SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

ASSESSING THE DETERMINANTS OF ANAEMIA AMONG PREGNANT TEENAGERS IN LA NKWANTANANG, MADINA.

BY

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DECLARATION

I Gladys Awini, do hereby declare that this study is the result of my own research. No part of the study has been presented for the award of a degree at the university or elsewhere. All references have been duly acknowledged. Any shortcoming will be my sole responsibility.

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09/05/2019	09/05/2019
(DATE)	(DATE)

DEDICATION

I dedicate the work to my husband Mr. Joseph Asako Azumyarn and the entire family, especially to Mr. Godwin Musah, a lecturer, who encouraged me in times of challenges.

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I am very thankful to the Lord Almighty for his kind mercy and grace that He has offered me in the entire programme. My appreciation also goes to my supervisor, Prof. Augustine Ankomah for his guidance and direction given to me throughout my project.

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SUMMARY

Introduction: Anemia in pregnancy is an important public health problem associated with increased maternal and perinatal morbidity and mortality. The World Health Organization revealed that more than half of all women living in developing countries are anemic. Teenage girls are confronted with lots of health threats during pregnancy and childbirth, prominent amongst these health threats is anaemia.

Aims: The aim of the study is to determine the prevalence of anemia and its determinants among pregnant teenagers utilizing the health facilities in La Nkwantanang, Madina of the Greater Accra region.

Methodology: A cross-sectional study was conducted among pregnant teenagers who utilized ANC services at Pentecost Hospital at La Nkwantanang, Madina in the Greater Accra region. A structured questionnaire was used to obtain socio-demographic, knowledge on the risk of anaemia during pregnancy as well as their level of adherence to iron preparations. Data was analyzed using STATA 14.

Results: The study recruited a total of 389 pregnant teenagers. The prevalence of anaemia among the pregnant teenagers was 69%, likewise malaria parasites were observed in 68.3% of the pregnant teenagers. Fifty-four percent of the respondents had a high knowledge of risk of anemia. Thirty-five percent had moderate knowledge while 11% had a low level of knowledge. Age and Educational level of the participants was significantly associated with the level of knowledge of risk of anemia. 85% of the respondents reported they were on iron supplements while 58 (15%) said they did not take iron supplement.

Conclusion: The study reports a high prevalence of anaemia among pregnant teenagers. High level of knowledge of risk of anaemia in pregnancy and high adherence to iron supplementation was also observed.

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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
APH	Antepartum Haemorrhage
APGAR	Appearance, Pulse, Grimace, Activity, And Respiration
CDC	Cener For Disease Control and Prevention
GDHS	Ghana Demographic and Health Survey
GDP	Gross Domestic Product
Hgb	Hemoglobin
HIV	Human Immune Virus
IDA	Iron Deficiency Anaemia
INACG	International Nutritional Anaemia Consultative Group
NSAID	Non-Steroidal Anti-Inflammatory Drugs
PPH	Postpartum Haemorrhage
RBCs	Red Blood Cells
SPRING	Strengthening Partnerships, Results, And Innovations In Nutrition Globally
USAID	United States Agency For International Development
UNICEF	United Nations Children Fund
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Women go through a variety of physiological changes during pregnancy. Changes in the blood circulatory system are particularly notable, permitting normal fetal growth. The United Nations Children's Fund (UNICEF, 2008) World Fact Sheet defines Teenagers as people who are within the ages of 13 to 19 years. Pregnancies associated with females within this age category are known as teenage pregnancies. The term teenage pregnancy as adopted and widely used in everyday speech ordinarily refers to females who become pregnant before reaching legitimate adulthood. Teenage pregnancy remains a public health concern with diverse serious consequences for the individual, the family and the society as a whole. Though teenage pregnancy is a global issue, differences exist in the rates at which they occur across countries (WHO, 2009). For instance, the rate of teenage pregnancy is estimated to be about 95% in developing countries with higher prevalence in sub-Sahara Africa (UNFPA, 2013). Most of the pregnancies that happen to unmarried teenagers are very likely to be unplanned and perhaps even lead to induced abortion.

According to UNICEF (2008), the number of children born to both married and unmarried Teenagers girls aged 15 to 19 is about 14 million. Women who begin childbearing in their teenage years face a variety of problems during pregnancy and in later life. They have higher rates of poor obstetric and neonatal outcome, lower educational achievement, higher rates of poverty and welfare dependence. Though pregnancy and child birth is believed to be a blissful occasion, for most teenagers, due to unplanned pregnancy and lack of support, this whole experience becomes

a nightmare. Also Teenage girls are confronted with lots of health threats during pregnancy and childbirth. Prominent amongst these health threats is anaemia.

The Centre for Disease Control and Prevention (1998) has defined anaemia to be haemoglobin (Hgb) value less than the fifth percentile of the distribution of Hgb in a healthy reference population based on the stage of pregnancy. The CDC Classification derived from an iron-supplemented population lists the following levels as anaemic: Hgb (g/dL) (percentage) levels below 11 g/dL in the first trimester; 10.5 g/dL in the second trimester; and 11 g/dL, respectively, in the third trimester (CDC, 1998).

According to Shaikh Sabina et al (2015), Anemia is the commonest hematological disorder that occurs in pregnancy. The most reliable indicator of anaemia at the population level is haemoglobin concentration although it does not indicate the cause (WHO, 2011). The World Health Organization technical report (1992-1993) revealed that 56% of all women living in developing countries are anemic. Some studies have shown that anaemia is a key 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). Low levels of haemoglobin to some extent are attributable to iron deficiency. It is estimated that more than 2 billion people are iron deficient globally. (Shaikh Sabina et al 2015). Among these people, 1.2 billion become severely anaemic (Shaikh Sabina et al 2015). Buseri et. al (2008) asserts that about 90% of all anaemia cases has an iron deficiency component. WHO (1972) opines that prevalent in the developing economies are the developing world are nearly half of the population are iron deficient. According to world Health Organization, estimates up to 56% of all women living in developing countries are anemic. Iron requirements in pregnancy have been purported to be higher than non-pregnancy state (Zavaleta *et al.*, 2000). The increased iron requirement is due to

expansion of maternal red blood cell mass for increased oxygen transport, including transfer of iron, to both the growing foetus and the placental structures, and as a needed reserve for blood loss and lochia at parturition (Beaton, 2000). Due to increased iron requirements, pregnancy is also a period of increased risk for anaemia. Thus, a high proportion of pregnant teenagers become anaemic during pregnancy.

According to the 2010 population and housing Census (GSS, 2012), LaNMMA has a total population of 111,926. The inter-censal growth is estimated to be 4.6% with an estimated 2017 population of 147,966. Presently, the Municipality has a total of forty-three health facilities. These include a Mission Hospital which serves as the only medical referral facility in the municipality, Nineteen Private Health facilities, a Quasi-Government facility and 19 CHPS centres. There are a lot more private facilities than public ones, including the biggest health facility which is the Pentecost Hospital. According to the Annual Health Directorate Report (2016), the Municipality recorded Antenatal Clinic cases of 9,040, with Pentecost Hospital amassing a majority attendance of 7,171 pregnant women. The municipality has an alarming increment in adolescent pregnancy frequency from 483 in 2013 to 576 in 2016, representing an 84% surge. The foremost complications to adolescent pregnancy in the municipality are Malaria and Anaemia, with a percentage of 18% and 6% respectively. Thus, Pentecost Hospital was adopted for this study as the last resort to all medical concerns that emanate from the municipality, and as such is more placed to have an exhaustive data on majority of anemia cases for the purposes of this study.

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).

Iron deficiency anaemia in 2002 was considered to be the most significant contributor to the global burden of the disease (World Health Organization, 2002). Anaemia is pervasive in Central and West Africa, where 71% of children under five years old, 48% of non-pregnant women, and 56% of pregnant women are affected (Stevens et al. 2013). The Family Health Division of the Ghana Health Service Annual Report (2016) revealed that, 63% of pregnant women registrants in the various Antenatal Clinics in Ghana have anaemia, a marginal increase of 62% in 2015.

Anaemia in pregnant women is a catalyst for low birth weight and haemorrhage during and after delivery, which consequently escalates the possibility of maternal mortality. This is because it can lead to still birth, spontaneous abortions and many complications associated with pregnancy. Research conducted by Intiful et al (2016) dubbed "Anaemia in Pregnant Adolescents" revealed that 76% of girls of pregnant adolescents had anaemia, with severity ranging from mild 47.8% to severe 0.8%. The study further revealed that about 27.5% were moderately anaemic. 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).

