ENSIGN COLLEGE OF PUBLIC HEALTH, KPONG, EASTERN REGION, GHANA

EXPLORING THE PREVALENCE AND FACTORS ASSOCIATED WITH ANAEMIA IN PREGNANCY AT TEMA GENERAL HOSPITAL IN THE GREATER ACCRA REGION, GHANA

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A Thesis submitted to the Department of Community Health in the Faculty of Public Health in partial fulfilment of the requirements for the award of

MASTER OF PUBLIC HEALTH DEGREE

JULY 2019

DECLARATION

I hereby declare that the work presented in this project for the award of Master degree in public Health has not been presented either partly or wholly for any degree elsewhere. The work is entirely the result of my research conducted under the supervision of Dr. Stephen Manortey. The works of other researchers have been acknowledged accordingly in the list of references.

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Certified by:

Dr. Stephen Manortey	……..	…….....
(Head of Academic Programme)	Signature	Date

DEDICATION

I hereby dedicate this work to my mother (Mrs. Vida Taylor) and my most supportive partner (Mr James Ankamah Okai) for their prayers and sacrificing their comfort to see me through school.

ACKNOWLEDGEMENT

This work would not have been successful without the support and assistance of many kind-hearted people.

I wish to thank God Almighty for seeing me through this program successfully.

My profound appreciation goes to my supervisor Dr. Stephen Manortey for his encouragement, continuous support and guidance throughout this project.

Special thanks go to my colleagues and friends, Kofi Bondah, John Yao Bedzo. Debbie Mangortey and Patrick Lekwa Umeh for their varied contributions in helping me complete this work successfully.

DEFINITION OF TERMS

Anaemia - Is a deficiency in the number or quality of red blood cells in the body.

Antenatal - Medical care given to pregnant women before their babies are born

Gravidity - Defined as the number of times that a woman has been pregnant

Haemoglobin - A substance in red blood cells that combines with and carries oxygen around the body, and gives blood its red colour.

Inter-pregnancy Interval - It is the interval between the delivery date of the preceding live birth and the conception date of the index birth.

Iron Deficiency Anaemia - A type of anaemia in which blood lacks adequate healthy red blood cell.

Lochia - It is the vaginal discharge after giving birth, containing blood, mucus, and uterine tissue.

Maternal mortality - The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Neonatal mortality - A neonatal death is defined as a death during the first 28 days of life

Parity - Is defined as the number of times that a woman has given birth to a fetus with a gestational age of 24 weeks or more, regardless of whether the child was born alive or was stillborn

Postnatal - Refers to the period of time immediately after a baby has been born

Post-natal mortality - The number of deaths of live-born babies weighing 500 grams or more between 28 and 364 days after birth

LIST OF ABBREVIATIONS/ACRONYMS

AIDS	-	Acquired Immunodeficiency Syndrome
ANC	-	Antenatal Care
AOR	-	Adjusted Odds Ratio
CHN	-	Community Health Nurse
CHPS	-	Community Based Health Planning and Services
CI	-	Confidence Interval
COR	-	Crude Odds Ratio
CWC	-	Child Welfare Clinic
ENT	-	Ear, Nose, and Throat
GHOD	-	Global Health Observatory Data
GHS	-	Ghana Health Service
HB	-	Haemoglobin
HIV	-	Human Immunodeficiency Virus
IDA	-	Iron Deficiency Anaemia
IFA	-	Iron and Folic Acid
IPT	-	Intermittent Preventive Treatment
MDG	-	Millennium Development Goals
MoH	-	Ministry of Health
MTCT	-	Mother-to-Child Transmission
PMTCT	-	Prevention of Mother-To-Child Transmission
PNC	-	Postnatal Care
SDG	-	Sustainable Development Goals
SHEP	-	School Health and Education Programme
SMI	-	Safe Motherhood Initiative
SSA	-	Sub-Saharan Africa.
TB	-	Tuberculosis
UNICEF	-	The United Nations Children's Fund,

USAID	-	United States Agency for International Development
WHO	-	World Health Organization

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ABSTRACT

Introduction: Anaemia during pregnancy is one of the most common indirect obstetric causes of maternal mortality in low-income countries. It is responsible for poor maternal and fetal outcomes. The purpose of this study was to explore the prevalence and factors associated with anaemia in pregnancy at the antenatal care unit at Tema General Hospital in the Greater Accra Region.

Method: A descriptive cross-sectional study was conducted from February to March 2019, with 422 pregnant women between the ages 15-49 years, who attended antenatal care (ANC) at the Tema General Hospital. A structured questionnaire was used to ascertain data on socio-demographic and economic, obstetric characteristics, health conditions, consumption of iron-containing foods, knowledge on anaemia, first and current haemoglobin recording of all participants. Data were analysed using STATA version 14.

Results: Out of 422 pregnant women who were interviewed, 171(41%) were found to be anaemic (Hb:<11 g/dl) at the period of the interview; with a mean of 11.05g/dl. Two hundred and fifty one (59.5%) (Hb: ≥ 11g/dl) had no anaemia, ninety (21%) were mildly anaemic (Hb: 9.0—10.9g/dl), seventy eight (18.5%) were moderately anaemic (Hb: 7.0 – 8.9g/dl) and three (1%) (Hb < 7g/dl) were severely anaemic. Bivariate analysis showed that age, marital status, occupation, family income and source of information from media were statistically associated with the condition. After adjustment it revealed age, source of information from either a health worker or from the media and interpregnancy interval were all significant predictive indicators

Conclusion: Anaemia in pregnancy stands to be a severe public health problem at Tema General Hospital. Female reproductive health education should be encouraged at all levels and information from health workers to pregnant women should be individualized and targeted towards available resources.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Anaemia is a condition in which the number and size of red blood cells or the haemoglobin concentration falls below an established cut-off value, consequently impairing the capacity of the blood to transport oxygen around the body (World Health Organization, 2014). The World Health Organization (WHO) defines anaemia as when the Hb levels are less than 12 g/dl in non-pregnant women and less than 11g/dl in pregnant women (Gopinath *et al.*, 2016). Anaemia is a major global public health problem that affects populations in both advanced and less advanced countries which causes significant consequences for human health as well as social and economic development (McLean *et al.*, 2009).

Anaemia is divided into three levels of severity, Mild anaemia (Hb level, 9 - 10.9g/dl), Moderate anaemia (Hb level, 7 - 8.9g/dl) and Severe anaemia (Hb level < 7g/dl) (Anchang-Kimbi *et al.*, 2009). During pregnancy, haemoglobin reductions have serious pregnancy-related complications and it is associated with an increased incidence of both maternal and foetal morbidity and mortality (Anlaakuu and Anto, 2017).

Anaemia is the most common nutritional deficiency disorder in the world (Bruno de Benoist, McLean *et al.*, 2009) and the most common cause globally is iron deficiency (Lelissa *et al.*, 2015). Hence Iron Deficiency Anaemia (IDA) and anaemia have often been used synonymously, and the prevalence of anaemia has been consistently used as a substitute for IDA (McLean *et al.*, 2009). Some of the predisposing factors include grand multiparity, low socioeconomic status, maternal

infection, late prenatal care, HIV infection and inadequate spacing of children (Lebso, Anato and Loha, 2017).

Improving maternal health is a high priority for the United Nations' international development agenda as part of the fifth Millennium Development Goal (MDG) set in the year 2000 and the third Sustainable Development Goal (SDG) set in the year 2015. With regards to Millennium Development Goal 5 (MDG 5), there was a significant achievement in almost all regions, except in sub-Saharan Africa, which was unable to reach the set target of reducing maternal mortality by 75% by 2015. Ghana's maternal mortality reduction was estimated to be 319 per 100,000 by the end of 2015 instead of the MDG target of 54 per 100,000 (Campbell and Graham, 2006). This may look bleak but there have been great strides considering as of 1990, the figures were at 634 and 467 in 2000 and it gives the hope with the right kind of measures maternal mortality in Ghana can be brought lower. Efforts and activities which were put in place to help Ghana meet the MDG included adoption of the Safe Motherhood Initiative (SMI) which was launched globally in 1987, together with other policy introductions such as free antenatal care for all pregnant women in 1998 and exempting all users from delivery fees in health facilities in 2003 (Maine and Rosenfield, 1999) Anaemia in pregnancy is still a public health menace in Ghana and needs frequent reviews which will serve as a meaningful contribution to effective control of the disease.

1.2 Problem Statement

According to the WHO's Global Health Observatory Data, the prevalence of anemia among pregnant women in Ghana as of 2016 was 54.30% and through WHO classification, If the prevalence of anaemia among pregnant women goes beyond 40.0% in any population group it is an indicator of a severe public health problem (World Health Organization (WHO), 2016), for which clearly Ghana qualifies.

Due to the importance of this pathology in the world, numerous countries conduct interventions to reduce anaemia, particularly in the groups most susceptible to its devastating effects such as pregnant women and young children (McLean *et al.*, 2009).

To help address this situation, the Ghana Health Service (GHS) in 2003 instituted a policy which was aimed at improving haemoglobin levels during pregnancy by administering iron supplements, providing health education on nutrition, ensuring quality of care, prevention of malaria infection through the administration of Intermittent Preventive Treatment (IPT) and prevention of helminths infestation through the administration of albendazole (Ministry Of Health, 2016). Although efficacious interventions such as these are in place, they do not seem to be working at an optimum level as evidenced by insufficient progress in reducing maternal anaemia.

1.3 Rationale of the Study

Failure to reduce anaemia worldwide has impaired the health and quality of life of millions of women, leading to generations of children having impaired development and cognitive disabilities, translating into diminished economic productivity and development (Xu *et al.*, 2016).

