SCHOOL OF PUBLIC HEALTH

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ANAEMIA AMONG PREGNANT WOMEN ATTENDING THE ANTENATAL CLINIC
AT SAVELUGU MUNICIPAL HOSPITAL

BY

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PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF
MASTER OF PUBLIC HEALTH (MPH) DEGREE.

DECEMBER, 2018
DECLARATION

I, DUUT DAMYAR, declare that this thesis is my original work and has not been presented for a degree in any other University. All material cited in this write up which are not mine have been duly acknowledged.

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DUUT DAMYAR (Student)

………………………….. DATE ………………………

DR. ANTHONY DANSO-APPIAH (Supervisor)
DEDICATION

This work is dedicated to my Lord Jesus Christ by whose Grace I have been able to accomplish this dissertation.

To my beloved Wife (Bukari Gifty), Parents, Brothers and Sisters, I say a big thank you for your immeasurable support.

The staff and students of School of Public Health, especially Epidemiology and Disease Control department and my supervisor Dr. Anthony Danso-Appiah, may the good lord continue to strengthen and bless us all.
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<tr>
<td>ANC</td>
<td>Antenatal Clinic</td>
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<tr>
<td>APGAR</td>
<td>Appearance, Pulse, Grimace, and Respiration</td>
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<tr>
<td>CL</td>
<td>Confidence Interval</td>
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<td>GDHS</td>
<td>Ghana Demographic Health Survey</td>
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<td>GHS</td>
<td>Ghana Health Service</td>
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<td>HB</td>
<td>Hemoglobin</td>
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<td>IPT</td>
<td>Intermittent Preventive Treatment</td>
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<td>MCH</td>
<td>Maternal and Child Health</td>
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<td>RBC</td>
<td>Red Blood Cells</td>
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<td>SHM</td>
<td>Savelugu Municipal Hospital</td>
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<td>Suiphadoxine-Primethane</td>
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ABSTRACT

Background: Most developing countries still suffer from anaemia as a major public health concern. Anaemia results in maternal morbidity and mortality and also has significant influence on the development of the foetus. This study seeks to determine the prevalence and associated factors of anaemia among pregnant women obtaining antenatal care at the Savelugu Municipal Hospital.

Method: A cross-sectional study was conducted from March to May 2018. A total of 348 pregnant women who attended antenatal care (ANC) at the Savelugu Municipal Hospital were selected through simple random sampling. Data on socio-demographics, obstetric characteristics, medical intervention, malaria illness, and iron-containing foods of the participants were collected using a checklist and structured questionnaire. The data was entered and cleaned in MS Excel and then exported and analyzed using stata15.0. Data was analyzed descriptively and factors associated with anaemia were identified. Bivariate and multivariate logistic regressions were used to identify predictors of anemia.

Results: Out of a total of 350 pregnant women who were enrolled for this study, 77.4% were aged between 20 and 30, 74% were employed and 99.7% of them were married. 57.7% of them had a parity of 0 and 2, whilst 46.3% of them had gravidity of 3 – 4. About 96% of them were in their third trimester of pregnancy and (63.8%) made their first ANC visit outside the first trimester. About 73.4% of them reported taking malaria prophylaxis, 43.7% reported taking anti-helminths drugs whiles, 79.4% of them had malaria, 73.7% had previous anaemia, and 59.4% reported abdominal pains during pregnancy. About 66.3% of them were anemic, 55.7% of them had knowledge scores above the mean score. Parity (p=0.026), gravidity (p=0.010) and perception of anaemia deadliness (p=0.04) were significantly associated with anaemia status.
Logistic regressions revealed that, the odds of being anaemic during pregnancy was higher among women with parity of greater than 4 (COR= 5.26; 95% CI 1.35-20.45; P=0.008) and gravidity of greater than 4 (COR= 2.39; 95% CI 1.26-4.56; P=0.007). Also, the odds of being anaemic during pregnancy was higher amongst women who perceived anaemia to be deadly (COR= 6.95; 95% CI 0.77-62.89; P=0.046).

**Conclusion:** Maternal knowledge of anaemia in pregnancy and intake of malaria prophylaxis was reportedly high, the prevalence of anaemia in Savelugu Municipality is still high and of public health concern.
CHAPTER ONE

INTRODUCTION

1.1 Burden of anemia

Anaemia is a global public health problem affecting all groups. It is estimated that, about 56 million pregnant women around the worldwide suffer from anaemia, although this varies from country to country with Africa and South East Asia having the highest burden. For example, in the USA only 1.8% of women as compared with 27.4 % in the Gambia are anaemic (Chathuranga, Balasuriya, & Perera, 2014).

Sub-Saharan Africa (SSA) is the most affected region with an estimated anaemia prevalence of 57% pregnant women which corresponds to about 17.2 million affected women with severe consequences to human health as well as social and economic development. Anaemia is prevalent among pregnant women (Abriha et al., 2014). Among pregnant women, 44.2% in the Mediterranean regions and 25% in Europe are estimated to be anaemic. (Chathuranga, Balasuriya, & Perera, 2014). Across SSA, prevalence rates of anaemia have been estimated at 65% in Kenya, 46% in Ghana, 42% in Namibia and 28% in Tanzania (Kawai et al., 2009). In Ghana, anaemia occurs in 65% of pregnant women (GSS, 2015).
According to the Ghana Demographic and Health Survey (GDHS), anaemia is predominantly as result of poor dietary iron intake, malaria infections as well as intestinal and worm infestation (GSS, 2015). Risk factors associated with anaemia in pregnant women are poverty, grand-multiparity, early pregnancies, frequent pregnancies, spacing of <1 year, low socioeconomic status, illiteracy, and late booking of pregnant women at antenatal care units (Jufaret et al., 2014). Other risks factors include; parasitic infestations, geographical location, food habits, gestational age, parity and pregnancies at early age (de Benoist et al., 2006).

The signs and symptoms of anaemia, shows the severity of underlying health problems. This includes; menstrual problems, cancer and hemorrhaging, unusual rapid heartbeats, loss of energy fatigue, headache, dizziness, abdominal pains, shortness of breath, difficulty in concentration, red urine and jaundice among others. The most common or easiest way to diagnosed anaemia is
through haemoglobin measurement. In Ghana, it is recommended that haemoglobin measurement should be carried out on every pregnant woman attending antenatal clinics at the first visits, at 28 weeks and at 36 weeks. The most accurate method is to measure the concentration of haemoglobin in the blood directly in the laboratory or with a Hemocue. Using the Hemocue has a great advantage of it giving an immediate result. The second most accurate one commonly used is the haematocrit or the packed cell volume. With this method, a sample of blood collected in a capillary tube is placed in a centrifuge to a pack cell volume, the higher the proportion, the more likely haemoglobin in the blood.

Management of anaemia in pregnancy is by increased in folate use during pregnancy, due to the acceleration of reactions requiring single-carbon transfer, the rapid rate of cell division in maternal and foetal tissues, and deposition in the foetus (Amoran et al., 2012). Treatment of anaemia in pregnancy is through improvements in dietary diversity; food fortification with iron, folic acid and other micronutrients; daily supplements of iron and folic acid to each pregnant women (WHO, 2011). Measures implemented by the Health Ministry to reduce anaemia among pregnant women in Ghana include: Iron and folic acid supplements, anti-malarial prophylaxis for the pregnant women, health campaigns for the use of insecticide-treated bed nets by all pregnant women. These are being championed by Ghana Health Service and its partners at the community levels to ensure adequate coverage to prevent highly vulnerable women to this condition (GDHS, 2015). Anaemia in pregnancy is currently measured at a cut-off point of 11.0g/dl which is the recommended cut off limit according to WHO (2010). In Savelugu, prevalence of anaemia among antenatal attendants is a major public health concern facing the municipality with 8,839 expectant mothers to attend ANC services in 2017.
1.2 Effects of Anaemia in pregnancy

Anaemia is the reduction of haemoglobin in the blood to carry an adequate amount of oxygen due to low availability of the red blood cells. Haemoglobin is the substance in the blood that transports oxygen from the lungs to all parts of the body. According to the standards of the world health organization (2010), a packed cell volume of less than 33 percent or a haemoglobin concentration of less than 11.0g/dl among pregnant women depicts anaemia. Anaemia affects the health outcomes of both pregnant women and their yet-to-be born children (foetuses). Approximately, 57% of pregnant women, 48% of non-pregnant women with young children and 65% of all pre-school children have some form of anaemia. A haemoglobin concentration above 11.0g/dl is essential to ensuring adequate foetal growth to prevent congenital abnormalities. Since haemoglobin is required by both mother and foetus for survival, inadequate supply may adversely affect both the mother and child.

Low haemoglobin level during pregnancy increases the risk of delivery complications that may result in foetal and maternal morbidity and mortality. This includes; risk of pre-term deliveries, still births, perinatal morbidity, and Low APGAR score. It is estimated that, more than 500,000 women die during delivery as a result of complications, majority of which are recorded in developing countries. Survival and optimum development of the foetus is supported by the placenta, which exchange of nutrients and gases takes place (Mahamuda, Feroza & Shamim, 2011). Anaemia in pregnancy could result in cardiac failure as result of excessive blood loss (Bondevik et al., 2000). It is estimated that anaemia in pregnancy is responsible for half of maternal deaths in India (Kalaivani, 2009).
1.3 Types of Anaemia in Pregnancy

The various types of anaemia identified include nutritional anaemia, iron deficiency anaemia, folic acid deficiency anaemia, vitamin B12 deficiency anaemia, vitamin A deficiency anaemia, sickle cell anaemia and anaemia due to soil transmitted helminth, malaria, HIV, and schistosomiasis (Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011).