Anaemia is considered to be high in countries with a prevalence rate greater than 40% (WHO, 2008). The Ghana Demographic and Health Survey Report (2008) has estimated that by the year 2020, about 9000 mothers in Ghana will die of anaemia if its levels during pregnancy are not improved. Pentecost Hospital and other health facilities in the La Nkwantanang Municipality of

the Greater Accra region have a high prevalence of anaemia among pregnant teenagers. In the year 2013, anaemia (Hgb< 11g/dl) was 6%; it increased to 31% in the year 2014 and further increased in 2015 to 41%. The GDHS (2014) report revealed that 42% of women are anaemic. Further reading of this report and other literature does not reveal any statistics and studies conducted on anaemia in adolescent pregnancy though this menace is endemic. This necessitates an extensive research on the subject matter in order to provide pragmatic and SMART (Specific, Measurable, Achievable, Realistic and Time bound) policy directions to reduce this menace and strive to attain the WHO standard of below 40%.

1.3 Justification of the Study

According to WHO (2003), infants, Adolescents, particularly girls and women of child bearing age, who are pregnant are at the greatest risk of being anaemic. Lemson et al., (1992) revealed that there is an increased risk of anaemia in pregnant women during delivery: Thus during perinatal period, their babies are at increased risk of death. Likewise, in pregnant women, the consequences of iron deficiency results in increased maternal and foetal disability and death.

Basically, anaemia which is influenced by nutritional factors, infections and other factors lead to high maternal and neonatal mortality, which consequently constraints development. Anemia leads to absenteeism from work and also leads to high number of orphans. Studies have shown that anaemia has been associated with depressed mental, decreased physical activity and negative consequence on scholastic performance (Grantham-McGregor and Ani, 2001; Schauer and Zlotkin, 2003). The loss of work productivity due to childhood anaemia has been estimated in economic terms by Horton and Ross to be 4.5% of the country's Gross Domestic Product (GDP) (Horton and Ross, 2003).

Anaemia is one of the top ten diseases in Ghana and remains a major risk factor of maternal mortality (GHS Annual Report, 2016). This prevalence in pregnancy has remained high despite improved antenatal care (Ndukwu et al., 2014). There's been countless number of researches done on anaemia, prominently GDHS Reports (2008 and 2014); however, few focused on anaemia among pregnant teenagers, such as Landscape Analysis of Anemia and Anemia Programming by the SPRING, Ghana Health Service. 2016. The periodic collection of data on anaemia in various countries, clearly identifying the aetiology of the disease will help assess the impact of the interventions being implemented, the adequacy of the strategies and the progress made in the fight against anaemia (De Benoist et al., 2008).The most important of this is that if pregnant teenagers would eat food with required nutrients and also practice good personal hygiene, the disease could have been reduced to 5% in 2014 (De Benoist et al., 2008).

Findings from the study will be useful in providing the requisite measures to reduce morbidity and mortality associated with maternal anaemia. It 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 seeking improving knowledge on risk of anaemia among pregnant adolescents and their adherence to the iron supplements prescribed for them. This study may inform policy on prevention of anaemia among pregnant women in Ghana. Evidence on the prevalence and determinants of anaemia among pregnant women in this study will inform stakeholders in the Health sector to incorporate the findings in their further reports.

1.4 Research Questions

1. What is the prevalence of anaemia amongst pregnant teenagers at Pentecost Hospital at La Nkwantanang Madina?
2. What dietary intake factors predispose pregnant teenagers utilizing Pentecost Hospital at La Nkwantanang Madina to anaemia?
3. What is level of knowledge of pregnant women on the risk of anaemia in pregnancy among pregnant teenagers in La Nkwantanang Madina?

1.5 Objective of the Study

The overall aim of the study is to determine the prevalence of anemia and its determinants among pregnant teenagers utilizing Pentecost Hospital in La Nkwantanang, Madina.

The following are specific objectives;

1. To determine the prevalence of anaemia amongst pregnant teenagers utilizing Pentecost Hospital in La Nkwantanang, Madina.
2. To determine the level of knowledge of pregnant women on the risk of anaemia in pregnancy among pregnant teenagers in La Nkwantanang Madina.
3. To determine the pregnant teenagers adherence to iron supplements.

1.6 Conceptual Framework

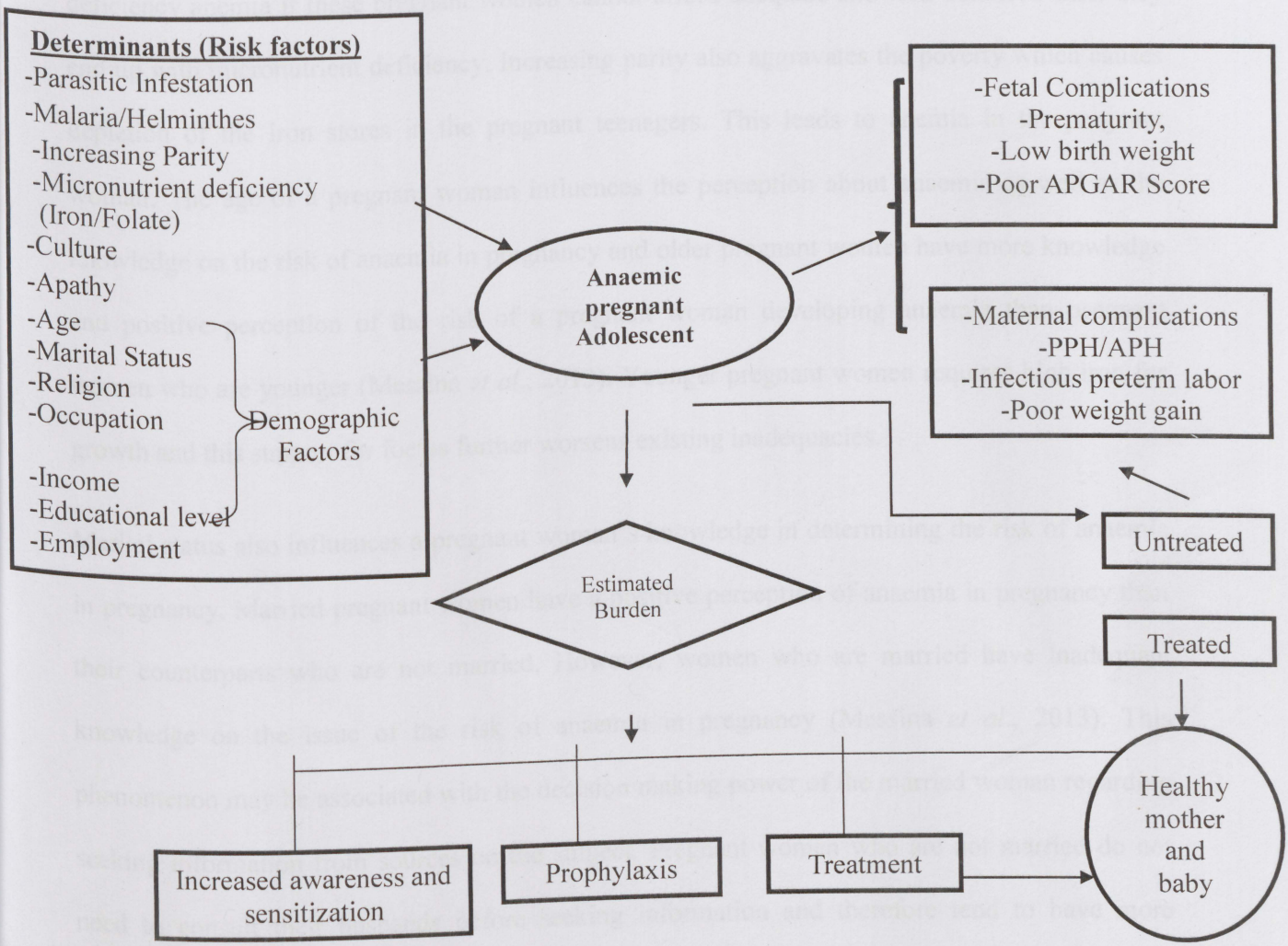

Figure 1.1 Conceptual Framework

Source: Author's construct, July, 2018

Narrative

Figure 1.1 demonstrates the interaction between Anaemia in pregnancy associated with teenagers. Anaemia is a major Public Health concern and more so in Saharan Africa. Poverty is an important contributing factor. People afflicted by poverty live in unsanitary conditions leading to parasitic

infestations such as malaria and soil transmitted helminthes. This leads to secondary iron deficiency anemia if these pregnant women cannot afford adequate and well balanced diets they end up with micronutrient deficiency. Increasing parity also aggravates the poverty which causes depletion of the iron stores in the pregnant teenagers. This leads to anemia in the pregnant woman. 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). Younger pregnant women requires high iron for growth and this support for foetus further worsens existing inadequacies.

Marital status also influences a pregnant woman's knowledge in determining the risk of anaemia in pregnancy. 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 is also considered in the assessment of risk and determinants 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 level is a core determinant 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 counterparts with low income earnings. Incidentally, the culture and beliefs of a pregnant woman can be a catalyst for her to be exposed to anaemia (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. Apathy or loss of interest in food resulting in lack of certain essential nutrients influences the iron levels of pregnant teenager which leads to anemia. Fear of being ridiculed and rebuked by peers and health workers on the basis of teenage pregnancy occasionally deter pregnant women from assessing ANC.