The problem is more common in low-income countries where there are inadequate diet and poor prenatal vitamins, iron and folic acid intake (Kassa *et al*., 2017). Although the prevalence of anaemia in pregnancy varies widely in different settings and accurate data are mostly lacking especially in resource-limited areas, alarmingly significant proportions of women of childbearing age, particularly pregnant women are anaemic (Melku *et al.*, 2014).

The purpose of this study, therefore, was to identify the current prevalence and factors associated with anaemia in pregnancy among antenatal attendants at the Tema General Hospital in the Greater Accra Region of Ghana. The findings from this study will inform policy and help to improve and

control maternal anaemia and reduce anaemia related health problems in the district and other areas of similar settings within the country and beyond.

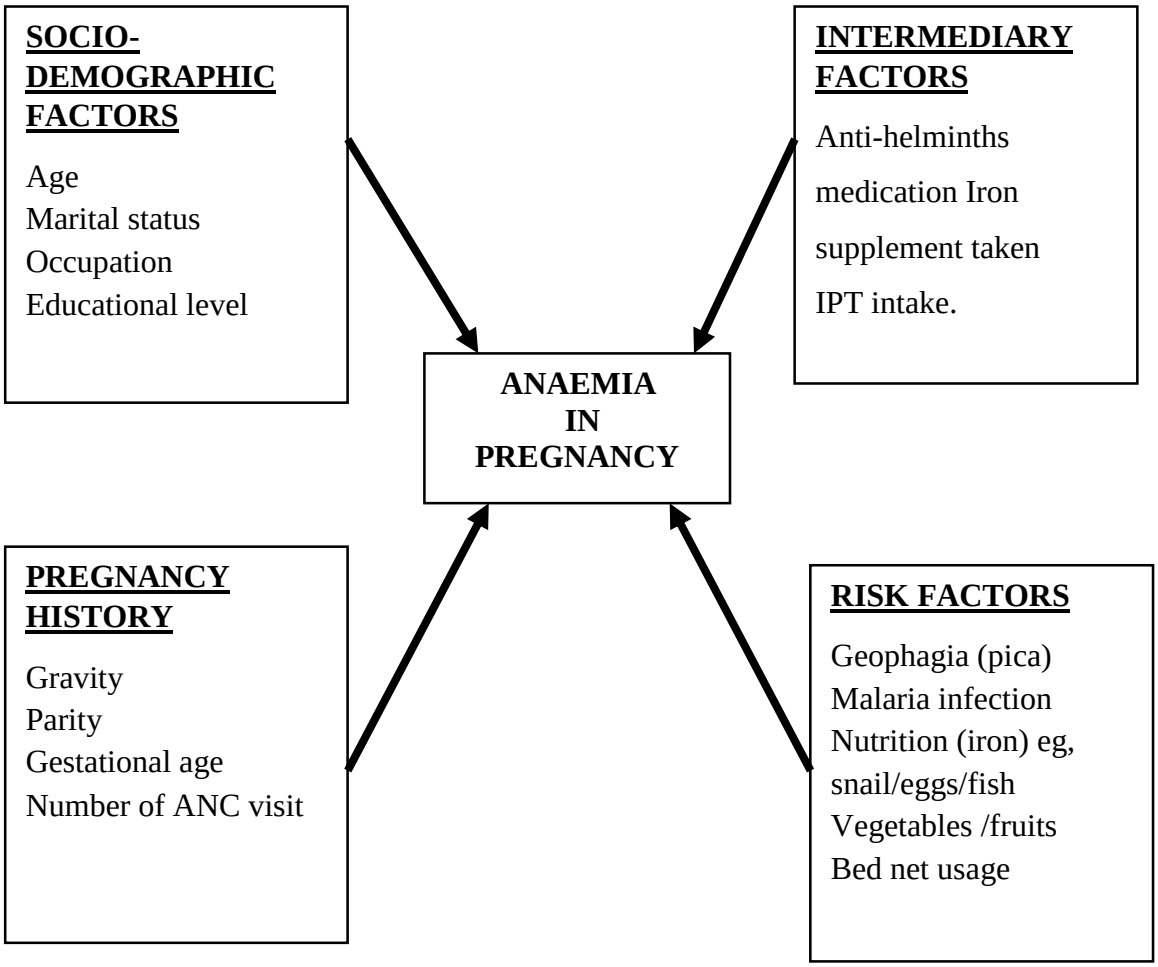

Figure 1: Conceptual Framework of factors associated with anaemia in pregnancy (modified from Anlaakuu and Anto, 2017)

1.4 Research Questions

1. What is the prevalence of anaemia in pregnancy at Tema General Hospital?
2. What risk factors contribute to anaemia in pregnancy?
3. What are the causes of anaemia in pregnancy?
4. What socio-cultural practices contribute to anaemia in pregnancy?

1.5 Objectives

1.5.1 Primary Objectives

To identify the prevalence and factors associated with anaemia in pregnancy among antenatal attendants at the Tema General Hospital.

1.5.2 Specific Objectives

1. To determine the prevalence of anaemia among pregnant women.
2. To identify health-seeking behaviours among pregnant women.
3. To determine the participant's knowledge level on the cause of anaemia in pregnancy.
4. To determine risk factors that influence anaemia in pregnancy.

1.6 Scope of Study

This study involves pregnant women ages 15-49 years visiting the Tema General Hospital antenatal clinic. The study was conducted between the period of January and March 2019 and adopted a quantitative approach which examined the prevalence of anaemia.

1.7 Organization of report

This report is organized into six chapters. Chapter one introduces the study by discussing the background of the study, problem statement, rationale of the study, conceptual framework, research questions, objectives of the study, profile of study area, scope of study and organization

of the report. Chapter two presents the literature reviewed for the study. Chapter three discusses the methods adopted. It includes the research design, data collection techniques, study population, study variables, data handling, analysis, ethical consideration and limitations of the study. Chapters four and five present the results and discussions respectively. Finally, chapter six focuses on the conclusion and recommendations from the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Prevalence of anaemia in Pregnancy

Anaemia is of great public health concern, particularly during pregnancy because it impairs health and wellbeing in women and increases the risk of maternal and neonatal unfavourable outcomes. Even though pregnant women are most frequently affected, it is also prevalent in non-pregnant women and other population groups including children (Hyder, 2002). Empirical research findings published by the Lancet in 2011 revealed that 293 million (47%) children younger than 5 years and 468 million (30%) non-pregnant women globally were anaemic (Balarajan *et al*., 2011).

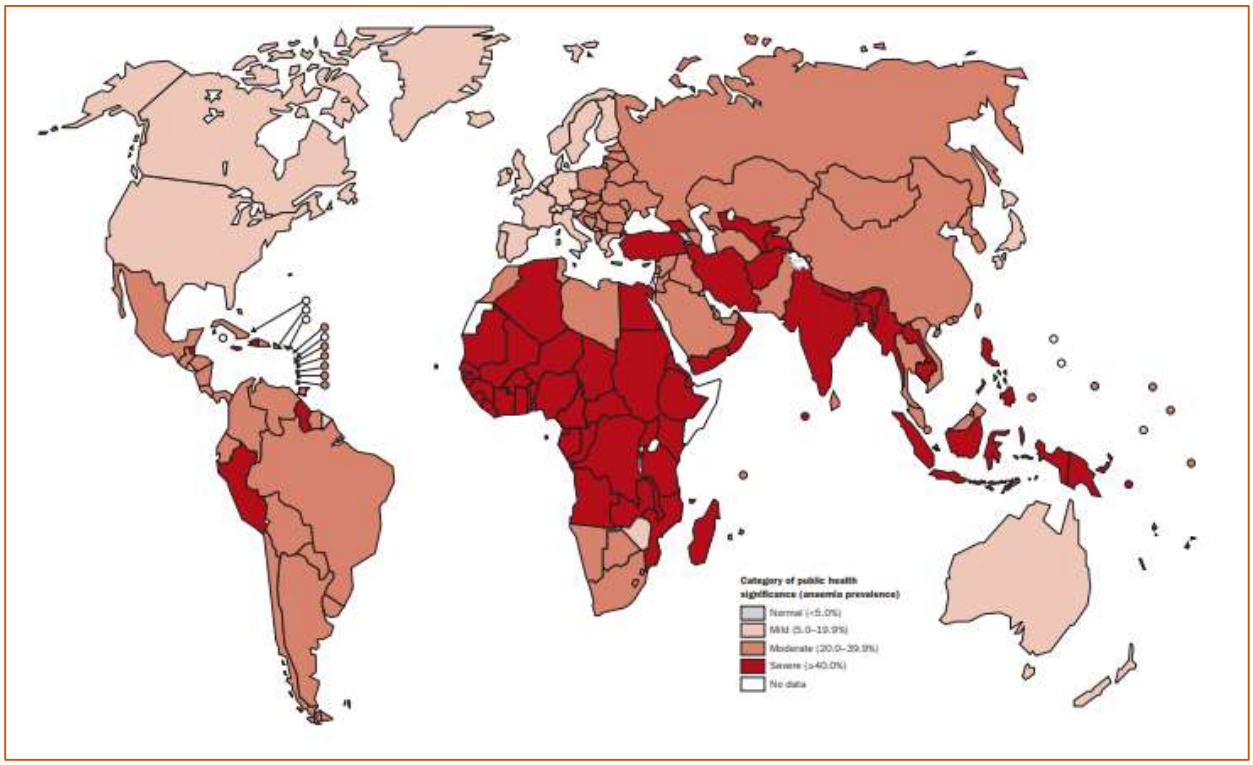

Figure 2: A map showing the global distribution of anaemia among pregnant women

Source: (Bruno de Benoist *et al.*, 2009).

