia during pregnancy and adherence to iron medication .......................................................... 31
LIST OF FIGURES

Figure 1: Conceptual framework ................................................................................................... 5
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>GDHS</td>
<td>Ghana Demographic Health Survey</td>
</tr>
<tr>
<td>GHS</td>
<td>Ghana Health Service</td>
</tr>
<tr>
<td>HB</td>
<td>Haemoglobin</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>IRS</td>
<td>Indoor Residual Spraying</td>
</tr>
<tr>
<td>ITNs</td>
<td>Insecticides Treated Nets</td>
</tr>
<tr>
<td>KBTH</td>
<td>Korle-Bu Teaching Hospital</td>
</tr>
<tr>
<td>LLIN</td>
<td>Long Lasting Insecticidal Nets</td>
</tr>
<tr>
<td>RCTs</td>
<td>Randomized Controlled Trials</td>
</tr>
<tr>
<td>TB</td>
<td>Tuberculosis</td>
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<td>WHO</td>
<td>World Health Organization</td>
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ABSTRACT

Introduction: Worldwide it is estimated that about half of all pregnant women are anaemic. In Ghana, the incidence of pregnant women with anaemia has increased and this accounts for about 20% of maternal mortality. This study therefore sought to investigate the knowledge and perception of the risk of anaemia during pregnancy and adherence to iron supplements among pregnant women in Ablekuma South.

Methods: A descriptive cross-sectional study was carried out among 384 pregnant women in Ablekuma South aged between 19 to 50 years to determine their knowledge and perceptions of the risk of anaemia in pregnancy as well as their level of adherence to iron preparations. Data were analysed using STATA version 13. Socio-demographic characteristics of the respondents were presented in tables and associations between independent variables such as age, marital status and occupation and the dependent variable knowledge of risk of anaemia were examined.

Results: A total of 384 pregnant women were interviewed. The study showed that 78% (301) had knowledge of risk of anaemia. Among the respondents who knew about the risk of anaemia in pregnancy, the majority (43%) were aged 21-30 years and about 43% (162) of them were married. The majority (90%) held positive perceptions about the condition and indicated that taking iron supplements was a measure to reduce the risk of anaemia in pregnancy. The level of adherence to iron supplements was found to be high (90%). There were statistically significant associations between age and knowledge of risk of anaemia (p=0.001) and educational level and knowledge of risk of anaemia (p=0.001).

Conclusion: The study reports a high level of awareness of risk of anaemia in pregnancy, positive perceptions about anaemia and high adherence to iron supplementation.
CHAPTER ONE

1.0. Introduction

This section of the research study provides background information on the study as well as the problem statement, justification and conceptual framework.

1.1. Background

Anaemia is a condition in which the number of red blood cells or their oxygen carrying capacity is insufficient to meet the physiological needs. It has been shown to be a public health problem that affects low, middle and high income countries and has significant adverse health and socio-economic consequences (Munasinghe, 2014). The most reliable indicator of anaemia at the population level is haemoglobin concentration although it does not indicate the cause (WHO, 2011). Haemoglobin is an iron containing oxygen transport protein in red blood cells of all vertebrates (Al Kahtani et al., 2012). It is composed of a protein group known as globin and four hem groups. Its function is to carry oxygen from the lungs to other parts of the body. It is produced by the bone marrow and destroyed by the spleen. Anaemia can present in two forms symptomatic or asymptomatic. Dizziness, palpitation, easy fatigability are some of the symptoms a person can exhibit when suffering from anaemia (Haas & Brownlie, 2001).

Anaemia during pregnancy is a serious public health problem particularly in developing countries (Al Akanni, et al., 2014; Al Hassan, 2015). Some studies have shown that anaemia is a major contributor to maternal death especially in developing countries where a strong association between severe anaemia and maternal mortality has been observed (Al Kahtani et al., 2012). Pregnant women and children are the most vulnerable groups of getting anaemia.
This is as a result of the additional demand on maternal stores during pregnancy (Bencaiova, et al., 2012; Karkowsky, 2015).

The World Health Organization (WHO) defines anaemia in pregnancy as Haemoglobin (Hb) level of less than 11g/dl (WHO, 2011). The most common type of anaemia in pregnancy is iron deficiency caused by low intake of iron and excessive iron loss (McLean et al., 2009; Bishop, 2007). A number of risk factors have been identified to cause anaemia during pregnancy and they include low iron consumption, frequent vomiting, multiple pregnancies, closely spaced pregnancies (WHO, 2012). Nutritional causes of anaemia include folic acid, vitamin B12, pyridoxine, and ascorbic acid deficiency (Bottalico et al., 2015; Fernandes, 2014).

Haemoglobin levels vary with age, sex, pregnancy and altitude. Symptoms of anaemia include dizziness, easy fatigability, palpitations and shortness of breath (Haas & Brown-lie, 2001). Anaemia is one of the most common nutritional problems we have globally. In sub-Saharan Africa the main causes of anaemia in pregnancy are iron deficiency and malaria, followed by micronutrient deficiencies and infection (Bernard et al., 2001). The burden of anaemia in pregnant women is still serious and unacceptably high (GHS, 2004).

Anaemia in pregnancy is a condition that can easily be prevented and it is treatable (WHO, 2011). A number of preventable programs have been rolled out in Africa to tackle the root causes of anaemia including malaria, worm infestations, iron and folic acid supplements and these programs have been shown to be efficient and effective in reducing anaemia in pregnancy (Al Kahtani et al., 2012; Dai et al., 2015). The prevalence of anaemia in pregnancy is significantly high (42%) across the world and much higher in Africa (57.1%) (McLean et al., 2009).
Anaemia in pregnancy is attributed to outcomes such as maternal death, poor cognitive development in young children and reduced mother’s ability to work (Fischer et al., 1992; Alemu & Umeta, 2015).

Anaemia in pregnancy can lead to complications both to the mother and the baby (Kozuki 2012; Ngnie-Teta, 2009; Zeng et al., 2009). Complications such as premature labour, low birth weight, dysfunctional labour, foetal distress, delayed growth and development in infant and children and increased susceptibility to infection are often attributed to anaemia (Al Kahtani et al., 2012; Bencaiova et al., 2012; Bottalico et al., 2015; Dai et al., 2015; Friedrisch & Cançado; Gafter-Gvili et al., 2015).

1.2. Problem statement

Anaemia have been identified as a major public health problem in both developed and less developed countries as about 2 billion people suffer from anaemia and it is reported to account for three-quarters of a million deaths per a year in Africa and South-East Asia (WHO, 2005). Studies across the world demonstrate a high prevalence of anaemia in pregnancy (Qureshi et al., 2014). However, the prevalence of anaemia in less developed countries is about four times more than developed countries (Hu et al., 2012). In less developed countries, anaemia affects over 50% of women who are pregnant (WHO, 2013). The condition affects pregnant women in all trimesters of pregnancy with varied causes of anaemia in pregnancy in sub-Saharan Africa (WHO, 2013). Iron deficiency, malaria, micronutrient deficiency and infection are the main causes of anaemia in pregnancy in sub-Saharan Africa (Bernard et al., 2001). Notable among the causes of anaemia are iron deficiency and malaria.
Anaemia is considered a severe public health problem in Ghana with a prevalence of 70% which is unacceptably high (Bernard et al., 2001). This prevalence in pregnancy has remained high despite improved antenatal care (Ndakuwu et al., 2014). Anaemia in pregnancy increases the risk of premature delivery and low birth weight babies (Brabin et al., 2001). Even though anaemia in pregnancy is treatable as demonstrated in Bangladesh where daily iron intake improved iron stores in pregnant women including non-pregnant women, the condition still accounts for several maternal deaths (Murphy et al., 2009; Khambalia, 2009). Even though, the World Health Organization recommends daily intake of iron during pregnancy, the reported gastro-intestinal side effects discourages some pregnant women from complying with the routine treatment (Anand et al., 2008). The study therefore sought to assess the knowledge level of pregnant women and their perceptions about the risk of anaemia in pregnancy. The study also explored adherence to iron supplementation.
1.3. Conceptual frame work of Knowledge and Perception of risk of Anaemia in Pregnancy

Narrative on conceptual framework

The figure 1.0 above demonstrates the interaction between individual factors (age, sex, marital status, religion, educational level, occupation and income) that influence a person’s perception and knowledge of the risk of anaemia in pregnancy. Whether a person will have high or low perception of the risk of anaemia in pregnancy or the person having adequate knowledge or inadequate knowledge will depend on these individual factors.