Without any interventions, anemia in pregnancy leads to maternal and fetal morbidity, mortality and increase complications such as puerperal infections, preterm labor, poor weight gain, postpartum hemorrhage, prematurity, low birth weight, fetal cognitive impairment and poor APGAR scores and even infant deaths. This grave situation can be improved by carrying out studies on the pregnant women to determine the actual prevalence and socio-demographic factors predisposing the pregnant teenagers to anemia and thus estimate burden of disease. Awareness creation and sensitization in the La-Nkwantanang municipality to educate and encourage pregnant women to visit any health facility in the locality will aid in the mitigation of complications arising from anaemia to both the mother and child. In addition, evidence on the burden can inform current anemia treatment and control programmes among pregnant women in the municipality to address the challenge.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The eventual goal of reviewing literature on the various concepts related to this study is to ensure that the reader is abreast with up-to-date literature on the study topic. It reviews what others have said and written about the study inferences can be drawn to support the basis for the study which is to evaluate the determinants of anaemia in pregnant teenagers within the La-Nkwantanang Municipality. This chapter highlights the various concepts of women classified as teenagers and pregnancy associated with female teenagers. The concept of anaemia will also be assessed in this chapter to ascertain precisely various types, causes, treatment and prevention of anaemia in teenage pregnancy.

2.2 Teenager

Teenagers are young people between the ages of 13 to 19 years. In effect, pregnancy associated with this age group is referred to as teenage pregnancy. According to UNICEF (2008), the causes of teenage pregnancy consists of poverty, sexual abuse like rape, incorrect/non-use of contraception, low self-esteem, low educational goals, lack of knowledge about sexual and reproductive health, risky sexual behavior, as well as customs and traditions that lead to early marriage of teenagers.

Teenage pregnancy remains a public health concern with diverse serious consequences for the individual, the family and the society as a whole. Teenage pregnancy is one challenge that is global in the sense that it occurs across every part of the world. The differences are in the rate at which they occur in these countries (WHO, 2009). According to WHO (2012) an estimated 16 million teenage girls give birth every year which mostly occur in low- and middle-income

countries. In almost all teenage births, about 95% occur in low- and middle-income countries (WHO, 2012) with the highest concentration in sub-Saharan Africa where 20-40% of teenagers are mothers or currently pregnant (Gyesaw & Ankomah, 2013). It has been shown to be one of the major contributor to maternal and child mortality, and to the vicious cycle of ill-health and poverty (Harden *et al.*, 2009). According to WHO (2007), 8 to 15% of Teenagers girls have had a child by the age of 15 in Bangladesh, Cameroon, Liberia, Malawi, Mali, Niger and Nigeria. According the GDHS (2014), 39% of births of births recorded were from teenage pregnancies. This is an increase from 33% (GDHS, 2008) that was recorded.

Child bearing is a crucial period of human development. In most African countries, it is seen as a sign of greatness and fulfillment for purpose on earth. In effect, people who are unable to give birth as a couple or as companions are often times ridiculed in their societies. Nonetheless, child bearing for teenage mothers might have serious consequences on their livelihood if improperly managed or cared for. It can limit educational attainment, restrict the skills young women acquire for the workforce, limit their capacity to support themselves financially, and reduce their quality of life (UNICEF, 2008). Medically, a pregnant teen is less likely to receive less antenatal and prenatal care, often seeking it only in the third trimester, if at all (UNICEF, 2008). In addition, Teenage girls account for 14% of the estimated 20 million unsafe abortions performed each year, which result in some 68,000 deaths. Buseri *et al.,* (2008) opines that teenagers may suffer disownment from their families who give birth before marriage since virginity is still considered important to a first marriage, a phenomenon common among African localities. As a result, the potency of majority of them has housing problems is feasible and move houses several times during pregnancy. Therefore, many are left with the responsibility of raising the children themselves that lead to social vices such as prostitution and armed robbery (Buseri *et al., 2008).*

Besides these problems, schoolgirls are not allowed to continue attending school when they are pregnant. Therefore, many of them might perform illegal abortion, which can cost their life so as to remain in schools (Ngalinda, 2000). Young mothers are more likely to have less than average weight babies, at risk of malnourishment, poor development or death (UNICEF, 2008). Infant and child mortality is highest amongst children of teenage mothers (WHO, 2014). Teenage mothers also stand the risk of having negative short, medium and long term mental health outcomes (HDA, 2003). Other health complications that confront these young mothers include hypertension, anaemia, obstructed labour and vesico-vaginal fistulae (VVF).

While governments in various countries have legalized marriage and set the legal age for marriage, the age for pregnancy is too far from legalization. Some countries such as India have drawn inspiration from the British legislation on 16 years as the legal age for consented sex (Dhawan, 2013). However, the concepts of marriage, sex, childbearing and family hold different meanings in the East and West worlds, which, although subtle, would result in large confusions, if ignored. One area of concern during the period of adolescence, is sexual and reproductive health (WHO, 2006) as teenagers face a lot of problems regarding their sexuality and reproductive lives.

2.3 Anaemia.

Anaemia is a malady that occurs when there are deficient circulating red blood cells or inadequate red cell haemoglobin or tissues oxygenation (SPRING, 2016).

Anaemia may result from defects at any stage of red cell and haemoglobin production or when an increased rate of red cell destruction (haemolysis) exceeds the capacity of the bone marrow to mount a compensatory increase in production. Changes in the relationships between red cell and plasma volumes may also result in a reduced haemoglobin concentration, such changes occur physiologically in pregnancy, where red cell volume is increased less markedly than plasma

volume. Generally, anaemia occurs at a haemoglobin level below 11g/dl (CDC 1998). Haemoglobin concentrations below which anaemia is likely to be present at sea level are usually defined as follows: Children 6 months – 6 years: 11 g/dL; Children 6-14 years: 12 g/dL; Adult males: 13 g/dL; Non-pregnant females: 11 g/dL; pregnant females 12 g/dL. All anaemia sufferers manifest signs and symptoms attributable to tissue and organ hypoxia and the ensuing reduced metabolism. It also occurs when there are an inadequate number of red blood cells or an inadequate amount of haemoglobin for the body to function properly. Haemoglobin is a protein molecule in red blood cells that carries oxygen to the brain, muscular system, immune system, and other parts of the body. Without adequate oxygen, the physical and mental capacities of individuals are reduced (Verhoef, 1999).

According to WHO (1997), approximately 30% of the world's population is affected by anaemia. In a meta-analysis of available data using WHO threshold criteria (De Maeyer and Adiels-Tegman, 1985), the problem was found predominantly in developing regions (especially south Asia and sub-Saharan Africa) where 36% of the total population were estimated to be anaemic compared to 8% in developed nations. In pregnancy, a WHO tabulation of available data averaged the prevalence to be 56% in developing countries, ranging between 50-70% for Hb< 11g/dL and 5-15% for Hb< 7 g/dL in sub-Saharan Africa (WHO 1992).

Most of the anaemic populations live in developing countries, where high anaemia prevalence is seen, particularly in pregnant women, young children, female teenagers, and women of childbearing age (WHO. 2001). Overall, anaemia contributes to about 20 percent of maternal and peri-natal deaths in developing countries. A recent WHO World Health Report noted that the risks of both maternal and peri natal mortality were reduced by 25 percent and 28 percent, respectively. This is contrary to the previous generally accepted understanding that only severe anaemia

resulted in death. This finding is very important because the numbers of women and children with mild and moderate anaemia are vastly greater than the number with severe anaemia. It follows then that the great majority of anaemia-related maternal and peri-natal deaths are due to mild and moderate anaemia rather than severe anaemia (WHO, 2003).

Anaemia's other serious negative consequences include poor pregnancy outcomes such as low birth weight and premature birth (SPRING, 2016). Anaemia also has adverse implications for social and economic development. There is now strong evidence that anaemia can reduce cognitive development and limit a child's learning in schools. This will lower the effectiveness of investments in education. Anaemia's role in reducing physical capacity and work productivity in adults has been long established. Nevertheless, anaemia continues to have a relatively low priority in health policies and programs, compared to other nutrition-related health problems with more obvious life-threatening implications (WHO, 2003) The low level of priority and attention given to anaemia are major constraints for policy formulation and program development. A better understanding of the etiology or causes of anaemia and the identification of critical issues related to effective anaemia program design and implementation are key to developing more successful actions. Recent progress in understanding the nature of the problem and the achievements and limitations of existing programs provides a firm basis for designing effective strategies and interventions. Prominent among such programs include the USAID Micronutrient Program. This program was geared towards the development of effective methodologies to deliver vitamins and minerals, collectively known as micronutrients, to populations. The USAID Micronutrient Program has supported ministries of health in the Democratic Republic of the Congo, Ghana, Uganda, and Nicaragua to develop approaches to address anaemia. Another Program geared towards giving prominent attention to anaemia prevalence among pregnant women is System for

Health Program. This Program commenced in 2014 and is expected to be completed in 2019. The focal objective of this program is to reduce underweight, stunting and anaemia among pregnant women and children. The Program is currently being funded by the USAID and implemented in five working regions; thus Greater Accra, Central, Western, Volta and Northern).