Anaemia is categorized as having public health significance when Severe ≥ 40%, Moderate 20% to 39 %, Mild 5.0% to 19.9% and Normal <5% (Erin McLean *et al.*, 2009). Globally, 1.62 billion people are affected by anaemia which translates to 24.8% of the population (Obai *et al.*, 2016). Anaemia is estimated to affect half a billion women of reproductive age worldwide (World Health Organization, 2014) with more than 500 million women in low-income countries where a staggering 4 out of every 10 pregnant women are anaemic (Klemm *et al.*, 2011).

In industrialized countries, anaemia in pregnancy occurs in less than 20% of women. Published rates for low-income countries range from 35% to 72% for Africa, 37% to 75% for Asia and 37% to 52% for Latin America (Majid *et al*., 2004). WHO's global database on anaemia in 2009 placed the prevalence of pregnant women in Africa at 65.8% which is still within the range in previous studies (McLean *et al*., 2009). The most affected region is Sub-Saharan Africa (SSA), with anaemia prevalence estimated to be 17.2 million pregnant women, which is approximately 30% of total global cases (Mbule *et al*., 2013).

A great number of anaemic pregnant women in Africa live in the West African sub-region. The prevalence rate in some selected countries ranges from 50.2% in Togo, 66.7% in Nigeria, 68.3% in Burkina Faso, 72.7% in Benin and 75.1% in the Gambia (Bruno de Benoist *et al.*, 2009). In Ghana, some local research was done by (Engmann, 2008), (Baiden, 2006), (Glover-Amengor *et al*., 2005) in Accra, Navrongo and the Sekyere West Districts reported the prevalence rates to be 34%, 70%, and 57% respectively.

WHO in 2004 estimated anaemia contributes to more than 115,000 maternal deaths and 591,000 perinatal deaths globally per year (Majid *et al*., 2004). The Lancet Global Health suggests globally, women's anaemia would take about 60 years or more before the prevalence rates of 15% seen in high-income regions are achieved. Studies indicated that in South Asia, this rate would take more

than a century to reach, and in regions such as central and west Africa, it would take more than 150 years (Stevens *et al.*, 2013).

2.2 Factors associated with anaemia in pregnancy

The aetiological factors for anaemia in pregnancy vary among countries and within countries. Although primarily iron deficiency tops the list, it rarely presents in isolation but mostly coexists with other factors such as socioeconomic conditions, multiple pregnancies, teenage pregnancies, malnutrition, maternal illiteracy, unemployment, less spacing between previous and index pregnancy, age of gestation, primigravida, multigravida and Infectious diseases such as malaria, helminth infestations, TB and HIV (Noronha, 2010). Knowledge of the importance of the various risks or factors forms the basis for public health or clinical intervention to control anaemia in pregnancy in different areas and populations (Hoque *et al*., 2014).

Pregnancy is a period of a significant increase in iron requirement over and above the non-pregnant state (Zavaleta, 2000). This is due to the expansion of maternal red blood cell mass which aids in increased oxygen transport, including the transfer of iron to both the growing fetus and the placental structures, and as a needed reserve for blood loss and lochia at parturition (Beaton, 2000). It has been estimated that the daily iron requirements of a 55kg pregnant woman increase from approximately 0.8 mg in the first trimester to 4–5 mg during the second trimester and more than 6 mg in the third trimester. This requirement is not achieved by mere consumption of food in low-income countries, therefore, oral iron supplementation is of essence (Oujimi *et al*., 2014). The consequences of iron-deficiency anaemia in pregnancy is therefore of great concern due to a higher risk of the mother's own mortality, having a low birth weight baby, neonatal mortality, possibly post-neonatal mortality and placing the infant at risk of iron-deficiency and declines in cognitive and motor development (Klemm *et al.*, 2011).

Low socio-economic condition is one major factor associated with anaemia in pregnancy (Nwizu *et al.*, 2011) and it has long been recognized that anaemia exists predominantly among poorer segments of the population in low-income countries (Chowdhury *et al.*, 2015) in which Ghana is no exception.

Anaemia is a marker of socioeconomic disadvantage, with the poorest and least educated being at greatest risk of exposure to risk factors for anaemia and its sequelae. Research findings published in the Lancet in 2011 on anaemia in low and middle-income countries showed that the risk of anaemia among women living in the lowest wealth segments was 25% higher than among those in the highest wealth areas. Furthermore, women who had no formal education were more likely to be anaemic than those with secondary and higher education after adjusting for all possible covariates (Balarajan *et al.*, 2011). Low socioeconomic conditions are coupled with deprivation or avoidance of some food items by pregnant women due to food taboos and superstitious beliefs. Most of the foods consumed in most African homes are low in vitamins and meat but high in carbohydrates and phytates, contents which reduce iron absorption (John, 2014). A study conducted by Nwizu *et al*. in Northern Nigeria showed women from the low socioeconomic class were 64.7%, significantly more affected by anaemia compared to those in higher socioeconomic classes. Data from economic impact analysis showed the Ghanaian female workforce lost over 14.2 million Ghana Cedis in economic activity due to anaemia (Aryeetey, 2013).

Multiparity leads to anaemia by reducing maternal iron reserves at every pregnancy and its associated blood loss at each delivery (Karaogl, 2010). Adolescent girls are at increased risk of suffering from anaemia due to poor nutrition and increased demand for growth and menstruation. Pregnancy, therefore, exacerbates the already existing anaemia status of the adolescent (Noronha, 2010).

Malaria in endemic regions is the most implicated cause of parasitic infections (Anlaakuu, 2015). Yearly, more than 30 million African women in these regions become pregnant and are at risk of the infection. Malaria in pregnancy leads to 10,000 maternal deaths and between 75,000 and 200,000 infant deaths annually (Akinleye *et al*., 2009). Malaria gives rise to maternal anaemia in pregnancy. This is as a result of diminished resistance to malaria infection during pregnancy with its associated negative effect on the fetus leading to intrauterine growth retardation, pre-term delivery and low birthweight infant (Owusu *et al*., 2005).

Helminths infections especially hookworm is one of the principal causes of iron deficiency anaemia in developing countries. About a quarter of the world's population has hookworm infection. It is prevalent throughout the tropics and subtropics. The adult hookworm lives in the small intestine and attaches itself to the mucosa from which they suck blood, this causes chronic blood loss. Over a period of time loads of even small hookworm may cause sufficient blood loss to deplete body iron stores. If the store is already depleted, hookworm infection can give rise to an iron deficiency within a few weeks especially during pregnancy when iron requirements are increased (John, 2014). This results in low pregnancy weight and intrauterine growth retardation progressing to low birth weight, which is associated with increased risks of infection and higher prenatal mortality rates (Mengist *et al.*, 2017).

Anaemia is a common clinical finding in human immunodeficiency virus(HIV) infected women and has been associated with advanced progression of disease and survival (Nandlal *et al.*, 2014). It also has a significant impact on clinical outcomes and quality of life. Anaemia is exacerbated by HIV/AIDS which has a high prevalence among pregnant women. Anaemia in HIV/AIDS may be a result of HIV infection, opportunistic infections and or highly active antiretroviral therapy (Mbule *et al.*, 2013). Anaemia in HIV infected women has been independently associated with

adverse maternal and fetal outcomes in pregnancy (Pamela S Belperio, 2004). Severe anaemia has been associated with increased unfavorable outcomes in HIV positive cases such as stillbirth, preterm birth, and MTCT of HIV by the time of birth, and by 4 to 6 weeks among those negative at birth (Klemm *et al.*, 2011). A study done by Tunkyi and colleagues showed a high prevalence of anaemia (71.3%) in HIV-infected patients, which was about 2.5 times higher than in those who were uninfected (Tunkyi *et al*., 2015).

2.3 Knowledge about anaemia in pregnancy

Knowledge stimulates the realization of healthy behaviour. If pregnant women know and understand the effects of anaemia and how to prevent it, they will adopt good health behaviours and consequently will avoid the undesirable consequences of developing anaemia during pregnancy.

Siti Nur' Hidayah Adznam and colleagues conducted a study on "Assessment of knowledge level on anaemia among pregnant women in Putrajaya". A total of 370 pregnant women were interviewed who attended four health clinics in Putrajaya. The results of the study revealed that 55.7%, 28.6% and 15.7% of subjects had high knowledge of causes of anaemia during pregnancy, moderate knowledge, and low knowledge score respectively. The study also revealed that participants lacked knowledge regarding the risks of anaemia. The knowledge score was significantly associated with the gestational week ($p<0.05$) and the number of children ($p<0.01$) while there was no significant association with other characteristics. The conclusion of the study was to improve knowledge on anaemia to help ensure the practice and attitude of women towards anaemia are at its optimum level during pregnancy (Siti Nur' Hidayah Adznam, 2018).

A study carried out on Socio-Demographic and Maternal Factors in Anaemia in Northern Nigeria showed Anaemia was highest among pregnant women with no formal education (33.3%) and

lowest among those with tertiary education (11.4%). Also, there was a high prevalence of anaemia among women in the low socioeconomic class (61.1%) compared to middle and high the socioeconomic class. The results call for vigilance, sustained health education and chemoprophylaxis for pregnant women (Nwizu *et al.*, 2011).

A cross-sectional study which was undertaken in Indonesia involving pregnant women who checked their health conditions at Aertembaga Public Health Center in Bitung City revealed there was a correlation between knowledge and risk of anaemia in pregnant women, also the relationship between knowledge and adherence to consuming blood increasing tablets. In conclusion, counselling and motivation for pregnant mothers were needed in order for them to be more obedient in consuming blood increasing tablets (Sineke *et al*., 2013).