The age of a pregnant woman influences the perception about anaemia as well as the knowledge on the risk of anaemia in pregnancy and older pregnant women have more knowledge and positive perception of the risk of a pregnant woman developing anaemia than pregnant women who are younger (Messina et al., 2013). Marital status also influences a
pregnant woman’s perception and knowledge as far as the risk of anaemia in pregnancy is concerned. Married pregnant women have a positive perception of anaemia in pregnancy than their counterparts who are not married. However, women who are married have inadequate knowledge on the issue of the risk of anaemia in pregnancy (Messina et al., 2013). This phenomenon may be associated with the decision making power of the married woman regarding seeking information from sources on the subject. Pregnant women who are not married do not need to consult their husbands before seeking information and therefore tend to have more information on the issue (Messina et al., 2013).

The educational level of a pregnant woman has an influence on her level of knowledge on anaemia and her perception of the risk of anaemia in pregnancy. Educated pregnant mothers have more knowledge on risk of anaemia and a positive perception towards risk of anaemia in pregnancy and this assertion is associated with the pregnant woman’s ability to read material on the subject of anaemia in pregnancy (Messina et al., 2013). A better informed pregnant woman will ultimately have a positive perception about risk of anaemia in pregnancy (Messina et al., 2013).

Income levels of pregnant women affect their knowledge level and perception of the risk of anaemia in pregnancy. Pregnant women with high income have access to resources and ultimately make decisions independent of their husbands in the search for information on anaemia compared to their low income earning counterparts. The culture, beliefs, and practices of an individual can expose one to anaemia during pregnancy (Messina et al., 2013). Foods that are taboos in some cultures such as pregnant women not eating nutritious foods such as eggs and snails can expose a pregnant woman to anaemia.
1.4. Justification

Anaemia is one of the top ten diseases in Ghana and remains one of the major risk factors of maternal mortality (GHS, 2005). The burden of anaemia in pregnant women remains serious and unacceptably high (Bernard et al., 2001). Many studies have explored the causes and the impact of anaemia in many parts of Africa (Compaore et al., 2014; Messina et al., 2013). However, to better appreciate the issue of anaemia in pregnancy, an exploration of the knowledge level of pregnant women as well as their perceptions of the issue will equip stakeholders to target their campaign messages when planning health programs to reduce the incidence of anaemia among this vulnerable group of people.

Findings of the study will be useful in providing the requisite measures to reduce morbidity and mortality associated with maternal anaemia and may also be useful for advocacy, policy change and in designs of programs aimed at positive changes towards improved knowledge on anaemia. The study findings may also pave way for further studies into issues of improving knowledge on risk of anaemia among pregnant women and their adherence to the iron supplements prescribed for them. This study may inform policy on prevention of anaemia among pregnant women in Ghana.

1.5. Research question

1. What is the level of knowledge of pregnant women on the risk of anaemia in pregnancy?

2. What is the perception of pregnant women on risk of anaemia in pregnancy?

3. What is the relationship between knowledge, perception and adherence to iron supplements among pregnant women?
1.6. Research objectives

1.6.1. Main objective

The general objective of the study was to investigate the knowledge and perceptions of the risk of anaemia during pregnancy and adherence to iron supplements among pregnant women in Ablekuma South district.

1.6.2. Specific objectives

1. To determine the level of knowledge of pregnant women on the risk of anaemia in pregnancy among pregnant women in Ablekuma South.

2. To assess the perceptions of pregnant women on the risk of anaemia in pregnancy among pregnant women in Ablekuma South.

3. To assess the relationship between knowledge, perception and adherence to iron supplements among pregnant women in Ablekuma South.
CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter focuses mainly on the thematic areas of the study such as knowledge of anaemia in pregnancy, perceptions of anaemia in pregnancy and adherence to iron supplements.

2.2. Anaemia prevalence

The prevalence of anaemia in pregnancy in developing countries is reportedly still high and nearly half of pregnant women worldwide are estimated to be anaemic, with 52% in sub Saharan Africa compared to 23% in industrialized countries (WHO, 2011). Recent world health organization data shows that approximately 10.8 million in African countries, 9.7 million in the western pacific are anaemic (Alemu, 2011). The prevalence may be as high as 56-61% in developing countries (Mclean et al., 2009). The WHO estimates that more than half of pregnant women worldwide have haemoglobin levels less than 11.0 g/dl (Mclean et al., 2009). Malaria endemic areas such as Ghana have even higher values (WHO, 2005).

Worldwide prevalence of anaemia according to WHO (2008) have been estimated by regions and population groups. In the analysis women and young children are most vulnerable to anaemia. The proportion of women and children is highest in the Africa region where 57% of pregnant women (17 million), 48% of non-pregnant women (70 million), and 68% of preschool children (84 million) are anaemic. In Southeast Asia, 48% of pregnant women (18 million), 46% of non-pregnant women (182 million), and 66% of preschool children (115 million) suffer from anaemia.

According to the 2014 Ghana Demographic Health Survey, 42% of women are anaemic with 32% mildly anaemic, 10% moderately anaemic and less than 1% severely anaemic. Highest
prevalence of anaemia is amongst the youngest age group 15-19 years and lowest among women aged 30-39 (GSS, 2015). Compared with estimates from recent Demographic and Health Surveys, the prevalence of anaemia among women age 15-49 years in Ghana (59 %) is higher than the prevalence in Sierra Leone: 45% in 2008, Niger: 46% in 2006 and Guinea: 53% in 2005 (Silva et al., 2015). Similar observations were made by Al Hassan, (2006) and higher prevalence have been recorded in Benin with 61% in 2006 and Mali with 69% in 2006 (Fiedler et al., 2014). Glover-Amengo et al in 2005 carried out research in the Sekyere west district in Ashanti Region on the determinants of anaemia in pregnancy. The levels of haemoglobin of 205 women who were between the ages of 15 to 49 years, in their third trimester of pregnancy and living within the sub-districts in Sekyere West district of the Ashanti region of Ghana, were determined. Demographic characteristics, dietary habits and other information were obtained and analysed. Stool and blood samples were tested for the presence of malaria parasites and intestinal worms respectively. The data showed that, 57.1% of pregnant women had Hb levels less than 10g/dl, the cut off point for anaemia by the Ministry of Health. The prevalence of Anaemia was low in the urban areas of the district as compared to the high prevalence recorded in the rural parts of the districts. Low parity and young age were significantly associated with low Hb and high prevalence of maternal anaemia. The presence of malaria parasites in peripheral blood constituted a significant risk for low Hb. Hookworm however was even more strongly associated with low Hb. In another study conducted by Getachew et al., (2012), to assess the factors associated with anaemia in pregnancy in Gilgel Gibe Dam area in Ethiopia, out of a total of 388 women, 205 (53%) were anaemic and the odds of rural pregnant women getting anaemia compared to their urban counterparts was 2.8 times.
Table 1 shows the optimum ranges of Hb and red blood cell levels in pregnant and non-pregnant individuals.