Anaemia is a huge public health and nutrition problem with serious consequences (WHO, 2017). In Ghana the condition primarily affects young children and women (GDHS, 2014).
Although the classic symptoms of iron deficiency have long been known, another symptom is also becoming classic: a poor tolerance to cold (Andrews, 2004). One way the body accelerates heat production when the environmental temperature falls involves the neurotransmitter norepinephrine and the thyroid hormones, which speed up the metabolic rate. Iron deficiency impairs temperature regulation in both animals and humans, probably by interfering with the normal production of these compounds (Andrews, 2004).

2.4 Types of Anaemia

a. Iron Deficiency Anaemia

Iron deficiency anaemia is a condition where there is a reduced amount of haemoglobin and decreased number of red blood cells in the body. Anaemia leads to less oxygen getting to the cells and tissues affecting their function (Lanerolle and Atukorala, 2006; WHO, 2017) About 3.3 million women of child bearing age have iron deficiency anaemia. About 1000 mg of iron is required during pregnancy (Sharma et al. 2010). Again, 500-600 mg is required for RBC expansion whilst 300 mg for fetus and placenta and the rest for the growing uterus. Iron deficiency with or without anemia reduces work productivity in adults and limits cognitive development in children, thus limiting their achievement in school and ultimately reducing

investment benefits in education (WHO, 2002). It is estimated that about 2,150 million people are iron deficient and that this deficiency is severe enough to cause anaemia in 1,200 million people globally. About 90% of all anaemia has an iron deficiency component (Fernando, 2008). In the developing world nearly half of the population is iron deficient. However, the industrial world is not free from it: Eleven percent of its population has iron deficiency (WHO, 2014).

Worldwide, 47% of non-pregnant women and 60% of pregnant women have anaemia, however including iron deficiency without anaemia the figures may approach 60 and 90% respectively. In the industrial world as a whole, anaemia prevalence during pregnancy averages 18%, and over 30% of these populations suffer from iron deficiency (WHO, 2014; Chowdhury et. al., 2014).

Women of fertile age and pregnant teenagers are at higher risk of anaemia due to iron deficiency. This is as a result of menstruation and the substantial iron demands of pregnancy. Median additional requirements of absorbed iron are estimated to be 1.36 and 1.73 mg per day among adult and teen-age menstruating females. However, 15% of adult menstruating women require more than 2.0 mg per day, and 5% require as much as 2.84 mg per day. The superimposition of menstrual losses and growth in menstruating teenage girls increases the demands for absorbed iron; 30% need to absorb more than 2.0 mg of iron per day; 10% as much as 2.65 mg, and 5% 3.21 mg. These requirements are very difficult, if not impossible to satisfy even with good quality, iron-fortified diets (Fernando, 2008).

Symptoms of Iron Deficiency Anaemia

Fatigue and decreased ability to work are some of the early symptoms of anaemia among pregnant women (Haas & Brown-lie, 2001). A mild case usually causes no symptoms or problems. However, a severe case can cause extreme fatigue (tiredness) and weakness. Severe iron-deficiency anaemia can lead to serious problems for young children and pregnant women, and it can affect the heart (Sharma et al. 2010).

Causes of Iron Deficiency Anaemia

There are many causes for iron deficiency anaemia. Sharma et al (2010) opines the following as major causes of anaemia in pregnant women;

- An inadequate dietary intake of iron (less than 1 to 2 mg/day) as a result of a poor diet; prolonged, unsupplemented breast- or bottle-feeding of infants; or during such periods of stress as rapid growth in children and teenagers. The elderly often develop anemia as their interest in food wanes. Dieters are another group that can become anaemic because they do not meet their iron needs.

- Iron mal-absorption which prevents iron from being used and may occur because of chronic diarrhea, partial or total gastrectomy, or such other mal-absorption syndromes as celiac disease (where the lining of the small intestine is damaged by the effects of gluten - the protein found in wheat and other cereal grains of the grass family) secondary blood loss resulting from drug-induced gastrointestinal bleeding (usually from anticoagulants, aspirin, or steroids); heavy menses; or hemorrhage from trauma, gastrointestinal ulcers, malignancy, or varices (enlarged veins, arteries, or lymphatic vessel)

- Pregnancy, which diverts maternal iron to the fetus for erythropoiesis and;
- Mechanical erythrocyte trauma caused by a prosthetic heart valve or vena cava filters.

Diseases such as rheumatoid arthritis, connective tissue disorders, chronic infection, trauma or malignancy are commonly confused with mild iron deficiency anaemia (Chowdhury et. al., 2014). Instead, they are related to anaemia of chronic disease.

Diseases that can lead to iron deficiency include the following:

i. Esophagitis: This is an inflammation of the esophagus and is the most common failure of the muscular valve between the esophagus and the stomach. This causes a failure to keep the highly acidic gastric contents from going back up (refluxing) into the esophagus. Since the esophageal lining is not adapted to withstand much acid, inflammation of the mucosa results and blood slowly leaks out, ultimately leading to anaemia.

ii. Gastritis; an inflammation of the mucosa of the stomach. There are two major causes: infection from the bacterium *Helicobacter pylori*, and the other being various oral medications (mostly aspirin and NSAIDs [ibuprofen sold as Motrin, Advil, and Midol], naproxen [Aleve], and ketoprofen [Orudis, Acton]). These drugs may be excellent for secondary blood loss resulting from drug-induced gastrointestinal bleeding (usually from anticoagulants, aspirin, or steroids); heavy menses; or hemorrhage from trauma, gastrointestinal ulcers, malignancy, or varices (enlarged veins, arteries, or lymphatic vessel). These drugs may also be excellent for cancer of the gut is adenocarcinoma of the stomach seen more commonly in Asia and developing countries. This type has a relatively poor prognosis.

b. Elemental Iron

Iron, one of the most abundant metals on earth, is essential to most life forms including humans. It is an integral part of proteins and enzymes that maintain good health. In humans, iron is an essential component of proteins involved in oxygen transport. It is also essential for the regulation of cell growth and differentiation. A deficiency of iron limits oxygen delivery to cells, resulting in fatigue, poor work performance, and decreased immunity. On the other hand, excess amounts of iron can result in toxicity and even death (Matina, 2003).

Iron is also found in proteins such as ferritin that store iron for future needs and that transport iron in blood (Andrews, 2004). Iron has the longest and best-described history among all the micronutrients and it is a key element in the metabolism of almost all living creatures (Ursel, 2001).

c. Folic Acid Deficiency Anaemia.

Folic acid is a member of the vitamin B family; it is used in the production of new red blood cells. Some people do not have enough folic acid in their normal diet, so their bodies are unable to produce enough red blood cells. In other cases, the body may not be able to properly use the folic acid ingested. Folic acid deficiency anaemia occurs most often in infants and teenagers. Some important sources of folic acid are cheese, eggs, fish, green vegetables, meat, milk, and yeast. Smoking can also interfere with the body's ability to use folic acid.

d. Vitamin B12 Deficiency Anaemia.

Like folic acid, vitamin B12 is used to make red blood cells. The vitamin is found in meat and vegetables. Some symptoms of vitamin B12 deficiency anaemia are loss of muscle control, loss of feeling in the arms and legs, soreness of the tongue, and weight loss. Vitamin B12's primary functions are in the formation of red blood cells and the maintenance of a healthy nervous system.

B12 is necessary for the rapid synthesis of DNA during cell division. This is especially important in tissues where cells are dividing rapidly, particularly the bone marrow tissues responsible for red blood cell formation. If B12 deficiency occurs, DNA production is disrupted and abnormal cells called megaloblasts occur. This results in anaemia. Symptoms include excessive tiredness, breathlessness, listlessness, pallor, and poor resistance to infection. Other symptoms can include a smooth, sore tongue and menstrual disorders.

The most common form of vitamin B12 deficiency anaemia is called pernicious anaemia. People between the ages of fifty and sixty are at highest risk for pernicious anaemia, which is a form of anaemia in which the body is unable to absorbe vitamin B12, Pernicious anaemia is characterized by decrease gastric production of hydrochloric acid and deficiency of intrinsic factor, a substance normally secreted by the parietal cell of the gastric mucosa that's essential for vitamin B12 absorption. Some conditions that can lead to pernicious anaemia are eating disorders, anorexia nervosa and bulimia entries, poor nutrition, diabetes mellitus stomach problems, and thyroid disease.

e. Sickle Cell Anaemia.

Sickle cell anaemia is a genetic disorder. Cells receive genes that give them the wrong instructions for making red blood cells. Red blood cells are normally shaped like plump doughnuts. People with Sickle Cell Anaemia have Sickle haemoglobin (HbS) which is different from the normal haemoglobin (HbA). When sickle haemoglobin gives up its oxygen to the tissues, it sticks together to form long rods inside the red blood cells making these cells rigid and sickle-shaped whiles the normal red blood cells are flexible.

