

UNIVERSITY OF CAPE COAST

FACTORS INFLUENCING ANAEMIA AMONG PREGNANT WOMEN IN
THE NKWANTA NORTH AND ADAKLU DISTRICTS, GHANA



ERIC TETTEGAH

2022



© Eric Tettegah

University of Cape Coast

UNIVERSITY OF CAPE COAST

FACTORS INFLUENCING ANAEMIA AMONG PREGNANT WOMEN IN
THE NKWANTA NORTH AND ADAKLU DISTRICTS, GHANA

BY

ERIC TETTEGAH

Thesis submitted to the Department of Health, Physical Education and
Recreation, Faculty of Science and Technology Education of the College of
Education Studies, University of Cape Coast in partial fulfilment of the
requirements for the award of Master of Philosophy degree in Health
Education

NOBIS

JUNE 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature: Date.....

Name: Eric Tettegah

Supervisors' Declaratio

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: Date:

Name: Dr. Nancy Innocentia Ebu-Enyan

Co-Supervisor's Signature..... Date.....

Name: Dr. Thomas Hormenu

ABSTRACT

The study sought to investigate the factors influencing anaemia among pregnant women attending antenatal clinics in the Nkwanta North and Adaklu Districts. The conceptual framework was deduced from Pender Health Promotion Model. A longitudinal retrospective and prospective study was conducted involving 300 pregnant women from the two districts. A questionnaire was used to collect the data and the data were analysed using frequencies, percentages and logistic regression. Findings revealed that the prevalence of maternal anaemia in the Nkwanta North and Adaklu Districts were 68% and 78% respectively. On knowledge, 91% of the pregnant women had excellent knowledge on anaemia in pregnancy. Long distance to the healthcare facilities was a barrier. In the Nkwanta North District, mature pregnant women, divorced pregnant women, pregnant women with obstetric history of 2 to 3 pregnancies, those with no formal education, monthly income higher than GHS500.00 were significant predictors of the anaemic status during pregnancy. In Adaklu District, mature pregnant woman, divorced pregnant women, pregnant women with obstetric history of 2 to 3 pregnancies, those without formal education, monthly income higher than GHS500.00 were significant predictors of the anaemic status during pregnancy. It is recommended that the health authorities in the two districts must go beyond education to advocate and monitor pregnant women to help translate knowledge into practice. Also, educated and relatively rich pregnant women must be counselled on the need to adhere to instructions given at ANCs so as to reduce their anaemic prevalence.

Keywords

Anaemia

Antenatal

Knowledge

Obstetric

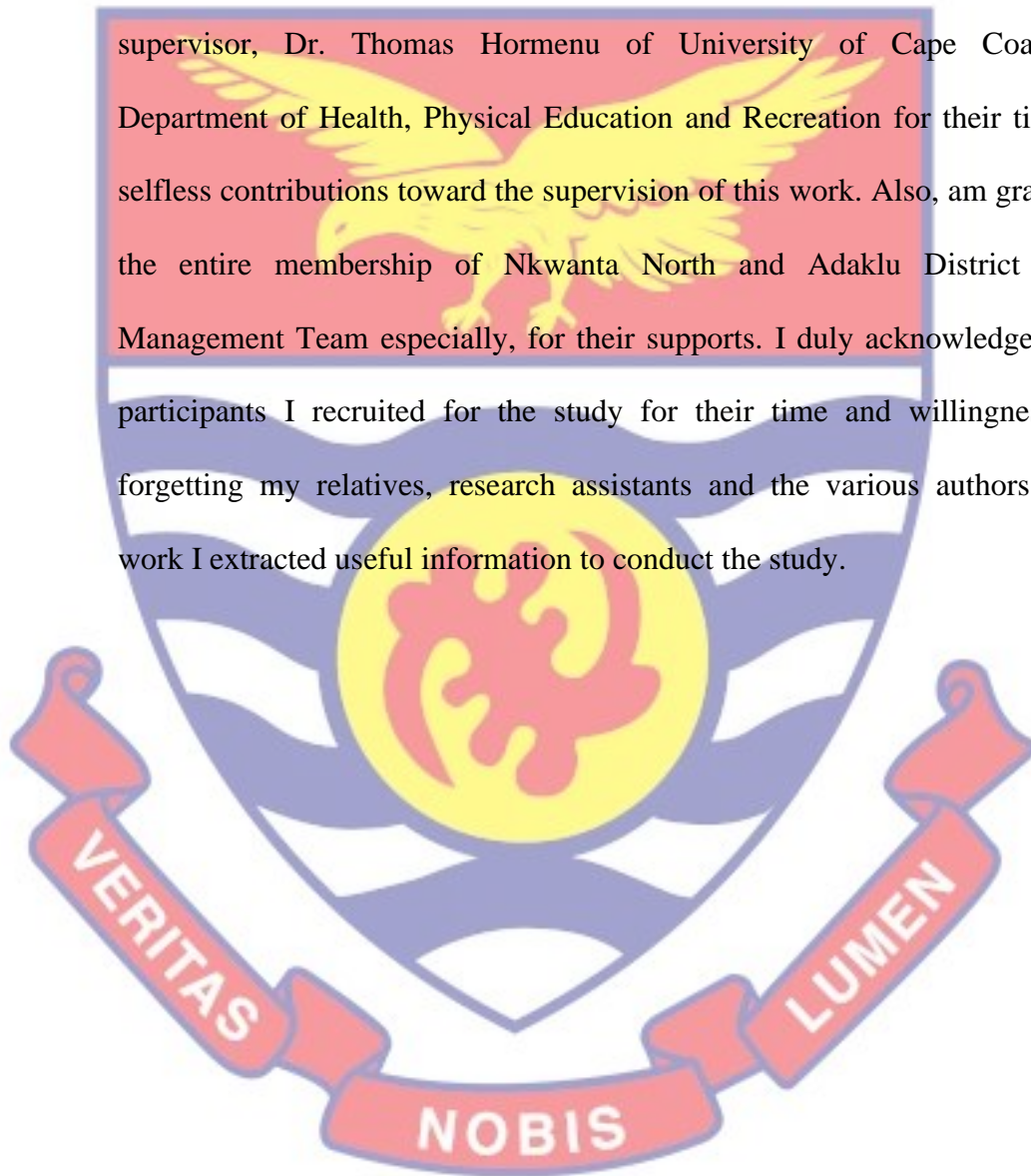
Pregnancies

Women



ACKNOWLEDGEMENTS

My first and foremost appreciation goes to Jehovah for His sufficient grace bestowed on me to complete this study. I really appreciate my supervisors: Principal supervisor, Dr. (Mrs.) Nancy Innocentia Ebu-Enyan of University of Cape Coast, the Department of Mental Health and my Co-supervisor, Dr. Thomas Hormenu of University of Cape Coast, the Department of Health, Physical Education and Recreation for their time and selfless contributions toward the supervision of this work. Also, am grateful to the entire membership of Nkwanta North and Adaklu District Health Management Team especially, for their supports. I duly acknowledge all the participants I recruited for the study for their time and willingness. Not forgetting my relatives, research assistants and the various authors whose work I extracted useful information to conduct the study.



DEDICATION

To my daughter, Tettegah Mighty.



TABLE OF CONTENTS

	Page
DECLARATION	ii
ABSTRACT	iii
KEYWORD	iv
ACKNOWLEDGEMENTS	v
DEDICATION	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ACRONYMS	xiii
CHAPTER ONE: INTRODUCTION	
Background to the Study	1
Statement of the Problem	4
Purpose of the Study	5
Research Questions	5
Significance of the Study	6
Delimitation	6
Limitations	7
Definition of Terms	7
Organisation of the Study	8
CHAPTER TWO: LITERATURE REVIEW	
Concepts of Anaemia in Pregnancy	10
Common Types of Anaemia in Pregnancy	12
Diagnosis of anaemia during pregnancy	13

Signs and Symptoms of Anaemia in Pregnancy	13
Effects/Complications of Anaemia in Pregnancy	14
Nutrition during Pregnancy	14
Macronutrients	15
Micronutrients	15
The first trimester	16
The second trimester	17
The third trimester	17
Malaria and Anaemia	18
Prevention of Anaemia in Pregnancy	18
The Prevalence of Anaemia among Pregnant women	19
Causes of Anaemia	21
Risk Factors of Anaemia in Pregnancy	23
The World Health Organisation's Policy on Anaemia Control	23
National Policy on Anaemia Control	24
Theoretical Framework	25
Knowledge of Pregnant Women on Anaemia	27
Perceived Barriers in Maintaining Appropriate Haemoglobin among Pregnant Women at ANC	30
The Components of Health Education that the Pregnant Women received at ANC	32
Factors that Predict Anaemia among Pregnant Women	35
Summary	39
CHAPTER THREE: RESEARCH METHODS	
Research Design	41

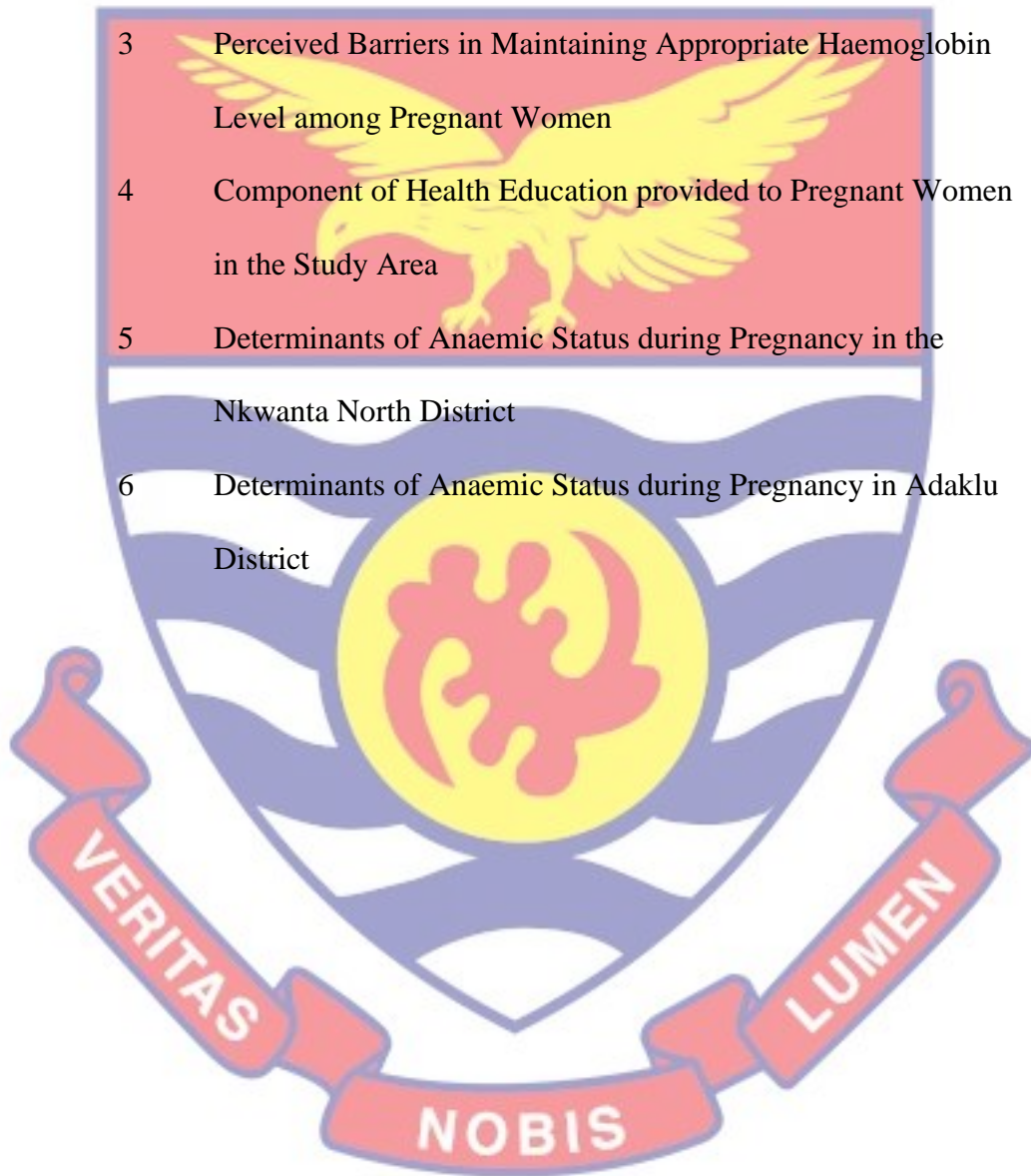
Study Areas	44
Population	46
Inclusion criteria	48
Exclusion criteria	48
Sampling Procedure	48
Data Collection Instrument	49
Data Collection Procedures	51
Ethical Consideration	53
Data Processing and Analysis	53
Model specification and Estimation Technique	55
Summary	57
CHAPTER FOUR: RESULTS AND DISCUSSION	
Research Question One: What is the Prevalence of Anaemia among Pregnant Women in the Nkwanta North and Adaklu Districts?	58
Research Question Two: What is the Level of Knowledge of Pregnant Women on Anaemia in the Nkwanta North and Adaklu Districts?	62
Research Question Three: What are the Perceived Barriers in Maintaining Appropriate Haemoglobin Level among Pregnant Women in the Nkwanta North and Adaklu Districts?	64
Research Question Four: What Components of Health Education do the Pregnant Women Received at ANC in Nkwanta North and Adaklu Districts?	68
Research Question Five: What Factors Predict Anaemia among Pregnant Women in the Nkwanta North and Adaklu Districts?	72

CHAPTER FIVE: SUMMARY. CONCLUSION AND
RECOMMENDATIONS

Summary	81
Key Findings	81
Conclusion	83
Recommendations	84
Suggestions for Further Research	85
REFERENCES	86
APPENDICES	109
APPENDIX A: Questionnaire for Pregnant Women	109
APPENDIX B: University of Cape Coast IRB Approval Letter	115
APPENDIX C: Introductory Letter from Adaklu District Health Directorate	116
APPENDIX D: Introductory Letter from Nkwanta North District Health Directorate	117
APPENDIX E: Administrative Map of Nkwanta North District	118
APPENDIX F: Administrative Map of Adaklu District	119
APPENDIX G: Informed Consent Form	120

LIST OF TABLES

Table		Page
1	Prevalence of Anaemia among Pregnant Women	59
2	The Knowledge Level of Pregnant Women on Anaemia in the Nkwanta North and Adaklu Districts	62
3	Perceived Barriers in Maintaining Appropriate Haemoglobin Level among Pregnant Women	66
4	Component of Health Education provided to Pregnant Women in the Study Area	70
5	Determinants of Anaemic Status during Pregnancy in the Nkwanta North District	75
6	Determinants of Anaemic Status during Pregnancy in Adaklu District	78



LIST OF FIGURES

Figure		Page
1	Theoretical Framework (Pender, 2002).	26
2	Conceptual Framework (Pender, 2002)	37



LIST OF ACRONYMS

ANC	Antenatal Clinic
APGAR	Appearance, Pulse, Grimace, Activity and Respiration
CDC	Centre for Disease Control and Prevention
GDHS	Ghana Demographic Health Survey
GHS	Ghana Health Service
GSS	Ghana Statistical Service
Hb	Haemoglobin
HIV	Human Immunodeficiency Virus
IPT	Intermittent Preventive Treatment
RBC	Red Blood Cell
SPSS	Statistical Package for Social Sciences
SP	Sulphadoxine Pyrimethamine
ITNs	Insecticides Treated Nets
UCCIRB	University of Cape Coast Institutional Review Board
WHO	World Health Organisation



CHAPTER ONE

INTRODUCTION

Background to the Study

Anaemia in pregnancy is a major public health concern affecting advanced countries and less advanced countries and has a serious implication on the country's social and economic status (Munasinghe, 2014). The World Health Organisation [WHO] (2011) posited that at a given population, haemoglobin concentration is used to determine anaemia. Haemoglobin is made up of iron and protein and it carries oxygen from the lungs to the tissues and transports protein in red blood cells of all humans (Al Kahtani et al., 2012). Haemoglobin is made up of the iron and protein groups.

Kefiyalew et al. (2014) shares the views that during pregnancy, a haemoglobin level below 11g/dl of human blood is referred to as anaemia. Anaemia is a nutritional disorder affecting pregnant women. Maternal anaemia is more prevalent in developing countries than advanced countries. Non pregnant women are less vulnerable in developing anaemia than pregnant women because anaemia is more common during pregnancy. The prevalence of anaemia among pregnant women varies because of the differences in socio-economic status, lifestyles and health seeking behaviours across diverse cultures during pregnancy (Abu-Ouf & Jan, 2015).