2.3. Knowledge of anaemia in pregnancy

2.3.1. Causes and risk factors of anaemia

There are several causes of anaemia in pregnancy. This range from micronutrient deficiency (folic acid, riboflavin, vitamin A and B12), acute and chronic infections (malaria, cancer, TB, HIV) to inherited and acquired disorders such as sickle cell that affect haemoglobin synthesis (Macdonald et al., 2010; Ter Kuile et al., 2004). There are three main categories of the causes of anaemia: 1) poor, insufficient, or abnormal red blood cell production, 2) excessive red blood cell destruction and 3) excessive red blood cell loss (Andrew et al., 2012). In some individuals, infections such as peptic ulcers may cause blood loss and anaemia. The commonest cause of anaemia in pregnancy is iron deficiency. It is a period of significant increase in iron requirement over and above non pregnant levels (Al Hassan, 2015). In developing countries, iron deficiency affects all vulnerable groups. Malaria, which can contribute to excessive red blood cell destruction and helminths infections, a cause of excessive red blood cell loss, are geographically specific (Messina et al., 2013). Other infectious diseases also may be at play. There are contributing causes of anaemia which include inadequate knowledge about the problem of anaemia, environmental factors, lack of access to services, and poverty (WHO, 2012). Messina et al., (2013). In their study to investigate factors associated with anaemia in pregnancy identified pregnancy as the single largest risk factor associated with anaemia. Due to increased iron requirement, pregnancy is also a period of increased risk of anaemia (Ndukwu et al., 2012). During pregnancy women get anaemia because of the increased demand for iron and other vitamins due to physiological
burden of pregnancy. Additionally, a woman loses about 500mg of iron with each pregnancy (Murphy, 2005). The increased iron requirement is due to expansion of maternal red blood mass for increased oxygen transport, including transfer of iron both to the growing foetus and placental structure and as a needed reserve for lochia at parturition (Silva et al., 2015). During pregnancy, iron is also needed for the manufacture of haemoglobin in both maternal and foetal red cells. The foetus accumulates most of its iron during the last trimester and at term (Murthy et al., 2005). Hookworms (Necator americanus and Ancylostomaduodenale) reside in the small intestine of infected individuals where they attach themselves to the villi and feed on host blood. Among individuals with inadequate iron intake and high physiological demands like pregnant women, this blood loss can result in anaemia (Getachew et al., 2012). In the study by Getachew et al conducted in 2012, there was a significant association between hookworm infestation and anaemia.

2.3.2. Effects of Anaemia

Fatigue and decreased ability to work are some of the early symptoms of anaemia (Haas & Brown-lie, 2001). However, being anaemic is also associated with an increased risk of mortality and cognitive loss in those who survive (Stoltzfus et al., 2005; Lozoff et al., 2000). Maternal anaemia is associated with 20% of maternal deaths (Black et al., 2008), with evidence that anaemia may cause increased blood loss at delivery and put women at risk of postpartum haemorrhage (Kavle et al., 2008). Mothers suffering from anaemia are at a higher risk of delivering premature and low birth weight babies who are at a higher risk of dying (Kozuki, 2012; Ngnie-Teta, 2009; Zeng, et al., 2009). Younger children less than two years of age with severe anaemia, caused by malaria and iron deficiency, are at higher risk of mortality and less milder forms, even if corrected, may cause shortening of memory and
permanent cognitive damage by decreasing attention span (Brabin et al., 2001). Children with anaemia have, on average, intelligence quotient that are two points lower per every 10 g/L decrease in haemoglobin than other children (Black et al., 2008; Stoltzfus et al., 2004). Iron deficiency in U.S. school-age children is associated with poorer performance on math’s tests (Halterman et al., 2001). Iron deficiency anaemia is characterized by microcytic erythrocytes and diminished circulating haemoglobin (Alemu et al., 2012). As the deficiency becomes more severe, defects arise in the structure and function of epithelial tissues especially nails, tongue, stomach, and mouth. The skin may appear pale (Brown et al., 2008). There is a strong association between the degree of anaemia during pregnancy as a result of worm infestations and pregnancy outcomes, namely preterm birth, low birth weight of infant, perinatal mortality and infant survival (Brooker et al., 2008).

2.3.3. Prevention of anaemia

Public health interventions which are effective at controlling anaemia include iron supplementation, malaria control interventions and de-worming. Iron supplementation programs have been found to reduce anaemia even though evidence from their success is not conclusive (Stoltzfus, 2001, Scholl, 1994, Palupi, 1997). Iron supplementation during pregnancy reduces anaemia and improves infant outcomes. Children of Indonesian mothers taking iron supplements during pregnancy had a decreased risk of dying in their first five years of life with a 40% decreased risk of dying in the first day of life (Dibley et al., 2012). Studies that administered iron supplements during pregnancy resulted in substantial impacts – reducing neonatal mortality by half in China (Zeng et al., 2008) and tremendously decreasing the risk of death in the first seven years of life (Christian et al., 2009). To achieve results in preventing the consequences of anaemia, an integrated package of interventions needs to be
delivered at-scale to address all the causes of anaemia. Adequate micronutrient intake has important benefits for both mothers and their children. Breastfeeding children benefit from micronutrient supplementation that their mothers receive, especially iron supplementation and vitamin A for women during pregnancy. Iron supplement protect the mother and infant against anaemia. And it is considered a major cause of perinatal and maternal mortality. Folic acid is of crucial importance in early pregnancy to help protect against neural tube defects (Andrew et al., 2015) as there is an inverse dose relationship between folate status and risk of neural tube defects (Messina et al., 2014). It is recommended that women planning to get pregnant should take daily dose of 5mg of folic acid. Rich sources of folate include meat, mushrooms, green leafy vegetables, yam, roots, etc. (Thomas & bishop, 2007). The management of iron deficiency anaemia also includes intake of fish, meat, and poultry and decrease intake of coffee and tea (Zeng et al., 2012). There is a considerable potential to reduce the impact of anaemia in pregnancy by treating pregnant women with anthelminthic drugs in areas where hookworm infestation is common (Getachew, 2013).

2.3.4. Malaria and anaemia

Infection is the next common cause of anaemia and malaria is of significant public health concern. This is common in sub-Sahara Africa with significant risk to both mother and foetus. Malaria is a life-threatening condition caused by parasites that are spread to people through the bites of infective female mosquitoes. About 3.2 billion persons, almost half of the world’s population are vulnerable to malaria and pregnant women, young children, and non-immune travellers who reside in malaria-free areas are most vulnerable to getting the disease when they become infected (WHO, 2005). For pregnant women living in moderate to high transmission settings, WHO recommends intermittent preventive treatment (IPT) with
sulfadoxine-pyrimethamine (SP) after quickening at each scheduled antenatal visit after the first trimester (WHO, 2012).

In pregnant women, there is sequestration of infected erythrocytes in the inter-villous space which causes local inflammatory process which is usually referred to as inflammatory placental malaria (Nosten et al., 2004). This process disturbs exchange between mother and foetus leading to abortions, still birth, low birth weight and infant mortality (Menendez et al., 2000). A study conducted in Congo by Messina et al., (2013) to investigate factors that drive anaemia revealed that anaemia is common among pregnant women with malaria. In this study the majority of pregnant women (60%) with malaria had anaemia compared to their non-pregnant counterparts. Every year, up to 200,000 infant deaths are attributed to malaria during pregnancy (Ismail et al., 2000). Maternal anaemia consequently leads to increase incidence of maternal mortality during pregnancy. It is estimated that about 25% of pregnant women are infected with malaria parasite with the greater risks to primiparous young adults and comorbidity such as infection with HIV (Shantz Dunn et al., 2009).

Malaria during pregnancy reduces birth weight, and low birth weight is a major determinant of infant mortality. Between 1993 and 1996, a cohort of 1,495 mothers and their infants were followed weekly from admission of the mother to antenatal clinics until the infant is one year of age. Both falciparum malaria and vivax malaria during pregnancy were associated with low birth weight but did not shorten gestation. Febrile illness in the week before delivery was associated with premature birth. Preterm and full-term low birth weight and fever in the week before delivery were associated with neonatal mortality. Maternal fevers close to term were also associated with the deaths of infants aged between 1 and 3 months, whereas no risk factors could be identified for deaths that occurred later in infancy. Thus, malaria during pregnancy increased neonatal mortality by lowering birth weight, whereas fever in the week
before birth had a further independent effect in addition to inducing premature birth. The prevention of malaria in pregnancy and, thus, of malaria-attributable low birth weight should increase the survival of young babies (WHO, 2005).