1.3.1 Nutritional Anaemia

Nutritional anaemia is a consequence of inadequate consumption of nutrients or their non-availability to support the production of erythrocytes and Hb in the individual. Inadequate nutrient intake could be due to changes in food preparations overtime or physiological changes in women such as pregnancy (Freire, Kahn, McGuire, & Post, 2003). Cereal and green leafy diets are being exposed to more heat during food preparations, thereby loosing nutrients such as iron, vitamin B12, and folic acid, which support Hb production (Karaoglu et al., 2010). Also, studies have shown that nutrients such as vitamin C that helps in the absorption of iron are inadequately consumed (Ramakrishnan, 2017). Besides other food products such as polyphenols (for example spices, coffee and tea), phytates (for example whole grains and legumes) and calcium from dairy food products inhibit iron absorption but are increasingly consumed by people who may even be at risk of anaemia (Hurrell, Reddy, & Cook, 1999). Micronutrient absorption that supports production of Hb and RBCs may be inhibited in the presence of some disease processes (e.g. peptic ulcer disease) (Muhsen & Cohen, 2008).

1.3.2 Iron Deficiency Anaemia

The iron deficiency usually results from imbalanced iron levels due to poor consumption of nutritious foods, higher iron demands in pregnancy, iron loss through menstruation and poor
absorption of iron and worm infestation (WHO, 2014, Keshav & Stevens, 2017). Iron plays very significant role in various biological processes. It is an essential component of Hb molecule. Non-availability of iron leads to very low haemoglobin levels and these results in hypochromic microcytic anaemia (Pavord et al., 2012). Usually children and women are at risk to anaemia due to developmental demands and physiological need of more iron for growth. Majority of these women tend to lose large amounts of iron during their monthly menstruation (Nguyen et al., 2015). Also pregnancy physiology requests more iron to sustain the placental unit for foetal survival (Bothwell, 2000). Anaemia in pregnancy is hardly being experienced by women in richer countries compared to poorer countries, due to their nutritional knowledge requirement (Arifulla et al., 2013).

1.3.3 Folic Acid Deficiency Anaemia

According to Perry and Morrison (2004), folic acid is essential for the production and growth of RBC but inadequate levels of folate in the individual changes the structure and function of red blood cells and even its death leading to megaloblastic anaemia. Studies show that, pregnant women need more folate in pregnancy because those who had low folate prior to pregnancy develop megaloblastic anaemia in pregnancy (Goonewardene et al., 2012).

1.3.4 Vitamin B12 Deficiency Anaemia

Vitamin B12 is mainly derived from animal products. The body needs Vitamin B12 for erythropoiesis and studies show that lack or inadequate vitamin B12 levels lead to erythrocyte loss resulting in megaloblastic anaemia (Satyam & Khushbu, 2015). A study conducted by Casey et al. (2010) measured vitamin B12 levels to determine whether it contributes to anaemia or not. The result was that 25% of those with low vitamin B1 levels were anaemic (Casey et al., 2010).
Vitamin B12 deficiency affects many individuals, but a real global estimate has not been identified. However, some studies reported at least 40% and 70% prevalence in both children and adults in South America and Africa respectively (Casey et al., 2010; de Silva, Sirisena, Gunasekera, Ismail, & de Silva, 1999). Furthermore, it is unknown how vitamin B12 contributes to development of anaemia especially in pregnancy though some information points to its haematological effect in the general population (de Silva et al., 1999).

### 1.3.5 Vitamin A Deficiency Anaemia

Vitamin A deficiency is due to inadequate consumption carotenoids from fruits, vegetables and meat (Freire et al., 2003). A study reported 21% children and 6% pregnant women lack vitamin A, leading to higher mortalities among children and pregnant women globally (Scholl, 2011). Studies have shown that Vitamin A is very crucial in erythropoiesis, improvement of Hb concentration and increase effectiveness of iron consumption (Oppenheimer, 2001). Unfortunately this mechanism is also unclear though studies suggested that vitamin A helps in iron absorption which stimulates the bone marrow for the production of RBCs (Perry & Morrison, 2004).

### 1.4 Problem Statement

Anaemia in pregnancy is a public health concern. The World Health Organization stated that a country with \( \geq 40\% \) prevalence of anaemia in vulnerable groups has severe public health problem (WHO, 2014). Over the years, prevalence of anaemia in Ghana has remained higher than the 40% (GSS, 2015). In 2011, Ghana was classified among countries with severe public health implication of anaemia since estimated prevalence was 56% (non-pregnant women) and 62% (pregnant women) (WHO, 2014). It has increased morbidity and mortality in both mother and child. It hinders the attainment of Sustainable Development Goals. According to Ghana
Health Service reports in 2015, about 180 pregnant women died during pregnancy and childbirth as a result of complication related to anaemia. The Ghana Health Service instituted policies aimed at improving haemoglobin level during pregnancy by giving iron and folic acid supplementation, health education on nutrition, ensuring the quality of care, prevention of malaria infection through IPT prophylaxis, helminths infestation through the administration of albendazole to every pregnant woman among others.

Despite these interventions, anaemia in pregnancy still persists and presents with adverse consequences such as, premature birth, low birth weight, increased risk of dying during birth, damage of brain of foetus in early pregnancy among others. In 2016, Ghana Health Service ranked anaemia as the sixth ten top diseases in the country (GHS, 2016). In 2016, anaemia among pregnant women in the Northern Region was found to be 35.0%. This prevalence was ascertained from the health records of pregnant women screened at the antenatal clinics. This situation was more serious among pregnant women who were screened at Savelugu Municipal Hospital. A total of 1438 women who were screened, 410 of them were anaemic representing 28.5% (SMH 2016 Annual Report).

Available data on factors associated with anaemia among pregnant women who attend Antenatal clinics within anaemia endemic districts of Northern Ghana is very limited. This data may be useful in informing policy and modifying existing interventions to reduce anaemia in pregnancy. Therefore, the purpose of this current study is to determine the prevalence of anaemia and identify factors that are associated with anaemia in pregnancy within the confines of Savelugu Municipality Hospital.
1.5 Conceptual framework

The conceptual framework below shows how the relationship between the outcome of interest (Dependent variable) and the independent variables relates. It shows how the independent variables are directly linked to anaemia in pregnancy.

![Conceptual Framework Diagram]

Figure 2: Frame work on factors associated with anaemia

1.5.1 Narrative of the Conceptual Framework

Demographic factors like maternal age, marital status, place of residence and ethnicity are known to affect anaemia in pregnancy. Mothers’ socioeconomic status comprising their educational level, income level and employment status have been identified to affect their health seeking behavior and therefore impact negatively during pregnancy. Also, pregnant women’s level of education and that of their spouses has greater influences on anaemia in pregnancy. Most pregnant women cannot afford well-nourished diet and hence ends ups with micronutrients deficiency.
Pregnant women’s socio-cultural beliefs about iron and folic acid consumption are associated with anaemia in pregnancy. Early health education and counseling be provided on preventive measures such as the importance of consuming iron rich foods, sleeping in insecticide treated nets (ITNs) and benefiting from prompt treatment.

In pregnancy, it is prudent to observe and adhere to prophylactic treatment of helminth, iron and folic acid supplementation and preventive measures to ensure anaemia-free pregnancy. However, pregnant women in poor communities poorly patronize antenatal care services making it difficult to promptly prevent anaemia in pregnancy.

Good context-specific policies formulation on pregnant women will be encouraged having good health-seeking behaviours and improved better outcomes for healthy pregnant women in bring forth and may lead us in achieving the sustainable development goals on maternal health.

1.6 Justification

Prevalence of anaemia in pregnancy in Savelugu Municipality is over 40% of pregnant women. This high prevalence necessitated investigation into the gap and factors contributing to this prevalence of anaemia among antenatal attendants. Therefore, determining the factors associated with anaemia in pregnancy will help stakeholders to institute timely interventions to avert this problem. The timely intervention may be maternal and child nutritional education, adequate iron and multivitamin supplements and quality of care during pregnancy will help by achieving a high quality of care and reduction in maternal and child health mortalities.
1.7 Research Questions

The specific questions are as follows

1. What is the prevalence of anaemia among pregnant women attending the antenatal clinic?
2. What are the factors associated with pregnant women with anaemia attending the antenatal clinic?
3. What is the level of knowledge on anaemia among pregnant women attending the antenatal clinic?

1.8 General Objective

To assess prevalence, knowledge and associated factors with anaemia in pregnancy among antenatal attendances at the Savelugu Municipal Hospital

1.8.1 Specific Objectives

1. To determine the prevalence of anaemia among antenatal women attending ANC.
2. To determine factors associated with anaemia among women attending ANC.
3. To assess knowledge of pregnant women attending ANC, on anaemia.
CHAPTER TWO

LITERATUREREVIEW

2.1 Prevalence of Anaemia

The World Health Organization’s database on anaemia is perhaps the only source of anaemia estimates at country, regional and global levels. The database uses blood concentration of haemoglobin as the indicator for anaemia and cut-off measurements to establish ranges for the various population groups. Thus, different cut-off points exists for adequacy and inadequacy among children, adolescents and pregnant women as defined at the World Health Organization’s Expert Consultation held in Geneva in 1992. Based on data collected over a long period (1993 to 2005), the WHO provides anaemia estimates by region for various population groups. With data covering 69% of pregnant women, 76.1% of pre-school aged children and 73.5% of non-pregnant women, the WHO’s estimates are closest to ideal. Coverage of data on other populations groups is considerably lower: 40.2% for men, 39.1% for the elderly and 33% for school aged children. This coverage covers an estimated 48.8% of the world.