Globally, anaemia adversely affects billions of people. About 32.4million (38%) of the pregnant women had suffered anaemia with a higher prevalence of (49%) in South East Asia (Tadesse et al., 2017). According to Stevens et al. (2013), anaemia affects almost a billion of women in their fertility age around the world. In 2011, 38.0% of pregnant women aged 15-49

years and 29.0% of non-pregnant women were anaemic globally. However, a higher prevalence was reported in South Asia, Central and West Africa. Many countries and international bodies implemented measures that are geared toward preventing and controlling the devastating impacts of maternal anaemia. The periodic data collection and identification of the cause of the disease will help assess the outcome of the interventions being implemented and the strategies to control and prevent anaemia (De Benoist et al., 2008). The WHO estimates that 52% of pregnant women in less advanced countries are anaemic as against 23% in the advanced world (Soma-Pillay, Nelson-Piercy, Tolppanen, & Mebazaa, 2016).

Research conducted in Africa, indicated that increasing cases of maternal anaemia ranging from 41% to 83% were recorded in different geographical settings (Haggaz, Radi & Adam, 2010). The high case of maternal anaemia in Sub-Saharan Africa (SSA) was as a result of most women commencing pregnancy with insufficient storage of iron and vitamins in the body. Again, the high prevalence of maternal anaemia can be associated to lack of family planning, poor dietary intake, blood loss during menstruation and persistent infections. Socio-economic factors, negative lifestyles and different cultures are also implicated (WHO, 2015a). In SSA, infectious diseases like malaria, worm infestations and Human Immunodeficiency Virus (HIV) bring about increase cases of maternal anaemia (Ouedraogo et al., 2012).

Ghana is part of the African countries with increase prevalence of maternal anaemia. Variations in rural and urban settings have been reported and it was realised that the rural settings recorded a higher prevalence of

anaemia in pregnancy (International Classification of Function, Disability and Health [ICF], 2015). In Ghana, researches revealed about 50% of all anaemia cases were as a result of iron deficiency (Anlaaku & Anto, 2017). On the contrary, governmental policies, such as education on adequate nutritional intake during pregnancy, food fortification with iron and folic acid supplementations, malaria and worm control contribute to prevention of maternal anaemia (WHO, 2016). The physiological demand for iron during pregnancy is three times higher than women who are not pregnant and it increases as pregnancy progresses (Tapiero, Gate, & Tew, 2001). During the first trimester of pregnancy, iron requirements may increase to about 4-6mg/day. In the second and third trimesters, iron requirement may reach about 10mg/day especially during the last two months of pregnancy (Bothwell, 2000). The total iron requirement for pregnancy has been estimated as 840mg, considering the requirements for the foetus, the maternal blood, the placenta and the blood lost during delivery of the baby (National Institute of Nutrition, 2009).

During pregnancy, inadequate circulation of blood can adversely affect the placenta. The capacity of the foetus to develop in the womb depends on the placenta which promotes gaseous exchange, metabolism of food nutrients and excretion of wastes (Mahamuda, Feroza, & Shamim, 2011). There are several causes and predisposing factors of anaemia during pregnancy. However, iron deficiency contributes to 75% of anaemia cases during pregnancy (Balarajan, Ramakrishnan, Ozaltin, Shankar & Subramanian, 2011). Anorexia, severe vomiting during the first trimester of pregnancy and increase menstrual flow just before pregnancy are some of the contributors of

maternal anaemia (Noronha et al., 2010). Socio-demographic factors like the age, number of pregnancies, educational status, and income levels are significant determinants of maternal anaemia. The most common type of anaemia is iron deficiency anaemia and is caused by excessive iron loss or low intake of iron (Thomas & Bishop, 2007).

Statement of the Problem

Ghana Health Service (GHS) report (2010), revealed that maternal anaemia was ranked sixth among the top 10 diseases in Ghana. Ghana Demographic and Health Survey (GDHS) Report (2014), indicated that the prevalence of anaemia during pregnancy is 45.0%. When the prevalence of anaemia during pregnancy is more than 40%, it is regarded as a major public health concern (McLean, Cogswell, Egli, Wojdyla, & Benoist, 2008). Maternal anaemia can have dangerous effects on the foetus and on the pregnant woman. Some of the policies that the GHS instituted to address the maternal anaemia problems include; health education on nutritious diet, administration of iron supplements, administration of Intermittent Prevention Treatment (IPT) to prevent malaria and administration of albendazole to prevent worm infections. In spite of these interventions, maternal anaemia is still a serious concern in some of the health service delivery centres in Ghana.

The Family Health Division (FHD) of the Ghana Health Service Annual Report (Ghana Health Service, 2016), revealed that Volta Region had the highest prevalence (49.0%) of anaemia among women in their reproductive age (15-49). Also, a critical analysis of 2016/2017 GDHS in the Volta Region on anaemia rate among pregnant women at registration by districts revealed that the prevalence of maternal anaemia in the Nkwanta

North and Adaklu Districts is very high. Out of the 25 districts in the Volta Region, Adaklu District had 72.0 %, which was the highest prevalence of anaemia among pregnant women in the year 2016. Nkwanta North District placed the second highest in the same year with 68.8%. In 2017, Nkwanta North District came first with 76.3% while Adaklu District placed second with 60.1%, which is still considered as a severe public health concern. Based on these statistics, there is the need to investigate the factors influencing anaemia among pregnant women in the Nkwanta North and Adaklu Districts.

Purpose of the Study

The purpose of the study was to investigate the factors influencing anaemia among pregnant women attending antenatal clinics (ANCs) in the Nkwanta North and Adaklu Districts. Specifically, the study sought to: ascertain the prevalence of anaemia among pregnant women in the Nkwanta North and Adaklu Districts; assess the level of knowledge of pregnant women on anaemia in the Nkwanta North and Adaklu Districts; determine the perceived barriers in maintaining appropriate haemoglobin level among pregnant women in the Nkwanta North and Adaklu Districts; identify the components of health education that pregnant women receive at ANC in the Nkwanta North and Adaklu Districts; determine the factors that do predict anaemia among pregnant women in the Nkwanta North and Adaklu Districts.

Research Questions

The study sought to find answers to the following questions:

1. What is the prevalence of anaemia among pregnant women in the Nkwanta North and Adaklu Districts?

2. What is the knowledge level of pregnant women on anaemia in the Nkwanta North and Adaklu Districts?
3. What are the perceived barriers in maintaining appropriate haemoglobin level among pregnant women in the Nkwanta North and Adaklu Districts?
4. What components of health education do the pregnant women receive at ANC in the Nkwanta North and Adaklu Districts?
5. What factors predict anaemia among pregnant women in the Nkwanta North and Adaklu Districts?

Significance of the Study

The findings of the study would help identify the factors that influence maternal anaemia from the pregnant women's perspectives. The findings of the study would also help to give adequate education on the causes, prevention and control of maternal anaemia in the Nkwanta North and Adaklu districts. The findings would also influence policy, research and behaviour on prevention of maternal anaemia in the two districts. Again, the study would form the basis for literature review by other researchers.

Delimitation

The study focused on factors influencing anaemia among pregnant women attending antenatal clinics at Kpassa and Damanko health centres in the Nkwanta North District and five health centres in the Adaklu District. The five health centres were: Waya, Ahunda, Nutifafa, Soda and Helekpe. The sampled was delimited to pregnant women who were within their first trimester and could be able to complete the three semesters at the selected health facilities. Though the study placed no limits on age, the accessible

population included pregnant women who were at least 15 years old. Also, because of the need to comment on knowledge level regarding ANC's pregnant women who visited the antenatal clinics for the first time were excluded.

Limitations

There are some limitations in this study that could be addressed in future research. First and foremost, the study focused on pregnant women who attended ANC's in the Nkwanta North and Adaklu Districts. The findings of the study could not be generalized because pregnant women who did not attend ANC were not part of the study. Secondly, the researcher did not check haemoglobin levels ourselves so the researcher solely relied on the haemoglobin levels recorded on the pregnant women's antenatal cards. Again, per the conceptual framework used, the study should have explored the association between knowledge and maternal anaemia and between perceived barriers and maternal anaemia. In spite of the limitations, the study provided vital information on the factors influencing maternal anaemia in both districts.

Definition of Terms

Anaemia: Refers to a decrease in haemoglobin concentration below 10.0 grams per deciliter of human blood.

Anaemia in pregnancy: Blood haemoglobin level below 11.0 grams per deciliter.

Cultural factors: Refer to beliefs about food and dietary intake.

Factors contributing to anaemia: Cultural and social situations contributing to anaemia.

First visit: The first time pregnant women visit the ANC's.

Gravidity: Meaning the number of pregnancy

Haemoglobin: A pigment on the surface of the red blood cell that gives it red colour.

Health centre: Refers to one a clinic which healthcare services are rendered.

Iron deficiency: Refers to inadequate iron to help in proper functioning of the body.

Maternal factors: It included age, parity, education, occupation and ANC attendance.

Morbidity: The rate at which anaemia occurs.

Mortality: The rate at which anaemia results in death.

Nutritional status: The level at which individual nutrient requirements are met.

Parity: It refers to the number of children.

Socio-economic factors: refer to indicators such as occupation, level of education and income.

Organisation of the Study

The research was organised in five chapters. Chapter one included introduction and it covered the information on anaemia among pregnant women, the problem statement, the purpose of the study, research questions, significance of the study, delimitation, limitation, term definitions and how the study was organised. Chapter two comprised a literature review based on the purpose of the study, conceptual and theoretical frameworks of the study. Chapter three described the research methods, the study design, study areas, population, sampling procedure, data collection instrument, data collection procedures, data processing and analysis and ethical consideration. Chapter four dealt with the results and discussion. Chapter five also dealt with summary, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

The purpose of the study was to investigate the factors that influence anaemia among pregnant women in the Nkwanta North and Adaklu Districts.

The study sought to ascertain the prevalence of anaemia among pregnant

women in the Nkwanta North and Adaklu Districts, assess the knowledge

level of pregnant women on anaemia in the Nkwanta North and Adaklu

Districts, determine the perceived barriers in maintaining appropriate

haemoglobin level among pregnant women in the Nkwanta North and Adaklu

Districts, identify the components of health education the pregnant women

receive at ANC in the Nkwanta North and Adaklu Districts and to determine

the factors that predict anaemia among pregnant women in the Nkwanta

North and Adaklu Districts. This chapter discusses the relevant literature on

the study as presented by diverse researchers. Relevant databases and search

terms were used. Published articles were carefully and systematically searched

in PubMed/Medline, Scopus, EMBASE and Web of Sciences electronic

databases, Google scholar and Google were also used to search for

information on anaemia among pregnant women. The WHO Global Database

on Anaemia in pregnancy was also searched. The search terms were developed

using key terms such as anaemia, pregnancy, prevalence and iron deficiency.

To simplify the literature for easy understanding, the subject matter had been segmented into the following subheadings:

1. Concepts of anaemia in pregnancy
2. Prevalence of anaemia among pregnant women
3. Causes of anaemia

4. Risk factors of anaemia in pregnancy
5. WHO and National Anaemia Policies
6. Theoretical framework of the study
7. The knowledge level of pregnant women anaemia
8. Perceived barriers in maintaining appropriate haemoglobin level

among pregnant women

9. Components of health education the pregnant women receive at ANC
10. Factors that predict anaemia among pregnant women
11. Conceptual framework of the study
12. Summary of the literature review

Concepts of Anaemia in Pregnancy

Patil (2013), stipulated that anaemia originated from the Greek word “*anaimia*,” a term that signifies “being without blood.” Kalaivani (2009), opined that anaemia refers to a decreased level of haemoglobin in the blood as evidenced by decreased functional capacity of the red blood cells (RBCs). Anaemia is a condition whereby there is decreased number of red blood cells which negatively affect the functions of the body (WHO, 2011). Also, WHO (2011) added that anaemia in pregnancy is a disorder whereby the haemoglobin level is less than 11g/dl. Based on the above definitions, it can be realised that anaemia in pregnancy refers to a decreased number of haemoglobin during pregnancy. The function of haemoglobin is to transport oxygen to the cells of the body for energy to be generated. A decrease in haemoglobin levels adversely affects the essential functions of organs such as the heart and the lungs (Kalaivani, 2009). Also, oxygen helps in generating

energy; hence, low haemoglobin level results into symptoms such as tiredness (K4Health, 2016).

During pregnancy, physiological changes mostly occur which eventually lead to a high volume of fluid but less nutritional binding proteins and less micronutrient in the blood (Boardman, Powers, Padilla & Hummer, 2002). The high blood volume normally occurs before the synthesis of red blood cells. Hence, leading to low haemoglobin and haematocrit levels in the first and second trimesters. This anaemia occurs when a pregnant woman does not take diet which is rich in iron and this can result to impaired foetal growth and the foetus is delivered low body weight (Pearl, Braveman & Abrams, 2001).

The requirement of iron during pregnancy increases. Iron is a vital element for the synthesis of haemoglobin, the protein in red blood cell that transports oxygen to other cells. De Benoist et al. (2008) argued that during pregnancy, there volume of blood in the body increases up to about 50% signifying haemodilution. Therefore, extra iron is required for the growth and development of the foetus, especially during the second and third trimesters. Goonewardene, Shehata, and Hamad (2012), indicated that women need more store before they start their pregnancy because iron deficiency anaemia during pregnancy mostly affects cognitive and motor development of the foetus, and it is associated with the preterm delivery (Rao & Georgieff, 2007). The physiology behind is due to decrease in oxygen supply to the placenta and foetus, which subsequently increase infection and poor brain development (Grieger & Clifton 2014). The WHO (2015), recommended that haemoglobin level during pregnancy should be sustained at or above 11g/dl.

Based on the WHO (2015b) policies, maternal anaemia is categorised as: Very severe anaemia (Hb < 4g/dl); Severe anaemia (Hb < 7 g/dl); Moderate anaemia (Hb 7-9.9 g/dl); Mild anaemia (Hb 10-10.9 g/dl).

Common Types of Anaemia in Pregnancy

According to Balarajan, Ramakrishnan, Özaltın, Shankar, and Subramanian (2011), the common types of maternal anaemia are folic acid anaemia, iron deficiency anaemia and vitamin B12 deficiency anaemia. Bendich (2008), posits that nutritional anaemias are consequences of insufficient intake of nutritious diet or low absorption of food nutrients to promote the synthesis red blood cells and Hbs in the individual. Insufficient intake of nutritious diet could be as a result of changes in the preparation of food or functional changes in women during pregnancy (Freire, Kahn, McGuire & Post, 2003). During food preparations, nutrients like folic acid, iron and vitamin B12 that stimulate the production of Hb are lost when exposed to heat (Karaoglu et al., 2010).

The deficiency in iron is caused by helminthiasis, monthly menstruation, low iron diet, a higher iron demands during pregnancy and poor absorption of iron (WHO, 2014). Iron plays an essential role in the various physiological activities of the body. During menstruation, most women tend to lose large volumes of iron in the body (Nguyen et al., 2015).

In folic acid deficiency anaemia, folic acid is vital for the synthesis and development of red blood cells. However, insufficient folate in the body alters the nature and the physiological activities of the RBC resulting in anaemia (Perry & Morrison, 2004). Studies indicate that, before women become

pregnant, they need to consume more folate to prevent megaloblastic anaemia. (Goonewardene, Shehata & Hamad, 2012).

Regarding vitamin B12 deficiency anaemia, vitamin B12 is an essential vitamin involved in the formation of RBC. Deficiency in vitamin B12 can lead to loss of RBC and the effect of the lost RBC is megaloblastic anaemia (Satyam & Khushbu, 2015). Research by Casey et al. (2010) concluded that 25% of women with low vitamin B12 levels were anaemic.

Diagnosis of anaemia during pregnancy

The basic method of diagnosing anaemia is inspection of the conjunctiva of the eyes for paleness. However, this method has shown to be unreliable. Checking of full blood counts and Hb levels are components of routine antenatal care (Sobhy, Rogozinska, & Khan, 2016). Per standard practice, all pregnant women are obliged to have their Hb checked for at least once in all the trimesters and this is normally done by the use of automated counter. In low income countries, according to Van den Broek (2003), an Hb photometer (HaemoCue) are mostly used to check Hb levels because is simple and accurate. Haemoglobin is measured with a blood sample inserted into a HaemoCue photometer. The HaemoCue has a sensitivity between 80% and 97% and specificity between 79% and 99%.

Signs and Symptoms of Anaemia in Pregnancy

Anaemia can be symptomatic or asymptomatic. Haas and Brownlie (2001), argued that pale appearance of the mucous membrane, difficulty in breathing and fatigue are some of the clinical manifestations of anaemia in pregnancy. A study by Muhe, Oljira, Degefu, Jaffar and Weber, (2000) revealed a specificity of 68% and a sensitivity of 95% for moderate anaemia

as evidenced by pale appearance of the palms, conjunctivae and the nail beds. Asymptomatic anaemia during pregnancy can be diagnosed following routine screening. The most common non-specific signs and symptoms of anaemia is tiredness in pregnancy. Some women may complain of weaknesses, headaches, palpitations, dizziness, dyspnoea and hair loss, tiredness and chestpain as early signs and symptoms of anaemia in pregnancy (Haas & Brownlie, 2001).