Research conducted by Aruna in Nellore, India on knowledge regarding anaemia during pregnancy among antenatal mothers showed that the majority of the respondents had satisfactory knowledge, poor knowledge and good knowledge score of 54%, 38%, and 8% respectively. The study also assessed the association between knowledge regarding anaemia among antenatal mothers and their selected socio-demographic variables such as age, gravida, type of family, education, occupation, monthly family income, among these results were contradictory to other research findings as there was no association between knowledge score and selected demographic variables. The conclusion was mothers needed to be educated regarding anaemia (Aruna, 2016).

A study conducted among pregnant women attending ANC service at Yirga Cheffe Health Center, South Ethiopia showed, 44.3% of the women were aware of the term anaemia, and 55.7% of them had poor awareness of anaemia. Awareness of anaemia was significantly associated with the number of ANC visit {AOR=7.407}, occupational status {AOR=1.970} and educational status

{AOR=6.141} of respondents. Thus pregnant women who were uneducated, unemployed and had only one ANC visit had a low awareness of anaemia. The conclusion drawn was, there was a need to promote the benefits of early and frequent ANC attendance, enhancing the quality of ANC and counselling on essential elements for improving the awareness of anaemia (Duko, 2017).

A study conducted in 16 hospitals in five provinces of Mainland China, involving 2,345 pregnant women, on “Prevalence and Sociodemographic and Lifestyle Determinants of Anemia during Pregnancy”, showed the overall prevalence of anaemia was 12.7%. It revealed women of low income were more likely to develop anaemia compared to high income earning women. Comparing women with non-manual jobs, women with manual jobs and unemployed women were associated with an increased risk of suffering from anaemia (Xu *et al.*, 2016).

A study conducted in India by Raksha *et al*., on "Knowledge, attitude and practice regarding anaemia in antenatal women" disclosed that out of 200 primigravidas visiting the hospital, 108 of them were aware of the correct sources of iron in food but only 60 actually implemented this in their diet practice. Also, 50 of them were aware of a few maternal complications of anaemia in pregnancy and 62 of them knew about fetal complications such as low birth weight. The study reflected the ignorance, poverty, and illiteracy among the majority of pregnant women coming to the Hospital. It was concluded that there was a need for assessments of knowledge and practice and that health education was an essential step towards the prevention of anaemia in pregnancy (Raksha M *et al.*, 2016).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study methods and design

A cross-sectional study design was employed for the study. It involved 384 pregnant women who attended the antenatal clinic at Tema General Hospital in the Greater Region of Ghana. The study was conducted between January and March 2019 and it adopted a quantitative approach, which examined the relationship between variables.

3.2 Study Area

Tema General Hospital is the largest Public Health Institution in the Tema Metropolis, which is in the Greater Accra Region of Ghana. The facility was established between 1954 and 1957 by J.W Harrow and Sons Limited and handed over to the government of Ghana in 1962. It was built to serve as a medical centre for workers at the nearby fishing harbour. The Hospital has a total bed complement of 280 and ten wards. It offers both General and Specialist Care Services in all the major clinical disciplines on both out-patient and in-patient basis. Some of the services include Internal Medicine, General Surgery, Paediatrics, Obstetrics and Gynaecology, Reproductive and Child Health Care/ Family Planning, Accidents and Emergency Services, Theatre, Dental, Eye, Diabetic, ENT, Dermatology, Chest, Hypertension, Anaesthetic, ART/PMTCT, and Sickle Cell clinics. The total staff strength is about 680, which includes 10 Specialists, 40 other Medical Doctors, and 340 nurses. Tema General Hospital is a very busy Hospital with a daily average Out-Patient Department attendance of 650 and a bed complement of 294 with an average bed occupancy rate of 80% (www.rainbowradioonline.com/Tema_Hospital), as accessed on January 7, 2019.

Tema Metropolis is one of the 16 districts of the Greater Accra Region, located in the Southeastern part of Ghana. Tema Metropolis is a virtually fully-built-up area. It is a vibrant commercial and industrial city, about the only well-planned city in the country. It has a large harbour, one of the world's biggest man-made harbours which are the main sea-port entry to Ghana. The estimated population of Tema Metropolis is 421,708. This makes it the second largest-populated of the 16 districts in the Greater Accra Region, after Accra Metropolis (Ghana Statistical Service, 2014). The Metropolis is situated about 5^0 N above the Equator and has the Greenwich Meridian (longitude zero) passing through it. Tema Metropolis is considered as being the city in the center of the world.

Tema Township was commissioned by Ghana's first president, Dr. Kwame Nkrumah, and grew rapidly after the construction of a large harbour in 1961. It is now a major trading centre, with numerous industries which produce aluminium, refined petroleum, chemicals, food products, and building materials.

3.3 Study population

Pregnant women visiting the Tema General Hospital antenatal clinic represented the study participants. This included females from the ages of 15-49 years during the period of January to March, 2019.

3.4 Data Collection Techniques and Tools

The study employed two main approaches to data collection. Data were extracted both from participants' ANC Booklet and administration of a structured questionnaire. Before the data collection, the general objective of the study was explained to qualified participants and their voluntary informed consent was sought for participation. After that, relevant data were extracted from the ANC booklets of the pregnant women and recorded on a case report form specifically

designed for the study. These included information on the number of ANC visits, gravidity, parity, Hb level at first and subsequent visits, gestational age at first and current ANC visits, administration of anti-helminths, iron supplementation and the Intermittent Preventive Treatment (IPT) received. Other data gathered included participant's demographic and socio-economic characteristics, obstetric history, taking of iron and folic (IFA) supplementation, awareness on the causes and consequences of anaemia, dietary habits and nutritional status. The questionnaires were answered with the aid of the research team through face-to-face interviews at a designated screened place not far away from point of care.

A participant who did not consent to participate in the study was replaced with the next participant following her. This was repeated until the required sample size was obtained.

3.5 Sampling

3.5.1 Sample size calculation

The sample of a study is a section of the population that is drawn to make inference or projections to the general population. This sample size is calculated based on previous research in anaemia in pregnancy at Ablekuma South District using 50% prevalence (Patience, 2016). The sample size was calculated using the Cochran's formula as shown below;

$$n = \frac{Z^2 \times pq}{e^2}$$

Where,

n = sample size (Cochran, 1977)

Z = the z-score that corresponds with a 95% confidence interval which is 1.96

p = Proportion of anaemia in pregnancy which is 50% which equals to 0.50

q = Proportion of antenatal attendants who are not anaemic which is equal to 1-50% = 0.5

e = Margin of error set at 5% (0.05)

Therefore,

$$n = \frac{(1.96)^2 \times (0.5 \times 0.5)}{(0.05)^2} \cong 384$$

A non-response rate of 10 % resulting in about 38 respondents was added to the minimum sample size to get 422 participants.

3.6 Pre-testing

The questionnaire was pre-tested at the antenatal clinic in University of Ghana Hospital, Legon, Accra where the respondents were presumed to have the same socio-demographical characteristics as the targeted population. The pre-test was done to ascertain any unforeseen problems with the questionnaires. After the pre-testing exercise, all necessary corrections and adjustments were made before proceeding to the actual field for data collection. Time taken to complete the questionnaire was estimated to be approximately 15 minutes.

3.7 Inclusion and Exclusion Criteria

3.7.1 Inclusion Criteria

All pregnant women aged 15- 49 years coming for their subsequent antenatal visits who are willing to participate in the study with a record of their haemoglobin status.

3.7.2 Exclusion criteria

1. Pregnant women who have received blood transfusions in the index pregnancy or were already receiving treatment for anaemia in pregnancy before their booking visit.
2. Pregnant women who were visiting the ANC for the first time and did not have any Hb recording.

3.8 Data Handling

Data collection was done exclusively by the researcher and research assistants. All filled out questionnaires returned from the fieldwork were assessed for mistakes and completeness. They were compiled and kept intact under safety conditions for easy reference. The data were entered into an excel spreadsheet and imported into STATA 14. Data cleaning was done to reduce errors during analysis. The data were also backed up unto a secured cloud storage system to avoid unforeseen data loss problems.

3.9 Data Analysis

The data collected using a questionnaire were compiled using Microsoft Excel 2016. The statistical analysis was done using STATA statistical software package *(StataCorp.2007. Stata Statistical Software. Release 14. StataCorp LP, College Station, TX, USA).* The results were presented as tables, figures and graphs. Univariate, bivariate and multivariate analysis was used to explore the effects of the independent variables on the dependent variable.

3.10 Ethical Considerations

Ethical approval for the study was obtained from the Ethical Review Committee of Ensign College of Public Health. Administrative permission was also sought from the management of the Tema General Hospital before the commencement of the study. Privacy and confidentiality were maintained during data collection, as interviews were conducted at places away from the location where care was provided to the other visiting clients. No personal identifiers such as names of patients were recorded. All procedures were explained and consent sought before interviewing respondents. The participants were assured of confidentiality regarding the information collected and had the option to opt out of the study at any time. Data access was strictly limited to the

Principal Investigator, Research Assistants, and the Academic Supervisor of the study only. All data collected have been stored under lock and key and after five years will be destroyed.

3.11 Limitations of the Study

The study relied on self-report and information from respondents' antenatal records, therefore the information given by self could not be verified and this may have led to information bias.

The study also excluded pregnant women who were reporting to the clinic for the first time and had no haemoglobin records, though their participation could have further corroborated the results obtained.