Literature indicates that about a third of the world’s people (24.8%) live with some form of anaemia. It is also estimated that 47.4% of pre-school children (293 million children) have anaemia. Data available indicates that the highest prevalence of anaemia exists in South East Asia and Africa (67.6% and 65.5% respectively). The World Health Organization recorded a prevalence of 46% for the Mediterranean regions and about 20% for advanced economic regions including Western Pacific, the Americas and Europe. Data from the World Health Organization’s database indicate that, the prevalence of anaemia among pregnant women is highest in Africa and South-East (57.1% and 48.2% respectively). About, 44.2% of pregnant women in the Mediterranean regions and 25% of pregnant women in Europe are estimated to be anaemic. Globally, it is estimated that 41.8% of pregnant women are anaemic.
In comparison, the prevalence of anaemia in non-pregnant women is slightly lower than among pregnant women. For non-pregnant women, it is estimated that about half a million (30.2%) of them are anaemic. Available data depicts that, the highest prevalence of anaemia among non-pregnant women globally, exits in Africa (47.5%). South-East Asia follows a similar suit with a prevalence of 35.7%. Also, the prevalence of anaemia among non-pregnant women in the western pacific region is 20.5% while that for the America’s is 17.8%. Additionally, the global prevalence of anaemia among men is 12.7%, then among school-age children 25.4% and that of the elderly is 23.9%.

Due to the enormous difficulty involved in the generation of data on anaemia for specific regions (countries especially), only a few have reliable data estimates of the burden experienced by the country. Thus, available data estimates on anaemia in most developing countries are driven from an integration and extrapolation of data form clinical records and small surveys (McLean et al., 2009). Also, Chathuranga et al., 2014 reported that, the burden of anaemia in developing countries is about four times that of being experienced by developed countries. A study by van den Broek & Letsky (2000), in Malawi noted that, 60% of iron-deficient women had other micronutrients deficiency as well, with a large proportion of them exhibiting signs of inflammation. A related study by Alene & Dohe, in 2014 in Ethiopia, also noted that, demographic characteristics including educational status, occupation, marital status and the age of mother were associated with the development of anaemia during pregnancy.

In Ghana, the prevalence of anaemia is estimated at 65% for pregnant women (GSS, 2015). According to the GDHS, anaemia in Ghana is predominantly a result of poor dietary iron intake, malaria infections as well as intestinal and worm infestation (GSS, 2015). Measures implemented by the Health Ministry to reduce anaemia among pregnant women in Ghana include: Iron and folic acid supplementation, anti-malarial prophylaxis for the pregnant women,
health campaigns for the use of insecticide-treated bed nets by all pregnant women. These measures are being championed by the Ghana Health Service and its partners at the community levels to ensure adequate coverage especially of people who are highly vulnerable to this condition (GDHS, 2015). Anaemia in pregnancy is currently measured at a cut-off point of 11.0g/dl which is the recommended cut off limit according to WHO (2010). In Savelugu, prevalence of anaemia among antenatal attendants is a major problem facing the municipality with 8,839 expectant mothers expected to attend ANC, and the situation may be more serious in years coming ahead.

2.2 Factors associated with anaemia in pregnancy

Several factors were identified to affect the haemoglobin level of pregnant women. These factors can be generally categorized into demographic factors, socio-cultural factors, socioeconomic factors, behavioral factors, nutritional factors, obstetric factors and some infections during pregnancy.

2.2.1 Demographic Factors

Demographic factors such as maternal age, marital status, place of residence and ethnicity are known to affect anaemia in pregnancy. A study in Bangladesh to recognize factors associated with anaemia in pregnancy reported maternal age as a predictor with \( p = 0.036 \) (Chowdhury et al., 2015). In a population-based study to recognize risk factors and anaemia in pregnancy consequences, older maternal age was associated with Hb levels \( p < 0.05 \) (Gaillard et al., 2014). However, in Uganda, a similar study to identify predictors of anaemia in pregnancy reported that maternal age had a weak association with anaemia in pregnancy (Ononge, Campbell, & Mirembe, 2014). A study on risk factor for anaemia in pregnancy in Tanzania reported that pregnant women who never married had increased odds of anaemia compared to those who were married (Marchant et al., 2002).
2.2.2 Socio-Cultural Factors

According to Vasilevski and Carolan-Olah (2016), cultural factors such as food taboos in pregnancy are associated with low socioeconomic status and nutritional deficiencies such as anaemia in pregnancy.

Compliance to iron supplements is often hindered by factors including concerns about the tablets taste, side effects, fear of adverse effects and a general negative attitude towards tablet intake. It is important to determine maternal knowledge with these barriers because this knowledge could prove valuable in causing appropriate behavioral and socio-cultural changes.

2.2.3 Socioeconomic Factors

Mothers’ socioeconomic status, educational level, income level and employment status have been identified to affect their health seeking behavior and had greater impact in their hemoglobin levels during pregnancy. Women’s level of education and that of their spouses are associated with anaemia in pregnancy. In Nigeria, anaemia was common among pregnant women who had no formal education, unemployed mothers, and women who attended antenatal care (Okunade and Adegbesan-Omilabu 2014).

2.2.4 Behavioral Factors

Pregnant women in poor communities poorly patronize antenatal care services making it difficult to promptly prevent anaemia in pregnancy (Adanikin & Awoleke, 2016). Also, antenatal follow up visits during pregnancy was beneficial to pregnant women since anaemia could be detected early and counseling provided on preventive measures such as the importance of consuming iron rich foods, sleeping in insecticide treated nets (ITNs) and benefiting from prompt treatment.
2.2.5 Obstetric Factors

Birth spacing interval of less than two years, grand-multiparity, gestational age and late booking at ANC are associated risk with anaemia. Birth spacing interval of less than two years is at risk associated with anaemic as compared to those with birth interval of more than two years. The result of decreased iron store status of affected women due to the occurrence of subsequent pregnancies in quick progression is true. Pregnant women who have had no iron supplements on the current pregnancy have been found to stand about two time’s higher risk of developing anemia as compared to those who have had iron supplements. The need for iron and folic acid supplementation for pregnant women arises from the mismatch between the cumulative maternal, growing foetal and placental iron demands and the availability of iron from various compensatory mechanisms. Literature indicates the demand usually outweighs what is available.

2.3 Malaria and Anaemia in pregnancy

Majority of anaemia among pregnant women in West Africa is caused by malaria infection (Jufaret al., 2014). Anaemia presents both foetus and mother with risk of adverse health. Malaria is usually contracted from bites of infective female mosquitoes, which carry malaria parasites. A large proportion of the world’s population is at risk of suffering malaria because they live in endemic areas with SSA mostly affected. The World Health Organization and its partners recommend that, pregnant women in malaria endemic regions be provided with intermittent preventive treatment (IPT) with sulfadoxine-pyrimethamine (SP) after quickening at each ANC visit after the first trimester (WHO, 2012). Anaemia in pregnancy leads to sequestration of infected erythrocytes in the inter-villous space which causes local inflammatory process which is usually referred to as inflammatory placental malaria (Nostenet al., 2004). This leads to mother and foetus abortions, still birth, low birth weight and infant mortality (Menendez et al., 2000). Messina et al., 2013 which sought to
determine factors that are associated with anaemia, predominantly among pregnant women who are infected with malaria. The study realized that, more pregnant women (about two-thirds) had malaria compared to their non-pregnant women. An estimated 200,000 deaths are as a result of severe malaria episodes during pregnancy (Ismail et al., 2000). Maternal anaemia increases the incidence of sudden foetal death during pregnancy. Though literature indicates that about a fourth of pregnant women are infected with malaria, the risk of adverse pregnancy outcomes is higher among primiparous young females and co morbidities such as HIV among others (Shantz Dunn et al., 2009).

In a prospective study (between 1993 and 1996) which involved weekly follow ups of a cohort of 1,495 mothers and their infants, from admission of the mother to antenatal clinics until the infant was one year of age, the study found that, malaria during pregnancy had a significant association with low birth weight but did not influence gestation. It was also found that, the experience of a short illness in the week before delivery resulted in premature births. It also estimated that babies who were born before term had a higher risk of dying within the neonatal period, likewise babies born with low birth weights.

In malaria endemic regions, malaria and anaemia are may cumulatively reduce birth weight. In a study conducted in Papua New Guinea, where malaria is endemic, suffering anaemia during pregnancy was related to giving birth to low weight babies in primigravidae. However, the study did not show an association between parasite positivity (parasitic infections) and the delivery of babies with low weight (Brabin et al., 1990).

Anaemia could also be caused by the use of medications that cause gastric bleeding. The phenomenon may also result from a surgical procedure that decreases absorption, stomach acidity and intestinal transit time. Inadequate dietary practices, such as chronic consumption of diets with insufficient iron and the craving and eating on non-food substances may result in
anaemia. It is imperative to note that the relative contribution of factors mentioned so far vary greatly from country to country.

The contributions of these risk factors associated with anaemia in pregnancy vary in different countries. To effectively reduce the adverse impact of anaemia in a particular region or locality, it must take the implementation of selected interventions that target the primary causes in the population under consideration, which may differ from geographical setting to setting. Evidence indicates that, about a fifth of pregnancy related deaths in developing countries can be attributed to anaemia (WHO, 2002).

2.4 Worm infestations and anaemia in pregnancy

Parasitic worms usually complete some part of their life cycles in a host, be it human or otherwise. These worms vary in size. The whale tape worm could reach a hundred feet in length in its adult stage. Parasitic worms gain way into the human system usually through food or water or a transmission agent. They thrive on part of the food eaten by the individual or eat part of the individual. Hook worms particularly cause the most harm in respect of anaemia as they warren the intestinal walls and feed on blood.

Anaemia is high among women in developing countries because they are unable to meet their dietary requirement through the chronic consumption of inadequate diets. Women in developing countries in effect enter pregnancy with depleted no iron reserves. The situation is further exacerbated by the higher requirement for the support of adequate maternal and foetal tissue synthesis (Gillespie & Allen, 2002). Pregnancy increases iron requirements in excess of 45% compared to state of being non-pregnant. This results in the decrease of the bioavailability of iron to the mother as there is more demand on the part of the developing foetus for oxygenation and nourishment. Deficiency of iron in pregnancy causes a gradual depletion of iron from its stores to compensate for the low serum iron levels and decreased transferrin saturation (Reveiz,
Adequate pre-pregnancy nutrition is important to ensuring optimum foetal development. The effects of maternal deficiencies during early pregnancy could be devastating and may persist into adulthood. Iron is abundant in animal products such as eggs, snails, fish and meat. It is also abundant in green vegetables. The absorption of iron is dependent on its balance in the body (De Andrade et al., 2014).