Effects/Complications of Anaemia in Pregnancy

There are a lot of health consequences when one suffers from anaemia which impacts on the country's development (WHO, 2014a). In low income countries, maternal anaemia is a public health canker and also a major complication during pregnancy (Buseri, Uko, Jeremiah, & Usanga, 2008). Anaemia during pregnancy is linked to 20% maternal mortality (Black et al., 2008). It is shown that anaemia may lead to heavy bleeding during delivery and predispose the women to postpartum haemorrhage. The complications of anaemia in pregnancy are maternal death, miscarriage, cardiac failure, preterm labour and still birth land still (Bodeau-Livinec, Briand & Berger, 2011). Anaemia in pregnancy also contributes to high perinatal mortality, low APGAR score and foetal wastage. During pregnancy, inadequate blood flow negatively affects the placenta. The capacity of the foetus to develop depends on the proper functioning of the placenta (Mahamuda, Feroza, & Shamim, 2011).

Nutrition during Pregnancy

Human beings need nutritious diet for proper functioning of the body system. Requirement of nutrients by the body in large amount is known as

macronutrients and in a small quantity is called micronutrients. Macronutrients are carbohydrates, fats, fibres, protein and water. The micronutrients are vitamins and minerals (Berg, Tymoczko, & Stryer, 2002).

Macronutrients

Carbohydrates give the body energy. Carbohydrate helps in the development of the foetal brain and for the synthesis of glucose (Whitney, Rolfes, Crowe, Cameron-Smith, & Walsh, 2009). Protein plays a vital role in the body by serving as a building block for the formation of muscles, hormones and enzymes. Lipids are essential for the growth of the foetus and the transportation vitamins such as fat-soluble vitamins. Fatty acids like linoleic and linolenic acid are needed for the development of the eye and the brain of the foetus (Innis & Friesen, 2008). Fibre is seen as an indigestible plant material which though it does not contribute to the development of the foetus, but prevent constipation and haemorrhoids among pregnant women. High blood sugars and high blood pressure can be controlled through the intake of dietary fibre (Threapleton et al., 2013). Generally, water and fluid act as a solvent for minerals, vitamins and glucose. It transports water soluble vitamins and eliminates waste products from the body. The standard water is 8-10 glasses for each day (Henderson & Lenders, 1999).

Micronutrients

According to Black et al. (2008), deficiency of micronutrients during pregnancy can be problematic for the foetus and the mother. Vitamins A, B12 D and iron deficiency are very common among pregnant women. Vitamin A, a fat-soluble micronutrient is necessary for good vision, immunity, and

development of epithelial tissues and formation of RBCs (Checkley et al., 2010).

The effects of vitamin D are on the bones which is responsible for maintaining the concentration of calcium in the body. During pregnancy, the foetus and the pregnant woman are prone to several diseases that have been associated with low levels of vitamin D (Christakos et al., 2013). A higher level of calcium is very necessary during the third trimester when the teeth and the bones are developing. It is then advisable that immediately after pregnancy, the pregnant woman should consume more calcium. One thousand miligrams (1000mg) of calcium is required during pregnancy (Wardlaw, 2000).

Iron is another essential mineral that performs various functions in the human body, including the ability to carry oxygen to the tissues via haemoglobin. The two forms of iron in the diet are haeme and non-haeme (Gropper, Smith & Groff, 2009). The difference between two is that the haeme iron can be found in haemoglobin and myoglobin as in animal products like meat and fish. Non-haeme iron is derived from plant products grain, fruit and vegetables. (Gropper, Smith, & Groff, 2009).

The first trimester

This stage involves the first 3 months of pregnancy. Nutritional deficiencies at this stage can limit the development of the foetus throughout the period (Wardlaw, 2000). During the first trimester of pregnancy, haemodilution occurs and the pregnant woman becomes anaemic. The haemodilution process is a physiological phenomenon and begins at 8th weeks of pregnancy and continuous to the 32nd and 34th weeks of pregnancy

(Chowdhury, Rahman & Moniruddin, 2014). They added that during the first trimester, there is a rapid development of the foetus. A deficiency in nutrient supply to the foetus may result in an adverse effect on the foetus before the maternal effects. As a result, the quality of nutritional intake by the pregnant woman is very paramount. Therefore, pregnant women need to consume nutritionally diet. In spite of the anorexia, nausea and vomiting in the first trimester, pregnant women should make sure that their nutritional needs are adequately met (National Institute of Nutrition, 2009).

The second trimester

The second trimester starts from the 4th month and the 6th month of pregnancy. Inadequate nutrition at this period, adversely affect the mother than the foetus. If the maternal nutrient is deficit at this stage, her capacity to produce breastmilk may be affected because the storage of fat during pregnancy serves as a source of energy for lactation (Worthington-Roberts & Williams, 2007). The cases of anaemia vary in the first, second and third trimesters. From a study conducted by Sayehmiri, Darvishi, Azami, and Qavam (2015), on prevalence of maternal anaemia in Iran, the study concluded that the prevalence of anaemia in the third trimester was 16%, the second trimester was 10% and the first trimester 20%.

The third trimester

The third trimester is characterised by a higher foetal demand of iron to the extent that the maternal iron may be depleted (Kalosa & Weismiller (1997). The functional changes that occur in the third trimester are very vital for the foetal development, maternal nutrient metabolism and preparation for labour and lactation. Among the developing countries, most pregnant women

have less iron storage. Hence, the need to provide them with 30-60mg iron supplements daily in their second and third trimesters. Sources of iron include eggs, fishes, meat, cereals, fruits and green leafy vegetables (WHO/FAO Report, 2004). In the third trimester, the Hb level is very essential in determining birth weight. The demands for iron and other micronutrients are highest leading to rapid growth of the foetus (Kumar, Asha, Murthy, Sujatha & Manjunath, 2013).

Malaria and Anaemia

The pregnant women, foetus and neonates are highly at risk of malaria infection (Gajida, Iliyasu & Zoakah, 2010). Most Sub-Saharan African countries have instituted several strategies to decrease the prevalence of malaria during pregnancy. The distribution of treated bed net at ANC and indoor residual spraying is among the efficient preventive measures (Ter et al., 2003). For pregnant women in the developing countries, WHO endorsed IPT with Sulfadoxine Pyrimethamine (SP) after quickening (WHO, 2012). A study in Congo by Messina, Mwandagilirwa, Taylor, Emch, and Meshnick (2013) on factors associated with anaemia indicated that anaemia is normally recorded among pregnant women with malaria. Most of the pregnant women (60%) with malaria were anaemic as compared to those who are not pregnant.

Prevention of Anaemia in Pregnancy

Maternal anaemia can be prevented or controlled by routine checking for maternal anaemia and regular intake of iron supplement to meet the iron needed during pregnancy (Dwumfour, 2013). An effective implementation of this policy is supported by improving environmental and social conditions and best practices to promote adequate maternal nutrition (Brooker, Hotez &

Bundy, 2008). Public health practices which aim at controlling anaemia include iron supplementation, control of malaria, intake of nutritious diet and deworming (Stoltzfus, 2001). Iron supplementation has been found to reduce maternal anaemia and improves infant development. A study conducted in Indonesia revealed that maternal intake of iron supplements contributed to a decreased risk of their children dying within 24 hours after birth (Dibley et al., 2012).

Parenteral iron can be given through the muscle or through the vein. Studies have shown that there is a significant association between low or average dose of iron supplementation and foetal development (Rodriguez-Bernal, Rebagliato, & Ballester, 2012). Pregnant women with mild anaemia (Hb level 9-10.5g/dl should be given oral iron 160 to 200mg daily (Breyman, Honegger & Holzgreve, 2010). When the anaemic status of the pregnant woman is severe (Hb < 7g/dl), there is the need for urgent medical treatment to prevent heart failure. Vitamin C really helps in the absorption of iron by changing ferric iron to ferrous iron. Ferrous iron is water soluble so it can easily be absorbed in the body (Hurrell & Egli, 2020).

The Prevalence of Anaemia among Pregnant women

Globally, about 50% of all pregnant women are suffering from anaemia with 52% in Sub-Sahara Africa as compared to 32% in industrialised countries (WHO, 2011). The WHO reported that over half of the pregnant women globally have Hb levels less than 11g/dl, which is classified as anaemia. In developing countries, the maternal anaemia cases are still high. Likewise, low haemoglobin levels are found in Ghana where malaria is endemic (WHO, 2005). Fiedler, D'Agostino and Sununtnasuk (2014),

recorded higher prevalence among pregnant women in Benin 61% in 2006 and Mali 69% in 2006.

Several studies have discussed the prevalence of maternal anaemia (Mangla & Singla, 2016; Raj & Mangasuli, 2016; Mbule, Byaruhanga, Kabahenda & Lubowa, 2013). In a retrospective study conducted by Raj and Mangasuli (2016) in India, the prevalence of maternal anaemia was 75% with 1 case classified as severe form with Hb level below 7g/dl.

In India, similar longitudinal observational research on the prevalence of maternal anaemia in rural India was conducted by Mangla and Singla (2016). A six months data was obtained from September 2014 to March 2015. It was concluded that the prevalence of maternal anaemia was 98%. From the ICMR classification of anaemia, out of 98% anaemia reported cases, 41.8% were mild, 37% were moderate anaemia, 16% were severe anaemia and 3.3% were very severe anaemia.

Mbule et al. (2013) conducted a study in Uganda. The study showed that the prevalence of maternal anaemia was 63%. For instance, in Egypt, a cross-sectional study by Zakia, et al., (2011), shown that the prevalence of maternal anaemia was 62%. A study by Kassa, Muche, Berhe and Fekadu (2017) on the prevalence and predictors of maternal anaemia in Ethiopia found that the prevalence of maternal anaemia was 32%. Another research conducted in Ethiopia by Abay, Yalew, Tariku and Gebeye (2017) on the determinants of prenatal anaemia showed that the prevalence of anaemia was 31.8%.

A cross-sectional study by Mulepati and Chaudhary (2017) to ascertain the factors that influence maternal anaemia. The study involved 280 pregnant women who were attending antenatal clinic at Tribhuwan University Hospital,

Kathmandu. A systematic random sampling procedure was used and the data were collected using interview schedule. The study had shown that the prevalence of maternal anaemia was 22.1%.

In 2014, the Ghana Demographic and Health Survey report indicated that 42% of the pregnant women were anaemic with 32% mildly anaemic, 10% moderately anaemic and less than 1% severely anaemic. Silva, Pimentel, and Camargo (2015), showed that the prevalence of maternal anaemia in Ghana was 59%. Acheampong, Appiah, Baffour-Awuah and Arhin (2018) also did a study in Ghana on the prevalence of maternal anaemia among 200 pregnant women. The study showed that the prevalence of anaemia was high and related to the number of children the pregnant women have. Another study conducted that assessed the levels of haemoglobin concentration of 205 pregnant women who were in their 3rd trimester concluded that the prevalence of maternal anaemia in the urban settings was lower than the rural settings (Glover-Amengo, Owusu, & Akanmori, 2005).

Causes of Anaemia

There are three causes of anaemia: 1) Insufficient or poor production of RBC, 2) increased RBC destruction and 3) increased RBC loss (Andrew et al., 2015). Noronha, et al (2010) added that the causes of maternal anaemia are multifaceted. The determinants of anaemia among pregnant women include; income levels, malnutrition, the age of pregnancy, multiple pregnancies, short pregnancy intervals and unemployment. However, in most cases, the major cause of anaemia in pregnancy is low socio-economic status (Leyla et al., 2010). Multiparity can cause anaemia in pregnancy due to reduction in the iron stores at every pregnancy and loss of blood during each delivery (Leyla et

al., 2010). Nwizu, Iliyasu, Ibrahim and Galadanci (2011) indicated that the more the number of pregnancies and deliveries, the more the pregnant women would likely develop anaemia. Also, married pregnant women are at risk of developing anaemia than single pregnant women (Nwizu et al., 2011).

Rush (2000) stipulated that in Sub-Sahara Africa, malaria and worm infestation (Schistosomiasis) account for 25% of anaemia among pregnant women. A research conducted by McClure, Meshnick, Mungai, Malhotra and King (2014), in coastal Kenya and it was revealed that 43% of the pregnant women had malaria, 31% had urogenital schistosomiasis, while more than 46% of the pregnant women were co-infected with two or more of these parasites.

From the points of view of Reveiz, Gyte and Cuervo (2007), anaemia in pregnancy has a variety of causes such as infection, inadequate nutrition and genetics. Hookworm infection is well noted and a common cause of anaemia in rural areas (Gamble, Ekwuru, Garner, & Kuile, 2007).

Micronutrient deficiency such as vitamin A, vitamin B12, folic acid, riboflavin can cause maternal anaemia. Also, lead poisoning can cause microcytic anaemia by inhibiting haemoglobin production as a result of abnormal globin synthesis. Excess alcohol consumption can lead to anaemia (Glover-Amengor et al., 2000). Gulen, Hanimeli, Karaca and Taneli (2012) reported that clients with chronic diseases like rheumatoid arthritis are predispose to microcytic anaemia.

Geophagia refers to the consumption of soil or clay during pregnancy. Geophagia makes pregnant women highly at risk of anaemia because it inhibits the metabolism of iron and other nutrients leading to maternal

anaemia. Research conducted in Sudan showed that pregnant women who eat clay were prone to anaemia (Adam, Khamis, & Elbashir, 2005). This clay ingestion is usually associated with the rural folks in Ghana.

Risk Factors of Anaemia in Pregnancy

Pregnant women in less resourced countries are more prone to anaemia as a result of low income, many pregnancies, many deliveries, short pregnancy interval, high illiteracy and late booking at ANC (Jufar & Zewde, 2014). Helminthiasis as results of the pregnant women's craving for soil may lead to anaemia. The UNICEF (2002), identified physiological processes like menstrual period which make a woman to be prone anaemia. The menstrual period consequently depletes iron stores in the body. Women who are pregnant are more at risk than non-pregnant women because anaemia is more common during pregnancy (Abu-Ouf & Jan, 2015).

A vegetarian or a woman who avoids red meat, is at a higher risk of developing maternal anaemia since animal protein is high in iron. Red meat, liver and even, seafood is high in iron, but some women can have aversions to meat during their pregnancies.

The World Health Organisation's Policy on Anaemia Control

The 2012 WHO policy on anaemia aimed at ensuring effective interventions that can help reduce maternal and infant's anaemia. The WHO recommended these interventions:

1. A diet rich in iron.
2. Malaria control using insecticide-treated nets and vector elimination.
3. Periodic deworming of all women in their reproductive age.

4. Late clamping of the umbilical cord at least one minute after birth to promote increased iron stores in both the mother and the infants.
5. Timely interventions that focus on the adolescent girls and pregnant women to prevent iron deficiency anaemia.
6. Hygienic practices to reduce the risk of infection.

7. Effective reproductive health education including prevention of pregnancy.

National Policy on Anaemia Control

The high prevalence of anaemia among vulnerable groups in Ghana has been documented for over a decade by in the Demographic Health Survey. In 2004, comprehensive policies to control anaemia among pregnant women were developed by the stakeholders at the Public Health Division of the Ghana Health Service. The major components of the policies are:

1. Maternal supplementation of iron and folic acid.
2. Food fortification.
3. Dietary diversification.
4. Malaria control, helminth infection control and reduction in exposure to common infections.
5. Education on health and nutrition at both static and outreach services.

To implement these strategies, there is the need for a capacity building in areas such as counselling, information, education and communication (IEC), resource mobilization, collaboration and coordination of relevant programmes, linking health facilities with communities, and monitoring and evaluation.

Theoretical Framework

Pender's Health Promotion Model (PHPM) is a model usually used for research in nursing, education and practice. The model is used to investigate the factors that predict person health promotion behaviour. The model initially looked at how individuals could make informed decision about their health and how some factors greatly influenced the decision and interventions the individual put in place to promote a healthy living (Sakraida, 2010). Pender (2011) opined that individual have different attitudes toward health. However, if each person understood the relevance of a healthy lifestyle, he or she would engage in health promotion behaviours.

The PHPM (2011) outlines its main components which include the following:

1. Individual characteristics and experiences. These include the previous behaviour of the individual and personal factors like psychological biological and sociocultural.
2. Behaviour – It involves specific cognition and affect. It also relates to the perceived barriers to action, perceived benefits of action, perceived self-efficacy, activity related affect, commitment to a plan of action, interpersonal and situational influences, immediate demands and preferences.
3. Behavioural outcomes – health promoting behaviours including the desired behavioural outcome of health decision making and preparation for action.