Because of their shape, sickled red blood cells can't squeeze through small blood vessels as easily as the almost donut-shaped normal cells. This can lead to this small blood vessel getting blocked which then stops the oxygen from getting through to where it is needed. This in turn can lead to severe pain and damage to organs. This condition can cause pain, weakness, and, in extreme cases, death.

2.5 Nutritional Factors that Predispose Pregnant Women to Anaemia

According to Maureen (2008), in reproductive-aged women of all races, risk factors for iron deficiency anaemia include a diet poor in iron-rich foods: such as clams, oysters, liver, beef, shrimp, turkey, enriched breakfast cereals, beans, and lentils. Another risk factor is diet poor in iron absorption enhancers; such as orange juice, grapefruit, strawberries, broccoli, and peppers. Customarily, a diet rich in foods that diminish iron absorption; such as dairy products, soy products, spinach, coffee, and tea are also factor that expose pregnant women to anaemia.

Nutritional Causes of Anaemia in Pregnancy

Jusoh et. al., (2015) suggests that, nutritional causes of anaemia include the following;

- Iron deficiency anaemia (60%),
- Macrocytic anaemia (10%) due to deficiency of folic acid and/or vitaminB12
- Dimorphic and protein deficiency anaemia (30%) both due to deficiency of iron and folic acid and /or vitaminB12
- Protein deficiency due to protein deficiency in extreme malnutrition

It is estimated that iron deficiency anaemia affects as many as 200 million people in the world probably making this the commonest nutritional deficiency in the world (Mohammed, 2003).

Among pregnant women at least half of all anaemia cases have been attributed to iron deficiency (van den Broek, Letsky, White &Shenkin, 1998). The prevalence of iron deficiency may be 2-3 times that of anaemia, ranging from about 50% in some countries to nearly 100% in parts of others (Van den Broek & Letsky, 2000). There is often evidence of iron deficiency before a drop in haemoglobin concentration is noted. As pregnancy proceeds, most women show haematological changes suggestive of iron deficiency especially if not receiving iron supplements. The additional demands placed on maternal iron stores by the growing foetus, placenta and the increased maternal red cell mass –though partially offset by cessation of menstruation and increased absorption of iron during pregnancy- lead to an increased demand of iron. Requirement during first trimester is low, 0.8mg per day, but this rises considerably during the second and third trimester to a high of 6.3mg/day.

Studies carried out in India and elsewhere have shown that iron deficiency is the major cause of anaemia followed by foliate deficiency. In recent years, the contribution of B12 deficiency has been highlighted (Shaikh Sabina et al 2015).

Anaemia and iron deficiency in the mother are not associated with significant degree of anaemia in the children during neonatal period. However, iron stores in these neonates are low, iron content in breast milk in anaemic women is low and because of these factors substantial proportion of infants become anaemic by six months (Kilbridge *et al.,* 1999). Thus maternal iron deficiency and anaemia render the offspring vulnerable for developing iron deficiency and anaemia right from infancy. Poor iron content of complementary food and family food consumed by the young child results in further increase in prevalence of anaemia in childhood (Kapur*et al.,* 2002).

To support the above finding by different researches, it is found in another study that one of the major contributory factors in less industrialized countries is consumption of plant based food containing insufficient iron, especially insufficient available heme iron from meat. Heme iron is absorbed about two to three times better than non-heme iron. A small amount of heme iron in the diet will improve absorption of non-heme iron and thus the diet composition is an important determinant of the amount of iron actually absorbed. Iron is stored in the reticulo endothelial system as ferritin and haemosidderin (van den Broek *et al.,* 2000). The study by Jaween (2013) in Tamale Municipality revealed that except for vitamin C, the majority of the respondents did not meet the mean percentage of the recommended daily allowance (RDA) for energy, protein, fiber, vitamin B12, folate, vitamin E, calcium, copper, iron and zinc. However, the contribution of vitamin B12, folate and vitamin A to the burden of anaemia is unclear though they have been documented as causes of anaemia (International Nutritional Anaemia Consultative Group (INACG), 2003). It remains therefore important to establish in various populations the role various micronutrient deficiencies play in the prevalence of anaemia. The impact of haemoglobinopathies on anaemia prevalence needs equally to be examined (WHO/UNICEF, 2004).

In developing countries, vitamin B12 deficiency is a significant problem (De Benoist *et al.,* 2008), and studies done in Lebanon and Turkey revealed that approximately 40% of women of reproductive age had vitamin B12 deficiency (Al Khatib et al., 2006; Karaoglu et al., 2010 as Cited by Kotey, 2012). This could be attributable to insufficient dietary vitamin B12 intake and food cobalamin mal-absorption syndrome or pernicious anaemia (Al Khatib et al., 2006). In the last decade, a high prevalence of vitamin B12 deficiency has been observed in diverse locations, such as Guatemala, India and Israel (Rogers et al., 2003). The causes of deficiency in these

population groups may be related to low intake and unrecognized mal-absorption (Carmel et al., 2003).

Fifty percent of the cases of anaemia are attributable to iron deficiency (WHO, 2001) but this proportion could vary among population groups in different areas according to local conditions. Low dietary intake of iron, poor absorption of iron from diets high in phytate or phenolic compounds, and period of life when iron requirements are especially high (i.e. growth and pregnancy) are the main risk factors IDA (De Benoist *et al.*, 2008).

Pregnancy increases protein requirement to support the synthesis of maternal and foetal tissues, but the magnitude of this increase is uncertain (Mahan et al., 2012). Protein requirement increases throughout gestation and is maximized during the third trimester. The current RDA of 0.8g/kg/day of protein for pregnant women is the same as that for the non-pregnant women in the first half of pregnancy. Nutritional needs increase in the second half to 71g/day, based on 1.1g/kg/day of pre-pregnant weight (Institute of Medicine, Food and Nutrition Board, 2001). For each additional foetus, another 25g/day of protein is recommended; this may be as much as 175g/day for the normal- weight women carrying a twin gestation that is consuming 3500kcal/day (Goodnight & Newman, 2009). Protein deficiency during pregnancy has adverse consequences. Limited intakes of protein and energy usually occur together, making it difficult to separate the effects of energy deficiency from those of protein deficiency (Jaween, 2013).

Folic acid deficiency in early pregnancy can also result in an infant with neural tube defect (Holdsworth et al., 2012). Prolonged inadequate diets, faulty absorption and use of folic acid, and increased requirements resulting from growth are believed to be the most frequent causes of iron deficiency (Mahan et al., 2012). Rich sources of folate include: green leafy vegetables,

mushrooms, roots, tubers, fruits, liver, kidney, meat, egg yolk, among others (Thomas & Bishop, 2007).

2.6 Infectious Diseases Related Factors of Anaemia

Other noticeable prevalent causes of anaemia include malaria and chronic infections (Dreyfuss *et al.*, 2000). Malaria disease contributes greatly to anaemia and accounts for about one in five of all childhood deaths (UNICEF, 2006).

Infection can also contribute to iron deficiency in developing countries (Chowdhury et. al., 2014). Infections causing chronic blood loss such as parasitic infestation with hookworm and to a lesser extent schistosoma, increase iron requirement (Chowdhury et. al., 2014). Viral and bacterial infections may also interfere with food intake, absorption, storage and use of many nutrients including iron (Chowdhury et. al., 2014).

There is evidence that malaria can induce iron deficiency by several mechanisms: possibly through immobilising iron in haemazoin complexes and loss of urinary iron, as well as reducing intestinal iron absorption during the acute illness period (van den Broek, White & Neilson, 1998). However, these effects exerted by malaria on body iron status are still poorly understood, in part because biochemical and haematological indices of iron status are confounded by the malaria infection. In a study by Tadege (2009), prevalence of intestinal parasite infection in pregnant women was 58.2%. Out of 218 intestinal parasite infected women 88(40.4%) had more than one intestinal parasitic infection. Prevalence of anaemia in this study subjects was 51.9% and the mean haematocrit level was 34%. Anaemic women were 14 times likely to have hookworm plus

other intestinal helminthic infection (p value = .000), 2 times likely to have birth interval less than two years (p value = .018) and 2 times likely not having taken iron during pregnancy (p value = .025).

In a study conducted in Nigeria by Buseri *et al.* (2008), the aetiology of anaemia was found to be multifactorial; 40.2% had anaemia of infection, 20.3% had *Plasmodium falciparum* alone, 8.5% had HIV alone, 2.5% had HIV and malaria parasite co-infection; 8.9% undetermined infections and 0.6% had sickle cell anaemia.

Anaemia has been shown to be prevalent in areas where malaria is endemic and the introduction of anti-malarial programmes has proven to be effective in reducing the burden of anaemia (Le Hung et al., 2005). Anaemia resulting from malaria is associated with factors which involve increased destruction and reduced production of red blood cells (Menendez et al., 2000). The direct mechanism involves increased splenic clearance of infected and uninfected red blood cells and induced dyserythropoiesis (Crawley, 2004; McDevitt et al., 2004). Depending on the degree immunity of the host, the infected red blood cells are destroyed before the schizonts mature and release merozoites. There has been suggested evidence that as many as ten uninfected red blood cells are removed from circulation for every one parasitized red blood cell Jakeman et al., 1999).