### 2.5 Knowledge, Attitude, and Practice

The ability to predict behavior and to employ this in programming involving maternal and child health cannot be over emphasized. Health behaviors are exhibited in attitudes, practices and in knowledge (Black et al., 2013). When the determinants of a particular phenomenon are identified, they serve as focal points that could be encouraged or altered to ensure better outcomes in respect of maternal and child nutrition and health. Attitude, knowledge and practices in respect of anaemia among pregnant women in resource poor setting have not been extensively explored. Thus, literature in this respect is very limited (Patimah, Royani, Mursaha, & Thaha, 2016). A study by Priyanka & Asfia (2015) noted the relevance of nutrition education in the creation of awareness and improvement of knowledge among adolescent on the control and prevention of anaemia.

Assessing knowledge, attitude and practices also provides valuable information on the performance of a maternal and child health program. The process aids in the identification of the needs as well as barriers of the target group regarding the problem under consideration. Information obtained, subsequently helps in appropriate focusing and tailoring, likely success of key intervention in addressing identified challenges (Hiew et al., 2015).

KAP assessment, thus, allows the identification of what is already known by the target group under consideration (Knowledge), how they feel (Attitude), and what they do (Practice)
(Vandamme, 2009) in respect of maternal and child health and nutrition, KAP assessments have been used extensively in nutritional studies and it findings underpin most interventions being adopted by the discipline in recent times (Hiew et al., 2015). In recent nutritional literature, knowledge, attitude, and practice assessment is a major determinant in Health Seeking Behavior (Hiew et al., 2015). KAP was used to evaluate the knowledge on the management of iron deficiency anaemia among adolescent females in European countries (Sichert-Hellert et al., 2011). Furthermore, questions on attitude and practice related have been used to identify the level of right attitude and practice towards health (Marías & Glasauer, 2014).

In 2011, Sichert-Hellert and colleagues used KAP assessment methodology to determine the knowledge of adolescent girls on the management of iron deficiency anaemia in European countries. In relation, questions on attitude and practices as regards health have been used to determine the level of practice of appropriate health behaviors (Marías & Glasauer, 2014). However, it is important to note that, the impact of Knowledge of anaemia on anaemia status among pregnant women especially in Ghana has not been extensively explored.

2.5.1 Knowledge

Projects targeting a reduction in anaemia rates among pregnant women have been largely unsuccessful owing to the attitude and knowledge that pregnant women have regarding anaemia. A study in developing countries revealed that, diagnosis or a disease name; anaemia is often used to recognize symptoms in patients present with the condition. The study further revealed that women paid less attention to symptoms of anaemia. The intake of iron supplements by women during pregnancy is dependent on the provision of supplements by state health institutions. Compliance to iron supplements is often hindered by factors including concerns about the tablets taste, side effects, fear of adverse effects and a general negative attitude towards tablet intake. It is important to determine maternal knowledge with these barriers because this knowledge could
prove valuable in causing appropriate behavioral changes that could be an improvement in compliance regarding iron supplements intake during and after pregnancy. Adequate iron supplements compliance has the capacity to improve the haemoglobin status of both mother and foetus. Improvements in knowledge of the mother can be very helpful in this regard. A number of studies have revealed an inverse relationship between maternal knowledge and level of anaemia among infants. In general, women with low knowledge on anaemia had more children being anaemic compared to women with high anaemia knowledge.

High intake of animal source foods, a behavior that causes improvements in haemoglobin levels could be precipitated by high maternal anaemia knowledge level. High intake of animal source foods improves dietary diversity and micronutrients adequacy as relatively higher bioavailable forms of micronutrients are consumed. This betterment in maternal nutrition promotes adequate maternal stores and foetal development in pregnancy and during lactation. The adequately address anaemia in pregnancy and during early childhood strategies must necessarily include high consumption of fortified milk as well as deworming medications. Adequate fortified milk consumption has proven potent at reducing anemia among children. This has been the basis for legislative directives involving mandatory fortification of powdered milk with minerals, iron and vitamins. Deworming has proven potent at reducing anaemia among children in endemic regions especially, by reducing blood losses as a result of parasitic worm infestations. Hookworm causes the most damage in respect of blood loss that result in iron deficiency anaemia. It must be mentioned that, recent health policies dictate the mandatory deworming of all pregnant women and children fewer than 5 in Ghana.

2.5.2 Attitude

Literature indicates that adherence (compliance) to medical regimens may be directly influenced by the nature of the pregnant women schedule and their inherent characteristics. Information on
these factors in a particular population may serve to guide programming in respect of improving anaemia rates among pregnant women, where supplements would be provided. Literature also indicates that, factors such as maternal educational level and maternal ethnic origin as well as maternal perception and knowledge have proven definitive of adherence to regimens targeted in improving health.

2.5.3 Practice

Every pregnancy is different. Most pregnant women practices leads to an increased risk of anemia. Nutrition practices during pregnancy are particularly of concern as pregnancy comes with some mood alterations due to hormonal changes. Some of these mood alterations might not encourage the intake of certain foods known to contain high amounts of iron and folateas well as supplements provided by the various health facilities. It is therefore, imperative to routinely assess dietary practices of pregnant women. Women need higher levels of folate in pregnancy. A supplement called folic acid is recommended even before a woman tries to get pregnant. Folic acid is a vitamin that helps in preventing defects of the developing brain and spinal cord during pregnancy, which is why it’s a recommended supplement. It is also used by the body in the synthesis of haemoglobin. Some women may have difficulty processing B-12, which can lead to a deficiency. Folate deficiency and vitamin B-12 deficiency can often be found together. A doctor will need to look at laboratory values to determine what type of anemia may occur and treatment appropriate. Majority of pregnant women adherence to supplements and nutritional education could be challenging.
CHAPTER THREE

METHODS

3.1 Study Design
A hospital-based cross-sectional study design was used to determine the prevalence of anaemia in pregnancy and factors associated with its occurrences in Savelugu Municipal Hospital from March to May 2018.

3.2 Study Area
The Savelugu Municipality is one of the Municipalities in Northern Region. Its capital is Savelugu. Notable area councils within the Savelugu Municipality include: Tampion, Diare, Nanton, Moglaa and Pong-Tamale. It has an estimated total land mass of 1,790 square kilometres. To its west the Savelugu district shares boundaries with the Kumbungu district. To its East, the Savelugu district shares boundaries with the Gushgu/Karaga district to the West the Savelugu Municipality also shares boundaries with Tamale Sagnerigu to the south and the West Mamprusi district to the North. It has a population of 170,149 with 226 communities with a growth rate of 4% (GSS, 2010).

Rainy season typically begins in May and ends in October whilst the dry season mostly begins in December and runs till March. As regards water supply, rivers within the Municipality are fed mainly by the Volta River which runs from the Northern to the Southern parts of Ghana. The Municipality has access to water since most of them rely on river and stream water. Transportation and movement within the Municipality becomes a problem during the peak of the rainy season as most roads become flooded.
At the peak of the rainy season the roads within the Municipality are either in a very deplorable state or flooded. This makes movement within the municipality somewhat restricted.

Literacy within the Savelugu municipality is very low. Dropout rates within the Municipality, is lower among boys (7.7% for males and 1201% for females). Also enrollment rates within the municipality favor males (46%) compared to females (35%). The Municipality has a Veterinary College, which is the only higher education facility. The municipality has 19 junior high schools and 2 senior high schools. The Municipality also has 3 private basic schools and 76 public basic schools. The municipality also inhabits 13 public pre-school age educational facilities and 44 private pre-school age educational facilities. The Ghana education service and its partners also provide education service for adults who haven’t been to school in some selected communities.

Dagombas are the main ethnic group within the Savelugu Municipality. Traditionally, power and authority resides within the ambits of religious leaders, chiefs and heads of clans, who in most instances are male. The inhabitants practice a patrilineal system of inheritance, thus males serve as household heads and custodians of the families’ resources. Females dominate in population, with a proportion of 51 percent. However, only about 3 percent of households are headed by females. Comparatively women within the Municipality have less access to health and social amenities. The Municipality is also riddled with poverty.

The Savelugu /Nanton Municipality healthcare setting has eight (8) Health centers, two (2) private clinics, Fourteen (14) functional CHPS, Nine (9) with compounds and One (1) Hospital which serves as referral health facility for the other peripheral health facilities. Majority of pregnant women in the municipality seek for health care at the hospital. They Hospital have a total OPD attendance of 180 with a bed capacity of 120. It is the only Hospital in the Municipality which serves as a referral center in the district. It has the following departments and
provides services like Clinical care, Laboratory, Public Health Unit where Maternal and child care services such as Antenatal care, Postnatal care, Newborn care, services are been rendered. The antenatal clinic under the maternal and child units is where the study took place.

Figure 3: The map of Savelugu-Nanton Municipality

Source: Ghana Statistical service (2010)
3.3 Study Population

All pregnant women between the ages of 15-45 years receiving ANC services during the period of March to May 2018 at Savelugu Municipal Hospital were eligible for inclusion.

3.3.1 Sampling Method

Simple random sampling method was used in the selection of 348 participants for the study. Thus, inclusion and exclusion criteria were used to select participants for the study. Each day at the antenatal care clinic, pregnant women were screened using “pregnant women screening questionnaire” to identify those who met the inclusion criteria. All qualified clients were included in the study. Simple random sampling method was used in the selection of 348 participants for the study. The first participant was randomly selected among the first 68 people on the first day and then subsequent randomized selection till the 350 were met.