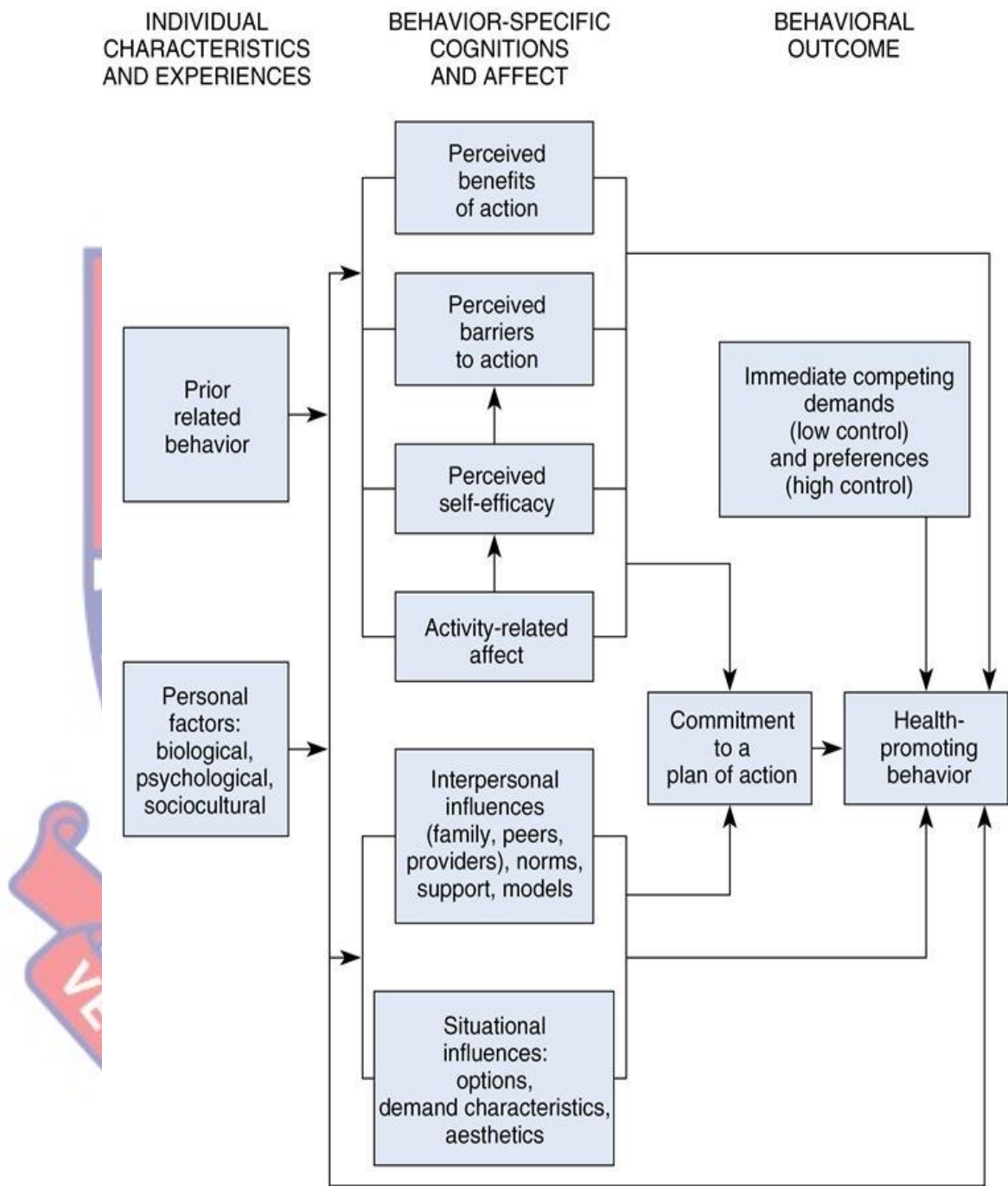


Figure 1: Theoretical Framework (Pender, 2002).

The PHPM has 4 assumptions:

1. The individuals voluntarily seek to take control of their own behaviours.
2. The individuals interact to develop themselves and the environment.
3. Health workers like nurses and doctors, form part of the interpersonal environment that affects the behaviours of the individuals.

4. The individual and environmental features are very important in transforming behaviour.

The strengths of the PHPM can easily be seen. It is used as a research tool. It is also simple, clear and highly applicable in the youth and adult. Furthermore, the model works best in the community health centres because the activities performed at the health centres focus on improving the well-being of people. However, the model is not applicable to children.

Knowledge of Pregnant Women on Anaemia

Nivedita and Shanthini (2016) did a study in India which aimed at assessing the knowledge and attitudes of pregnant women and their impacts on their Hb levels. The study indicated that about 40% of the pregnant women were enlightened about anaemia and understood the term anaemia. About 54% of the pregnant women agreed that pregnant women were more at risk to anaemia and 66% correctly responded that severe anaemia in pregnancy can affect the foetus. About 32.6% responded that apart from the consumption of adequate nutritious diet, pregnant women should regularly take iron supplementation. About 44.6% of the pregnant women were aware of their haemoglobin levels. Knowledge on the intake of iron rich food was poor among the pregnant women. At least, 20.0% of the pregnant women did not receive health education on anaemia from any source.

Yadav, Swamy and Bijendra (2014) did a study on the knowledge and practice of pregnant women with anaemia. The study involved 400 pregnant women. From the data collected, it was analysed by using descriptively and inferential. The study showed that the knowledge of the pregnant women regarding the cause of anaemia, clinical manifestations of anaemia and the

consumption of nutritious diet to prevent anaemia was poor. Nevertheless, knowledge on the treatment and preventive measures of anaemia was good.

Another study concerning a total of 354 pregnant women was carried out in Tanzania by Margwe and Lupindu (2018), to identify the anaemia trend and knowledge and attitude of the pregnant women toward preventive practices in rural areas. It was revealed that about 35% of the pregnant women correctly defined anaemia while 65% of them did not define anaemia correctly. About 37% of the pregnant women correctly responded to causes of anaemia such as parasitic infestations, genetic factors, poor diet and chronic infections. About of 36.7% of the participants correctly identified some of the food sources of iron like eggs, green leafy vegetables, and fruits which are required for prevention and treatment of anaemia. About 35.9% of the participants were aware that maternal anaemia has negative effects on both the foetus and the mother while 64.1% of the participants were not aware effects of anaemia during pregnancy. In general, 42% of the participants had no knowledge on anaemia, 23% of them had low knowledge and 35% of the participants had high knowledge.

In Malaysia, a research by Adznam, Sedek and Kasim (2018), on knowledge, attitude and practice levels on maternal anaemia which involved 370 pregnant women showed that 64 (17.3%) of the pregnant women correctly responded to all the questions on knowledge. About 67.0% of the pregnant women agreed that worm infestations could cause anaemia. About 51% of the pregnant women did not have insight regarding less than two years interval between pregnancies could cause anaemia in pregnancy. Majority of the

pregnant women (85%) agreed that regular intake of iron supplement and consumption of adequate nutritious diet during pregnancy could treat anaemia.

Another study by Ndukwu & Dienye (2013) on the prevalence and socio-demographic factors associated with maternal anaemia in Nigeria. It was revealed that 80% levels of knowledge among married pregnant women while about 75% levels of knowledge among pregnant women who were single. Dickson (2016) conducted a study that involved 384 pregnant women in Ablekuma South to assess their perceptions of risk of maternal anaemia, knowledge levels and levels of compliance to iron supplementation. It was indicated that 78% of the participants had knowledge regarding the risk factors of anaemia and the levels of compliance to iron supplements was 90%.

Duko, Tadesse, Gebre and Teshome (2017) did a research on knowledge of anaemia and its contributing factors among pregnant women attending antenatal clinic at Yiga Cheffe health centre in South Ethiopia. It was found out that the level of knowledge among pregnant women on anaemia was below average (44.3%).

Again, a study by Baby, Venugopal, D'silva, Chacko, Vineesha and Kumary (2014) on the assessment of knowledge level of pregnant women on anaemia in Putrajaya, indicated 29.9% levels of knowledge among the pregnant women. Therefore, the need for further study and health education to increase the knowledge level of the pregnant women on anaemia.

Perceived Barriers in Maintaining Appropriate Haemoglobin among Pregnant Women at ANC

There are potential barriers that affect pregnant women soliciting antenatal services. These barriers include long distance to the healthcare centre, educational level and socioeconomic status of the pregnant women (Titaley, Dibley, Roberts, Hall & Agho, 2010). Nisar, Aurangzeb, Dibley and Alam (2016) commented that in visiting antenatal for services pregnant women encountered barriers such as monetary limits, problems in getting to health centres in the rural settings, restraints partners, inadequate information about antenatal services. Nisar et al. (2016) recommended proactive policy implementation such as availability of health professionals at the health centres, involving men as partners to motivate and support pregnant women to access antenatal services and the improvement in the transportation to the health centres.

Adam (2015) did a study to ascertain the effects of nutritional education on Hb levels of pregnant women in the Central Region, Ghana. The study indicated that there are several causes of maternal anaemia including the consumption of less iron diets. At the end of the nutritional education, most of the pregnant women 89.8% demonstrated sound knowledge on anaemia.

Socio-cultural beliefs affect anaemia in pregnancy harmfully. Pregnant women live in communities where there are various beliefs and cultural practices that influence their knowledge on pregnancy, health and health care (Clerk, Bruce, Greenwood & Chandramohan, 2009). Clerk et al. (2009), documented that iron and folic acid supplementation are commended, however, economic hardships, cultural and social obstacles affect it

implementation. In some parts of the world, due to traditional beliefs, pregnant women are compelled not to consume nutritious diet.

Compliance to iron supplementation is a challenge as a result of programs implementation (Ogundipe et al., 2012). Due to the side effects of iron supplements, some pregnant women do not take iron supplementation (Ekstrom et al., 2008). Chandyo et al. (2016) did a research to predict the prevalence of iron deficiency anaemia. It was revealed that 90% of the pregnant women agreed that they take iron supplementation in the third trimester with majority of them commencing it in the first trimester. Blood loss due to infection causes gastrointestinal reduction of iron stores and impairment of the synthesis of red blood cells. Several factors such as excessive blood loss, alcohol intake, vitamin B12 and folate deficiencies, smoking and lack of sanitation predispose the pregnant woman to anaemia (Moosa & Zein, 2011).

Abriha, Yesuf and Wassie (2014) also conducted a study on determinants of prenatal anaemia. Total sample sizes of 762 pregnant women were selected for the study. It was realised from the study that the maternal age of 30-34 years household size of ≥ 6 , dietary diversity, no consumption of meat, not drinking soft beverages, under nutrition, not consuming fruits, inter-pregnancy interval of ≥ 2 years and 3rd trimester of pregnancy were significantly associated with anaemia.

Mulepati and Chaudhary (2017) did a study to find out the factors that are related to maternal anaemia in Kathmandu. A pretested questionnaire was used to collect the data. It was revealed that anaemia was statistically significant with pregnant women who did not regularly take iron supplements.

The Components of Health Education that the Pregnant Women received at ANC

The WHO endorsed focused antenatal care in Ghana which involves individualised care, diagnosing of diseases by the health professionals (Kinzie & Gomez, 2004). As part of the policy, all pregnant women were to have their Hb status checked at the first antenatal visit, 28th weeks and 36th weeks of pregnancy to detect and manage anaemia.

Antenatal care is a preventive health service rendered to pregnant women in both private and public healthcare facilities (Hofmeyr & Mentrop, 2015). Antenatal care focuses on promotive and preventive health care services in maternity with the aim of deriving positive outcomes for women, survival of the foetus and the infants (Fried, Sunderji, Birch & Eyles, 2013). According to Weiner, Billamay, Partridge and Martinez (2011), the health talk the pregnant women received at clinics can lead to improvement in understanding of new born care. World Health Organisation explained antenatal care as a promotive and preventive health care rendered to pregnant women for identifying and managing diseases that affect them and the foetus (WHO, 2013). The first antenatal visit enables the health professionals to identify pregnant women who are prone to a specific disease and need specific care and those who need only routine care (WHO, 2013). This can be achieved through early visit of pregnant women to antenatal clinic in their first trimester (Amoakoh-Coleman et al., 2016). Also, early first antenatal visit by pregnant women gives them the opportunity to be given health education that would produce positive maternal and infant outcomes (Agus & Horiuchi, 2012).

Dhange, Breeze and Kean (2013) remarked that the principle of antenatal care for women with no report of complicated pregnancies are to give health education, to screen pregnant women, to provide reassurance and to address minor problems of pregnancy. WHO (2002), determined three essential domains such as screening of the pregnant women for disease conditions, providing interventions to prevent or treat the conditions and educating pregnant women on safe birth. Also, ANC offers key opportunity for discussion between the health professionals and the pregnant women about how to detect complications during pregnancy. Furthermore, the health personnels provide health information on breastfeeding, newborn care and appropriate action to be taken if there is any health problem (Gerein, Mayhew & Lubben, 2003).

Hofmeyr and Mentrop (2015), revealed that the main goal of antenatal care is to help pregnant women with healthcare service such as routine iron supplementation, health education, identifying complications to prevent death. Nevertheless, there is argument between health education and the maternal factors (Hildingsson, Haines, Cross, Pallant & Rubertsson, 2013). Noncung (2017), conducted a study to assess the health educational needs of 240 pregnant women during their first ANC visit in Khayelitsha. The study revealed that the participants had a higher level of health education needs as compared to other studies. Most of the pregnant women preferred to listen to the midwives, nurses and doctors than the other health professionals. The study indicated that the need for health education was high for the first timers.

Rosliza and Muhamed (2011) conducted a study among 104 pregnant women age 15 to 49 years to assess attitude, knowledge and practice on antenatal care in Jempol, Negeri Sembilan. The study found out that, 92.3% of the respondents agreed that they visited the ANC in their previous pregnancies while 48% visited early for the first medical check-ups. Seventy percent of the pregnant women had previous records of delivery at home and 44% of the pregnant women were highly at risk of anaemia. Another research conducted by Igbokwe (2012) to assess attitude and knowledge among 259 pregnant women toward ANC and services in Nsukka, Nigeria. The study indicated that in the urban areas, pregnant women had average knowledge level on the components of ANC and services while in the rural areas the pregnant women had below average knowledge level. In Bangladesh, Ezeruigbo (2013), did a research to determine knowledge, attitude and practice concerning care during pregnancy and maternal nutrition and lactation. The study revealed that maternal health was influenced by socio-cultural beliefs and about food intake during pregnancy. The kinds of protein rich sources of foods mostly avoided were egg, meat and fish.

In Ghana, Dickson, Darteh and Kumi-Kyereme (2017) conducted a study on antenatal service providers in Ghana. The study focused on the impacts of antenatal service providers in Ghana from 1988-2014. It was revealed from the study that most of the antenatal services were provided by nurses. The proportion of pregnant women who had antenatal services improved from 55% in 1988 to 90% in 2014. Also, it was realised that pregnant women from the rural settings were more likely to seek antenatal

services rendered by the Tradition Birth Attendants (TBAs) while pregnant women from urban settings seek antenatal services from health professionals.

Factors that Predict Anaemia among Pregnant Women

Factors like maternal age, marital status and distance to the health facility influence maternal anaemia. According to a study by Chowdhury et al.

(2015) to determine the factors associated with maternal anaemia, it was shown that maternal age is a determinant of maternal anaemia. Nwizu et al. (2011) also did a research on the predictors of maternal anaemia in Kano, Northern Nigeria. It was revealed that about 33% of the pregnant women had no formal education. About 11.4% of them were those with tertiary education.

Also, regarding marital status, single or divorced pregnant women (67%) were more likely to develop anaemia as compared to the married women (16.0%).

The study indicated that the occurrence of anaemia was high (61.1%) and more common with pregnant women with low income than those with high income. Anaemia was found in pregnant women with high parity (grandmultiparous women (26.5%) as compared to grand uniparous women.

The study indicated that pregnant women who visited the ANC during the 1st trimester were less likely to develop anaemia (6.5%) as compared to those who visited ANC during the 2nd trimester (15%) and the 3rd trimester (28%).

Also, anaemia was found to be higher in pregnant women with less than one year interval between pregnancies.

In Ethiopia, Kassa et al. (2017), did a study on the prevalence and the determinants of maternal anaemia reported that primigravid and urban women were less likely to develop anaemia. Also, mothers with short pregnancy interval and malaria infection during pregnancy had a higher risk to develop

anaemia. Novivanti et al. (2019) did a research on the the association between socio-economic levels and maternal anaemia in Indonesia. The study revealed that there was no significant association between the level of education, occupational status, income level and maternal anaemia.

In a research by Chowdhury et al. (2015) on 224 pregnant women who visited ANC of the Marie Stops, Dhaka reported that about 63% of the pregnant women had Hb level above 11g/dl and 37% were anaemic, 26% had mild anaemia and 11% had moderate anaemia. Anaemia in pregnancy was significantly associated with maternal age, educational level, income status and place of residence.

Abiselvi, Gopalakrishnan, Umadevi and Rama (2018) conducted a study that involved 270 pregnant women in Tamil Nadu. It was found out that 41.5% of the pregnant women were anaemic. It was rounded up from the study that anaemia is a social canker, so pregnant women and their family members should be educated to understand anaemia in pregnancy and its risk factors.

Anlaakuu (2015) did a study on the prevalence of maternal anaemia in Sunyani. It was revealed the prevalence of anaemia among pregnant women who made four ANC visits was 44%. The study indicated that maternal age, the trimester of first visit, consumption of fish, meat, snail and malaria infection were significant determinants of maternal anaemia. Therefore, the study concluded that pregnant women should be educated on nutritious diet, prevention of malaria and early antenatal booking.