2.7 Adherence to Iron Supplementation in Pregnant Women

The proportion of pregnant 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. 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 (Compaore *et al*., 2014).

CHAPTER THREE

STUDY PROFILE AND RESEARCH METHODOLOGY

3.1 Research Design

This was cross sectional study where pregnant teenagers who attend antenatal clinic at the Pentecost Hospital in La Nkwantanang, Madina were recruited into the study after informed cpnsent. Using a structured questionnaire socio-demographics and clinical characteristics were obtained from the teenagers along side blood sample for laboratory investigation.

3.2 Study Profile

The La Nkwantanang Municipality was created in 2012 by a legislative instrument LI 2131 as an administrative district among the sixteen (16) Metropolitan/Municipal/District Assemblies in the Greater Accra Region. The Municipality has three (3) administrative sub-districts namely; Madina, Danfa and Pantang. There are twenty-three (23) communities comprising of mixed settlements of urban, peri-urban and rural areas with the capital being Madina. The district has a total land size of 166 sq/km. According to the 2010 population and housing Census (2010 PHC), LaNMMA has a total population of 111,926. The inter-censal growth is estimated to be 4.6% with an estimated 2017 population of 147,966, comprising 51% male and 49% female with an average household size of 6.2. The population is concentrated mainly along the urban and peri-urban areas of the municipality. The urban and peri-urban population constitutes 82% of the municipality's total population with 18% residing in the rural settlements (GSS, 2014).

The Municipality has a total of twenty-one (21) health facilities, both public and private with public facilities constituting only 19% (4), the remaining 81% (17) being private. The public facilities are; one Psychiatric hospital, two government Polyclinics and one Health Centre.

The municipality has 144 basic and 13 Senior High schools.

3.3 Study Population

All pregnant teenagers (13 to 19 years) who sought ANC services from the Pentecost Hospital and have signed the informed consent were included in the study

3.4 Sampling method and sample size

Simple random sampling technique was used as the sampling technique for the study.

The size was calculated using the Cochran formula (1967). Thus;

Sample size, $n = \frac{z^2 * p * q}{d^2}$

where n is the desired sample size; z= statistics corresponding to the level of confidence, p=the proportion in the target population estimated to be 50%; q is the acceptable deviation from the assumed proportion (1-0.5=0.5); d= degree of precision desired at 0.05.

Therefore, $n = \frac{(1.96)^2 (0.5) (0.5)}{(0.05)^2}$

$n = 384.16$

n=384

3.5 Data Collection Instrument

A structured questionnaire was administered to collect data from the participants on all the variables. The items in the questionnaire were categorized into 4 sections: socio- demographic data, determinants of anaemia in pregnancy, symptoms of anaemia in pregnancy, knowledge on risk of anaemia in pregnancy and adherence to iron supplements.

Socio-demographic information collected include as age, marital status, occupation, income and educational level. Knowledge of the study participants about anaemia was assessed by questions on causes, signs and symptoms, prevention and treatment of anaemia. The responses were coded yes and no to measure participant's level of knowledge.

The level of adherence to the dietary iron intake 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.

3.6 Laboratory analysis

Blood samples (5ml) were collected from the participants for laboratory analysis to determine their haemoglobin levels. The haemoglobin levels were determined using a haematology auto

analyzer. Participants with haemoglobin level less than 11g/dl were considered to be anaemic and 11g/dl or more were considered non-anaemic. A malaria rapid diagnostic test (RDT) and blood film were subsequently perform to determine the malaria status of the participants.

3.7 Data processing and analysis

Data were coded, entered and cleaned using Microsoft Excel 2016 and imported into STATA 14 for analysis. Descriptive statistics was used to describe the frequencies and percentages for age, marital status, occupation, income level, educational level, knowledge an anemia and the malaria status. A chi square test of association was used to determine the relationship between the anemia and the participants characteristics likewise for the level of knowledge of the risk of anemia and the patient characteristics. Statistical significance was set at p value less than 0.05.

3.7 Ethical Consideration

3.7.1 Ethical Review

Approval for the study was sought from the Ethics Review Committee of the Ghana Health Service/Research Department. Approval was also sought from the Pentecost Hospital in the La Nkwantanang, Madina municipality.

Permission was sought from the Central Administration and the Deputy Director of Nursing Service (DDNS) in-charge of the ANC clinic at the Pentecost Hospital.

All participants that were recruited into the study signed the informed consent. Study participants were assured of confidentiality. Also, in order to minimize participant's discomfort about the issues being discussed, all interviews were conducted in a private place. During training, field staff was made aware of the importance of protecting interviewee's privacy and confidentiality of information obtained from them. No identifiers were recorded or collected during the interviewing of the participants. All data collected were kept under lock and access was strictly limited to the project team only.

CHAPTER FOUR

RESULTS

4.1 Demographic Characteristics of participants

The study recruited a total of 389 pregnant teenagers. Table 4.1 shows the demographic characteristics of the participants. The mean age of the participants was 17 years. Sixteen percent of the respondents were within the ages of 13 to 15. However, 84% of the respondents were within the age category of 16 and 19. Majority of the teenagers (32%) were Senior High School and Technical graduates, with a minority percentage of 10% been Tertiary graduates. The study further revealed from table 4.1 that 31% of the respondents were in their 4th to 6th month pregnancy period, with the least being 14% representing pregnant teenagers who are less than a month pregnant. With regards to employment status, 35% of the respondents were employed in both the formal and informal sector, whilst the remaining 65% were unemployed. One hundred and eighty four (48%) of the respondents were single, 88 (23%) were married whilst 84 (22%) were cohabitating. The results also revealed that 32 percent of the respondents attended Senior High school while 10% were tertiary students.

Table 4.1: Socio-Demographic Distribution of Respondents

Demographics	Frequency	%
Age		
13-15	64	16
16-19	325	84
Marital Status		
Married	88	23
Divorced	26	7
Single	184	48
Cohabitants	84	22
Educational level		
Basic	114	29
J.H.S	63	16
Secondary/Technical	125	32
Tertiary	37	10
No Formal Education	50	13
Employment status		
Formal	20	5
Informal	123	30
Unemployed	255	65
Religion		
Christianity	210	54
Islam	179	46
Gestation period		
1-3 Months	106	27.5
4-6 Months	118	31
Above 6 Months	108	28
Less Than a Month	54	14

4.2 Prevalence of Anaemia among Pregnant Teenagers at the Pentecost Hospital in La Nkwantanang, Madina

Figure 4.1, shows the prevalence of anemia among the study participants. Sixty nine percent of the participants were anemic while 31% were not.

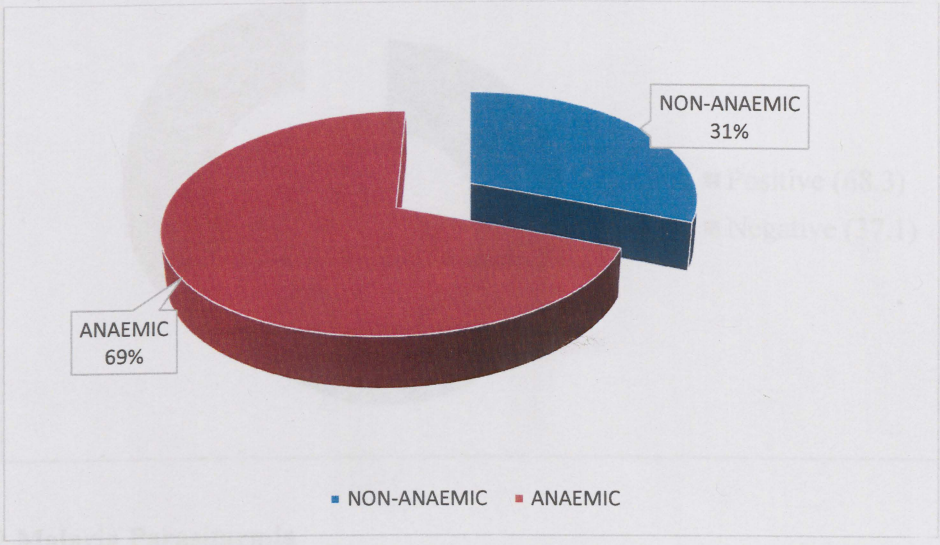

Figure 2: Prevalence of Anaemia Among Pregnant Teenagers Utilizing Pentecost Hospital in La Nkwantanang, Madina

4.3 Malaria Parasitaemia

Presence of malaria parasites mainly Plasmodium falciparum was observed in 68.3% of the pregnant teenagers (Figure 4.1).