The major adverse effect of malaria in pregnancy on the mother is anaemia. In malaria prone areas, malaria and anaemia are likely to act together to reduce birth weight. Their independent effects are difficult to distinguish. In a study conducted in a highly malarious area of Papua New Guinea, severe maternal anaemia was associated with low birth weight in primigravidae, whereas there was no obvious consistent association between parasite positivity and low birth weight (Brabin, 1990). A more recent study that was conducted in the same country, which attempted to quantitate the separate effects of anaemia- and malaria-attributable low birth weight, concluded that, in malarious areas, malaria was a more important risk factor for low birth weight than was anaemia (Brabin, 1999).

2.4. Perception of anaemia in pregnancy

In a study conducted by Kouadio et al., (2013) in Cote d’Ivoire to assess local concepts of illness, anaemia was reported to be caused among others by sitting close to fire, the sun and hard work. They also found no resistance to medication during pregnancy. Another study (Alam et al., 2015) conducted to explore perceptions of women about anaemia in Bangladesh revealed the respondents believed that by taking iron and folic acid tablets, their chances of getting anaemia will be reduced. In the same study, it was found that fewer pregnant women shared concerns about the association between folic acid intake and large babies. All vitamins are needed for optimal pregnancy outcome as some studies have reported that in the developing countries micronutrient intake of pregnant women were inadequate due to poor balanced diet (Zeng et al., 2008). Messina et al., (2013), found living in an urban area as well
as owing a refrigerator to be protective against anaemia. This was attributed to increased access to a variety of foods that will provide for the iron needs of the individual.

2.5. Socio-demography and Anaemia

While other studies (Cheng, et al., 2009; Ngnie-Teta et al., 2007) have reported significant associations between socio-economic status of individuals and anaemia, Messina et al., (2013) found no significant association between the income and educational level of persons and the development of anaemia. The age of individuals has been reported by Ndukwu et al, 2013 not to be significantly associated with risk of anaemia.

2.6. Adherence to iron supplementation

The current intake of iron from dietary sources has been found to be below the lower recommended nutrient intake in over 40% of 19-64 year old women (Henderson et al., 2003). The proportion of women who take iron supplements for 90 or more days which is the recommended dose is higher in urban women 67% to rural women 53% (GSS, 2015). It is recommended that women planning pregnancy should ensure they achieve adequate intake of iron. Efforts to reduce iron deficiency include education on nutrients, iron fortification of food and treating of worm infestations (Sanou et al., 2010; Rohner et al., 2010). Several risk factors associated with anaemia have been linked to iron deficiency and women who are pregnant have been provided with daily folic acid and iron tablets routinely during ante-natal visits (Pena-Rosas et al., 2009). The WHO encourages iron supplementation for women menstruating in areas with high prevalence of anaemia more than 20% (Lynch et al., 2009). This recommendation by WHO particularly targets adolescent girls as this period is seen as the optimum time for building iron stores in preparedness for pregnancy (WHO, 2011). In
Bangladesh, daily iron intake improved iron stores in pregnant women including non-pregnant women (Beard *et al*., 2009; Khambalia *et al*., 2009). Adherence to iron supplementation is however, an issue and remains difficult to attain partly due to operational difficulties during programs (Tetaley *et al*., 2009; Ogundipe *et al*., 2012). Women do not take iron supplementation because of the gastro-intestinal side effects that are related with it (Ekstrom *et al*., 2008). Those women who do not adhere to iron tablets do not take the recommended dose and this raises the issue of whether they are bothered about their risk of anaemia especially during pregnancy (Tetaley *et al*., 2009). This situation probably stems from the fact that anaemia is often considered a non-urgent maternal health issue compared with other incapacitating illness and suggest that non-adherence to routine iron supplementation is not important. (Nikiema *et al*., 2008). This lack of urgency could be a reflection of the limited appreciation of anaemia and the important role of iron medication. In the study of Ashraful *et al*., (2013), none of the respondents reported having received counselling on folic acid supplements from health workers. Rather they received information on the need to take iron tablets. The study did not also indicate resistance to folic acid supplementation. In another study to determine prevalence of anaemia and iron deficiency, 90% of the respondents who were pregnant reported taking iron supplementation in their last pregnancies with the majority of them starting it in the first trimester. (Chandyo *et al*., 2016).

There are recommendations from stakeholder encouraging health workers to provide counselling on nutrition for clients and to ensure the information is well targeted, an appreciation of how anaemia is viewed in the community is needed (Compaore *et al*., 2014).

In summary, anaemia in pregnancy is a public health problem worldwide. Its detrimental effects are both on mother and child. Its impact in Africa is more serious and its effect is both on health and socio-economic activities of the country.
CHAPTER THREE

METHODOLOGY

This section provides a detailed description of the research methodology used for this work, the issues discussed include the study area, the study design, study population, sample size calculation, sampling method and population, data processing and analysis, instrumentation, ethical issues.

3.1. Study area

Ablekuma South District is one of the eleven (11) Sub-Metropolitan Districts of Accra Metropolitan Assembly. It is bounded on the east by the Odododiodio constituency, on the west by Weija constituency, on the south by the Gulf of Guinea (sea) and on the north by Ablekuma Central and North constituencies. Ablekuma South District has eight (8) suburbs with a population of 213,914 with a slight predominant female population. There are 101,392 males and 112,522 females in the population. According to the Ministry of local government and rural development in 2014 the eight suburbs are Gbenu, Mampong Okai, Mamprobi, Korle Gonno, Korle Bu, Chorkor, Mamsralor and Banana Inn. The study was carried out in Ablekuma South District. Ablekuma South District is an urban community with the predominant ethnic group being the Gas followed by Akans and Ewes (GSS, 2012)

The predominant occupation includes trading, fishing, and civil service. There are few private health facilities in the community. However, there are a number of public health facilities such as Mamprobi Polyclinic and Korle Bu Poly clinic. The Korle Bu Teaching Hospital which is a referral centre is also found in the district (2012).
3.2. Study design.

This is a descriptive cross-sectional study where the knowledge and perceptions of the participants were explored. Cross-sectional study is a collection of data at one point in time. It is carried out to obtain information that exists at that particular time. The reason for the choice of the design was to assist the researcher to obtain information concerning the knowledge and perception of risk of anaemia in pregnancy.

3.3. Study population.

The research population for the study was aimed at pregnant women residing in all the eight communities in the Ablekuma south district at the time of the study.

3.4. Sample size calculation

The sample of a study is a section of the population that is drawn to make inference or projections to the general population. The size was calculated using the Cochran formula (1967); the sample size was calculated using the formula:

\[
\text{Sample size, } n = \frac{Z^2pq}{d^2}
\]

Z is the confidence limits which in this case was 95% level of confidence and 1.96 as critical value. p was the assumed prevalence of the dependent variable which is the proportion of women with knowledge about anaemia in pregnancy in Ablekuma south (50%=0.5).

q is the acceptable deviation from the assumed proportion (1-0.5=0.5).

d is the margin of error around p to be estimated which is 0.05 in this study.

Therefore, \( n = (1.96)^2 (0.5) (0.5) ÷ (0.05)^2 \)
n =384.16=384. This was the minimum number of women to be interviewed. 10% (38 persons) of the sample size was added to the minimum sample size to get 422 participants.

3.5. Sampling method
The study adopted a quantitative approach, and therefore participants were selected by using the multistage sampling approach. First, the two public health facilities in the study community were identified as clusters and their respective populations in terms of antenatal visits per month were obtained from the management of the two health facilities. Using the probability proportional to size approach the sample size for each of the facilities was determined. In the second phase of the sampling process the register of daily attendance from the facilities was obtained and a number randomly selected from 1 and 10. The first person was located by adding the number selected to two. Subsequently the rest of the participants were selected by adding 2 to the number that located the previous participants until the three hundred and eighty four participants were selected.

3.6. Instrumentation
A structured questionnaire was administered to collect data from the participants on all the variables. A structured questionnaire was appropriate for a quantitative cross sectional study. The items in the questionnaire were categorized into 4 sections: socio-demographic data, knowledge on risk of anaemia in pregnancy, perception of risk of anaemia in pregnancy and adherence to iron supplements. The entire questionnaire included 33 items: 9 in the demographic section, 7 on the knowledge section, 11 questions in the perception sections and 6 in the adherence section.
Under socio-demographic section, data were collected on variables such as age, marital status, occupation, income and educational level.