A study to predict the socio-demographic and antenatal characteristics of 400 pregnant women who were prone to anaemia at ANC at in the Bolgatanga Regional Hospital, Ghana was conducted by (Ahenkorah, Nsiah & Baffoe 2016). From the findings, it was shown that anaemia was significantly related to the number of pregnancy, number of delivery, trimester of pregnancy, sources of drinking water as well as young maternal age. Hence, pregnant women should be motivated to seek antenatal care for early detection of anaemia and to ensure that pregnant women use portable water for drinking and preparation of food to reduce increase the risk of anaemia.

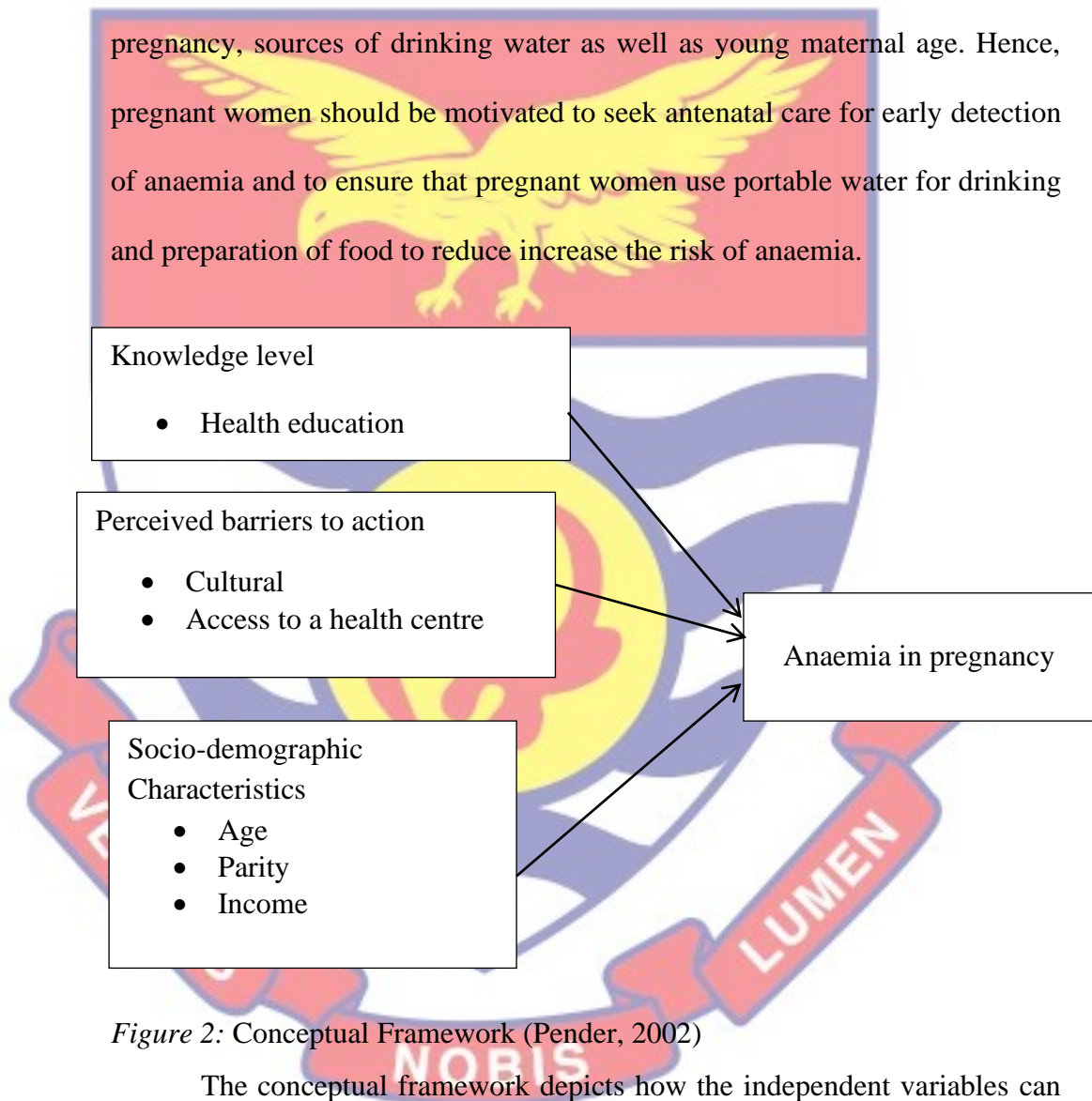


Figure 2: Conceptual Framework (Pender, 2002)

The conceptual framework depicts how the independent variables can contribute to anaemia during pregnancy. The conceptual framework is based on Pender's Health Promotion Model. Among the independent variables that can contribute to maternal anaemia is the age of the pregnant woman. For example, the younger pregnant women have less level knowledge on maternal

anaemia while the older pregnant women have a higher level of knowledge. (Messina et al., 2013).

Also, high parity can lead to reduction in the iron stores in the pregnant woman contributing to anaemia in pregnancy (Messina et al., 2013). Women who earn more are more likely to buy nutritious foods that could boost their haemoglobin levels. Again, the knowledge level of the pregnant woman on anaemia can influence the rate at which the pregnant woman is at risk of anaemia. Pregnant women with increased knowledge on anaemia, nutritious diet as well as prevention of infections such as malaria are less likely to develop anaemia. The perceived barriers to maintaining good haemoglobin level include the culture of the community and how accessible the health centres are to the pregnant women.

Cultural practices including food taboos may have negative effects on the pregnant women in rural areas because they may be denied of consuming iron and foods rich protein. In some communities, husbands do not allow their wives to go to social gatherings. Again, when there is accessibility to health services, pregnant women will be educated on positive health seeking behaviours so that early treatment of maternal anaemia can be administered to prevent complications. Also, thorough comprehensive laboratory investigations and other causes of anaemia will be confirmed and treated. Furthermore, health education on the benefits of good nutrition, family planning, prevention of malaria and prevention of worm infestation is likely to reduce or prevent anaemia among pregnant women. On the contrary, pregnant women who lack health education at the ANC are more likely to develop anaemia.

Pender's model has been used to ascertain the factors influencing maternal anaemia in the Cape Coast Metropolis of Ghana (Azu, 2016).

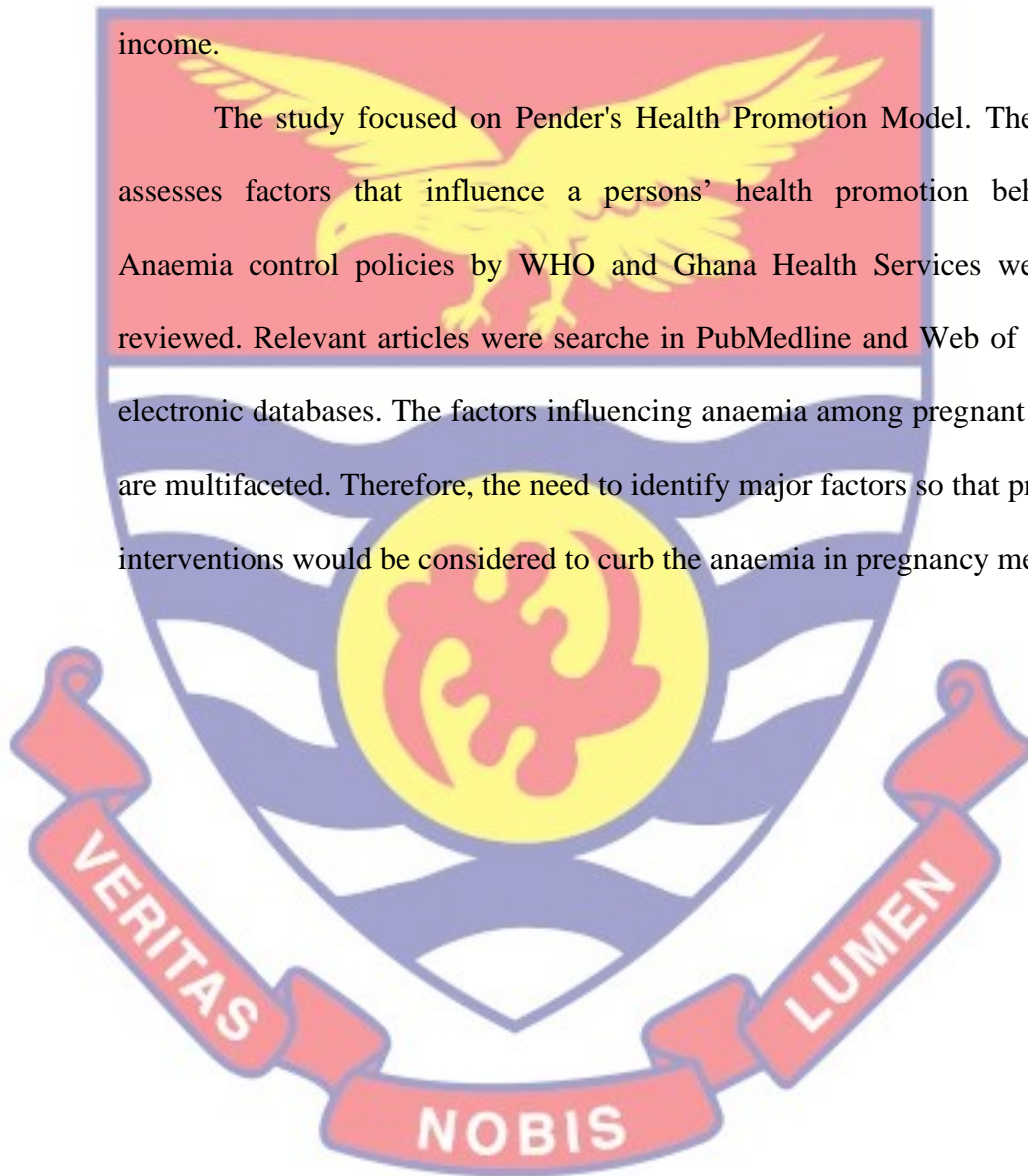
Summary

Globally, during pregnancy, anaemia is a serious health issue. The prevalence of maternal anaemia is still high in developing countries as compared to developed countries. Almost about 50.0% of pregnant women globally are anaemic, with 52.0% in Sub Saharan Africa as compared to 23.0% in developed countries. The knowledge level of pregnant women on anaemia focuses on general concepts of anaemia such as risk factors, causes, diagnosis, signs and symptoms as well as the prevention of anaemia. A study revealed that some of the participants have heard of the term anaemia and understood the concepts. However, the level of knowledge on consumption of food rich in iron was poor among some of the pregnant women.

Also, on the perceived barriers to maintain appropriate haemoglobin among pregnant women at ANC, pregnant women normally encounter challenges or barriers in their quest to receive antenatal care. Notable among these barriers are: long distance to the health facilities, restrictions from partners or husbands and absence or inadequate health professionals at the health facilities. Again, on the components of health education given by the health care providers, to the pregnant women at ANC, one of the best strategies to prevent or reduce maternal and infant mortality is the effective and regular use of the antenatal services by the pregnant women. The concerns on inadequate health education to address the information needs of the pregnant women in rural areas need to be effectively addressed. Encouraging regular antenatal care visit and educating on the preconception nutrition is

important for preventing maternal anaemia. Maternal factors like young maternal age, income status, place of residence, marital status and number of pregnancies are known to affect maternal anaemia. Results of the regression analysis indicated that anaemia during pregnancy was significantly associated with the age of the pregnant woman, educational status, living area and income.

The study focused on Pender's Health Promotion Model. The model assesses factors that influence a persons' health promotion behaviour. Anaemia control policies by WHO and Ghana Health Services were also reviewed. Relevant articles were searche in PubMedline and Web of Science electronic databases. The factors influencing anaemia among pregnant women are multifaceted. Therefore, the need to identify major factors so that proactive interventions would be considered to curb the anaemia in pregnancy menaces.



CHAPTER THREE

RESEARCH METHODS

The purpose of the study was to investigate the factors influencing anaemia among pregnant women attending antenatal clinic at Nkwanta North and Adaklu Districts. The study sought to ascertain the prevalence of maternal anaemia in the Nkwanta North and Adaklu Districts, assess the level of knowledge of pregnant women on anaemia in the Nkwanta North and Adaklu Districts, determine the perceived barriers to maintaining appropriate haemoglobin level among women during pregnancy in the Nkwanta North and Adaklu Districts, identify the components of health education the pregnant women receive at ANC in the Nkwanta North and Adaklu Districts and to determine the factors that predict maternal anaemia in the Nkwanta North and Adaklu Districts.

Research Design

The study was a quantitative one where the factors influencing anaemia among pregnant women were investigated. A longitudinal retrospective and prospective observation study design was used to conduct this research in both the Nkwanta North and Adaklu Districts. A longitudinal study is made up of observations of the same variables over a short period of time (Shadish, Cook & Campbell, 2002). According to McKinlay (2011), a longitudinal study refers to a study design which the researcher follows one group of the individuals over a long period of time, for example one month or years. The researcher must evaluate the participants at least two different periods so that they can do comparison. The researchers meet the participants at least two different times. It could be every three months or every year. The

duration for meeting the participants depends on the research topic, the length of the study and the age of the participants. It is observational study because the same group of individuals is studied over a long period. Data are collected from the beginning of the study and repeated throughout the period of the study for the researcher to observe how some of the variables may change over time. A retrospective study is normally conducted using information on events that have already occurred. In most cases, the researchers rely on some of the data that have been stored in the registry (Marijke, 2015). According to Sedgwick (2013), a retrospective study considers the health records of a group of patients or clients to reconstruct their experiences.

A prospective design is a longitudinal cohort type of design that follow up is done on homologous group of people at a point in time. The individuals may have different characteristics with the factors to be determined in the study (LaMorte, 2013).

The reasons for choosing a longitudinal retrospective and prospective observational design for this study was that already existing database (health record) of the pregnant women and also did a follow up to complete the data collection on the pregnant women attending antenatal clinics in the Nkwanta North and Adaklu Districts were used. Therefore, pregnant women in their last trimester were recruited; their Hbs for the last trimester were checked and their Hbs for the first and second trimesters were picked from their antenatal cards. The anaemia level of the pregnant women was ascertained based on the haemoglobin level below 11.0 g/dl as recommended by the (WHO, 2015). Again, longitudinal retrospective observational study design was particularly recommended for assessing the relationship between the development of a

disease and risk factors which was in concomitant with the research topic. A longitudinal retrospective observational study design did not involve manipulating of variables. Data was collected on a particular group of individuals and the appropriate statistical tools were employed to analyse changes over time for the group (Van Belle, Fisher & Heagerty, 2004).

The strength of a longitudinal retrospective observational study design is that the researcher does not need to follow patients or clients into the future. Also, various patients or clients can be compared to one outcome or several outcomes. A longitudinal retrospective observational study design considers past record of events to trace participants who have been exposed or not exposed to a particular disease. A longitudinal retrospective observational study design is relatively less expensive and faster to conduct than prospective study. This design is able to ascertain the current status of a particular disease in individuals and it is better for analysing multiple outcomes (Sedgwick, 2013).

Actually, every research methodology comprises planning stage and execution stage (Younus, 2014). Hence, within these two stages, there is a probability to have limitations or weaknesses which may be beyond the control of the researcher (Simon, 2011). When conducting a retrospective study, the researchers rely on others for accurate record keeping. This type of study design requires being very careful because errors as a result of confounding variables may be common. Furthermore, retrospective studies may require large sample sizes for real outcomes (James, 2017).

Steps taken to mitigate the weaknesses included proper representation of the study population to help the researcher to meet the purpose of the study. Again, the study was carefully planned to ensure that extraneous variables were reduced or eliminated. This was done by showing the questionnaire to experts and they made their inputs. Bias and confounding variables were also reduced by making sure that the outcomes and other variables were specific and clearly defined. Research Assistants were given training and motivation to enable them to collect accurate and complete data. The researcher also instituted checks to make sure that the data collected were valid.

Study Areas

The research was carried out at Kpassa and Damanko health centres in the Nkwanta North District and the five health centres in the Adaklu District (Waya, Ahunda, Nutifafa, Soda and Helekpe health centres). Originally, Nkwanta North District was part of Volta Region until December 27, 2018 when a referendum was done to create Oti Region. On the 15th of February 2019, the Oti Region has been carved out of the Northern part of the Volta Region, following the demands by Chiefs and other leaders. Oti Region is made up of eight districts. The districts are: Nkwnata North, Nkwanta South, Krachi-East, Krachi-West, Krach-Nchumuru, Biakoye, Jasikan and Kadjebi-Akan. The geographical characteristics of Nkwanta North District are similar to that of Adaklu District.

The Adaklu District is located at the southern part of the Volta Region and lies within longitudes 06°41'1"N and 6.68361°S and latitudes 00°20'1"W and 0.33361°E. It shares boundaries with Ho Municipal to the North, Central Tongu District, to the South, Agotime-Ziope District to the East and to the

West with Ho West District. The Adaklu District has 75 communities and the demands for land in the regional capital, and its surroundings is high and it becoming scarce and expensive. The proximity of the Adaklu District to Ho positions it as a suitable destination for investors and developers. A prominent characteristic of the District is Adaklu Mountain, located between Adaklu-Abuadi, and Adaklu -Tsrefe.