3.12 Assumptions

- It was assumed that all respondents had sound reasoning and proper understanding.
- It was assumed that the responses given were truthful.
- It was assumed that the gathered antenatal data were accurately recorded.

CHAPTER FOUR

RESULTS

4.0 Introduction

The purpose of the data analysis was to reduce the data to a manageable and explainable form so that the research problems can be studied and tested. This chapter presents an analysis of the study findings. It is organized as follows; descriptive information of the study variables, bivariate analysis of factors associated with anaemia and finally multivariate analysis summarizing the independent predictors of anaemia among pregnant women.

In total, four hundred and twenty-two (422) pregnant women attending Tema General Hospital Antenatal Clinic at different stages of their pregnancy were recruited to participate in the study.

4.1 Socio-demographic characteristics of participants

Women in their reproductive ages ranging from 15 – 49years (mean 31.43 years and SD ± 6.47 years) participated in the study. The women were placed in different age categories with the majority of them falling within 25-29 and 30-34 years making 25.36% and 26.3% respectively.

A greater percentage 118 (27.96%) of the pregnant women resided in Ashaiman, followed by Tema Newtown with a number of 82(19.43%) and the least number came from other isolated communities making 8(1.9%). The categorization by marital status showed the majority of the respondents were married, thus making 274(64.93%). There were 49(11.61%) single pregnant women, 87(20.62%) cohabiting and 12(2.84%) widowed/divorced/ separated.

One hundred and eleven (26.3%) of the pregnant women were self-employed doing some form of business, 185(43.84%) were employed in the formal sector, 85(20.14%) were traders and the remaining 41(9.72) were unemployed.

With regards to religion, there were 321(76.07%) who professed faith in Christianity, 96 representing 22.75% who admitted being Muslims and five (5) representing 1.18% were Traditionalists. The reported educational level at the time of the study was categorized using Tertiary, Secondary, Primary and No formal education with their corresponding percentages being 41.47%, 35.07%, 13.03 and 10.43 respectively. Participants having a family income less than GH₵300 (per month) was found to be the lowest amongst the categories with 52(12.44%) whereas those receiving GH₵ 300-500 was the highest with 166(39.71%).

Table 4.1: Socio-Demographic Characteristics of Respondents (N=422)

Variable	Categories	Frequency	Percentage
Age (years)	15-19	19	4.50
	20-24	43	10.19
	25-29	107	25.36
	30-34	111	26.30
	35-39	89	21.09
	Above 40	53	12.56
Residence	Tema	70	16.59
	Ashaiman	118	27.96
	Tema Newtown	82	19.43
	Afienya	55	13.03
	Sakumono	37	8.77
	Dohwenya	52	12.32
	Others	8	1.90
Marital status	Single	49	11.61
	Married	274	64.93
	Cohabiting	87	20.62
	Widowed/Divorced/Separated	12	2.84
Occupation	Self-employed	111	26.30
	Government/Private employed	185	43.84

	Trader	85	20.14
	Unemployed	41	9.72
Religion	Christianity	321	76.07
	Islam	96	22.75
	Traditional	5	1.18
Educational Level			
	No formal education	44	10.43
	Primary	55	13.03
	Secondary	149	35.07
	Tertiary	175	41.47
Family Income	<300	53	12.56
	300-500	85	20.14
	500-1000	166	39.34
	>1000	118	27.96

Source: ***Field Data, 2019***

4.2 Obstetric characteristics of study participants

A great proportion of the pregnant women 339(80.88%) had already made the recommended minimum of four antenatal visits. Seventy-two (17.1%) of the women reported not having any biological child at the time of the study, 123(29.22%) had one child and 226(53.68%) had two or more children. Of the total respondents, 74 representing 17.54% said this was their first pregnancy, 124(29.38%) were having their second pregnancy, 132(31.28%) third pregnancy and those having their fourth or more pregnancy made up 92(21.8%). One hundred and forty-eight (35.07%) of the women had a time interval of fewer than two years between their current pregnancy and last delivery, whereas 274(64.93%) had an interval of two years or more. The majority, 301(71.33%) of the respondents sought their first antenatal care visit in their first trimester while the remaining came during their second trimester. None of them reported for the first time in their third trimester. More than half of the respondents, 258(61.41%) were currently in their second trimester with the least number 39(9.24%) in their first trimester.

Table 4.2: Obstetric History of Participants (N=422)

Variables	Frequencies	Percentage
No. of ANC visit		
Less than four visits	83	19.67
Four or more visits	339	80.88
Parity		
Para zero	72	17.6
One child	124	29.38
Two or more children	226	53.55
Gravidity		
First pregnancy	74	17.54
Second pregnancy	124	29.38
Third pregnancy	132	31.28
Four or more pregnancy	92	21.80
Inter-pregnancy Interval		
Less than two years	148	35.07
More than two years	274	64.93
Gestational age at first ANC visit		
First trimester	301	71.33
Second trimester	121	28.67
Gestational age at current ANC visit		
First trimester	39	9.24
Second trimester	258	61.41
Third trimester	125	29.62

Source: ***Field Data, 2019***

4.3 Prevalence of anaemia among antenatal attendants

Out of the 422 respondents, the overall prevalence of anaemia among the pregnant women at Tema General Hospital was 40.52%. With a breakdown of its severity being 21.33%, 18.48% and 0.71% as Mild, Moderate and Severe respectively.

Table 4.3: Prevalence and Severity of Anaemia

Variable	Frequency	Percentage
Prevalence of anaemia		
Anaemia	171	40.52
No Anaemia	251	59.48
Severity of Anaemia		
Severe	3	0.71
Moderate	78	18.48
Mild	90	21.33
No Anaemia	251	59.48

Source: ***Field Data, 2019***

4.4 Consumption of iron and iron-containing foods

The table below displays the consumption of iron and iron-containing foods. Pregnant women who received iron/folate were 415(98.34%) and those who took it always was 338(81.25%). Women who reported taking eggs twice per week were in the majority 179(42.42%) with those who took meat/fish/pork twice per week amounting to over half the total number under study (54.27%). Two hundred and seventy-two (64.61%) of the respondents consumed green vegetables/fruits three or more per week. Pregnant women who consumed pica/clay were 174 amounting to 41.23%.

Table 4.4: Consumption of Iron and Iron Foods (N=422)

FACTORS	RESPONSE	FREQUENCIES	PERCENTAGES
Have you been given iron/folate tables since you became pregnant?	Yes	415	98.34
	No	7	1.66
If YES, how many times do you take it?	Always	338	81.25
	Sometimes	77	18.51
	Never	1	0.24
	Never	41	9.72
Eggs	Once a week	129	30.57
	Twice per week	179	42.42
	Three or more per week	73	17.30
	Never	1	0.24
Meat/fish/pork	Once a week	36	8.53
	Twice per week	229	54.27
	Three or more per week	156	36.97
	Never	2	0.48
Green vegetables/fruits	Once a week	15	3.56
	Twice per week	132	31.35
	Three or more per week	272	64.61
Pica/Clay consumption during this current pregnancy	Yes	174	41.23
	No	248	58.77

Source: ***Field Data, 2019***

4.5 Knowledge of Anaemia among participants (N= 422)

A great number of the respondents, 398(94.31%) had heard about anaemia in pregnancy with a high number of them 303(76.13%) hearing/learning it from a health worker. Four hundred and seventeen (98.53%) of the respondents knew what anaemia was and approximately all of the pregnant women knew what caused anaemia.

Table 4.5: Knowledge of Anaemia (N= 422)

Question	Response	Frequency	Percentage
Have you ever heard about anaemia in pregnancy?	Yes	398	94.31
	No	24	5.69
If YES, from what source did you learn of it? (N=398)	Health worker	303	76.13
	Friend	66	16.58
	Relative	77	17.59
	Media	75	18.84
	School	110	27.64
	Other	1	0.25
What is Anaemia?	Shortage of blood	417	98.82
	Leaking of blood	5	1.18
What do you think is the cause of Anaemia?	Poor dietary intake, infection	420	99.53
	Contact with an infected person	2	0.47

Source: ***Field Data, 2019***

4.6 Bivariate analysis of anaemia status among pregnant women

Anaemia was more prevalent among pregnant women of age group 15 to 19 years (78.95%) and also among pregnant women who were cohabiting 50(57.47%) compared to those who were single and married with their corresponding percentages being 24.53% and 51.02% respectively (Fisher's exact, p-value<0.001).

Table 4.6: Bivariate Analysis of Anaemia by Socio-Demographic and Economic Status

Variables	Categories	Anaemia status		p-value
		Yes n (%)	No n (%)	
Age (years)	15-19	15(78.95)	4(21.05)	**0.0001***
	20-24	28(65.12)	15(34.88)	
	25-29	45(42.06)	62(57.94)	
	30-34	42(37.84)	69(62.16)	
	35-39	28(31.46)	61(68.54)	
	Above 40	13(24.53)	40(75.47)	
Marital status	Single	25(51.02)	24(48.98)	**0.0001***
	Married	95(34.67)	179(65.33)	
	Cohabiting	50(57.47)	37(42.53)	
	Widowed/Divorced/Separated	1(8.33)	11(91.67)	
Occupation	Self-employed	50(45.05)	61(54.95)	0.069
	Gov't/Private employed	66(35.68)	119(64.32)	
	Trader	32(37.65)	53(62.35)	
	Unemployed	23(56.10)	18(43.90)	
Religion	Christianity	131(40.81)	190(59.19)	0.967
	Islam	38(39.58)	58(60.42)	
	Traditional	2(40.00)	3(60.00)	
Educational Level	No formal education	18(40.91)	26(59.09)	0.254
	Primary	28(50.91)	27(49.09)	
	Secondary	62(41.89)	86(58.11)	
	Tertiary	63(36.00)	112(64.00)	
Family Income	<300	29(54.72)	24(45.28)	0.064
	300-500	36(42.35)	49(57.65)	
	500-1000	67(40.36)	99(59.64)	
	>1000	39(33.05)	79(66.95)	

Source: ***Field Data, 2019***

4.7 Health Condition in relation to Anaemia

From the study output, it was revealed that 259 pregnant women gave a history of having suffered from malaria and out of this number 42.86 % had anaemia with 57.14% not having anaemia. Those who had received anti-malaria prophylaxis were 372 and out of this 39.78% had anaemia. A weak statistical association was found between sickle cell status and anaemia. Though 60% of the respondents with sickle cell were anaemic. The study showed no statistical significance among the various health conditions under study.