Sample Size Calculation

This study appears to be the first of its kind conducted within the catchment of the Savelugu Municipality. The sample size for the study was calculated using a prevalence estimate of 28.5% (SHM, 2016). The Cochrane and Snedecor formula, given by

\[
n = \frac{Z^2 \times P \times (1-P)}{d^2}
\]

Where

- \( n \) = Sample Size,
- \( Z \) = Z-score for a 95% confidence level
- \( P \) = Prevalence of anaemia amongst pregnant women
Q = 1 - Prevalence of anaemia amongst pregnant women

And D = Margin of error (5%)

Thus, 
\[ n = \frac{(1.96)^2 \times 0.29 \times (1-0.29)}{(0.05)^2} = 316 \]

\[ \frac{3.8416 \times 0.2059}{0.0025} = 316 \]

10% adjusted for overage = 0.10 \times 316 = 31.6

Therefore, total sample size is 316 + 32 = \textbf{348}

3.3.4 Inclusion Criteria

A pregnant woman was eligible to take part in the study, if she was aged between 15 and 45 and had HB records for her first ANC visit and her current visit.

3.3.5 Exclusion criteria

1. Pregnant women who were coming to the ANC for the first time
2. Pregnant women without registered ANC book
3. Pregnant women who had a blood transfusion between their current visit and the previous two weeks.
4. Pregnant women who had any history of severe sickness within the previous two weeks.
<table>
<thead>
<tr>
<th>NUMBER</th>
<th>VARIABLE</th>
<th>OPERATIONAL DEFINITION</th>
<th>TYPE OF VARIABLE</th>
<th>SCALE OF MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hb at current visit</td>
<td>Hb level of pregnant women at ANC clinic during the study</td>
<td>dependent</td>
<td>Continuous</td>
</tr>
<tr>
<td>2</td>
<td>Hb at first ANC visit</td>
<td>First ANC visits Hb level</td>
<td>independent</td>
<td>Continuous</td>
</tr>
<tr>
<td>3</td>
<td>Age of participants</td>
<td>Age in completed years of pregnant women during the study</td>
<td>independent</td>
<td>Continuous</td>
</tr>
<tr>
<td>4</td>
<td>Gestational age</td>
<td>Gestational age at weeks of the pregnancy</td>
<td>independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>5</td>
<td>Gravidity</td>
<td>Number of times a woman has been pregnant</td>
<td>independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>6</td>
<td>Parity</td>
<td>No of Children of a pregnant woman</td>
<td>independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>7</td>
<td>Educational level</td>
<td>Educational level of the pregnant woman giving during the study</td>
<td>independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>8</td>
<td>Occupation</td>
<td>The work the pregnant woman does</td>
<td>Independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>9</td>
<td>Iron Supplementation (IPT)</td>
<td>How often a pregnant woman take iron supplement</td>
<td>independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>10</td>
<td>Malaria prophylaxis</td>
<td>Refers to whether pregnant woman has taken SP</td>
<td>Independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>11</td>
<td>Bed net usage</td>
<td>Refers to whether a pregnant woman sleeps in bed nets</td>
<td>independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>12</td>
<td>Anti-Helminthes</td>
<td>Whether pregnant woman has been dewormed during the study</td>
<td>Independent</td>
<td>Categorical</td>
</tr>
<tr>
<td>13</td>
<td>Marital status</td>
<td>Thus the marital status of the pregnant woman</td>
<td>Independent</td>
<td>Categorical</td>
</tr>
</tbody>
</table>
3.3.6 Pre-Testing

The questionnaire was tested at the Tamale West Hospital. Questionnaires were tested to identify any potential problems with the questions. All necessary corrections were made before proceeding to the actual field for data collection.

3.4 Data Collection Techniques and Tools

The study employed two main approaches for data collection. These were data extraction from participants ANC Booklets and administration of a structured questionnaire. Data was collected from the pregnant women after they had given written informed consent and received their ANC service. Relevant data was extracted from the ANC booklet of the pregnant women. These data included the number of ANC visits Gravidity, Parity and Gestational age. Data on Haemoglobin levels recorded during their first and current ANC visits as well as administration of anti-helminthes during pregnancy were also extracted from the booklets. In addition, data on malaria infection, health facility administration of iron tablets and gestational age at which IPT was administered were taken from the ANC booklets. A structured questionnaire was be used to collect data on age of participants, the occupation of a pregnant woman, level of education, marital status, the frequency of consumption of iron-containing foods, birth spacing/interval between pregnancies, and bed net usage.

3.4.1 Data Collection

A structured pre-tested interviewer-administered questionnaire was used to collect socio-demographic information and obstetric history among pregnant women. The questionnaire was developed in English. Pretesting of the questionnaire was done on 5% of the sample size among ANC attendees who were not included in the study; this was done a week before the commencement of the actual data collection. Data completeness and consistency on daily basis were supervised.
3.4.2 Quality Control

Research assistants were recruited and trained on the purpose of the study, how to collect data and how to communicate with people during the data collection period. At the end of each day, data collected was assessed to ensure that adequate information was collected for analysis.

3.4.3 Data Management and Analysis

Questionnaires were inspected for completeness and consistencies daily. Field data collected were entered into designed data collection template in Statistical Package for the Social Sciences (SPSS) Version 20, daily until data collection from the field was completed. Data was double checked to ensure there were no mistakes. Data were exported to Stata version 15 for data analyses. Anaemia was categorized into mild anaemia (Hb: 10 – 10.9 g/dl), moderate anaemia (Hb: 7 – 9.9 g/dl) and severe anaemia (Hb< 7 g/dl). Bivariate analyses were run using Pearson Chi square test of independence to examine relationship between factors and anaemia at current visit. Statistically significant variables were included in a multivariable analysis. Variables with p–value (p) less than 0.05 at 95% confidence interval (CI) were considered to be predictors of anaemia in pregnancy.

3.5 Ethical Consideration

All the rules and regulations governing the conduct of project work were followed. Ethical approval for the conduct of this study was given by the Ghana Health Service Ethics Review Committee (GHS-ERC) through the School of Public Health, University of Ghana, upon review of the research proposal and protocols. The objectives of the study and its procedures, was explained to all participants. All participants consented to taking part by means of thumb prints of Signatures. The study was voluntary participation and the right of participants to discontinue at any stage of the study was made known to them before the start of the interview.
3.5.1 Informed Consent

Even though a routine counseling was in place for pregnant women, participant’s voluntarily counseled and permission/consent sought before questionnaires were administered. Well trained data collectors translated the questionnaires into local languages to the best of the understanding of the participants.

3.5.2 Confidentiality

Clients who agree to participate in the study had their data coded to ensure privacy and confidentiality. The hardcopies were stored in cabinets with lock and key. The findings of this study would be shared with the Ghana Health Service Savelugu as per the guided procedure. The findings of the study would be presented at health seminars and published in scientific journals.

3.6 Potential Benefits

There was a direct benefit to the participants as they had the opportunity to know factors associated with anaemia in pregnancy.
CHAPTER FOUR

RESULTS

4.2 Socio-demographic characteristics of women

The socio-demographic characteristics of sampled pregnant women, is presented in Table 4.1. More than seven in ten of the women were aged 20-30 years (77.4%). The women were predominantly unemployed (74%) and had no formal education (76.3%). Almost all the sampled women were currently married (99.7%).

Table 2: Socio-demographic characteristics of women (n=350)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 20</td>
<td>33</td>
<td>9.4</td>
</tr>
<tr>
<td>20-30</td>
<td>270</td>
<td>77.4</td>
</tr>
<tr>
<td>Above 30</td>
<td>46</td>
<td>13.1</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal employment</td>
<td>46</td>
<td>13.1</td>
</tr>
<tr>
<td>Non employment</td>
<td>45</td>
<td>12.9</td>
</tr>
<tr>
<td>Unemployed</td>
<td>259</td>
<td>74</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal education</td>
<td>47</td>
<td>13.4</td>
</tr>
<tr>
<td>Non formal education</td>
<td>36</td>
<td>10.3</td>
</tr>
<tr>
<td>No education</td>
<td>267</td>
<td>76.3</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>349</td>
<td>99.7</td>
</tr>
<tr>
<td>Not married</td>
<td>1</td>
<td>0.3</td>
</tr>
</tbody>
</table>
4.2 Maternal obstetric and pregnancy related characteristics

Majority of the mothers (57.7%) had a parity of 0-2 and a gravidity of 3-4 (46.3%). Majority of the women believed that the recommended birth spacing was above two years. A majority of study participants were within the third trimester of pregnancy (95.4%), made their premier ANC attendance outside the first three months of pregnancy (63.8%) and had made less than four ANC appearances during the current pregnancy (69.7%).