Potable water coverage in the district is low. Other sources of water are boreholes, rain catchments, rivers, hand-dug wells, dams and dugouts. Wells and boreholes form the major sources of domestic water supply to the people. The rivers are sometimes treated and distributed for household use.

Health service delivery in the District is categorised into Traditional and Modern. The modern one is administered by the District Directorate of Health located at Adaklu-Tsrefe. Health activities are carried out in the District by the Christian Health Association of Ghana (CHAG), Private and Ghana Health Service which operates a clinic at Sofa. There is no hospital in the Adaklu District so health services are mostly delivered at Community-Based Health Planning and Services (CHPS) compound. Severe cases are referred to Ho Municipal Hospital and the Ho Teaching Hospital which is about 25 kilometres from Adaklu District. The final disposal site for waste management is spearheaded by Zoomlion in collaboration with the Environmental Health Unit of the District Assembly.

There are various educational institutions in the District which cater for different categories of the school going population. These include tertiary, senior high, junior high, primary and pre-school education. The transportation system in the district is poor. The main means of transport is motor cycle

services. However, commercial drivers ply Ho-Adidome Highway and they render services to community members along the highway. Vehicular movement within the district is mostly witnessed during market days.

The people of Adaklu community have diverse religious and cultural set-ups. The people from the Ewe society give traditional worship recognition and acceptance. Other religions found are Christianity and Islam. Many festivals are annually celebrated to commemorate their ancestors. During these celebrations, libations are poured to the gods and ancestors of the land thanking them for their protection and guidance throughout the past years. The main festival for the people of Adaklu is Glidzi. Every January, the people of Adaklu celebrate the Glidzi festival to remember the death of their ancestors during their escape from Nortsie, their ancestral home. During such festivities, people from all walks of life and natives who reside outside the District come down to celebrate the event. This fosters unity and socialization culminating from a display of this rich cultural heritage to project the culture and the people of Adaklu in general. The culture of the District also defines the lifestyle and the occupation of the people. The traditional rulers are the custodians of these cultures, beliefs and practices of the people of Adaklu people. It can therefore be stressed that culture is an integral part of development and therefore should be critically looked at in the development of the District.

Population

Per the 2010 Ghana Population and Housing Census, Adaklu District has a population of about 42,344 people, made up of 20,774 males representing 49% and 21,570 females representing 51%. The total number of

women in fertility age was 9,351. The population of the Nkwanta North District per 2010 Ghana Population and Housing Census was 64,553 made up of 32,394 males representing 50.2% and 32,159 females representing 48.8%. The total number of women in fertility age was 14,758. The study population comprised all pregnant women, who are registrants and attending antenatal clinic at health centres in the Nkwanta North and Adaklu Districts and were available during the data collection period. The age range of the pregnant women was 15- 49 years. In 2017 and 2018, pregnant women who registered at the five health centres in the Adaklu District were 444 and 495 respectively and the deliveries in the same years were, 445 and 513 respectively. With regards to Nkwanta North District, in 2017 and 2018, pregnant women who registered at the two health centres in Nkwanta North District were 532 and 664 respectively and the number of deliveries in the same years were 465 and 526 respectively (Adaklu and Nkwanta North, District Health Directorates, 2018). To ensure all the pregnant women in their last trimester were captured, the registers of daily antenatal attendance from the health centres were obtained in order to know the total number of all the pregnant women in their last trimester. The total number according to the registers of both districts was 324 pregnant women. The total number of registrants in Adaklu District over the period of three months was 169 pregnant women and that of Nkwanta District was 155 pregnant women. The pregnant women who came for antenatal services were selected for each day until all of them were captured for the study.

The actual population of the research was 300 pregnant women for both Nkwanta North and Adaklu Districts. The reason for the 300 pregnant women was that within the three months of data collection, the researcher came across 150 pregnant women in Nkwanta North District and another 150 from Adaklu District.

Inclusion criteria

All pregnant women aged 15-49 years with at least 2 ANC visits (one in the 1st trimester and the other in the 2nd trimester) and a record of Hb status in their antenatal cards and were willing to partake in the study were included. The reason for considering at least two antenatal visits was to record the Hb of the pregnant women in their 1st, 2nd and 3rd trimesters.

Exclusion criteria

Pregnant women who reported at the ANCs for the first time and those who had blood transfusion the past two weeks. The study also excluded pregnant women who were not willing to be part of the study. Pregnant women in both districts who did not attend ANC were also excluded.

Sampling Procedure

The study adopted a census which was a quantitative method that attempted to collect information on all eligible elements in a defined population (Barnett, 2002). Census does not suffer sampling error and results are reliable and accurate. However, it is a time consuming process, expensive method and appropriate for population of homogenous nature. A common problem is missing data (nonresponse). The missing data occurs only when a portion of the data is usable due to inability of the participant to provide the information needed (Barnett, 2002). Data cleaning may be applied when

addressing issues associated with a missing data. Census is the most appropriate method for the study because data was collected on all the pregnant women in Nkwanta North and Adaklu Districts who attended antenatal clinic.

Actually, all pregnant women did not attend antenatal clinic at the same time so the researcher gave a time frame of three months to collect the data on all the pregnant women in their third trimester who registered and were attending ANC at the health centres readily available and willing to take part in the study.

Data Collection Instrument

A questionnaire was developed based on my knowledge of relevant literatures for the data collection. A questionnaire is a tool which is used for collecting data (Cohen, 2013). Questionnaire was chosen because a large number of participants can be reached and representative sample is possible. O'Leary (2014) suggests some of the strengths for using a questionnaire as it helps the researcher to collect data that is specific to the study. A large number of respondents can be reached and it can generate standardized, quantifiable, empirical data. However, O'Leary (2014) claims that some of the limitations associated with questionnaire as a research instrument include being; time consuming in administering and expensive to produce.

The entire questionnaire had 60 items. Three items on the prevalence of maternal anaemia. These are the Hb levels from first, second and third trimesters. Twenty-four items on knowledge of pregnant women regarding anaemia. Thirteen items on perceived barriers in maintaining appropriate haemoglobin level among pregnant women. Ten items on the components of

health education the pregnant women received at ANC and ten items on sociodemographic factors like maternal age, marital status, average monthly income, religion, educational level and number of children.

Under level of knowledge on anaemia, data were collected on what anaemia is, the causes, risk factors, signs and symptoms, effects and measures to prevent maternal anaemia and the response choice was Yes or No. On the perceived barriers in maintaining appropriate haemoglobin level among pregnant women, data were collected on whether religion of the pregnant woman accepted blood transfusion, her partner supported her financially, partner allowed her to go for antenatal visits, were you given iron pills for free at the ANC, attitude of the health workers was encouraging, the pregnant woman had a valid National Health Insurance card, were you given antimalaria drugs during ANC visits, the pregnant woman has taken dewormer during pregnancy, the distance to the health facility is very far, antenatal visit is not beneficial to the pregnant woman, the pregnant woman took snail and the response choice was four-point Likert Scale.

Also, on the components of health education the pregnant women received at ANC, data were collected on whether the pregnant women were given health talk on anaemia at ANC, given health talk on the benefits of good nutrition, family planning, how to prevent worm infestation, how to prevent malaria, on adequate rest, on the benefits of regular medical check, cleanliness and whether they were given talk on birth preparedness and the response choice was Yes or No. The anaemia status of the pregnant women was ascertained by measuring their Hb levels. The haemoglobin levels were measured and recorded on the antenatal card by the Laboratory Technicians or

the Midwives. Some of the instruments and reagents used for checking the haemoglobin levels were haemoglobinometer, pipette, sterile lancet, sterile tissue, surgical glove and surgical spirit, potassium cyanide and ferricyanide.

The questionnaire was pre-tested at Kpassa health centre in Nkwanta North District and at Helekpe health centre in Adaklu District. Forty participants were used for the pretest. Before the pre-test, the questionnaire consisted of 56 items. After the pre-test, four items were added to the barriers in maintaining appropriate haemoglobin making a total of 60 items. The four items added were: I have taken dewormer during pregnancy, I was given antimalarial drugs during ANC visits, antenatal visit is not beneficial to me and the distance to the health facility is very far. The reason for adding four items was to make the items on the perceived barriers to measure what they were supposed to measure. The validity is the extent to which the instrument is able to measure what it is intended to measure. The reliability of the instrument was measured using Cronbach Alpha. This was done after the pretest. The data was analysed with a software, Statistical Package for Social Sciences (SPSS) version 21. After the analysis, items on barriers for maintaining appropriate haemoglobin were not reliable so four extra items were added and when the data were collected again, the Cronbach Alpha value was 0.815 which could be interpreted as very good (Hulin, Netemeyer & Cuddeck, 2001).

Data Collection Procedures

Ten Research Assistants, five for each district were recruited and trained for two days in order to help to collect accurate and complete data. The components of the training included establishing of rapport with the

participants, explanation of the procedure, seeking the consent of the participants, recording the haemoglobin levels on the questionnaire which were obtained from the antenatal cards, ensuring privacy by inviting each participant to the counseling room, administration of the questionnaire and collection after it had been filled. Some of the Research Assistants who understood the local dialects interpreted the items on the questionnaire. For example, how old are you? This was interpreted in Ewe as "Fe nenie ne xor?"

For ethical implications, the researcher obtained clearance from the University of Cape Coast Institutional Review Board (ID UCCIRB/CES/2019/14). An introductory letter for data collection was also taken from the Head of Department (HPER UCC). The researcher sent letters to the authorities that matter and permission granted before the collection of the data at the health centres. The data was collected with a structured questionnaire. The researcher picked the haemoglobin value of the participants and recorded it in the questionnaire. After rapport was established, the procedure was explained to the participants. The questionnaire was filled at the counselling room at the health centres and it took 20 -25 minutes for each questionnaire to be completely filled. However, pregnant women who could not write or read were assisted by the Research Assistants to fill the questionnaire. Haemoglobin level less than 11.0g/dl during pregnancy was referred to as anaemia. After the explanation of the purpose of the study to the participants, informing the participants about their rights and the need for the participants to voluntarily participate in the study, informed consent was obtained. Confidentiality was also assured. An informed consent form was signed by the

participants before the data collection. The data were collected from 11th November, 2019 to 14th February, 2020.

Ethical Consideration

Ethical clearance was obtained from the University of Cape Coast. Introductory letters were also obtained from the Health Directors of Nkwanta North and Adaklu Districts. The organisational heads of the health centres in both the Nkwanta North and Adaklu Districts were duly informed. The concepts of the study were explained to the pregnant women and consent was sought before including them in the research. The pregnant women were assured that they have the right to withdraw from the study and their withdrawal would not influence the quality of services they received at the antenatal clinic. Any participant with language barrier was assigned an interpreter.

Data Processing and Analysis

After the data were collected, they were managed by assigning A to all data collected from Adaklu District and B for Nkwanta North District. The labeling was done to prevent mixing up of the data from the two different districts. The data were coded, entered and processed with SPSS version 21. The purpose of Research Question 1 was to determine the prevalence of maternal anaemia in the Nkwanta North and Adaklu Districts. Data generated was nominal. A percentage and a frequency were used to analyse the data (Raj & Mangasuli, 2016). The reason was to calculate the proportion of pregnant women with anaemia in both Nkwanta North and Adaklu Districts.

The purpose of Research Question 2 was to ascertain the knowledge level of the pregnant women on anaemia in the Nkwanta North and Adaklu Districts. Data generated were nominal. The data were analysed by using frequency and percentage (Yadav et al., 2014). The reason was to determine the level of knowledge of the pregnant women on anaemia in both Nkwanta North and Adaklu Districts. To calculate the knowledge level of the pregnant women on anaemia, pregnant women who scored 75.0 percent and above were categorised excellent knowledge. Also, pregnant women with knowledge between 50.0 percent and 75.0 percent were considered to have good knowledge and below 50.0 percent were classified as poor knowledge (Neetu & Anoldeep, 2017).

The purpose of Research Question 3 was to identify the perceived barriers in maintaining appropriate haemoglobin level among pregnant women in the Nkwanta North and Adaklu Districts. Ordinal data were generated using four-point likert scale. Before the analysis, the data were transformed into two-points by putting agree and strongly agree together and disagree and strongly disagree together. Data were analysed by using frequency and percentage (Adam, 2015). The reason was to identify major perceived barriers in maintaining appropriate haemoglobin level among pregnant women in both Nkwanta North and Adaklu Districts. To determine the perceived barrier for maintaining appropriate haemoglobin level, composite scores was generated. The focus of the composite scores is to reduce the potential of information overload.

Composite Scores

Scores	Rating
26-29	Competitive
30-35	Best
36	Maximum

The purpose for Research Question 4 was to identify the components of health education the pregnant women receive at ANC in the Nkwanta North and Adaklu Districts. Data was analysed by using frequency and percentage (Dickson et al., 2017). The reason was to ascertain the components of health education the pregnant women received at ANC.

The purpose of Research Question 5 was to ascertain the factors that predicted maternal anaemia in the Nkwanta North and Adaklu Districts. The data were mainly categorical and binary logistic regression was used to determine the factors that predicted the development of anaemia (Anlaakuu, 2015).

The study included the dependent and the independent variables. The dependent variable is the anaemia status and was measured on a nominal scale. The independent variables were categorical in nature (age, parity, gravida and educational status, marital status, religion and the occupation).

Model specification and Estimation Technique

The use of the logistic regression was appropriate because the dependent variable as dichotomous; defined as 1 if the pregnant woman was anaemic and 0 otherwise. The binary logistic regression as based on the odds and probability that a pregnant woman in the sample could be anaemic and the factors that could influence such probabilities.

If the probability of a pregnant woman being anaemic is given by p then the odd ratio is calculated as: $\frac{p}{1-p} = e^y$, where $1-p$ is the probability of

not a pregnant being anaemic. The odds ratio is therefore interpreted to mean by what factor does the probability of being anaemic multiplied when there is a

unit change in any of the predictors of anaemia (Long, 2016). This interpretation is a bit complex as compared to the marginal effects (Greene, 2000) which is estimated as: $\frac{\delta y}{\delta x_i} = \beta_i \cdot P(1-p)$. The ampical model as therefore

specified as: $y_i = \alpha + \beta_i X_i + \varepsilon_i$ Where α is the intercept, β_i is the marginal

effects of the i^{th} explanatory variables and ε is the stochastic error term. The

dependent variable y captures the probability that a pregnant woman could be

anaemic or not; while X is the vector of explanatory variables including age, gender, education level, marital status and income level of the respondents.

The model was estimated using the Maximum Likelihood Estimation (MLE)

methods (Kapsalis, 2010). The marginal effects are straight forward to

interpret than the odds ratio (Kapsalis, 2010). A case of marginal effects is

predicted which gives the probability that a pregnant woman will be anaemic

(Long, 2016). With the exception of age, all the other independent variables

were categorical, hence the margins were used for the analysis. The STATA

statistical model was chosen for the estimation over other statistical softwares

(such as SPSS) because such software do not have a better command to

estimating the marginal effects as compared to STATA (Kapsalis, 2010).

Summary

The chapter presented the road map to the conduct of the research. It explained how 300 respondents were sampled from the accessible population from two district for the study. The process of questionnaire development and validation was explained. The empirical model was presented and the estimation technique was stated.



CHAPTER FOUR

RESULTS AND DISCUSSION

The purpose of the study was to investigate the factors influencing maternal anaemia in the Nkwanta North and Adaklu Districts. The study sought to ascertain anaemia prevalence among pregnant women in the Nkwanta North and Adaklu Districts, determine the knowledge level of pregnant women on anaemia in the Nkwanta North and Adaklu Districts, determine the perceived barriers to maintaining appropriate haemoglobin level among pregnant women in the Nkwanta North and Adaklu Districts, identify the components of health education the pregnant women receive at ANC in the Nkwanta North and Adaklu Districts and determine the factors that predict anaemia among pregnant women in the Nkwanta North and Adaklu Districts. This chapter deals with the results of the research and discusses the results in relation to the specific research questions.

Research Question One: What is the Prevalence of Anaemia among Pregnant Women in the Nkwanta North and Adaklu Districts?

This research question sought to ascertain the prevalence of anaemia among pregnant women in the Nkwanta North and Adaklu Districts. Data were collected on Hb levels at first, second and third trimesters of pregnancy. Haemoglobin level of 1 to 10 g/dl was categorised as anaemia while haemoglobin level of 11 to 15 g/dl was considered normal (WHO, 2015a). Table 1 shows that out of the total of 150 pregnant women who participated in the study in the Nkwanta North District, 64% (n=96) were anaemic in their first trimester, while 36% (n=54) were not anaemic. For Adaklu District, out of the total of 150 participants, 75% (n=113) were anaemic while 25% (n=37) were not anaemic in the first trimester. With regards to the second trimester,

67% (n=101) of the participants in Nkwanta North District were anaemic while 33% (n=49) were not anaemic. In Adaklu District, 81% (n=121) of the participants were anaemic while 19% (n=28) were not anaemic. For the third trimester, 71% (n=107) of the participants in the Nkwanta North District were anaemic while 29% (n=43) were not anaemic. In relation to Adaklu District, 79% (n=118) of the participants were anaemic while 21% (n=32) were not anaemic.