Overall knowledge of the study participants about anaemia was assessed using 7 items covering areas such as causes, signs and symptoms, prevention and treatment. The responses were coded yes and no to measure participant’s level of knowledge. Scores ranging from 1 to 7 were generated. A score of 2 was given to a yes response and 1 was used for a No response. The Likert scale was used to measure the participants’ perception of risk of anaemia. Perception was measured as positive or negative depending on participant’s responses to the perception questions on the Likert scale.

The level of adherence to the iron supplements was measured using the Morisky Medication Adherence Scale (MMAS) (Morisky, Green, & Levine, 1986). The MMAS is an 8-item scale which originally measures medication adherence behaviour in hypertensive patients, but has been modified and adopted for the measurement of adherence to iron supplements. The scale is made up of eight questions about medication taking, which covers forgetfulness, carelessness and the stoppage of medication taking as a result of either subjectively experiencing an improvement or a deterioration in medical symptoms. Respondents’ scores ranged from zero to eight and this enabled categorization into low adherence and high adherence based on the number of positive responses obtained.

The tool was pre-tested in the Odododiodio locality to ensure that the items were reliable and valid. After the pre-test, some of the questions were removed because they were found to be intrusive. Some of the items were re-ordered to ensure they flowed coherently. Some of the questions were also reframed to capture what they were set to measure.
3.7. Data processing and analysis

Data analysis is the process of making meaning out of any data set and drawing conclusions from them. Data was entered into Microsoft office Excel and imported into STATA 13 for analysis. Participant's socio-demographic characteristics were summarized using descriptive statistics in terms of means with correspondent percentages. The independent and outcome variables were also summarized descriptively in frequency tables.

Univariate and multivariate analysis was used to explore associations between the individual factors (independent variables) and the outcome variables (knowledge, perception and adherence to iron supplements). Chi square was used as the statistical test to test associations between the independent variables and the outcome variables using regression analysis.
CHAPTER FOUR

RESULTS

This chapter presents the findings of the study. It shows the socio-demographic characteristics of the women who participated in the study. The chapter also covers the knowledge and perception of the respondents about the risk of anaemia in pregnancy.

Table 4.1: Demographic characteristics of respondents

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-20</td>
<td>17</td>
<td>4.33</td>
</tr>
<tr>
<td>21-30</td>
<td>231</td>
<td>60.33</td>
</tr>
<tr>
<td>30+</td>
<td>136</td>
<td>35.33</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>201</td>
<td>52.51</td>
</tr>
<tr>
<td>Single</td>
<td>156</td>
<td>40.8</td>
</tr>
<tr>
<td>Divorced</td>
<td>12</td>
<td>3.01</td>
</tr>
<tr>
<td>Separated</td>
<td>12</td>
<td>3.01</td>
</tr>
<tr>
<td>Widowed</td>
<td>3</td>
<td>0.67</td>
</tr>
<tr>
<td><strong>Level of education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>38</td>
<td>10</td>
</tr>
<tr>
<td>Basic</td>
<td>60</td>
<td>15.66</td>
</tr>
<tr>
<td>Secondary</td>
<td>105</td>
<td>27.33</td>
</tr>
<tr>
<td>Tertiary</td>
<td>181</td>
<td>47</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>65</td>
<td>17.06</td>
</tr>
<tr>
<td>Christian</td>
<td>301</td>
<td>78.6</td>
</tr>
<tr>
<td>Others</td>
<td>9</td>
<td>4.34</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petty trading</td>
<td>64</td>
<td>16.72</td>
</tr>
<tr>
<td>Civil servant</td>
<td>118</td>
<td>30.77</td>
</tr>
<tr>
<td>Seamstress</td>
<td>28</td>
<td>7.36</td>
</tr>
<tr>
<td>Hairdresser</td>
<td>36</td>
<td>9.36</td>
</tr>
<tr>
<td>Unemployed</td>
<td>68</td>
<td>17.73</td>
</tr>
<tr>
<td>Others</td>
<td>70</td>
<td>18.06</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>384</td>
<td>100</td>
</tr>
</tbody>
</table>
4.1. Socio-demographic characteristics of the respondents

In all, 384 participants were interviewed with a mean age of 29 years. As shown in Table 4.1, above 60% (231) of the respondents were between the age category of 20 and 30 years. The next age category of 30 years and above constituted 35% (136) of the respondents. Two hundred and one (52.5%) respondents were married compared to 156 (40.8%) who were single. Majority, 47% (181) of the respondents had tertiary education and only 10% (38) of the respondents had no formal education. Majority of the respondents representing about 80% (301) of the total respondents were Christians compared to about 17% (65) of them were Muslims. On occupation, about 30% (64) of the respondents indicated they were engaged in petty trading while 33% (36) were hairdressers and only 7% (28) said they were seamstresses. About 17% (68) of the respondents however stated they were unemployed.

4.2. Description of perception of risk of anaemia in pregnancy.

The Table 4.3 illustrates respondents’ perception about anaemia in pregnancy. About 28% (110) of the respondents answered “very likely” to the perception of how likely they are you to getting anaemia. 80 (20.76%) respondents answered “likely”, 22 (7.61%) respondents said neither. Whereas 113 (29.41%) answered “unlikely”, 52 (13.49%) respondents said it was very unlikely they would get anaemia during pregnancy. About 15% (61) of the respondents indicated “No” when they were asked “Do you think pregnant women should eat eggs?” the majority, 323 (83.7%) respondents said yes. About 89.2% (342) and 10.8% (42) of the study participants said “yes” and “No” respectively to the question “should pregnant women take iron supplement?
Table 4.2: Description of respondents and perception of risk of anaemia in pregnancy

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Perception of anaemia in pregnancy among pregnant women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td><strong>Likelihood of getting anaemia</strong></td>
<td></td>
</tr>
<tr>
<td>Very likely</td>
<td>110</td>
</tr>
<tr>
<td>Likely</td>
<td>80</td>
</tr>
<tr>
<td>Neither</td>
<td>29</td>
</tr>
<tr>
<td>Unlikely</td>
<td>113</td>
</tr>
<tr>
<td>Very unlikely</td>
<td>52</td>
</tr>
<tr>
<td><strong>Pregnant women eating eggs</strong></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>61</td>
</tr>
<tr>
<td>Yes</td>
<td>323</td>
</tr>
<tr>
<td><strong>Pregnant women taking iron supplement</strong></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>42</td>
</tr>
<tr>
<td>Yes</td>
<td>342</td>
</tr>
</tbody>
</table>