The reported usage of malaria prophylaxis among pregnant women was mainly SP 73.4%. While anti-helminths drugs was 43.7%. The prevalence of infections and ailments during pregnancy were obvious. For example, 79.4% of the mothers had malaria, 73.7% had previous anaemia, and 59.4% reported abdominal pains during pregnancy. ITN use among mothers was high (99.7%). Table 4.2 presents further statistics on the maternal obstetric as well as other pregnancy related characteristics of the sampled women.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>202</td>
<td>57.7</td>
</tr>
<tr>
<td>3-4</td>
<td>137</td>
<td>39.1</td>
</tr>
<tr>
<td>Above 4</td>
<td>11</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Gravidity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>134</td>
<td>38.3</td>
</tr>
<tr>
<td>3-4</td>
<td>162</td>
<td>46.3</td>
</tr>
<tr>
<td>Above 4</td>
<td>54</td>
<td>15.4</td>
</tr>
<tr>
<td><strong>Recommended birth spacing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 2 years</td>
<td>74</td>
<td>21.1</td>
</tr>
<tr>
<td>Above 2 years</td>
<td>276</td>
<td>78.9</td>
</tr>
<tr>
<td><strong>Current gestational age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second trimester</td>
<td>16</td>
<td>4.6</td>
</tr>
<tr>
<td>Third trimester</td>
<td>334</td>
<td>95.4</td>
</tr>
<tr>
<td><strong>Gestational age at first ANC visit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First trimester of pregnancy</td>
<td>111</td>
<td>31.7</td>
</tr>
<tr>
<td>Older than first trimester pregnancy</td>
<td>239</td>
<td>68.3</td>
</tr>
<tr>
<td><strong>ANC attendance frequency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 4</td>
<td>106</td>
<td>30.3</td>
</tr>
<tr>
<td>Less than 4</td>
<td>244</td>
<td>69.7</td>
</tr>
<tr>
<td><strong>SP use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>257</td>
<td>73.4</td>
</tr>
<tr>
<td>No</td>
<td>93</td>
<td>26.6</td>
</tr>
<tr>
<td><strong>Anti-helminths drugs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>153</td>
<td>43.7</td>
</tr>
<tr>
<td>No</td>
<td>197</td>
<td>56.3</td>
</tr>
</tbody>
</table>
4.3 Haemoglobin level, anaemia prevalence and dietary practices during pregnancy

The average woman in the study made her first ANC visit anaemic (mean Hb: 9.36 ±1.2) but had marginally normal haemoglobin level at their current visit (mean Hb: 10.91 ± 0.9). The prevalence of anaemia at first ANC and current ANC visits were therefore 93.4% and 62.9% respectively.

More than nine in ten of sampled women reported intake of iron supplements (99.7) and had taken above two times during pregnancy (74.2%).

Overall, women reported favorable dietary practices during their current pregnancy. For example, majority of them reported consumption of eggs (81.7%), meats/fish/snails (92.0%) and vegetables (95.7%). Only 4.3% of the women reported food taboos during pregnancy (Table 4.3)

![Anaemia prevalence among pregnant women](Image)

**Figure 4: Prevalence of anaemia among pregnant women attending ANC at Savelugu municipal Hospital**
Table 4: Haemoglobin level, anaemia prevalence and dietary practices during pregnancy

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency (n)/</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haemoglobin characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hb level at first ANC visit</td>
<td>258</td>
<td>73.7</td>
</tr>
<tr>
<td>Hb level at current visit</td>
<td>350</td>
<td>100</td>
</tr>
<tr>
<td><strong>Anaemia prevalence characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaemia prevalence at first ANC visit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>23</td>
<td>6.6</td>
</tr>
<tr>
<td>Anaemic</td>
<td>327</td>
<td>93.4</td>
</tr>
<tr>
<td><strong>Anaemia prevalence at first ANC visit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>130</td>
<td>37.1</td>
</tr>
<tr>
<td>Anaemic</td>
<td>220</td>
<td>62.9</td>
</tr>
<tr>
<td><strong>Intake of iron supplements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>349</td>
<td>99.7</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Frequency of iron supplements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 2 times</td>
<td>90</td>
<td>25.8</td>
</tr>
<tr>
<td>Above 2 times</td>
<td>259</td>
<td>74.2</td>
</tr>
</tbody>
</table>

Figure 5: Dietary practice during pregnancy
4.4 Knowledge level of pregnant women on anaemia

Maternal knowledge on anaemia was assessed on their knowledge on certain aspects of the pregnancy anaemia condition including hearing/awareness of the condition, causes, symptoms, and its effects to the mother and child.

Anaemia awareness was high (98.0%) among the women and they had heard about the condition from health facilities (99.4%) and to a lesser extent from the media (13.1%). Surprisingly, a large percentage of the women felt anaemia was the result of mosquito bites (90.6%). A good proportion of them however, knew that bleeding (47.4%), worm infestation (90.9%), poor eating habits (47.4%) and genetic factors (53.4%) could cause anaemia in pregnancy.

At least 60% of the mothers knew the prominent symptoms of anaemia which include; dizziness (82.0%), fatigue (60.0%), fever (87.7%) and general body weakness (63.1%).

In addition, mothers knew that anaemia could lead to maternal death (84.6%), low birth weight (86.6%), intra uterine death of child (60.9%), and congenital anomalies (30.3%). Majority of the mothers knew that pregnancy anaemia could be treated (94.9%).

Overall, maternal knowledge on pregnancy anaemia was high, with 55.7% of them having knowledge scores above the mean score (Table 4.4)
Table 5: Knowledge level of pregnant women on anaemia

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heard of anaemia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>343</td>
<td>98.0</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Places anaemia heard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>348</td>
<td>99.4</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>0.6</td>
</tr>
<tr>
<td>Media</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>46</td>
<td>13.1</td>
</tr>
<tr>
<td>No</td>
<td>304</td>
<td>86.9</td>
</tr>
<tr>
<td>Friend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>3.7</td>
</tr>
<tr>
<td>No</td>
<td>337</td>
<td>96.3</td>
</tr>
<tr>
<td>Other source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>3.7</td>
</tr>
<tr>
<td>No</td>
<td>337</td>
<td>96.3</td>
</tr>
<tr>
<td><strong>Causes of anaemia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mosquitoes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>317</td>
<td>90.6</td>
</tr>
<tr>
<td>No</td>
<td>33</td>
<td>259.4</td>
</tr>
<tr>
<td>Bleeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>166</td>
<td>47.4</td>
</tr>
<tr>
<td>No</td>
<td>184</td>
<td>52.6</td>
</tr>
<tr>
<td>Not eating well</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>166</td>
<td>47.4</td>
</tr>
<tr>
<td>No</td>
<td>184</td>
<td>52.6</td>
</tr>
</tbody>
</table>
4.5 Factors associated with anaemia among mothers

Factors statistically significance were parity (p=0.026), gravidity (0.010) and perception of anaemia deadliness (0.04). The results show that, anaemia decreased with increasing parity and gravidity. For example, while mothers with a parity of 0-2 had a 66.3% anaemia prevalence, those with parity above four had 27.3% anaemia prevalence. A similar trend is observed for gravidity. Women who felt pregnancy anaemia were less likely (20.0%) to have anaemia than those who felt otherwise (63.5%).

Even though ANC attendance frequency, knowledge on pregnancy anaemia, anti-helminths use and intake of iron supplements were not statistically associated (p<0.05) with pregnancy anaemia, important patterns were identified. For instance, women who made at least 4 ANC visits were less likely to have anaemia compared to those who made less visits (61.1% vs. 67.0%, respectively). Women who had low knowledge were also more likely to have anaemia than those with adequate knowledge (65.2% vs. 61.0%, respectively). Similarly, mothers who used anti-helminths medication had lower (62.1%) prevalence than those who did not use these medications (63.5%). A similar trend was observed among women who reported frequent use of iron supplements in pregnancy.
Table 6: Bivariate analysis of factors associated with anaemia among mothers

<table>
<thead>
<tr>
<th>Factor</th>
<th>N</th>
<th>Anaemia status</th>
<th>p-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Anaemic n (%)</td>
<td>Normal n (%)</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>202</td>
<td>134 (66.3)</td>
<td>68 (33.7)</td>
</tr>
<tr>
<td>3-4</td>
<td>137</td>
<td>83 (60.6)</td>
<td>54 (39.4)</td>
</tr>
<tr>
<td>Above 4</td>
<td>11</td>
<td>3 (27.3)</td>
<td>8 (72.7)</td>
</tr>
<tr>
<td>Gravidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>134</td>
<td>88 (65.7)</td>
<td>46 (34.3)</td>
</tr>
<tr>
<td>3-4</td>
<td>162</td>
<td>108 (66.7)</td>
<td>54 (33.3)</td>
</tr>
<tr>
<td>Above 4</td>
<td>54</td>
<td>24 (44.4)</td>
<td>30 (55.6)</td>
</tr>
<tr>
<td>Anaemia deadly?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>1 (20.0)</td>
<td>4 (80.0)</td>
</tr>
<tr>
<td>No</td>
<td>315</td>
<td>219 (63.5)</td>
<td>126 (36.5)</td>
</tr>
<tr>
<td>ANC attendance level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 4</td>
<td>106</td>
<td>71 (67.0)</td>
<td>35 (33.0)</td>
</tr>
<tr>
<td>At least 4</td>
<td>244</td>
<td>149 (61.1)</td>
<td>95 (38.9)</td>
</tr>
<tr>
<td>Knowledge on anaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>155</td>
<td>101 (65.2)</td>
<td>54 (34.8)</td>
</tr>
<tr>
<td>Adequate</td>
<td>195</td>
<td>119 (61.0)</td>
<td>76 (39.0)</td>
</tr>
<tr>
<td>Anti-helminths use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>153</td>
<td>95 (62.1)</td>
<td>58 (37.9)</td>
</tr>
<tr>
<td>No</td>
<td>197</td>
<td>125 (63.5)</td>
<td>72 (36.5)</td>
</tr>
<tr>
<td>Intake of iron supplements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least 2 times</td>
<td>259</td>
<td>159 (61.4)</td>
<td>100 (38.6)</td>
</tr>
<tr>
<td>Below 2 times</td>
<td>91</td>
<td>61 (67.0)</td>
<td>30 (33.0)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Pearson Chi square test.