Table 1: Prevalence of Anaemia among Pregnant Women

Prevalence	Nkwanta North		Adaklu	
	F	%	F	%
First Trimester				
Hb range				
1-10	96	63.99	113	75.33
11-15	54	36.01	37	24.67
Second Trimester				
Hb range				
1-10	101	67.33	121	81.33
11-15	49	32.67	28	18.67
Third Trimester				
Hb range				
1-10	107	71.32	118	78.67
11-15	43	28.67	32	21.33

Source: Field data (Tettegah, 2020)

The findings of the study indicated there is high prevalence of maternal anaemia in the Nkwanta North and Adaklu Districts. The overall prevalence of anaemia among pregnant women overall prevalence of anaemia among pregnant women in the Nkwanta North over the three trimesters was 68% while that of Adaklu District was 78%. Secondly, the study revealed that anaemia occurred in all the three trimesters of pregnancy with the highest occurrence in the second trimester in Adaklu district. Most common occurrence of anaemia was in the third trimester in both districts. The high prevalence of anaemia in pregnancy in both districts may be that the study was

conducted in a developing country where infectious diseases such as malaria, worm infestation are rampant. Inadequate nutritional intake, lack of family planning and inadequate health education are also implicated.

Again, the occurrence of anaemia in all the three trimesters of pregnancy could be that in their 1st trimester of pregnancy, pregnant women were more likely to develop anaemia because of the process of haemodilution which starts from the 8th week of pregnancy and also some of the women might not have enough store of iron before pregnancy sets in. Furthermore, early morning sickness (Hyperemesis gravidarum) characterised by severe vomiting in the first trimester could lead to anaemia in pregnancy. In the second trimester, increased development of the foetus leads to increased demand of nutrients especially iron. Deficiency of iron at this stage could lead to anaemia. The occurrence of anaemia was most common in the third trimester because at this stage, the foetus is well developed and could even survive outside the uterus, hence a higher increase in the demand of nutrients especially iron.

Implication of the result is that, pregnant women in the Nkwanta North and Adaklu Districts are more prone to maternal mortality and morbidity, preterm birth, low birth weight, miscarriage and poor intrauterine growth. Also, these effects could lead to prenatal mortality and morbidity. To address the issue, Stoltzfus (2001), proposed that public health practices which aimed at controlling anaemia included iron supplementation, control of malaria, intake of nutritious diet and deworming should be given special attention. Again, regular antenatal visits eating fruits and green leafy vegetables can prevent anaemia among pregnant women in the Nkwanta North and Adaklu

Districts. The high prevalence of anaemia among the pregnant women in the Nkwanta North and Adaklu Districts could also be due to some of the pregnant women not regularly taking the iron supplementation or some of the pregnant women may not take the iron supplement with fruits rich in Vitamin C (Orange, guava and pineapple) which help in the absorption of iron in the body

This high prevalence of maternal anaemia in the Nkwanta North and Adaklu Districts is in concomitant with (Ghana Demographic Health Survey, 2016), which revealed that out of the 25 Districts in the Volta Region, Adaklu District had the highest percentage of 72.0 in 2016 while Nkwanta North District placed second in the same year with a percentage of 68.8. This indicates that the anaemia in pregnancy situation has not changed. Therefore, there is the need for immediate interventions to curb the problem. Also, the result of the study confirms the views of Munasinghe (2014) that anaemia in pregnancy is a major public health concern that affects both developed and developing countries and has a serious implication on the socio-economic status of each country. The researcher did the study in Ghana, which is a developing nation with high prevalence of anaemia. The result is also in line with the idea that 23% of the pregnant women in high income countries are anaemic as compared to 52% of the pregnant women in low income countries (Soma-Pillay et al., 2016).

Research Question Two: What is the Level of Knowledge of Pregnant Women on Anaemia in the Nkwanta North and Adaklu Districts?

This research question sought to determine the knowledge level of the pregnant women on anaemia. Table 2 shows the knowledge level of pregnant women on anaemia in the Nkwanta North and Adaklu Districts. From the results, out of a total of 100% (n= 300) of the pregnant women, 91.3% (n=274) of the pregnant women had excellent knowledge on anaemia in pregnancy, 8.7% (n=26) had good knowledge and none of the pregnant women had poor knowledge. Specifically, in Nkwanta North District, 90.7% (n=136) of the pregnant women had excellent knowledge on anaemia while 9.3% (n=14) had good knowledge. In Adaklu District, 92.0% (n= 138) of the pregnant women had excellent knowledge on anaemia while 8.0% (n=12) had good knowledge.

Table 2: The Knowledge Level of Pregnant Women on Anaemia in the Nkwanta North and Adaklu Districts

Districts	Level of Knowledge					
	Excellent		Good		Total	
	F	%	F	%	F	%
Nkwanta North District	136	90.7	14	9.3	150	100
Adaklu District	138	92.0	12	8.0	150	100
Total	274	91.3	26	8.7	300	100

Source: Field data (Tettegah, 2020)

The findings of the study showed that the knowledge of the pregnant women on anaemia in the Nkwanta North and Adaklu Districts is high. The increase knowledge on the definition of anaemia, its signs and symptoms as well as prevention measures means the pregnant women understood the health education they received at ANC.

Implication of high knowledge level on anaemia demonstrated by the pregnant women in the Nkwanta North and Adaklu Districts, suggests that the healthworkers attending to these pregnant women are really performing their duties and they need to be commended. Also, the finding indicates that there is the need to maintain the health education given to the pregnant women at ANC because there might be a situation where some of the pregnant women could forget the concept that they were taught. In fact, knowledge on maternal anaemia is very essential because the cause of anaemia is multifactorial.

Generally, the increase level of knowledge on anaemia should have led to the reduction in the prevalence of anaemia in both districts. Unfortunately, the opposite was witnessed. This could be that sometimes, knowledge may not be translated into action or some of the pregnant women may not apply their knowledge due to cultural barriers. In Adaklu District, the pregnant women were aware of snails as rich source of protein and snails are abundant there so the consumption of snail could boost their haemoglobin levels. Unfortunately, it is a taboo to eat snail in Adaklu so the pregnant women would not consume snail which may contribute to anaemia in pregnancy. In Nkwanta North District, food processing before consumption is a challenge. Green leafy vegetables including okro have to be dried under the sun for at least three days before it would be used for a soup. In effect, the nutritional values in the food are reduced. Meat, egg, green leafy vegetables and fish are rich in iron but some indigenes are less likely to add them to their diet.

The knowledge exhibited by the pregnant women on anaemia is in accordance with the views of Yadav et al. (2014), that knowledge regarding prevention of anaemia was good. Again, the finding supports the views of

Ndukwu and Dienye (2013) and Dickson (2016). Ndukwu and Dienye (2013) observed that about 80% of the pregnant women who married had knowledge on anaemia as compared to 75% of the pregnant women who are single. While Dickson (2016) reported that 78% of pregnant women had knowledge on the risk factors of anaemia and their level of compliance to iron supplement was 90%. A similar geographical and socio-demographic characteristic might contribute to the consistency in the findings of the research.

Research Question Three: What are the Perceived Barriers in Maintaining Appropriate Haemoglobin Level among Pregnant Women in the Nkwanta North and Adaklu Districts?

The purpose of this research question was to determine the perceived barriers in maintaining appropriate haemoglobin level among pregnant women in both districts. The results are presented in Table 3. Out of the 100% (n=300) pregnant women in both Nkwanta North and Adaklu Districts, 92.4% (n=277) agreed that their partners supported them financially while 7.6% (n=23) of the pregnant women disagreed. The views of the pregnant women were sought as to whether they did not take folic acid regularly. Out of the 300 pregnant women, 9% (n=27) of them agreed that they did not take folic acid regularly while 91% (n=273) of the pregnant women disagreed. Also, 32% (n=97) of the pregnant women agreed that in their community, pregnant women did not take eggs while 69% (n=203) of them disagreed. Furthermore, 55.3% (n=166) of the pregnant women agreed that in their community, pregnant women did not take snail while 44.7% (n=134) of the pregnant women disagreed. Besides, 73.3% (n=217) of the pregnant women agreed that the attitude of the health workers was encouraging while 26.7% (n=83) of them disagreed. Again, 11%

(n= 63) of the pregnant women agreed that they do not have a valid National Health Insurance card while 89% (n=267) of the pregnant women disagreed.

Based on whether the participants had taken dewormer during pregnancy, 72% (n=217) of them agreed while 29% (n=83) of the pregnant women disagreed. About 67.7% (n=203) of the pregnant women agreed that they were given antimalaria drugs during ANC visits while 32.3% (n=97) of them disagreed. Also, 79% (n=236) of the pregnant women agreed that their religion accept blood transfusion while 21% (n=64) of the pregnant women disagreed. Moreover, 8% (n=23) of the pregnant women agreed that Antenatal visit was not beneficial to them while 92% (n=277) of the pregnant women disagreed. Besides, 91% (n=273) of the pregnant women agreed that the distance to the health facility was very far while 9% (n= 27) of the pregnant women disagreed.

The finding of the study demonstrated that most of the pregnant women in the Nkwanta North and Adaklu Districts do not eat eggs and snails and were not given antimalarial drugs during ANC visits. Secondly, far distance from the residence of the pregnant women to the healthcare facilities is a potential challenge. The reason for the majority of the pregnant women not taking eggs and snails in their community could be due to culture and belief systems that adversely affect the pregnant women to develop anaemia. For example is a taboo to eat snails in Adaklu.

Table 3: Perceived Barriers in Maintaining Appropriate Haemoglobin Level among Pregnant Women

Statements	Nkwanta North District				Adaklu District				Total			
	Agreed		Disagreed		Agreed		Disagreed		Agreed		Disagreed	
	F	%	F	%	F	%	F	%	F	%	F	%
Whether partner supports me financially	139	92.7	11	7.3	138	92.0	12	8.0	277	92.4	23	7.6
My partner allows me to go for antenatal visits.	136	90.7	14	9.3	130	88.7	20	13.3	267	88.7	34	11.3
I am given iron pills for free by at the clinic.	136	90.7	14	9.3	137	91.3	13	9.7	273	91.0	27	9.0
I do not take folic acid regularly	14	9.3	136	90.7	13	9.7	137	91.3	27	9.0	273	91.0
In my community, pregnant women do not take eggs.	49	33.7	101	67.3	48	32.0	102	68.0	97	32.3	203	68.7
In my community, pregnant women do not take snail.	80	53.3	70	46.7	86	57.3	64	42.7	166	55.3	134	44.7
The attitude of the health workers is encouraging.	102	68.0	48	32.0	115	77.0	35	23.0	217	73.3	83	26.7
I do not have a valid National Health Insurance card.	11	7.3	139	92.7	22	14.7	128	85.3	33	11.0	267	89.0
I have taken dewormer during pregnancy.	102	68.0	48	32.0	115	77.0	35	23.0	217	72.3	83	28.7
I was given antimalaria drugs during ANC visits.	101	66.0	49	34.0	102	68.0	48	32.0	203	67.7	97	32.3
My religion accepts blood transfusion	123	82.0	27	18.0	113	75.3	37	24.7	236	78.6	64	21.4
Antenatal visit is not beneficial to me.	11	7.3	139	92.7	12	8.0	138	92.0	23	7.7	277	92.3
The distance to the health facility is very far.	136	90.7	14	9.3	137	91.3	13	9.7	273	91.0	27	9.0

Source: Field data (Tettegah, 2020)

Furthermore, the long distance from the residence of the pregnant women to the healthcare facilities is a potential challenge because it would prevent some of the pregnant women in both districts not to regularly attend the antenatal clinic or they may go to the clinic late or they may not even go to the clinic for the antenatal services.

Implication of the finding on perceived barriers in maintaining appropriate haemoglobin level among pregnant women in Nkwanta North and Adaklu Districts, suggests that socio-cultural beliefs increase the possibility of the pregnant women to develop anaemia.

With regards to the findings on the perceived barriers in maintaining appropriate haemoglobin, the views of the pregnant women were sought as to whether they did not regularly take folic acid is in line with the opinions of Clerk et al. (2009) that iron and folic acid supplementations are commended. On whether pregnant women did not take eggs and snails in their communities, it was seen that many of the pregnant women agreed that they did not take eggs in their community. In relation to the pregnant women who took dewormers during pregnancy, the outcome is in line with the views of Jufar and Zewde (2014) that worm infection is as results of women's craving for soil during pregnancy and may contribute to anaemia. The consistency of the finding with that of Jufar and Zewde (2014) could be that many pregnant women in both study areas crave for clay. Antenatal visit is beneficial to the pregnant women. Long distance to the health facility is a potential challenge. This supports the views of Nisar et al. (2016) who endorsed the need to formulate and implement policies like community awareness campaigns to encourage, availability of healthcare professionals and to encourage pregnant

women to access antenatal services. Besides, it was identified that most of the pregnant women were financially supported by their partners. Again, their partners allowed them to go for antenatal visits. The endorsement given here contradicts the views of Nisar et al. (2016). Nisar et al. lamented that visiting antenatal for services, pregnant women encounter barriers such as monetary limits, problems in getting to government health facilities especially in rural areas, restraints from husbands or mother-in-law's, a perceived lack of information about antenatal services and no experience of antenatal services during previous pregnancies.

Research Question Four: What Components of Health Education do the Pregnant Women Received at ANC in Nkwanta North and Adaklu Districts?

This question sought to identify the components of health education that the pregnant women received at ANC. The results are presented in Table 4. Most of the pregnant women, 99% (n=297) agreed that they received education on malaria when they attended antenatal care with the situation at Nkwanta North District being relatively higher than that of Adaklu District. The universality of the endorsement of this statement suggested that the health providers took the issue of malaria prevention during pregnancy as serious as it was required of them in both districts. About 97.67% (n=293) of the pregnant women agreed that they received health talks on cleanliness during pregnancy with the situation in Nkwanta North District being relatively better than that of Adaklu District.

Another highly endorsed area was health talks on the benefits of good nutrition and regular medical check-ups which were endorsed at about 97% (n=291). About 96.3% (n=289) of the pregnant women agreed that they were

given health talks on adequate rest. Besides, 93.7% (n=281) of the pregnant women agreed that they were given health talks on anaemia during their ANC visits while 93% (n=279) of the pregnant women indicated that they received health talks on birth preparedness. About 90.3% of the pregnant women accepted that there was health talk on family planning and health talks on effects of alcohol use. The least accepted statement was health talks on how to prevent worm infestation which the result was about 88% (n=264) of the pregnant women.

The findings of the study revealed that most of the pregnant women in the Nkwanta North and Adaklu Districts received health education in all the components except few of the pregnant women disagreed with some of the statements. Why the majority of the pregnant women did agree that they were given health talk at antenatal clinic may be that the Health Workers are committed to rendering antenatal services to the pregnant women. On the contrary, few of the pregnant women disagreed with some of the statement because they may be late or they did not regularly attend antenatal clinic to listen to the health talks.

The implication of the result on the components of the health education the pregnant women received at ANC in the Nkwanta North and Adaklu Districts, suggests that the pregnant women in both districts received health education on most of the important issues related to pregnancy, which ideally should have contributed to the reduction of anaemia cases in the study areas.

Table 4: Component of Health Education provided to Pregnant Women in the Study Area

Parameters	Overall				Adaklu District				Nkwanta			
	Yes		No		Yes		No		Yes		No	
	F	%	F	%	F	%	F	%	F	%	F	%
Have you been given health talk on how to prevent malaria?	297	99.00	3	0.1	147	98.00	3	2.0	150	100.00	0	0
Have you been given health talk on cleanliness?	293	97.67	7	2.4	144	96.00	6	4.0	149	99.3	1	0.7
Have you been given health talk on the benefits of good nutrition?	291	97.00	9	3.0	143	95.3	7	4.7	148	98.7	2	1.3
Have you been give health talk on the benefits of regular medical check-ups?	291	97.00	9	3.0	143	95.3	7	4.7	148	98.7	2	1.3
Have you been given health talk on adequate rest?	289	96.3	11	5.7	139	92.7	11	7.3	150	100.00	0	0
Have you been given health talk on anaemia at ANC?	281	93.7	19	6.3	137	91.3	13	8.7	144	96.00	6	4.0
Have you been given health talk on birth preparedness?	279	93.00	21	7.0	132	88.00	18	12.0	147	98.00	3	2.0
Have you been given health talk on family planning?	271	90.3	29	9.7	127	84.7	23	15.3	144	96.00	6	4.0
Have you been given health talk on effects of alcohol use?	270	90.00	30	10.0	131	87.33	19	12.7	139	92.7	11	7.3
Have you been given health talk on how to prevent worm infestation?	264	88.00	36	12.0	134	89.3	16	10.7	139	86.67	11	7.3

Source: Field data (Tettegah, 2020)

Unfortunately, there is increased number of anaemia cases in both districts. The decision to give health talk to pregnant women during ANC visit could be motivated by the fact that such knowledge has close link with the well-being of the pregnant women. The percentages for all the statements could be accepted as higher enough for relatively rural communities since there were higher tendencies that some of the pregnant women disagreed with certain statements. Some of the pregnant women actually did not attend antenatal clinic continuously to listen to the health talks. Hence, the efforts of the Health Professionals in the two districts deserved commendation for the overwhelming endorsement of their good service delivery educating the pregnant women on key issues relating to anaemia in both districts.