Table 4.7: Bivariate Analysis of Anaemia by Health Condition

Variables	Categories	Anaemia status		p-value
		Yes n (%)	No n (%)	
Have you suffered from malaria during current pregnancy?	Yes	111(42.86)	148(57.14)	0.224
	No	60(36.81)	103(63.19)	
Have you received Anti-malaria prophylaxis during current pregnancy?	Yes	148(39.78)	224(60.22)	0.444
	No	23(46.00)	27(54.00)	
Do you use insecticide-treated nets?	Yes	97(41.10)	139(58.90)	0.842
	No	74(39.78)	112(60.22)	
Are you suffering from any hemorrhagic disease	Yes	40(42.55)	54(57.45)	0.721
	No	131(39.94)	197(60.06)	
What is your Sickle Cell status?	Yes	6(60.00)	4(40.00)	0.057
	No	161(39.56)	246(60.44)	
	Do not Know	4(80.00)	1(20.00)	

Source: ***Field Data, 2019***

4.8 Anaemia in relation to Obstetric History

Anaemia was higher among those who had no children 39(54.17%) as compared to those who had one child (39.52%) and two or more children (36.73%) p-value = 0.032. In much the same way, those who were pregnant for the first time were much more anaemic 39(52.70%) p-value=0.038.

Table 4.8: Bivariate Analysis on Obstetric History of Participants (N= 422)

Variables	Categories	Anaemia status		P-value
		Yes n (%)	No n (%)	
No. of ANC visit				0.454
	Less than four visits	37(44.58)	46(55.42)	
	Four or more visits	134(39.53)	205(60.47)	
Parity				**0.032***
	Para zero	39(54.17)	33(45.83)	
	One child	49(39.52)	75(60.48)	
	Two or more children	83(36.73)	143(63.27)	
Gravidity				**0.038***
	First pregnancy	39(52.70)	35(47.30)	
	Second pregnancy	51(41.13)	73(58.87)	
	Third pregnancy	53(40.15)	79(59.85)	
	Four or more pregnancy	28(30.43)	64(69.57)	
Inter-pregnancy Interval				0.836
	Less than two years	61(41.22)	87(58.78)	
	More than two years	110(40.15)	164(59.85)	
Gestational age at first ANC visit				0.276
	First trimester	127(42.19)	174(57.81)	
	Second trimester	44(36.36)	77(63.64)	

Note: *p-values with asterisks were generated from Fisher's exact test between anaemia and corresponding variables. P-value <0.05 are statistically significant.*

4.9 Anaemia in Relation to Iron Containing Foods

Out of the four hundred and fifteen (415) participants who said they had been given iron/folate tablets since they became pregnant, 247(59.52%) were not anaemic. Likewise, 59.17% of those who said they had been taking it always had no anaemia. All the variables were not statistically significant.

Table 4.9: Bivariate Analysis of Iron-Containing Foods

Variables	Categories	Anaemia status		p-value
		Yes n (%)	No n (%)	
Have you been given iron/folate tablets since you became pregnant?	Yes	168(40.48)	247(59.52)	1.000
	No	3(42.86)	4(57.14)	
If YES, how many times do you take it?	Always	138(40.83)	200(59.17)	0.880
	Sometimes	30(38.96)	47(61.04)	
	Never	0(00)	1(100)	
Eggs	Never	15(36.59)	26(63.41)	0.399
	Once a week	49(37.98)	80(62.02)	
	Twice per week	71(39.66)	108(60.34)	
	Three or more per week	36(49.32)	37(50.68)	
Meat/fish/pork	Never	1(100)	0(0.00)	0.278
	Once a week	15(41.67)	21(58.33)	
	Twice per week	99(43.23)	130(56.77)	
	Three or more per week	56(35.90)	100(64.10)	
Green vegetables/fruits	Never	2(100)	0(0.00)	0.252
	Once a week	4(26.67)	11(73.33)	
	Twice per week	52(39.39)	80(60.61)	
	Three or more per week	113(41.54)	159(58.38)	
Pica/Clay consumption during this current pregnancy	Yes	79(45.40)	95(54.60)	0.107
	No	92(37.10)	156(62.90)	

Source: ***Field data, 2019***

4.10 Bivariate and Multivariate Analysis of Anaemia by Selected Factors

Results from unadjusted and adjusted analyses of anaemia by selected factors showed advancement in age served as a protective factor for a respondent becoming anaemic. All age groups except for 20-24 years, were all statistically significant in predicting the condition in both models compared to the reference age group of 15-19years. The study showed being married and pregnant was associated with higher odds of experiencing anaemia compared to being pregnant and single p=0.031, (COR 0.51; 95% CI 0.28-0.94) also being widowed/ divorced/ separated had a protective effect against anaemia compared to being single and pregnant p=0.024, (COR 0.09; 95% CI 0.01-0.73). In both models, women who reported cohabiting had a higher likelihood of becoming anaemic. For example, a cohabiting woman is about twice more likely to experience the condition after controlling for other covariates in the adjusted model.

Pregnant women who worked in the government or private sectors were 57% less likely to be anaemic compared to those unemployed (p=0.017, COR 0.43; 95% CI 0.22-0.86), it, however, lost its significance after adjustment.

The odds of pregnant women whose family income is greater than GH₵ 1000 becoming anaemic is reduced by 61% (p=0.006, COR 0.39; 95% CI 0.20-0.76) compared to pregnant women whose family income is less than GH₵ 300. Despite the loss of statistical significance, the odds increased to 1.12 times more likely after adjusting for all other variables.

Pregnant women who had heard about anaemia from health workers were approximately 2 times more likely when all other covariates were held constant (p=0.035, AOR 1.78; 95% CI 1.04-3.06). In much the same way, those who had heard information about anaemia from the media were 1.76 times likely to be anaemic compared to those who had heard it from other sources (p=0.027, COR

1.76; 95% CI 1.07-2.92). Consequently, when other variables were adjusted for, it revealed an increased likelihood (2.16 times more likely), holding all other covariates constant (p=0.007, AOR 2.16; 95% CI 1.23-3.79).

The odds of pregnant women whose time of delivery to the time of next conception (interpregnancy interval) was two years and more had 1.96 times increased risk of being anaemic compared to those less than two years p=0.015, (AOR 1.96; 95% CI 1.14-3.36)

The other selected variables such as educational status, iron /folate intake, and sickle cell status did not show any statistical significance in predicting the likelihood of a woman's anaemic status.

Table 4.10: Bivariate and Multivariate Analysis of Anaemia by Selected Factors

Variables	Categories	COR	95% CI	P- Value	AOR	95%CI	P- Value
Age (years)	15-19 ***(Ref.)***	1			1		
	20-24	0.50	0.14-1.77	0.281	0.41	0.10-1.59	0.196
	25-29	0.19	0.06-0.62	**0.006***	0.13	0.03-0.54	**0.005***
	30-34	0.16	0.05-0.52	**0.002***	0.10	0.02-0.45	**0.002***
	35-39	0.12	0.04-0.40	**0.001***	0.07	0.02-0.32	**0.001***
	Above 40	0.09	0.02-0.31	**0.001***	0.06	0.01-0.27	**0.001***
Marital status	Single ***(Ref.)***	1			1		
	Married	0.51	0.28-0.94	**0.031***	0.86	0.40-1.86	0.699
	Cohabiting	1.30	0.64-2.62	0.468	1.87	0.82-4.25	0.135
	Widowed/Divorced/Separated	0.09	0.01-0.73	**0.024***	0.22	0.02-1.96	0.173
Occupation	Unemployed***(Ref.)***	1			1		
	Self Employed	0.64	0.31-1.32	0.228	1.42	0.53-3.82	0.483
	Gov't/Private employed	0.43	0.22-0.86	**0.017***	1.01	0.38-2.70	0.990
	Trader	0.47	0.22-1.01	0.052	0.91	0.29-2.82	0.864
Educational Level	No formal education***(Ref.)***	1			1		
	Primary	1.50	0.67-3.33	0.322	1.19	0.47-3.03	0.710
	Secondary	1.04	0.53-2.06	0.908	0.59	0.25-1.37	0.218
	Tertiary	0.8	0.41 -1.60	0.547	0.62	0.24-1.61	0.325
Family Income	<300***(Ref.)***	1			1		
	300-500	0.56	0.28-1.13	0.107	0.95	0.40-2.23	0.906
	500-1000	0.54	0.29-1.00	0.053	1.39	0.56-3.43	0.475

	>1000	0.39	0.20-0.76	**0.006***	1.12	0.41-3.09	0.822
Health worker	No***(Ref.)***	1			1		
	Yes	1.18	0.75-1.84	0.473	1.78	1.04-3.06	**0.035***
Media	No***(Ref.)***	1			1		
	Yes	1.76	1.07-2.92	**0.027***	2.16	1.23-3.79	**0.007***
Interpregnancy Interval	Less than Two Years***(Ref.)***	1			1		
	Two years and More	0.96	0.64-1.44	0.831	1.96	1.14-3.36	**0.015***
Given Iron/Folate	No***(Ref.)***	1			1		
	Yes	0.91	0.20-4.10	0.899	0.40	0.08-2.11	0.283
Sickle Cell Status	Without sickle cell***(Ref.)***	1			1		
	With sickle cell	2.29	0.64-8.25	0.204	3.48	0.80-15.09	0.095
	Don't know	6.11	0.68 - 55.17	0.107	5.84	0.56-60.46	0.139

Note: *p-values with asterisks were generated from Fisher's exact test between anaemia and corresponding variables. P-value <0.05 are statistically significant*

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

Anaemia among pregnant women poses serious health consequence for both mother and baby worldwide, especially those in middle and low-income countries. This study focused on exploring the prevalence and some factors associated with anaemia in pregnancy at the Tema General Hospital in the Greater Accra Region of Ghana.