*significant at p<0.05.
Figure 6: Knowledge level of pregnant women on anaemia

Table 7: Results on logistic regression

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hb status</th>
<th>COR (95% CI)</th>
<th>P-value</th>
<th>AOR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is anaemia deadly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>219</td>
<td>6.952 (0.77-62.89)</td>
<td>0.046</td>
<td>8.125 (0.873.74)</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>126</td>
<td>1.282 (0.82-2.01)</td>
<td>0.279</td>
<td>1.065 (0.55-2.08)</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>134</td>
<td>68</td>
<td>5.255 (1.35-20.45)</td>
<td>0.008</td>
<td>2.712 (0.55-13.46)</td>
</tr>
<tr>
<td>3-4</td>
<td>83</td>
<td>54</td>
<td>2.391 (1.26-4.56)</td>
<td>0.007</td>
<td>1.941 (0.74-5.11)</td>
</tr>
<tr>
<td>Above 4</td>
<td>3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COR = Crude odds ratio, AOR = adjusted odds ratio, ref = reference category
Table 7 above shows logistic regression of factors assessed to be significantly associated with anaemia by means of bivariate analysis as depicted in table 4.5. The results indicate that individuals who perceived anaemia as a deadly condition were not significant (AOR= 8.125; 95% CI 0.89-73.74; P=0.063). The odds of being anaemic were 5.25 among pregnant women with parity of above 4 when compared to pregnant women with a parity of less than 3(COR= 2.71; 95% CI 0.55-13.46; P=0.222). In a similar vein, the odds of being anaemic was 2.39 among pregnant women with parity of above 4 when compared to pregnant women with a parity of less than 3(COR= 1.941; 95%CI 0.74-5.11; P=0.179).
CHAPTER FIVE

DISCUSSION

5.2 Prevalence of Anaemia among Pregnant Women

The prevalence of anaemia among pregnant women at their current ANC visit (62.9%) was similar to the prevalence of 69.1% reported by Ouma et al., 2007, among pregnant women in Kisimu in Western Kenya, the prevalence of 61.4% recorded by Kavle et al., 2008, among pregnant women in Tanzania. Also similar prevalence have been recorded by Al hassan, 2006 (61%) in Benin and Fiedler et al., 2014 (69%) in Mali and in Sudan (62.9%) by Adam et al., 2005.

However, the prevalence recorded was marginally higher than the prevalence of 52.5% in Central Sudan recorded by Bushra et al., 2010, the prevalence of 41.5% among pregnant women, in Easten Caprivi, Namibia (Thompson,1995), the prevalence of 54.5% among pregnant women in Oyu in Nigeria (Olatunbosun et al.,2014), the prevalence of 47.4% among pregnant women (Msuya et al.,2011), in the Moshi Municipality of Tanzania, and the prevalence of 47% among pregnant women (Ayoya et al.,2006), in Mali. The prevalence for the current study is also marginally higher than that ascertained in prior studies by Melku et al., 2014 with a recorded prevalence of 40% and Anlaakuu, 2015 in Sunyani with a recorded prevalence of 41.5%, Achampong et al., 2018 with a recorded prevalence of 51% among pregnant women in Accra, and another study in the Sankyere West district (Glover-Amengo et al., 2005) with a recorded prevalence of 57.1%.

It is also noteworthy to mention that the prevalence recorded in this study is considerably higher than the prevalence of 26.8% reported by Alzaharani (2012) in Taif, Saudi Arabia, the prevalence of 23.2% among pregnant women (Buseri et al.,2008), in Niger Delta state in Nigeria.
and the prevalence of 33.8% in a related Sudan (Alzaharani, 2012). The prevalence for the current study is also considerably higher than that ascertained in prior studies by Khadija (2006) with recorded prevalence of 25.7% and Sawe et al. (1992) with a prevalence of 24.5% and Margwe (2015) with a recorded prevalence of 38.7%.

It is again important to note that the prevalence recorded in this study is considerably lower than the prevalence of 90.5% among pregnant women in Taif, in Saudi Arabia (Baig-Ansari et al., 2008), the prevalence of 87.2% among pregnant women in Auranbagad in India (Lokare et al., 2012), and the prevalence of 72.6% among pregnant women (Dreyfuss et al., 2000), in Nepal. The wide stream of disparities realized as can be seen when the study is compared to other related studies perhaps could be attributed to differences in geographical locations, development and socioeconomics including access to economic resources, health care and healthy foods for consumption.

It is again noteworthy to mention that the prevalence of anaemia at first ANC visit (93.9%) falls considerably outside of that reported for pregnant women in Africa (57.1%), Ghana (65%) and Northern Region (43%) in which the study was conducted (GHS, 2016). This is very worrying as it indicates that many mothers go into pregnancies with anaemia which is a poor start could result into developmental difficulties on the part of the growing foetus. Also since many prior studies have reported that pregnant women report for their first visits at health facilities usually in the second trimester, grave harm could have been caused to the foetus before the initiation of corrective measures. Anaemia in pregnancy greatly increases the risk of delivery complications including excessive blood loss that could result in maternal mortality. It also contributes to low birth weight.
The disparity of anaemia ascertained between the first and current ANC visits could be attributed to high reported compliance of intake of iron and folic acid supplements and the impressive reported dietary diversity especially in respect of protein intake. As this is bound to cause a rise in haemoglobin levels and consequently improve anaemia status. Overall, the high prevalence also insinuates that amidst interventions that have been put in to address anaemia in Ghana, its alleviation still remains a challenge.

**5.3 Obstetric Characteristics of Pregnant Women**

With more women having births of between 0 and 2, the study participants are similar to study participants in related studies conducted by Achampong et al., 2018, Ahenkora et al., 2015, Dreyfuss et al., 2000 and Buseri et al., 2008 in respect of parity since they recorded 0-2 parities of 83%, 66%, 63% and 87% respectively. They however, differ marginally from participants of studies conducted by Lakore et al., 2012 with a mean parity of 1 among pregnant women and Ayoya et al., 2006 with 0-2 parity of 44%. Also, pregnancies of between 3 and 4 in their reproductive years, the study participants are similar to study participants in related studies conducted by Ahenkora et al., 2015 with multigravidas of 68%.

The trends recorded above is perhaps indicative of high fertility among in developing countries which indicates the need to alleviate problems of anaemia especially in late adolescence since its impact on yet be born babies in developing countries riddled with poor nutrition and healthcare systems could be very deleterious.

The finding that majority of women reported for their first ANC visit outside of the first trimester is also in line with studies conducted by Achampong et al., 2018, Ahekora et al., 2015, Idowu et al., 2005 and Ayoya et al., 2006 who reported similar trends.
The high reported intake of malaria prophylaxis coupled with the high reported ITN usage may have contributed to the disparity of malaria prevalence as seen when prevalence as first visit is compared to prevalence at current visit. However, the low compliance with reported intake of deworming drugs and low antenatal attendance frequency may have militated against a greater reduction in the anaemia prevalence than that achieved.

Also the finding that many mothers had suffered malaria, anaemia and abdominal pains during period of pregnancy suggests the need to strengthen health care coverage and provision especially in deprived rural areas since the situation may be dire in those settings.

5.4 Anaemia knowledge among pregnant women

Awareness of anaemia within the survey group was high with many indicating having received information on anaemia principally from health workers and to a less extent form the media. This finding is in line with findings of Aruna, 2017. This also indicates that health workers within the locale may have been up to the task since it is priority within the Ghana health service to drastically reduce anaemia since its influence in maternal mortality and delivery complications has been greatly suffered in the past.

With more pregnant women having more than average knowledge on anaemia in pregnancy, this finding is in line with findings of Adznam et al., 2018 who recorded high maternal knowledge on anaemia (71.4%), Baby et al., 2014 who also reported high knowledge of pregnant women on anaemia (54%), Berhanu et al., 2018 who also ascertained many pregnant women being knowledgeable on anaemia in pregnancy (57.3%). The finding however deviates from findings of Souganis et al., 2012, Yadav et al., 2014, Nivedita, 2016, Namazi and Alizadeh (2016), Mishra et al., 2016, Tedasse et al., 2017 and Margwe, 2015 who recorded low maternal knowledge of anaemia.
Several pregnant women knew that anaemia in pregnancy could be as result from malaria, worm infestations or the individuals’ genetic constitution. Also, a good proportion of pregnant women knew that bleeding and poor eating habits could result in anaemia. This finding, buttresses the assertion indicated above that, health workers may have been very productive in this regard.

The high knowledge of pregnant women on prominent symptoms of anaemia coupled with the knowledge of women on the fact that anaemia in pregnancy could be treated is particularly of public health significance, as things being equal majority women upon realizing they are anaemic would report to the nearest health facility to ensure the problem is resolved.

Also a more than average knowledge on the effects of maternal anaemia perhaps, will lead to a considerable reduction in the high prevalent rates often recorded for the Ghanaian populace, since it will serve as cue to take an action to resolve it.

5.5 Associated factors of anaemia in pregnancy

The study realized that parity was associated with anaemia among pregnant women. This finding is in line with findings of Achampong et al., 2018, Owusu-Sarpong and Tetteh, 2018, Glover-Amengor et al., 2006, Ahenkora, 2015 and Margwe, 2015. This finding however deviates from findings of Dim et al., 2007, Buseri et al., 2008, Anlaakuu, 2017 and de Bionist et al., 2006 who did not find an association between parity and anaemia status. The results further demonstrated that increasing parity increased one’s risk of developing anaemia in pregnancy. The study also realized that gravidity was associated with anaemia among pregnant women. This finding is in line with findings of Margwe, 2015 and Ahenkora, 2015 but deviates from findings of Dim et al., 2007, Owusu-sarpong and Tetteh, 2018, and Anlaakuu, 2017. The results again further demonstrated that, increasing gravida increased one’s risk of developing anaemia in pregnancy. Parity and gravida (or gravidity) has been shown to increase anaemia susceptibility of pregnant
women in Malaria endemic regions. Perhaps, this explains why a high proportion of pregnant women were found anaemic in this study.

The study also realized that perception of deadliness of anaemia was associated with anaemia status among the pregnant women under study. It further demonstrated that increasing perception of anaemia as being deadly decreased one’s risk of developing anaemia in pregnancy. This finding is particularly important as it indicates a cue to action. Perhaps counselors in the health care terrain could use this as a means to effecting appropriate behavioral changes that would cause improvements in anaemia status among pregnant women. It however realized that realized that knowledge on anaemia, ANC attendance level, anti-helminths use and intakes of iron supplements were not associated with anaemia among pregnant women. This finding is in line with findings of Mishra et al., 2016, Souganidis et al., 2012 (rural setting) and Anlaakuu, 2017.