4.3. Relationship between socio-demographic characteristics and knowledge of risk of anaemia in pregnancy

As shown in table 4.2 age and knowledge of risk of anaemia among the respondents were measured and reported as below. Among the respondents within the age range of 11-20 years, 17 (48.1%) of them were aware of the risk of anaemia in pregnancy whereas 18(51.9%) respondents were not aware. The majority 77.8% (166) of the respondents who were between the ages of 21 and 30 years indicated they had knowledge of the risk of getting anaemia during pregnancy and about 20% (47) did not know of the risk of anaemia during pregnancy. Out of the total number of respondents aged more than 30 years, 118(86.8%) said yes and 18(13.2%) said no respectively when they were asked if they knew about the risk of anaemia in pregnancy. The association between age and knowledge of the risk of anaemia in pregnancy was statistically significant (p=0.001). Among respondents who were married, the majority 162 (81.4%) knew about the risk of anaemia during pregnancy while about 39
(17%) of them did not know about the risk of anaemia in pregnancy. Among the single respondents, while 117 (74.8%) of the respondents were aware of the risk of anaemia associated with pregnancy, 39 (25.2%) had no idea of the anaemia in pregnancy. There was no significant association (p=0.983) between the marital status of respondents and their knowledge of the risk of anaemia in pregnancy. On educational status, among the respondents who had no formal education, 14 (56%) knew there was risk of anaemia associated with pregnancy whereas 11 (44%) had no knowledge of risk of anaemia in pregnancy. Among respondents who had basic education, 30 (44.7) indicated that they had knowledge about the risk of anaemia in pregnancy and 37(55%) respondents with basic education did not have knowledge about the risk of anaemia in pregnancy. While 100 (89.0%) respondents with secondary education had knowledge of risk of anaemia in pregnancy only 12 (10.9%) respondents indicated they did not have knowledge on the risk of anaemia in pregnancy. Majority, 91.3% (166) of the participants of the study who attained tertiary education were aware of the risk of anaemia in pregnancy compared to about 8% (14) of their counterparts who had no knowledge of the risk of suffering from anaemia during pregnancy. Again, the association between educational status and knowledge of risk of anaemia were statistically significant (p=0.001). Among the Christian respondents, 188 (82.8%) had ever heard about the risk of anaemia in pregnancy and 37 (17.2%) had never heard of the risk of anaemia among pregnant women. Out of the total number of the study participants who were Muslims, 35 (68.6%) respondents were aware of the risk associated with anaemia when pregnant and 16 (31.4%) of them indicated they had no knowledge of anaemia during pregnancy. Religion and knowledge of anaemia did not demonstrate statistical significance (p=0.076). About 74% (51) of the study participants who indicated that they were in petty trading knew about the risk of anaemia in pregnancy while about 25% (17)
of the respondents did not know about the risk of anaemia in pregnancy. Among the Civil servants, 116 (95.5%) of them knew about the risk of anaemia in pregnancy and 5 (4%) did not have knowledge of risk of anaemia in pregnancy. While 51 (70%) respondents who were unemployed had knowledge of the risk of anaemia in pregnancy 22 (30%) of them did not know of the risk of anaemia associated with pregnancy. Out of the participants who said they were Seamstresses, 19 (80%) of them knew about the risk associated with suffering from anaemia when pregnant whereas only 4 (17.7%) respondents did not have knowledge of anaemia during pregnancy. Among the respondents who were Hairdressers while about 89% (26) knew about the risk of anaemia in pregnancy, only 10.8% (9) of them had not heard of the risk of anaemia in pregnancy.
Table 4.3: Distribution of risk of anaemia in pregnancy by socio-demographic characteristics

<table>
<thead>
<tr>
<th>Knowledge of risk of Anaemia in Pregnancy</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 – 20</td>
<td>17(48.1)</td>
<td>18(51.9)</td>
<td>0.001</td>
</tr>
<tr>
<td>21 – 30</td>
<td>166(77.8)</td>
<td>47(22.2)</td>
<td></td>
</tr>
<tr>
<td>30+</td>
<td>118(86.8)</td>
<td>18(13.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>117(74.8)</td>
<td>39(25.2)</td>
<td>0.983</td>
</tr>
<tr>
<td>Married</td>
<td>162(81.4)</td>
<td>39(17.3)</td>
<td></td>
</tr>
<tr>
<td>Divorce</td>
<td>12(70.0)</td>
<td>5(30.0)</td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>8(80.0)</td>
<td>2(20.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>None</td>
<td>14(56)</td>
<td>11(44)</td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>30(44.7)</td>
<td>37(55.3)</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>100(89.0)</td>
<td>12(10.9)</td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>166(91.3)</td>
<td>14(8.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td>0.076</td>
</tr>
<tr>
<td>Christian</td>
<td>188(82.8)</td>
<td>37(17.2)</td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>35(68.6)</td>
<td>16(31.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td>0.954</td>
</tr>
<tr>
<td>Petty trading</td>
<td>51(74.5)</td>
<td>17(25.5)</td>
<td></td>
</tr>
<tr>
<td>Civil servant</td>
<td>116(95.5)</td>
<td>5(4.5)</td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>51(70.3)</td>
<td>22(29.7)</td>
<td></td>
</tr>
<tr>
<td>Seamstress</td>
<td>19(82.3)</td>
<td>7(17.7)</td>
<td></td>
</tr>
<tr>
<td>Hairdresser</td>
<td>26(89.2)</td>
<td>9(10.8)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>52(73.5)</td>
<td>17(26.5)</td>
<td></td>
</tr>
</tbody>
</table>

4.4. Adherence to iron drugs

Iron medication adherence was measured among the respondents and reported as shown in the Table 4.5 below. About 90% (346) of the respondents reported they were on iron supplements while 38 (9.89%) said they did not take iron supplement. About 70% (295) of the respondents indicated they take iron supplements on daily basis, about 8% (34) took it every other day, 5% (20) took it once in a week and about 7% (28) rarely took the medication. Also, 167 (43%) study participants said they did not take iron supplements the
previous day whereas 217 (56.63%) respondents indicated that they took iron supplement a day prior to the interview. While a majority, 67.74% (260) of the respondents said they did not feel hassled taking iron supplements, about 32% (124) of the respondents felt hassled taking the medication.

Table 4.4: Descriptive results for iron adherence

<table>
<thead>
<tr>
<th>Variable</th>
<th>freq.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant women taking iron supplements during pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>38</td>
<td>9.89</td>
</tr>
<tr>
<td>Yes</td>
<td>346</td>
<td>90.11</td>
</tr>
</tbody>
</table>

| Frequency of taking the iron supplements | | |
| Daily | 295 | 76.68 |
| Every other day | 34 | 8.83 |
| Once in a week | 20 | 5.3 |
| Rarely | 28 | 7.42 |
| Other | 7 | 1.77 |

| Taking iron supplements the previous day | | |
| No | 167 | 43.37 |
| Yes | 217 | 56.63 |

| Pregnant women sticking to iron supplements treatment plan | | |
| No | 260 | 67.74 |
| Yes | 124 | 32.26 |

4.5. Relationship between knowledge and perception of risk of anaemia during pregnancy and adherence to iron medication

As shown in table 4.6., among the respondents who took their drugs the previous day 183(82.3%) had knowledge of the risk of anaemia in pregnancy compared to their counterparts, 39 (17.7%) respondents who did not have knowledge of the risk of anaemia in pregnancy. Among the respondents who did not take iron supplements the previous day,
40(24.8%) respondents did not have knowledge of risk of anaemia in pregnancy while majority, 75.2% (122) of the study participants had knowledge of the risk of anaemia in pregnancy. Knowledge of the risk of anaemia in pregnancy and adherence to iron medication had no significant association. Among the participants who took their drugs, only 10% (25) of them had a negative perception about the risk of anaemia in pregnancy and about 90% (193) had positive perception about the risk of anaemia in pregnancy. Out of the total number of respondents who did not take their iron supplements about 20% (30) and 80% (136) had negative and positive perceptions about the risk of anaemia respectively. There was no significant association between perception of risk of anaemia in pregnancy and adherence to iron medication among the respondents.

Table 4.5: Relationship between knowledge and perception of risk of anaemia during pregnancy and adherence to iron medication

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Adherence to iron medication</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (%)</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>Knowledge of risk of anaemia in pregnancy</td>
<td>No 40(24.8%)</td>
<td>39(17.7)</td>
</tr>
<tr>
<td></td>
<td>Yes 122(75.2)</td>
<td>183(82.3)</td>
</tr>
<tr>
<td>Perception of anaemia in pregnancy</td>
<td>Negative 30(18.3)</td>
<td>25(11.5)</td>
</tr>
<tr>
<td></td>
<td>Positive 136(81.7)</td>
<td>193(88.5)</td>
</tr>
</tbody>
</table>
CHAPTER FIVE

DISCUSSION

5.1. Introduction

This section of the write up compares study findings with reviewed related literature. The discussion is done under three main headings of socio-demographic characteristics and their relationship on the knowledge and perception about the risk of anaemia in pregnancy and the relationship between knowledge, perception of risk of anaemia in pregnancy and adherence to iron supplement.