5.2 Prevalence of Anaemia at Tema General Hospital

The prevalence of anaemia in this study was 41% with less than 1% of pregnant women being severely anaemic. This study further found age, marital status, occupation, family income, parity, gravidity, interpregnancy interval, hearing information about anaemia through a health worker and the media to be significantly associated with the anaemic conditions of the respondents.

With reference to the WHO criteria of anaemia in a population, it shows anaemia is still a major public health problem at Tema General Hospital. This result is similar to the results of the study done at Sunyani Municipal Hospital where the prevalence of anaemia was also slightly over 40% (Anlaakuu, 2015). The results were however higher than the study done in Tanzania in Mbulu District in Manyara Region which placed the prevalence at 30.2% and lower than that of the study done in Nairobi, Kenya with a prevalence of 57% (Okube *et al.*, 2016). Compared to the study done by USAID in 2011 on "*Cross-country Comparison of Anemia Prevalence"*, Africa's prevalence of pregnant women was pegged at 55.8%, Asia at 42% and Europe 18.7% (Klemm *et al.*, 2011). With reference to this study, the slightly lower prevalence may be partly due to the

study being conducted at a more urbanized community with the majority of the participants having some form of formal education with only about 10% having no formal education. Also, it can be due to easy access to health care facilities and health care information through the mass media be it the television or radio.

5.3 Maternal Age and Anaemia

The odds of being less anaemic were observed to rise as maternal age advanced. The results obtained from the analysis bewrayed women who were pregnant aged 20 years and above were significantly less likely to be anaemic compared to those between the ages 15-19 years. This result was consistent with the various age groups in both the bivariate and multivariate logistic regression. Similar studies were done in other parts of the country such as Sekyere-West District in the Ashanti Region (Glover-Amengor, 2005) and Bolgatanga Regional Hospital in Northern Ghana (Ahenkorah *et al.*, 2018) also revealed a lower prevalence of anaemia was significantly associated with increasing age of the women. This current study's findings were however in contradiction with findings of other studies such as the study done in Sunyani Municipal Hospital in Ghana and Pumwani Maternity Hospital in Nairobi, Kenya by (Anlaakuu, 2015)&(Okube *et al.*, 2016) respectively, which showed the odds of being anaemic rose as maternal age advanced.

The results obtained may be attributed to the fact that younger pregnant women belong to the physically active group, undergoing rapid growth and having increased nutritional requirements that pregnancy puts on their bodies. Also, the results may be so because pregnant women with advanced age have more knowledge on the modalities for preventing anaemia through experience and a better understanding of the significance of the illness as compared to the younger age group of 15-19years.

5.4 Marital Status and Anaemia

The prevalence of anaemia was higher in married pregnant women but lower in participants who were widowed/divorced/separated compared to single pregnant women. This could have happened because married women in the Ghanaian traditional home, after preparing family meals tend to serve the best part of the meals to their husbands and children and feed on the least food left hence denying themselves of adequate and essential nutrition. On the other hand, those who are widowed/separated/divorced eat what they want without compromising on their nutrition for anyone else.

Contrary to this finding a study was done in Kenya by, Chrispinus Siteti,(2014) and (Meda *et al.*, 1999) in Burkina Faso, discovered that the risk of developing anaemia during pregnancy was equal irrespective of marital status. Another study which looked into risk factors and birth outcomes of anaemia in early pregnancy in a nulliparous cohort (Masukume *et al.*, 2015) showed that not having a marital partner was associated with increased risk of developing anaemia in early pregnancy.

5.5 Socio-Economic status and Anaemia

This study analyzed the employment status of pregnant women, whether or not they were doing some income generating activities and overall family income to assess their socio-economic status.

There was a significant association between the occupation of the respondents and anaemia as those who were government or private sector workers had a decreased tendency of being anaemic as opposed to being unemployed. This can be because the majority of the respondents who worked in these sectors had tertiary education, hence it is prudent to assume that they will have more knowledge on the prevention of anaemia as opposed to those who were unemployed and having a much lower educational status. This finding is supported by findings of a study carried out by Xu

et al., (2016) in China on the prevalence, sociodemographic and lifestyle determinants of anaemia during pregnancy. It is viewed that being employed would translate into a good socio-economic status and hence being able to afford good nutrition.

Other studies have also contradicted this belief, as a study done in India revealed that the odds of women having anaemia were higher among pregnant women who were employed (OR = 1.33, $p < .01$) compared to those who were unemployed (Daru *et al.*, 2018)

This study showed that participants with a high family income had a lower prevalence of becoming anaemic compared to those with a low family income. This results may be due to the location where this research was conducted, as Tema is a more urbanized community with the majority of the inhabitants being in the middle–class group. However, it is important to note that participants of this study could have also come from urbanized rural communities such as Tema New Town, Tema Manhean and Ashaiman. This information is consistent with current knowledge and findings from Chowdhury *et al*., (2015) in Dhaka and (Derso *et al*., (2017) in Ethiopia. High-income earners have a higher probability of being able to afford more varieties of food, pay more attention to balanced nutrition, afford healthcare and generally make better health choices as opposed to low-income earners.

5.6 Knowledge and Anaemia

Participants who had heard about anaemia from a health worker were about 2 times more likely to be anaemic in the adjusted analysis. Also, results from pregnant women who had heard the information from the media both through the bivariate and multivariate analysis were statistically significant and it showed they had a greater chance of being anaemic compared to hearing from other sources. This information was however not expected as health workers and information from the media are supposed to be authentic and hence should have some form of positive impact on

the public. This results may be due to the fact that information from these sources are too generalized and not targeted to the available resources these women may have readily. Hence, if they do not have the resources to acquire foods or change in lifestyle recommended for them through these platforms, they abandon the advice totally.

5.7 Obstetric History and Anaemia

This study showed that increased parity and gravidity were associated with a lesser risk of getting anaemia since those who had conceived two or more children and pregnant women with four or more pregnancies were less likely to be anaemic compared to those who had no children. This information is however not in isolation as studies done by Ahenkorah, (2015) in Ghana, Lubeya, (2017) in Zambia and (Buseri *et al*., 2008) all revealed an inclination towards more prime gravidas having anaemia than the multigravida. These results are in variance with findings of other studies conducted by (Kassa,*et al*., 2017) in Ethiopia, (Nwizu *et al*., 2011) in northern Nigeria and (Taner *et al.,* 2015) which showed that primigravida women were less likely to develop anaemia during pregnancy compared to multigravida women because anaemia in pregnancy would tend to increase with rising parity owing to the effect of repeated pregnancy in depleting the iron store of a pregnant woman. The results obtained from this study may be due to the fact that multiparous and multigravida women having gained extra knowledge and experience after successive pregnancies/birth on how to better curb anaemia.

Interpregnancy interval associated with anaemia in this study revealed an increased prevalence of anaemia among those whose birth interval was two years and more. This study's results corroborate with those of the study done in Lusaka district, Zambia by (Lubeya, 2017) where the trend of anaemia was inclined towards those with an inter-delivery time of 36 months and more. This is a contradiction to other studies' findings such as (Kassa *et al.*, 2017a),(John, 2014) and

(Nwizu *et al.*, 2011) which support the traditionally accepted fact that shorter interpregnancy interval increases the risk of adverse obstetric outcomes and delays the mother's recovery from the effects of previous pregnancies. The current results may be due to women not consciously planning for pregnancies hence even after the said gap of two years their bodies are not being prepared for another pregnancy while those who have children lesser than two years may still be breastfeeding hence eating healthier and being very conscious of their health.

5.8 Iron/ Folate Supplementation and Anaemia

Even though there was no statistical significance established in this study with regards to iron and folic acid supplementation, the results showed pregnant women who took the iron and folate supplements had a decreased odds of 60% in becoming anaemic compared to those who did not take the supplement. Several studies such as (Mekuria *et al*., 2016); (Taner *et al.*, 2015); (Okube *et al.*, 2016) and (Cheema *et al.*, 2016) have all confirmed these findings. On the contrary, though, a research done in Northwest Ethiopia proved otherwise as the supplements did not reduce the prevalence of anaemia compared to those who did not take (Melku *et al.*, 2014). Pregnancy is associated with an increase in blood volume of about 50% and there is a grave requirement of iron to the growing fetus and placenta hence taking the iron tablets during pregnancy can help increase haemoglobin level and prevent anaemia.