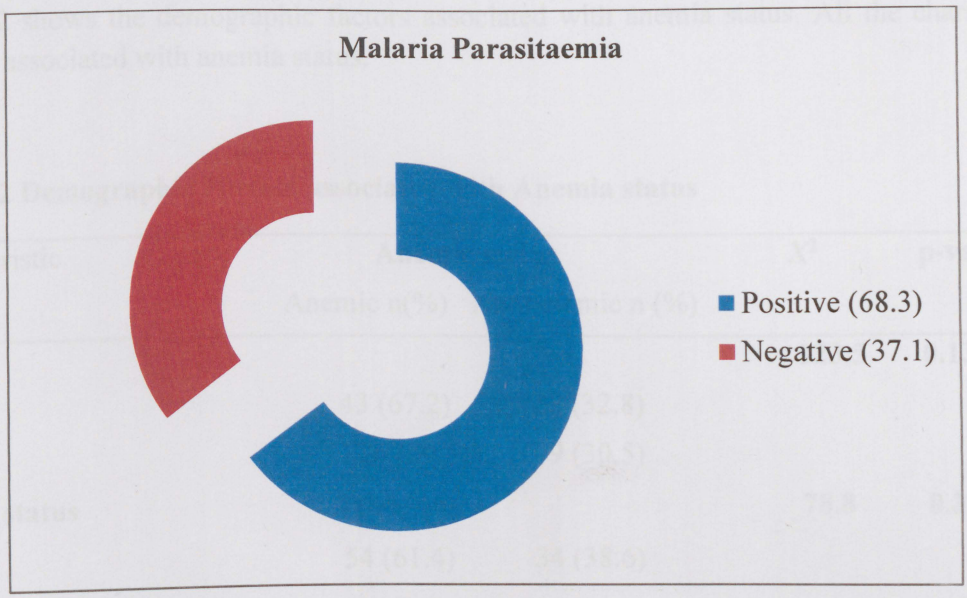

Figure 4.2 Malaria Parasitaemia

4.4 Demographic Factors Affecting Anaemia Among Pregnant Teenagers Utilizing ANC Services at Pentecost Hospital in La Nkwantanang, Madina

Table 4.2 shows the demographic factors associated with anemia status. All the characteristics were not associated with anemia status.

Table 4.2 Demographic Factors associated with Anemia status

Characteristic	Anemic status		X^2	p-value
	Anemic n(%)	Non-anemic n (%)		
Age			**123.5**	**0.133**
13 -15	43 (67.2)	28 (32.8)		
16 – 19	226 (69.5)	99 (30.5)		
Marital status			**78.8**	**0.372**
Married	54 (61.4)	34 (38.6)		
Divorced	9 (34.6)	17 (65.4)		
Single	150 (81.5)	34 (18.5)		
Cohabiting	56 (66.7)	28 (33.3)		
Educational Level			**45.9**	**0.143**
None	34 (68.0)	16 (32.0)		
Primary	90 (78.9)	24 (21.1)		
JHS	35 (55.6)	28 (44.4)		
Secondary/Technical	85 (68.0)	40 (32.0)		
University	25(67.6)	12 (32.4)		
Religion			**134.7**	**0.234**
Christian	178 (84.8)	32 (15.2)		
Muslim	91 (50.8)	88 (49.2)		
Employment status			**234.3**	**0.670**
Formal	7 (35.0)	13 (65.0)		
Informal	105 (84.0)	20 (16.0)		
Unemployed	157 (61.6)	98 (38.4)		

4.5 Knowledge of Risk of Anemia

Figure 3 shows the knowledge of risk of anemia of the respondents. Fifty-four percent of the respondents had a high knowledge of risk of anemia. Thirty-five percent had moderate knowledge while 11% had a low level of knowledge.

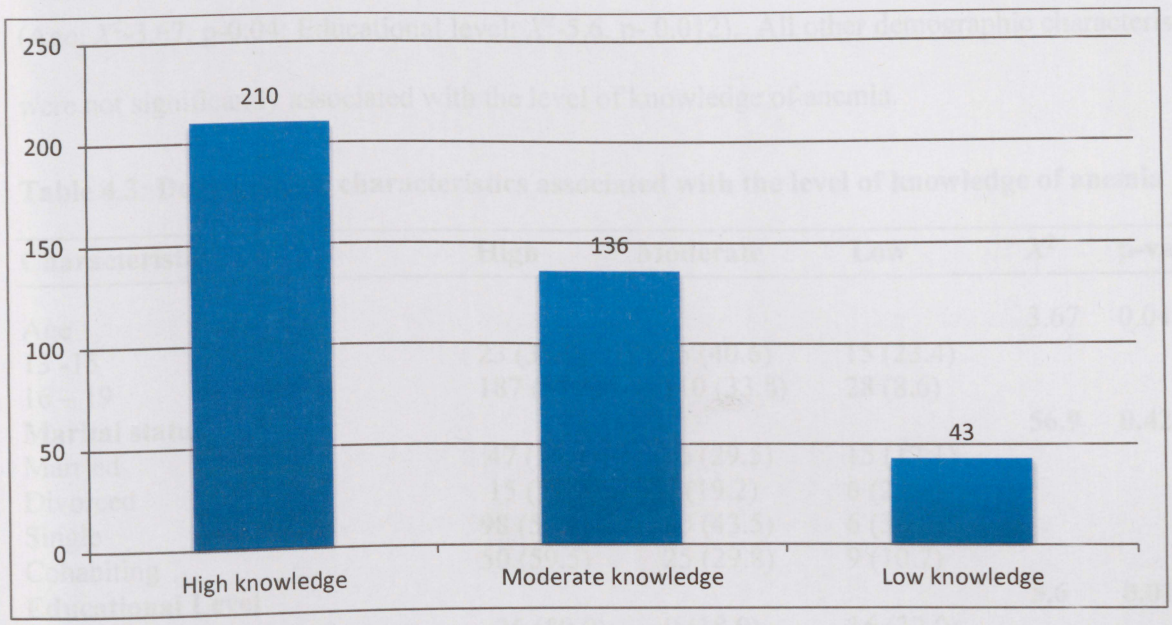

Figure 4.3: Level of Knowledge of risk of anemia among participant

4.6 Demographic characteristics associated with the level of knowledge of risk of aneamia

Table 4.3 shows demographic factors associated with the risk of anemia. Age and Educational level of the participants was significantly associated with the level of knowledge of risk of anemia (Age: X^2-3.67, p-0.04; Educational level: X^2-5.6, p- 0.012). All other demographic characteristics were not significantly associated with the level of knowledge of anemia.

Table 4.3: Demographic characteristics associated with the level of knowledge of anemia

Characteristic	High	Moderate	Low	X^2	p-value
Age				3.67	0.04*
13 -15	23 (35.9)	26 (40.6)	15 (23.4)		
16 – 19	187 (57.5)	110 (33.8)	28 (8.6)		
Marital status				**56.9**	**0.423**
Married	47 (53.4)	26 (29.5)	15 (17.1)		
Divorced	15 (57.7)	5 (19.2)	6 (23.1)		
Single	98 (53.3)	80 (43.5)	6 (3.2)		
Cohabiting	50 (59.5)	25 (29.8)	9 (10.7)		
Educational Level				**5.6**	**0.012**
None	25 (50.0)	9 (18.0)	16 (32.0)		
Primary	75 (65.8)	30 (26.3)	9 (7.9)		
JHS	30 (47.6)	27 (42.9)	6 (9.5)		
Secondary/Technical	60 (48.0)	60 (48.0)	5 (4.0)		
Tertiary	20 (54.1)	10 (27.0)	7 (18.9)		
Religion				**14.7**	**0.765**
Christian	110 (52.4)	75 (35.7)	25 (11.9)		
Muslim	100 (55.9)	61 (34.1)	18 (10.0)		
Employment status				**23.56**	**0.067**
Formal	10 (50.0)	7 (35.0)	3 (15.0)		
Informal	80 (65.0)	23 (18.7)	20 (16.3)		
Unemployed	120 (47.1)	115 (45.1)	20 (7.8)		

4.7 Adherence to Iron Supplements

Adherence to iron supplements was measured among the respondents and reported as shown in the Table 4.3 below. About 85% of the respondents reported they were on iron supplements while 58 (15%) said they did not take iron supplement. About 70% of the respondents indicated they take iron supplements on daily basis, about 8% (31) took it every other day, 5% took it once in a week and about 7% rarely took the medication.

While a majority, 67% (260) of the respondents said they did not feel hassled taking iron supplements, about 33% (129) of the respondents felt hassled taking the medication.

Table 4.4: Adherence to Iron Supplements

Variable	Frequency	%
Pregnant women taking iron supplements during pregnancy		
No	58	15
Yes	331	85
Frequency of taking the iron supplements		
Daily	272	80
Every other day	31	8
Once in a week	29	5
Rarely	27	7
Taking iron supplements the previous day		
No	172	44
Yes	217	56
Pregnant women sticking to iron supplements treatment plan		
No	260	67.7
Yes	124	32.3

CHAPTER FIVE

DISCUSSION

5.0 Introduction

The wellbeing of the pregnant individual particularly a pregnant teenager is vital to the public health sector globally. It is therefore prudent for stringent mitigation approaches to be developed for the reduction in the risk of getting bad outcomes during and after pregnancy in order to have a healthy mother and child towards the achievement of optimum health. All these are geared towards achieving the WHO standard of anaemia prevalent rate below 40%.