5.2. Relationship between socio-demographic characteristics and knowledge of risk of anaemia in pregnancy.

The study reports a statistically significant association between the age of respondents and their knowledge of risk of anaemia in pregnancy. The results are in contrast to the findings of the Ghana Demographic and Health Survey (2014) which suggest that anaemia is prevalent among age group 15-19 years. Another study by Andrew et al., (2006), reported similar findings. The study found that the majority of the respondents had knowledge on the risk of anaemia in pregnancy. This finding demonstrates a positive correlation between the age of respondents and their awareness of the risk of anaemia in pregnancy. This is also supported by the assertion that age represents accumulated experience in terms of the number of pregnancies. Older respondents were more likely than their younger counterparts to carry more pregnancies and the associated risk of anaemia. This is probably because age represents accumulated experience exposing older pregnant women to the issue of risk of anaemia in pregnancy. This experience exposes older pregnant women to issues of anaemia than younger pregnant women. This result is however in contrast with the finding of the study conducted
by Ndukwu and Dienye, (2013) who observed that young adults were more aware of risk of anaemia. The study also reports about 75% and 80% level of awareness among single pregnant women and married women respectively. In the analysis even though there was not a statistically significant association between marital status and knowledge of risk of anaemia by respondents, the married category of pregnant women were most aware of the issue of risk of anaemia in pregnancy. This disputes the notion that married pregnant women do not make decisions independent of their husbands when searching information on the subject matter. There was a statistically significant association between educational level of respondents and their level of awareness of the risk of anaemia in pregnancy. The association is one of a positive correlation where the level of awareness increased with educational level. The results suggests that the higher the educational level of the individual the higher the individual’s level of awareness of the risk of anaemia in pregnancy. According to the results, among pregnant women without any form of education 56% of them knew of the risk of anaemia in pregnancy, 81% and 90% for secondary and tertiary levels respectively. Awareness of the risk of anaemia was however low among the respondents with basic education. The positive correlation between the education level and knowledge of risk of anaemia is contrary to the result reported by Messina et al., (2013) who found no association between educational and the risk of developing anaemia. The relationship suggests that pregnant women with higher education could read and appreciate the information on the risk of anaemia in pregnancy compared to their non-educated counterparts. No statistically significant association was recorded between the religion of pregnant women in the study community and their level of knowledge of the risk of anaemia. The proportion of pregnant women who were Christians were probably slightly high than their counterparts who were Muslims because the study setting was a Christian dominated area. The occupation of the pregnant women was not
5.3. Relationship between Perception and risk of Anaemia in pregnancy

About 50% of the respondents agreed that pregnancy was associated with the risk of anaemia. This reflects the high level of awareness of the risk of anaemia in pregnancy among the age categories 15-20 and 21-30 year groups with exception of the older age group (more than 30 years) group of respondents. However, considering the older group with a high level of awareness, the perception of risk of anaemia is not good as there appears to be a paradox where even though the level of awareness of risk of anaemia is high among the respondents, only half of them agreed they were at risk of developing anaemia. The study finding is consistent with that of the finding by Alam et al., (2015). The respondents (29%) who indicated that they were not likely to get anaemia while they were pregnant believed their iron supplementation regimen had a protective effect against anaemia in pregnancy. The result indicates that majority of the respondent were more likely to eat eggs during pregnancy to avert anaemia. This result is similar to the findings made by Messina et al., (2013). However, in the study of Messina et al., (2013), even though there was a general agreement about pregnant women eating eggs, the women did not eat eggs for fear of large babies which they said was accompanied by difficult labour. The respondents who held a negative perception about eating eggs could also be of similar views of large babies and difficult labour. The study area is a community of people of diverse cultural background and the
finding was (unsurprising). In this study, the majority of the respondents held a positive perception about taking iron during pregnancy. The result is supported by that of Kouadio et al., (2013). The results, again suggests that pregnant women were more likely to accept iron supplementation to reduce their chances of getting anaemia.

5.4. Association between knowledge, perception and adherence to iron supplements among respondents

In this study, there was no statistically significant association between the three outcome variables- knowledge, perception of risk of anaemia in pregnancy and adherence to iron supplements. However, about 90% of the respondents with positive perception about the risk of anaemia in pregnancy reported taking iron compared to about 10% of their counterparts not taking iron supplements. A look at the results suggests that respondents with positive perception of the risk of developing anaemia in pregnancy were several times more likely to take iron supplements. Among the respondents who reported taking iron supplements during pregnancy, about 80% had knowledge of risk of anaemia in pregnancy. A similar observation was made with those who reported taking iron supplements even though they had no knowledge of the risk of anaemia in pregnancy.

5.5. Respondents adherence to iron supplements

On adherence to iron drugs, about 90% of the respondents responded to taking in these preparations. This indicates that respondents did not resist taking iron drugs during pregnancy. They did so probably with the knowledge that they were at risk of anaemia and that iron supplement could reduce their risk of getting anaemia while pregnant. The response rate reflected the routine iron supplementation for pregnant women in public facilities in the
country. However, the response rate among the respondents is higher than the 67% reported by the 2014, Ghana Demographic and Health Survey (GSS, 2015). A similar result was reported by Chandyo et al., (2016) when they carried out a study to determine prevalence of anaemia and iron deficiency. In their work, they found that about 90% of the respondents who were pregnant reported taking iron supplementation in their last pregnancies with the majority taking the medication in the first trimester. However, when a follow up question was asked demanding how often they took the iron supplements about 76% of them indicated they took the medication on daily basis. About 8% of respondents indicated taking the iron medication every other day while about 7% of them rarely took iron supplements. This is slightly higher than reported in the Ghana Demographic and Health Survey in 2014 (GSS, 2015). The low compliance to iron supplementation by the respondents could be due to respondents high level of awareness of the risk of anaemia associated with pregnancy. About 60% of the respondents reported taking iron medication a day prior to the interview day while about 40% said they did not take iron medication the previous day. This partly explains the disparity between the positive response rate (90%) and the daily iron intake rate (76%). The finding suggest an almost (50%) chance of adhering to daily intake of iron as recommended by the World Health Organization (WHO, 2011). This reflects a daily iron intake defaulter rate which could be attributable to mere forgetfulness in taking drugs or respondents busy work schedule. Respondents were also asked if they felt hassled taking their iron supplements. About 70% of them indicated they did not feel hassled taking the medication compared to about 30% of the respondents who said they felt hassled taking the medication. This compares favourably with what is reported by other studies (Alemu et al., 2008 & Tetaley et al., 2009). In these studies, women were found to cite gastro-intestinal effects associated with iron supplements as the reason for their non-compliance. Even those women
who do not averse to iron tablets failed to take the recommended dose and raises the issue of whether they are bothered about their risk of anaemia especially during pregnancy (Tetaley et al., 2009).
CHAPTER SIX
CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The findings in this study demonstrate that some 78% of the women interviewed had knowledge of the risk of anaemia in pregnancy amongst pregnant women in the study area. This knowledge of risk of anaemia among the respondents was positively correlated with older age. This suggests that a pregnant woman’s age represents accumulation of experience and as they age they experience pregnancies with the associated risk of anaemia which subsequently exposes them to information on risk of anaemia in pregnancy. The high level of knowledge of the risk of anaemia in pregnancy was also significantly associated with the respondents’ level of education where educated women were more likely than their non-educated counterparts to have more knowledge on the risk of anaemia.

The study recorded positive perceptions about the risk of anaemia among the majority of the respondents. The majority of the women (80%) held a positive view about eating iron containing foods while about 90% of the respondents had a good perception about iron tablet reducing the risk of anaemia among them. This is suggestive of low resistance to and high compliance with iron supplements among the study participants.

Finally, the respondents’ level of knowledge and perception did relate with adherence to iron supplements. Similar adherence to iron medication levels were reported in both groups with high knowledge and low knowledge of risk of anaemia in pregnancy. Perceptions about the risk of anaemia in pregnancy and the adherence to iron medication did not also demonstrate significant association. An individuals’ knowledge level on risk of anaemia and the
perceptions held about the risk of anaemia in pregnancy did not also show statistically significant association.

### 6.2. Recommendation

**Policy recommendations**

1. Given the impact of anaemia on pregnancy outcomes, it is obviously advantageous for clinicians to have a practical and efficient means of screening and treating anaemia in pregnancy.

2. The Ministry of health and the Ghana Health Service should consider introducing a policy requiring all pregnant women take iron supplements under direct observation of a health worker or a family member at home.

3. It is recommended that health promotion and disease prevention campaigns on anaemia be organised at places of contact with pregnant women and women of the reproductive age group.