5.9 Sickle Cell Status and Anaemia

Sickle cell disease by itself makes sufferers prone to anaemia. Without statistical significant evidence, the study still showed after adjusting for all other covariates that the odds of becoming anaemic was about 3 times higher for those with sickle cell disease and for pregnant women who did not know their sickle cell status, it was as much as 6 times higher. This shows the importance

of pregnant women being aware of their sickle cell status to help reduce the risk of anaemia and its implications on pregnancy and the health of the woman.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Anaemia has highly unfavourable effects on both mother and foetus hence its prevention is critical and cannot be overemphasized. The prevalence of anaemia among pregnant women in this study remains a public health problem with regards to the WHO classification, even though there are ongoing modalities in places such as administration of iron and folate supplementation, giving of anti-malarial prophylaxis and anti-helminths. The study established that younger women were at increased risk of getting anaemia. It also found that being married had a slightly greater chance of being anaemic while those who were widowed /divorced /separated had a decreased risk of being anaemic compared to single pregnant women. Pregnant women who were in government or private employment were less likely to be anaemic compared to those unemployed. The research also disclosed that a higher family income was associated with a decreased likelihood of being anaemic. Source of anaemia information either from a health worker or media were all statistically significant in this study.

6.2 Recommendations

Based on the findings of the study, the following recommendations are made:

- Public awareness campaigns should be undertaken by the Ghana Health Service (GHS) and its developmental partners such as the United States Agency for International Development (USAID) through programs like the "*GoodLife*" campaign, to sensitize the general public on what anaemia is, its causes, associated risk factors, and complications and how to ameliorate it.

- There is a need to strengthen our healthcare system through capacity building for primary healthcare personnel to ensure a definitive diagnosis, so that appropriate and targeted counselling, referral and treatment can be provided in early pregnancy for all women in the reproductive ages regardless of where they may be.
- Reproductive health providers should incorporate in their education the need for women to be involved in income generating activities to enable them to take good care of themselves during pregnancy through good nutrition and general care
- The government through the Ministry of Health (MoH) and its stakeholders and development partners should continue with the current strategies aimed at preventing anaemia in pregnancy such as the iron and folate supplementation, deworming, presumptive treatment of malaria and routine laboratory testing of various illnesses such as sickle cell, Hepatitis B and HIV/AIDS services.
- Adolescent and reproductive health education to teenage girls should be encouraged in schools through the School Health Education Programs (SHEP) and community Health Nurses from the varied health centres should help curb unplanned pregnancies and individualized care when pregnancies occur in teenagers. This can go a long way to help delay first pregnancy or the complications that may occur with the first pregnancy in this population.
- It is highly recommended for reproductive health workers to go beyond writing the sickle cell status of clients on their folders and actually educate them about their sickle cell status, its implications on their health, the pregnancy, and their unborn children. This will ensure that pregnant women can on their own take the required precaution

to prevent anaemia and report to the facility immediately they feel uncertain about their health for proper care.

- There will also be the need for future students' research work to adopt a qualitative approach to gather in-depth clues on the risk factors associated with anaemia in pregnancy.

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APPENDICES

Appendix 1: Consent form

EXPLORING THE PREVALENCE AND FACTORS ASSOCIATED WITH ANAEMIA IN PREGNANCY AT TEMA GENERAL HOSPITAL, GHANA

Respondent's ID #: ……. Date:/……./……...

Name of interviewer…….……..……..

Dear Madam,

My name is ……I am a Student at Ensign College of Public Health, Kpong. I am conducting research on the prevalence and factors associated with anaemia in pregnancy in this facility. It is an academic work which could be used for a database in policy formulation. I would be grateful if you could spare some time to answer this questionnaire. You are hereby assured of anonymity and that any information provided will be treated with the utmost confidentiality. If at any point you feel reluctant to participate you have the right to drop out without any offense or hindrance. Thank you.

Appendix 2: Questionnaire on factors associated with anaemia in pregnancy at Tema General Hospital

STUDY ID……..….. **DATE……**

INTERVIEWER: ……

Section 1: Demographic Information of Participant

1. No. of ANC visit……..
2. Haemoglobin (Hb) status at first visit ……
3. Haemoglobin (Hb) status at current visit……..
4. Age: ……..
5. Residence: [1] Tema [2] Ashaiman [3] Tema Newtown [4] Afienya [5] Sakumono [6] Dohwenya [7] Others (specify)…….…
6. Marital status: [1] Single [2] Married [3] Cohabitation [4]Widowed/Divorced/Separated
7. Occupation status: [1] Self-employed (Business) [2] Government or private employed [3] Trader [4] Unemployed
8. Religious affiliation: [1] Christian [2] Muslim [3] Traditional [4] Others (specify)…….
9. Educational level attained: [1] No Formal Education [2] primary [3] secondary [4] Tertiary
10. Family's monthly income (GH₵) : [1] <300 [2] 300-500 [3] 500-1000 [4] >1000

Section 2: Obstetric history of the participants

11. Gravidity (Number of pregnancies): _____
12. Parity (Number of children): _____
13. Age of the youngest child: _____
14. Gestational age at first ANC visit (in weeks): _____
15. Gestational age of the current pregnancy (in weeks): _____
16. How many times have you attended ANC during this pregnancy? _____
17. Have you been given iron/folate tables since you became pregnant? 1. Yes 2. No
18. If **YES**, how many times do you take it? 1. Once 2. Always 3. Sometimes 4. Never
19. If **No**, what are the reasons? _____

Section 3: Frequency of consumption of the following foods during current pregnancy in a week

20. Eggs 1. Never 2. Once a week 3. Twice per week 4. Three or more per week
21. Meat/fish/pork 1. Never **2**. Once a week 3. Twice per week 4. Three or more per week
22. Green vegetables/fruits 1. Never 2. Once a week 3. Twice per week 4. Three or more per week
23. Pica/Clay consumption during this current pregnancy 1. Yes 2. No
24. Are there any food taboos during pregnancy in your culture? 1. Yes 2. No

    If **YES**, state the taboos (s)……..

Section 4: Health Conditions

25. Have you suffered from malaria during current pregnancy? 1. Yes, 2. No

26. Do you use insecticide-treated nets? 1. Yes, 2. No

27. Have you received Anti-malaria prophylaxis during current pregnancy?

1. No anti-malaria drug taken 2. At least one dose of the anti-malaria drug taken

28. Have you received deworming medication during current pregnancy? 1. No deworming received during current pregnancy 2. At least once during the current pregnancy

29. Are you suffering from any hemorrhagic disease? 1. Yes 2. No

30. Are you suffering from any sort of stress or worry? 1. Yes 2. No

31. What is your Sickle Cell status?

1. Without sickle cells traits 2. With Sickle cell traits 3. Don't know

Section 5: Knowledge of anaemia in pregnancy

32. Have you ever heard about anaemia in pregnancy? 1. Yes 2. No

33. If **YES**, from what source did you learn of it? 1. Health worker 2. Friend

3. Relative 4. Media 5. School 6. Other……..

34. What is Anaemia? a. Shortage of blood [ ] b. Leaking of blood [ ]

c. Too much blood [ ] d. Spiritual attack [ ] e. Others [ ]……..

35. What do you think is the cause of Anaemia? (a) Poor dietary intake, parasitic infections, chronic infection i.e. TB and HIV, reproductive cause and genetic blood disorders

(b) Witchcraft (c) Contact with an infected person (d) Others (Specify)…….....

Appendix 3: Ethical Review

ENSIGN COLLEGE OF PUBLIC HEALTH - KPONG

OUR REF: ENSIGN/IRB/M4
YOUR REF:
Tel: +233 245762229
Email: irb@ensign.edu.gh
Website: www.ensign.edu.gh

P. O. Box AK 136
Akosombo
Ghana

Tuesday, 13 November 2018

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Rukmini Taylor
Ensign College of Public Health

Dear Miss Taylor,

OUTCOME OF IRB REVIEW OF YOUR THESIS PROPOSAL

At a meeting of the INSTITUTIONAL REVIEW BOARD (IRB) of Ensign College of Public Health held on 1st November, 2018 your proposal entitled **"Exploring the prevalence and factors associated with anaemia in pregnancy at Tema General Hospital"** was considered.

Your proposal has been approved for data collection in the following settings:

1. Thesis title should include the name of the District and Region of study.
2. Women with low HB should be referred to the nutritional clinics for pregnant women for further management
3. Include Supervisor's name.
4. Provide consent forms.

We wish you all the best.

Sincerely,

Dr (Mrs) Acquaah-Arhin
(Chairperson)

Cc. President, ECOPH
Cc: Academic Registrar, ECOPH
Cc: Head of Academic Program, ECOPH

Appendix 4: Introductory Letter

ENSIGN COLLEGE OF PUBLIC HEALTH - KPONG

OUR REF: ECOPH/AR/EL/GHS/ST104/001
YOUR REF:
Tel: +233 245762229
Website: www.ensign.edu.gh

P. O. Box AK 136
Akosombo
Ghana

6th December, 2018.

The Medical Superintendent
Tema General Hospital
Tema.

Dear Sir/Madam,

LETTER OF INTRODUCTION

We write to respectfully introduce to you Rukmini Taylor (Student Identification number 177100104), a second year student of the Master of Public Health (MPH) degree program of the College.

As part of her graduation requirements, she is writing a thesis on; **"Exploring the Prevalence and factors associated with anaemia in pregnancy at the Tema General Hospital"** and would like to obtain data at your facility.

She has received ethical clearance from the Institutional Review Board (IRB) and wishes to assure you that ethical considerations and confidentiality are at the fulcrum of any data collected from your outfit for this project.

We are also confident that the recommendation from the findings would equally be useful to your facility. We would, therefore, be grateful if you kindly accede her any assistance she may require in the collection of this data in your facility for the thesis.

Thank you.

Respectfully yours,

Patrick Kuma
Academic Registrar