The finding however deviates from findings of Tedasse et al., 2014. These findings seems to suggest that efforts towards the alleviation of anaemia in pregnancy streamlined towards planning of pregnancies and reduction of the frequency of births perhaps will allow the realization of greater gains.
CHAPTER SIX

CONCLUSION

Based on the findings of the study, it can be concluded that the prevalence of anaemia in Savelugu Municipality is still high and of public health significance, intake of malaria prophylaxis was high and first ANC visits occurred outside the first trimester. There was also high maternal knowledge of anaemia in pregnancy. There were significant associations between anaemia status in pregnancy and parity and gravidity in the Savelugu Municipality. Even though, there was high maternal knowledge on anaemia in pregnancy, it was not associated with anaemia status. Factors such as ANC attendance level, anti-helminths use and intake of iron supplements were not associated with anaemia among pregnant women.

6.1 Recommendations

Based on the findings of the study, the following recommendations are made to help reduce the prevalence of anaemia among pregnant women attending ANC services in the Savelugu Municipality;

6.1.1 Public Health/Clinical Practice

- Despite free and routine prescription of haematinic, ITP and anti-helmenthic drugs at ANC clinics, anaemia burden still remains high. Therefore, supplements during pregnancy alone are inadequate to improve the situation; there is the need to promote other strategies to improve the nutrition and general health before and during pregnancy.

6.1.2 Policy Makers

- The Savelugu Municipal Health Directorate should help train all their ANC and CWC staff on assessment and appropriate management of anaemia in pregnancy.
• Stakeholders (SMHD, NGO’s) should work closely to ensure the continuous sensitization of Adolescents and pregnant women on the need for early first trimester registration and sustained ANC attendance during pregnancy to help reduce the prevalence of anaemia within the Savelugu Municipality.

• Government should collaborate with all relevant stakeholders in education to promote girl child education to ensure they are well educated before going into motherhood to promote adequate growth and development of children.

6.1.3 Research

• The study had given some limitations; all causes of anaemia were not identified, hence further laboratory evaluation from other underlying causes of anaemia, especially infection such as HIV/AIDS could be done in the future. Further research studies on the assessment of public knowledge on different health interventions in order to identify the gaps in knowledge so as to institute the appropriate interventions where necessary.
REFERENCES


Ghana Health Service (2010). Anaemia Control during pregnancy


Mahamuda, B., Feroza, W., & Shamim, A. (2011). Original article Effects of maternal anaemia on neonatal outcome – a study done in the specialized urban hospital set up in Bangladesh, 10(3)


APPENDIX

Appendix A: Participants Consent Form

TITTLE: Anaemia in pregnancy among antenatal attendants at the Savelugu Municipal Hospital.

I ....................................................... Have been duly briefed on methodology and the significance of the study to be conducted by Mr. Duut, Damyar (MPH) student SPH, University of Ghana, Legon.

On my own free will I hereby consent to be part of the study, based on my understanding of what the study entails.

I am consenting to this study based on the condition that there will be no reference made to my identity to any person after providing the entire information request from me.

Respondents Signature/Thumbprints ...................... Date ......................

Researchers Signature .................................................. Date ......................
Appendix B: Participants Consent Form

A HOSPITAL-BASED CROSS-SECTIONAL STUDY ON ANAEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIL AT THE SAVELUGU MUNICIPAL HOSPITAL

TITLE: Anaemia among pregnant women attending antenatal at the Savelugu Municipal Hospital.

PRINCIPAL INVESTIGATOR: DuutDamyar

QUALIFICATION: MASTERS IN PUBLIC HEALTH

This is a study to determine anaemia in pregnancy among antenatal attendants at the Savelugu Municipal Hospital. You are invited to participate in a research being conducted on anaemia by Mr. DuutDamyar a student at the Epidemiology and Disease Control Department of the school of the Public Health University of Ghana. The study will employ two main approaches for data collection. The information is meant for pure academic research or publication and to help in generation of good policies in improving maternal and child health. Information provided by you will be kept confidential and you're free to withdraw your participants any anytime should you feel uncomfortable during the study.

Please, if you have any question or concerns, feel to contact me through 0248157303 or duutdamyar@gmail.com

I certify that the participant has been given ample time to read and known about the study.

All question and clarification raised have been duly addressed.

I certify that voluntary agree to answer the question which has been explained and is free to discontinue participation at any time is I so do.
Parents/ guardian consent for Participants below 18 years

The above document on “Anemia among pregnant women attending the Antennal clinic at Savelugu Municipal Hospital” has been read and explained to me. I have been given an opportunity to ask any question about the research and answered to my satisfaction.

Date ……………. Signature/thumbprint of parent/guardian……………………………..

If parent/guardian cannot read the form themselves, witness must sign here:

I was present while the research procedure on” Anemia among pregnant women attending the Antennal clinic at Savelugu Municipal Hospital” was read, all questions were answered and she has agreed that, she will take part in the study.

Date………………. Signature/thumbprint of witness ………………………………………

I certify that, the process of participating in this research, its potential benefits, risk has been explained to the above individual.

Date ……………. Name/signature of person who obtained consent…………………………

Signature/thumbprint of participant……………..Date……………..Contact number………………

Research Signature ……………. Date ……………… Contact information…………………….

If you have further information about this study, please contact,

Dr. Anthony Danso-Appah  contact 026578698 tdappiah@yahoo.com

Miss Hannah Frimpong Ghana Health Service Ethical Review committee, 0507041223 or ghserc@gmail.com
Appendix C: Questionnaire

QUESTIONS ON FACTORS ASSOCIATED WITH ANAEMIA AMONG PREGNANT WOMEN ATTENDING THE ANTENATAL CLINIC AT SAVELUGU MUNICIPAL HOSPITAL

FORM NUMBER……………. DATE OF INTERVIEW……………………………

A. Information from ANC Booklet of the Participant

1) ANC registrations number .........................................................
2) ANC serial number .................................................................
3) Number of ANC visits .............................................................
4) Hb at first ANC visits ..............................................................
5) Hb at current ANC visits ..........................................................
6) Age of participant .................................................................
7) Gestational age at first ANC visits .........................................
8) Gestational visits at current visits ...........................................
9) Use of anti-helminthes ...........................................................
10) Anti-malaria prophylaxis (SP).................................................
QUESTIONS TO BE INTERVIEW

FACTORS ASSOCIATED WITH ANEMIA

11) Occupation of participants
   (a) Civil servant
   (b) Unemployed
   (c) Seamstress/Hairdresser
   (d) Trader
   (e) Others

12) Educational level of participants
   (a) Primary/JHS
   (b) Secondary
   (c) Tertiary
   (d) Non

13) Marital status of participants
   (a) Married
   (b) Not married
   (c) Single

14) History of deworming during this current pregnancy date given

15) Gestational age at which IPT is been administered under this current pregnancy

16) Parity of participant (Number of children)

17) Gravidity of participants (Number of pregnancy)
KNOWLEDGE OF ANAEMIA

18) What is the age limit of birth spacing?
   (a) Below 2 years [ ]
   (b) Above 2 years [ ]

19) Have you fallen sick during this current pregnancy of this disease before?
   (a) Anaemia
   (b) Malaria
   (c) Abdominal pains
   (d) Others

20) Did you get malaria infection in this your current pregnancy? If no skip to Q22
   (a) Yes [ ]
   (b) No [ ]

21) At what gestational age did you experience it? ..............................

22) What are the symptoms of anaemia?
   (a) Dizziness
   (b) Easy fatigability
   (c) Fever
   (d) Weakness

23) What causes anaemia during pregnancy?
   (a) Mosquitoes
   (b) Bleeding
   (c) Not eating well
   (d) Worm infestation
   (e) Genetic disease
24) What are the effects of anaemia in pregnancy on the unborn child?
   (a) Low birth weight
   (b) Intra-uterine death
   (c) Congenital anomalies

25) What are the effects of anaemia in pregnancy on the mother?
   (a) Body weakness
   (b) Maternal death
   (c) Do not know

26) Have you ever heard of Anaemia?
   (a) Yes [ ]
   (b) No [ ]

27) Where did you hear of Anaemia?
   (a) Health facility [ ]
   (b) Media [ ]
   (c) Friend [ ]
   (d) others (specify)

28) Please, do you know how anaemia condition spread?
   (a) Yes [ ]
   (b) No [ ]

29) Is anaemia a deadly or dangerous disease like HIV/AIDS?
   (a) Yes [ ]
   (b) No [ ]

30) Is there a vaccine for anaemia?
   (a) Yes [ ]
   (b) No [ ]
31) Can anaemia be treated?
   (a) Yes [ ]
   (b) No [ ]

32) If yes, from whom did you hear?
   (a) Health worker
   (b) friend/Relative
   (c) Media

ATTITUDE AND PRACTICE

33) Have you taken iron supplementation during this your pregnancy?
   (a) Yes [ ]
   (b) No [ ]

34) If yes how many times ......................

35) Please, how many times do you eat in a day?
   (a) Once
   (b) Twice
   (c) Three or more times

36) What is the frequency of consumption of the following foods during your current pregnancy in a week?

A. Eggs
   (a) 1-2 [ ]
   (b) 3 and above [ ]
B. meat/fish/snails

(a) 1-2

(b) 3 and above

C. Green leafy vegetables

(a) 1-2

(b) 3 and above

37) Do you have bed nets?

(a) Yes

(b) No

38) If yes, did you sleep under it last night?

(a) Yes

(b) No

39) Please is there any food that pregnant women do not eat when pregnant?

(a) Yes

(b) No

40) If yes are these foods good for a pregnant woman?

(a) Yes

(b) No

41) Do you sometimes forget to take your routine drugs?

(a) Yes

(b) No

42) How is the attitude of health staff towards you during ANC services?

(a) Poor
(b) Satisfactory

(c) Good

43) What are your views on pregnant women suffering from anaemia?

........................................................................................................................................

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Appendix D: Ethical Approval