5.1 Anaemia Prevalence.

The prevalence of anemia recorded in this study was very high, 69%. This was higher than what was reported by the La Nkwantanang Municipal Health Directorate in 2016, which pegged the prevalence of anaemia among teenagers at 45%. Similarly, more than half of pregnant teenagers in studies conducted by Aikawa*et al.*, in 2005 and Brooker*et al.* in 2008 had anaemia. Likewise a study conducted by Medaet al.1999 found anaemia to be 66% in Burkina Faso, Tanzania at 95% and South Africa at 57.3%.

Globally, the prevalence of anaemia in pregnancy ranges from 41.8% – 43.8% (Chrispinus, 2014). The cause of anaemia is multifactorial; the variations may be attributed to different causes of anemia, dietary differences, population differences, study design and difference in methodology used in determining hemoglobin levels.

The presence of malaria parasites mainly *Plasmodium falciparum* was observed in 68% of the pregnant teenagers. This may be an underlying cause of the high prevalence of anaemia recorded

in this study. Malaria parasites are known to cause haemolytic anaemia due to the destruction of the red blood cells by haemolysis.

5.2 Knowledge on the risk of Anaemia

More than half of the pregnant teenagers have high knowledge of risk of anemia. The study reports a statistically significant association between the age of respondents and their knowledge of risk of anaemia in pregnancy. This finding is consistent with the findings of the Ghana Demographic and Health Survey (2014), which suggest that anaemia is prevalent among age group 15-19 years. A study by Andrew et al., (2006), also found that the majority of the respondents had knowledge on the risk of anaemia in pregnancy. A study by Ndukwu and Dienye, (2013) findings were in contrast with the finding of the study; it was 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 category of marriage pregnant women had the greatest awareness 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 results suggest that the higher the educational level of the individual the higher the individual's level of awareness of the risk of anaemia in pregnancy. A study by Messina *et al.*, (2013) found no significant statistical association between educational level and the risk of developing anaemia among participants. 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 though the study setting was a Muslim dominated area, nonetheless the Pentecost Hospital serves people from other settings such as East Legon, Ashalley Botwe and Adenta.

5.3 Respondents Adherence to Iron Supplements

The high proportion of respondents reporting to taking iron supplements suggests 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 study by Chandyo *et al.*, (2016) where about 90% of the respondents who were pregnant women reported taking iron supplementation in their last pregnancies with the majority taking the medication in the first trimester. The proportion reported in this study 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 (85%) and the daily iron intake rate (80%). The finding suggests 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 RECOMMENDATION

6.1 Conclusion

The findings in this study reveal that prevalence of anemia among pregnant teenagers is 69% of pregnant teenagers in the La Nkwantanang, Madina are anemic. Likewise, presence of malaria parasites mainly Plasmodium falciparum was observed in 68.3% of the pregnant teenagers. However there was statistical significant difference in the demographic characteristic of the participants with regards to their anemia status. Fifty-four percent of the respondents had a high knowledge of risk of anemia. Thirty-five percent had moderate knowledge while 11% had a low level of knowledge. Majority of the pregnant teenagers were on iron supplements.

6.2 Recommendation

- 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.
- The Ministry of health and the Ghana Health Service should consider introducing a policy requiring all pregnant teenagers to take iron supplements.
- It is recommended that health promotion and disease prevention campaigns on anaemia be organized at places of contact with pregnant women, particularly teenagers
- Further research should be carried out in other communities among pregnant teenagers so as to obtain an iron deficiency data base for effective planning and implementation of control programmes.

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APPENDICES

Appendix I: Interviewer's statement

I, the undersigned, have explained this consent form to the participant and participant's parent in English/Ga/Twi. I have ensured understandability of the purpose of the study, procedures to be followed as well as the risks and the benefits of the study.

The participants have agreed to actively participate in this study.

Name of research assistant .....

Signature .....

Date .....

Address.....

Any further questions should be directed to Gladys Awini on 0243170658

Appendix II: Questionnaire

SECTION A: Demographic Data

1. Marital status. Age.....

a) Married [ ] **b**)Divorced [ ] **c**) Single [ ] **d**) Widowed [ ] **e**)Co-habitating [ ]

2. Educational level.

a) Basic/Primary [ ] **b**) Secondary/ Technical [ ] **c**) Tertiary [ ] **d**) None [ ]

e) Other(s) specify.....

3. Occupation

a) Apprentice [ ] b) Self-employed [ ]

b) c) Formal Sector [ ] d) Unemployed [ ]

SECTION B: Prevalence of Anaemia among Pregnant Women

1. How many months is your pregnancy? a) 1-3 months [ ] b) 4-6 months [ ] c) above 6 months [ ]
   d) Less than 1 month [ ]

2. Number of pregnancy? a) primigravidae [ ] b) multigravidae [ ]

3. Patient Haemoglobin (HB) level? .....

SECTION C: Infectious Diseases that Predisposes Pregnant Women to Anaemia

4. From the patient folder what is the previous episode of disease? (tick Yes or No)

EPISODE	YES	NO
Malaria		
RTI		
UTI		
Cough		
Worm Infections		
Diarrhoea		
Gastro-enteritis		

SECTION D: **Knowledge of risk of anaemia in pregnancy**

Question Number	Question	Response
1	Have you ever heard about anaemia in pregnancy? 1. No 2. Yes	[ ]
2	If yes, from what source did you learn of it? 1. Health worker 2. Friend 3. Relative 4. Radio 5. School 6. Other	[ ]
3	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	[ ]
4	What causes anaemia during pregnancy 1. Mosquitoes 2. Bleeding 3. Not eating well 4. Worm infestation 5. Genetic disease 6. Other	[ ]
5	What are the symptoms of anaemia? 1. Dizziness 2. Easy fatigability 3. Fever 4. Weakness 5. Palpitations 6. Other	[ ]

SECTION E: Adherence to Iron Drugs

Question Number	Question	Response
1	How often do/did you take the iron supplements? 1. Daily 2. Every other day 3. Once a week 4. Rarely 5. Other	[ ]
2	Do you sometimes forget to take your iron supplements? Over the past two weeks, were there any days when you did not take your iron supplements?	[ ]
3	When you travel or leave home, do you sometimes forget to bring along your iron supplements?	[ ]
4	Did you take your iron supplements yesterday?	[ ]
5	Do you ever feel hassled about sticking to your iron supplements treatment plan?	[ ]

SECTION F:

Infectious Diseases of Anaemia

Question Number	Question	Response
1.	Have u had any malaria Incidence in your current pregnancy? 1. Yes 2. No	[ ]
2.	How frequent do you experience Malaria? 1. Quite often 2. Not often 3. Very often	[ ]
3.	Do you know any Method of acquiring Malaria? 1. Mosquitoes 2. Dust	[ ]
4.	Malaria Prevention method used. 1. Treated Bed Nets 2. Insecticide Spray 3. No method	[ ]

Appendix III

CONSENT FORM

Consent form is for the signature or thumb print of the participant. It is an acknowledgement that one has seen the information sheet, read and understood it and has agreed to participate in the study voluntarily.

A. Heading (CONSENT FORM) (state target group) Note: Consent form should be made for each participating group or study population. E.g. Household heads, opinion leaders, caregivers, health provider etc

B. PARTICIPANT STATEMENT AND SIGNATURE

i. Write briefly a statement to show that participants have read and understood what the study is about, its purpose, its implications (risks and benefits), voluntary participation and right to withdraw.

Example: I certify that I voluntarily agree to answer the survey questions, that the survey has been explained to me. All my questions have been answered satisfactorily. I understand I am free to discontinue participation at any time if I so choose.

Signature or thumbprint of Participant

(Thumbprint for those who cannot read and write)

Date

For participants under 18 years

iii. Signature or thumbprint of Parent or Guardian or Legally Authorized Representative and Date.

Note: If participants are unable to read the form themselves. A witness must sign declaring they were present while the benefits, risks and procedures were read to the participants and all questions were answered and the participant has agreed to take part in the research.

C. INVESTIGATOR STATEMENT AND SIGNATURE

Brief statement or declaration that investigator has given enough information to participants to make informed decisions.

Example: 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.

Signature of person who sought consent

Date

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Voluntary consent

Please indicate below that you agree with the statement.

I have read the information given or the information has been read and duly explained to me.

My concerns about this study have been duly addressed. I now voluntary agree to participate in this study knowing that I have the right to withdraw from the study at any time without it affecting my access to services in this Hospital.

....

(Name of Participant) (Signature) (Thumbprint) (Date)

I the undersigned agree that information concerning this study has been fully read and explained to the participant who voluntarily agreed to participate in this study.

....

(Name of Participant's parent) (Signature) (Thumbprint) (Date)