**Future Research**

Future research should explore using a qualitative approach to explore the factors that hinder daily intake of iron supplements among pregnant women.

**Study limitations**

Due to geographical and socio-cultural differences across regions, the results of the study are indicative but not necessarily applicable to all other districts and regions.
REFERENCES


APPENDICES

Appendix 1: Ethical Issues

Risks and benefits

Participants may feel uncomfortable with some of the questions that will be asked during the interviews. The research proposal was submitted to the Ghana Health Service Ethics Review Committee to analyse and give an objective opinion on it. Also, the questionnaires were piloted to review all questions that were likely to make clients uncomfortable. There was no monetary compensation for the participant as a reward for their participation. The research study was however analysed to help improve on knowledge and perception of risk of anaemia in pregnancy among pregnant women.

Right to refusal

Participation in the study was voluntary, and participants were not under any obligation to do so. Participants were made to understand that even if they consented to participate in the study they were at liberty to withdraw from the study at any stage of it without any sanctions.

Anonymity, privacy and confidentiality

The study involved collecting data from participants through interviews. Participants were assured that any information given during the study would be used for the purpose of research. Any information given shall not be disclosed but treated with utmost confidentiality. Apart from the researchers, no other person knew the names of participants granting interviews. Data collected was entered into MS Excel of a computer with pass word that was only known by the principal investigator. All filled out questionnaires were stored in shelves of a cupboard and kept under key. The principal investigator will keep the key to the locked cupboard containing the filled out questionnaires. The data will be stored for five
years and all records destroyed in an environmentally friendly manner with witnesses and photographic evidence when the five year period elapses. Research assistants were given adequate training on data collection and instruction to go according to the questions on the questionnaire to avoid intrusion of participants’ privacy. The final report was disseminated to the Ghana Health Service and the Ablekuma South health directorate. Participants were provided with contact numbers to discuss any issues of concern related to the research study. Participants could contact the following numbers:

0243186293, 0202536099 (The principal investigator)

Consent

Permission was obtained from the Ablekuma South Health Directorate to undertake this project. Participants were told the purpose of the study, who the researchers were, information on risk, benefits, privacy and anonymity in the language they understood so that they could make informed decision as to whether or not to participate. Participants who agreed to participate were made to sign the consent form which captured the explanation above.

Conflict of interest

The project was a self-sponsored one as it was fully funded by the principal investigator.
Appendix 2: Consent form

Hello thanks very much for your permission. I am Patience Dickson, a student pursuing a Master of Science (AHSS) program at the University Of Ghana School Of Public Health Legon, Accra. This interview is being conducted as part of a research into the knowledge and Perception of Risk of Anaemia during Pregnancy. I would be very grateful if you could kindly find some time to answer these questions. Your views, opinions and contributions are valuable and would assist me determine the knowledge and Perception of Risk of Anaemia during Pregnancy. This study is strictly for academic purposes and you are assured of confidentiality on any information that you would provide. You are free to decide if you want to participate in this research or otherwise. The information about you taking part in this study will be protected to the best of our ability. Your name will neither be used in any reports nor discuss your participation with anyone outside the research team. No payments will be made for your participation and you suffer no penalties for declining to participate.

If you have any questions about the research, please call Patience Dickson on 0243186293 or email her through bossmaxxi@gmail.com.

This research has been reviewed and approved by the Ghana health Service ethical review board. If you have any questions about how you are being treated by the study or your rights as a participant you may contact Mrs. Hanna Frimpong on 0244516482/0202920651.

I understand all that has been explained to me about the study-objectives, benefits, risks and my rights and I agree to participate in this study

____________________________________________________________________________________________

Signature of respondent                          Date

Thanks for your cooperation.
### Section A: Socio-demographic data

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Questions</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How old are you?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>What is your marital status?</td>
<td>[ ]</td>
</tr>
<tr>
<td>3</td>
<td>What is your level of education?</td>
<td>[ ]</td>
</tr>
<tr>
<td>4</td>
<td>What is your religion?</td>
<td>[ ]</td>
</tr>
<tr>
<td>5</td>
<td>What is your occupation?</td>
<td>[ ]</td>
</tr>
<tr>
<td>6</td>
<td>Is your spouse employed?</td>
<td>[ ]</td>
</tr>
<tr>
<td>7</td>
<td>If yes, please specify</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>What is the gestational age of your current pregnancy</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

### Section B: Knowledge of risk of anaemia in pregnancy

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Questions</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Have you ever heard about anaemia in pregnancy?</td>
<td>[ ]</td>
</tr>
<tr>
<td>11</td>
<td>If yes, from what source did you learn of it?</td>
<td>[ ]</td>
</tr>
<tr>
<td></td>
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<td>---</td>
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<td></td>
</tr>
<tr>
<td>6.</td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
| 12 | If yes, what do you understand by anaemia in pregnancy  
1. A problem of blood in pregnant women  
2. Low level haemoglobin in pregnancy  
3. Low oxygen carrying capacity of blood  
4. Low volume of blood in pregnancy  
5. Others |
| 13 | What causes anaemia during pregnancy  
1. Mosquitoes  
2. Bleeding  
3. Not eating well  
4. Worm infestation  
5. Genetic disease  
6. Other |
| 14 | What are the symptoms of anaemia?  
1. Dizziness  
2. Easy fatigability  
3. Fever  
4. Weakness  
5. Palpitations  
6. Other |
| 15 | What are the effects of anaemia in pregnancy on the unborn child?  
1. low birth weight  
2. intra-uterine death  
3. congenital anomalies  
4. other |
| 16 | What are the effects of anaemia in pregnancy on the mother?  
1. Body weakness  
2. Maternal death  
3. Stroke  
4. Other |

### Section C  
**Perception of Anaemia in pregnancy**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 17 | Do you think pregnant women should eat eggs?  
1. No  
2. Yes |
| 18 | If no, why?  
1. Baby will grow bigger and makes delivery difficult  
2. Baby will become a thief  
3. Mother will undergo operation  
4. Other |
| 19 | What foods are forbidden during pregnancy  
1. Eggs  
2. Fish  
3. Meat  
4. Leafy soup  
5. Other |
| 20 | Is it good for pregnant women to take iron supplements?  
1. No  
2. Yes |
| 21 | If no, why?  
1. It causes disease in the baby  
2. It causes colour changes in toilet  
3. It increases appetite  
4. It delays birth |
<p>| 22 | Do you take any iron supplements during pregnancy? |</p>
<table>
<thead>
<tr>
<th>Question no</th>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>If yes. At which stage of the pregnancy did you take it?</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Do you sleep under mosquito net?</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>If no, why?</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>How likely are you in getting malaria?</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Is it likely you can get malaria at any stage of your pregnancy?</td>
<td></td>
</tr>
</tbody>
</table>

### Section D: Adherence to iron supplement

<table>
<thead>
<tr>
<th>Question no</th>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>How often do/did you take the iron supplements?</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Do you sometimes forget to take your iron supplements?</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Over the past two weeks, were there any days when you did not take your iron supplements?</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>When you travel or leave home, do you sometimes forget to bring along your iron supplements?</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Did you take your iron supplements yesterday?</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Do you ever feel hassled about sticking to your iron supplements treatment plan?</td>
<td></td>
</tr>
</tbody>
</table>
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/1pp/16/99
Your Ref. No.

Dickson Patience
University of Ghana
School of Public Health
Legon, Accra

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

<table>
<thead>
<tr>
<th>GHS-ERC Number</th>
<th>GHS-ERC 69/02/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title</td>
<td>“Knowledge and Perception of Risk of Anaemia during Pregnancy among Women in Ablekuma South”</td>
</tr>
<tr>
<td>Approval Date</td>
<td>11th May, 2016</td>
</tr>
<tr>
<td>Expiry Date</td>
<td>10th May, 2017</td>
</tr>
<tr>
<td>GHS-ERC Decision</td>
<td>Approved</td>
</tr>
</tbody>
</table>

This approval requires the following from the Principal Investigator:

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

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

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

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

SIGNED: ........................................
PROFESSOR MOSES AIKINS
(GHS-ERC VICE-CHAIRPERSON)

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