The high endorsement in relation to health talk on the benefits of good nutrition and regular medical check-ups is in support of the earlier observation of Adam (2015) in the Central Region where he found the knowledge level of pregnant women on good nutrition to be about 90%. The consistency of the finding with that of Adam (2015) could be that there are a lot of Ewes in the Central Region and the common occupation is fishing. Again, it is generally agreed that ANC visits are not only for medication but serves as contact ground for health promoters to interact with the pregnant women. Mulepati and Chaudhary (2017), Amoakoh-Coleman et al. (2016), and WHO (2013) explained the effectiveness of ANC visit by stating that ANC visit helps to recognise and distinguish between pregnant women who need special care and those who need normal care. Dhange et al. (2013) underscored the reasons for ANC visits for pregnant women even if they have no complication by stating that the principles of ANC is to give health education, screening and to treat

minor ailments and referrals. That is, ANC visits are at the heart of health education and the pregnant women can best be educated if they are present at the health facilities. In essence, it is during health talks on ANC that the health promoters can help the pregnant women to understand the need to be regular at the health facility even if they feel they are not ill.

Research Question Five: What Factors Predict Anaemia among Pregnant Women in the Nkwanta North and Adaklu Districts?

This research question sought to determine the factors that predict anaemia among pregnant women in the Nkwanta North and Adaklu Districts. Binary logistic regression was used to ascertain the factors that predict anaemia among pregnant women in the two districts. The trimester was used for the logistic regression because anaemia was most common in this trimester. The odd ratio was used for the analysis though the absolute coefficients were also presented. The overall class percentage was 70% in the model for Adaklu District and 71% in the model for Nkwanta North District, both indicating relatively good fits of the models for interpretation. In both tables, the odd ratio was captioned as Exp (B), since the odd ratio is the natural exponent of the coefficient.

The maternal anaemia cases in the Nkwanta North District were also assessed and the outcomes presented in Table 5. Shows that age was a significant predictor of anaemic status of pregnant women in Nkwanta North District. The young pregnant women had less chance of being anaemic during pregnancy as compared to the matured and older pregnant women. This outcome was consistent with what was observed at Adaklu District since increasing age was found to increase the chance of a pregnant woman being anaemic. Comparing the young pregnant woman, the probability of a mature

pregnant woman being anaemic increased significantly by 79.1% (OR=1.7905852, 95% CI= [1.444-1.974], $P=.037$), while the increase in anaemic level of the older pregnant women was not significant by 8.2% (OR=1.081866, 95% CI= [0.822-1.979], $P=.086$).

The outcome on marital status also indicated that the divorced pregnant women were more likely to be anaemic than the married and single pregnant women. That is, compared to the married pregnant women, the odd that a divorced pregnant would be anaemic is 1.1951267 which results in about 19.5% increase in the probability of being anaemic (OR=1.1951267, 95% CI= [0.473-2.146], $P=.034$) while that of the single is multiplied by 0.3006535.

In Nkwanta North District, it was observed that the probability of being anaemic during pregnancy decreased as the number of times of pregnancy increased, which was consistent with what was observed in Adaklu District. Comparing the women who were pregnant for the first time, the odd of being anaemic is 2.952139 for those with 2 to 3 pregnancies which result in about 195.2% increase in the probability of being anaemic (OR=2.952139, 95% CI= [1.497-2.662], $P=.017$) while pregnant women with more than 4 pregnancies in the past, the odd of being anaemic was multiplied by 2.191577 which increased by 19% (OR=.2.191577, 95% CI= [1.031-2.600], $P= 0.016$).

The outcome suggested that the less educated pregnant women had lower probability of being anaemic than the more educated pregnant women. The odd that a pregnant woman with high education being anaemic was about 1.4454275 times that of a pregnant woman with no formal education, representing an increase of 44.5% in probability (OR=1.4454275, 95% CI= [0.338-1.956], $P=.019$). The outcome further indicated that pregnant women

with lower income have lower chance of being anaemic during pregnancy than those with high income. As compared to a pregnant woman without formal education, the odd that a pregnant woman with monthly income between GHS300.00 and GHS500.00 being anaemic was multiplied by 3.394791, which represented a probability increase of about 39.5% (OR=3.394791, 95% CI= [2.084-4.529], $P=.047$), while those with monthly income higher than GHS500.00 is multiplied by 2.501056, representing an increase in anaemic probability of about 50.1% (OR=2.501056, 95% CI= [1.146-2.685], $P=.020$).

The result in Table 6 presents the factors that predict maternal anaemia anaemia in the Adaklu District. The results suggested that the cases of anaemia during pregnancy increased with age in Adaklu District such that older pregnant women had higher chances of being anaemic than the younger pregnant women. The result indicated that a matured pregnant woman would be 1.231 (23%) more likely to be anaemic than a younger pregnant woman (OR=1.23, 95% CI= [0.59-1.568], $P=.015$). The odds of the older or aged pregnant women being anaemic could not explain the odds of being anaemic or not (OR=0.999, 95% CI= [-0.302-1.303], $P=.050$). Generally, the age of the pregnant women is a significant determinant of anaemia but with decreasing effect on the probability of a pregnant woman being anaemic in the Adaklu District.

In the case of marital status, pregnant women who were divorced had a higher chance of being anaemic during pregnancy as compared to the married and single pregnant women. As compared to the married pregnant women, the odd of being anaemic was 2.978 times significantly higher for divorced pregnant women (OR=2.978, 95% CI= [-0.301-3.461], $P=.035$), while that of

Table 5: Determinants of Anaemic Status during Pregnancy in the Nkwanta North District

Variable	Dependent Variable= anaemia status						[95% Conf. Interval]
	Coef.	Std. Err.	Wald	Df	Sig	Exp(B)	
Young	Ref		.457	2	0.001		Lower Upper
Matured	0.2349819	.06168799	0.385	1	0.037	1.7905852	1.444 1.974
Old	0.0786877	.04593599	0.178	1	0.086	1.081866	0.822 1.979
Married	Ref		2.451	3	0.012		
Divorced	0.178	.7712559	2.124	1	0.034	1.1951267	0.4723 2.146
Single	-1.201797	.08288565	1.453	1	0.014	.3006535	-2.826 .423
First time	Ref		1.56	2	0.024		
2-3	1.08253	.8056258	1.34	1	0.017	2.952139	1.496 2.662
4 or more	0.7846214	.9262694	0.85	1	0.016	2.191577	1.031 2.600
No formal education	Ref.		0.462	4	0.002		
JHS/Primary	0.073484	.4764774	0.153	1	0.877	1.076251	-0.860 1.007
Higher	0.8087208	.5852124	1.381	1	0.019	1.4454275	0.338 1.956
Less than 300	Ref.		1.993	2	0.001		
300-500	1.222242	.6664852	1.833	1	0.047	3.394791	2.084 4.529
500 or more	.9167129	.3932352	2.331	1	0.020	2.501056	1.146 2.687
Public servant	Ref.		1.823	2	0.001		
Traders	.1636855	.4002197	0.41	1	0.006	0.177844	-0.621 0.948
Farmers	-1.95833	.950716	2.06	1	0.039	.1410938	-3.822 -.095
_cons	2.22121	.6054213	3.67	1	0.000	9.218478	1.035 3.409

N/B: Ref indicates the reference category

Source: Field data (Tettegah, 2020)

the single pregnant women were 0.683 less likely having anaemic condition (OR=0.683, 95% CI= [-0.098-0.779], $P=.017$).

On the pregnant women who are married are less likely to develop anaemia than divorced pregnant women. Therefore, marital status is a significant determinant of anaemia but with decreasing effect on the probability of a pregnant woman being anaemic in the Adaklu District.

Again, the outcome suggested that the first time pregnant women had lower chances of being anaemic than those who had more than one pregnancies in the past. As compared to the first time pregnant women, those with obstetric history of 2 to 3 times pregnancies were 0.525 times more likely to develop anaemia (OR=.525, 95% CI= [-3.103-0.664], $P=.037$) while those who had more than 4 pregnancies had 1.163 increase in probability of being anaemic (OR=1.163, 95% CI= [0.0480-1.813], $P=.038$).

The result on level of education indicated that those with less education had lower chances of becoming anaemic during pregnancy than those with higher education. As compared to the pregnant women with no formal education, the probability that a JHS leaver would be anaemic during pregnancy increased by 1.078, while pregnant women with higher education were increased by 1.366. The outcome suggested that the probability of the educated pregnant women becoming anaemic was higher than those without formal education by about 7.8% for JHS leavers (OR=.1.078, 95% CI= [0.29-1.173], $P=.001$) and 36.6% for those with higher education (OR=.1.366, 95% CI= [1.133-1.666], $P=.006$).

The results on income level also suggested that higher income level leads to higher chances of being anaemic during pregnancy than those with lower income. As compared to pregnant women with monthly income less than GHS300.00, the odd of a pregnant woman with income between GHS300.00 and GHS500.00 increased by 0.038, while that of those with income above GHS500.00 increased by 1.637, representing about 64% increase in probability of occurrence (OR=1.637, 95% CI= [0.266-2.085], $P=0.039$). The results suggested that the pregnant women with lower income level were less likely to become anaemic during pregnancy as compared with those with high income.

Occupation was found not to be a significant predictor of anaemia status during pregnancy in the Adaklu District at the 5.0% significance level.

The findings on the determinants of anaemic status in pregnant women revealed that, in both districts, age, marital status, number of pregnancies, educational level and income level significantly predicted the anaemic status during pregnancy. Occupation was a significant predictor of anaemia in the Nkwanta North District but not in Adaklu District and this could be that most of the pregnant women in the Nkwanta North District were farmers. Again, Adaklu District is very close to the Volta Regional capital, Ho so the tendency to find pregnant women in diverse occupations that cannot be underestimated.

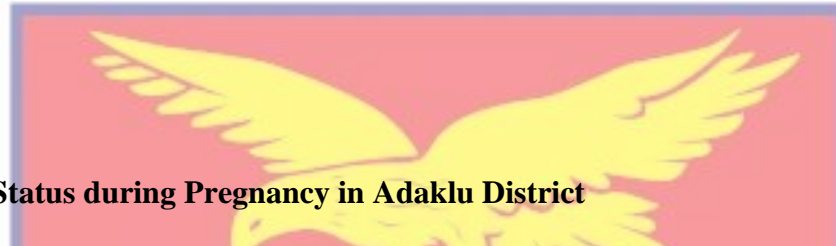
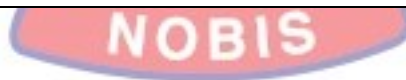


Table 6: Determinants of Anaemic Status during Pregnancy in Adaklu District

Variable	Dependent Variable= aneamia status						95% C.I.for Exp(B)	
	B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Young	Ref.		.387	2	.024			
Matured	.208	0.037	.307	1	.015	1.231	0.59	1.568
Old	-0.001	0.061	.000	1	.050	0.999	-0.302	1.303
Married	Ref.		6.179	3	.013			
Divorced	1.091	0.169	.871	1	.035	2.978	.301	3.461
Single	-1.381	.993	.014	1	.017	0.683	-0.098	0.779
First time	Ref.		1.371	2	.045			
2-3 times	-0.644	.829	.605	1	.037	0.525	-3.103	0.664
4 or more	.151	.451	.012	1	.038	1.163	0.480	1.813
None	Ref.		.473	4	.076			
JHS/Primary	.075	.071	.003	1	.001	1.078	0.29	1.173
Higher	0.312	.072	.185	1	.006	1.366	1.133	1.666
Public Servant	Ref.		0.763	2	.046			
Trading	-2.017	.861	.021	1	.0885	0.133	-0.210	0.124
Farmers	-0.052	1.103	.002	1	.962	.949	-0.109	-0.246
Less than 300	Ref.		2	.357	.059			
300-500	-3.270	2.060	.0914	.006	.001	0.038	1.074	2.179
More than 500	0.493	.928	.282	1	.039	1.637	0.266	2.085
Constant	1.202	1.524	.018	1	.894	1.224		

N/B: Ref indicates the reference category

Source: Field data (Tettegah, 2020)



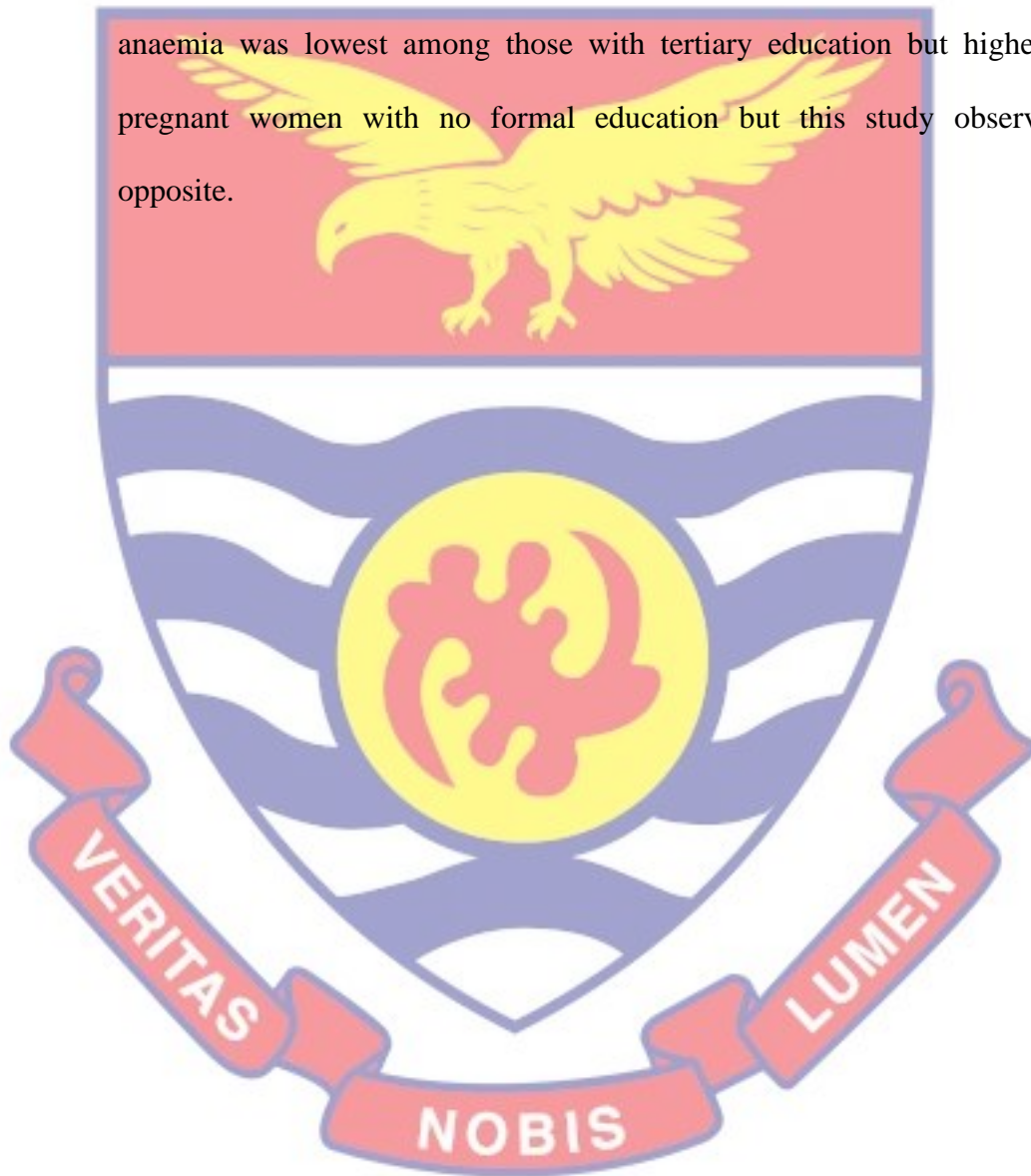
The observation that age of pregnant women is directly related to their probability of being anaemic is consistent with the findings of Chowdhury et al. (2015), Anlaaku (2015) and Glover-Amengoet et al. (2005), but contradicted the finding of Ahenkorah et al. (2016) in Ghana. Ahenkorah et al., suggested maternal anaemia was associated significantly with young maternal age, which the findings of this study refuted. The differences can, however, be resolved by the definition of younger maternal age since Ahenkorah et al actually mean teenage for younger pregnant women, while this study defined younger mother to be ages from 15 to 24 years.

Marital status was found to matter in all trimesters. The findings indicated that married pregnant women have lower probability of being anaemic than the divorced women and single pregnant women. The observation that single pregnant women have the worst case of anaemia was in line with a study conducted by Nwizu et al. (2011). Nwizu et al. asserted that single or divorced pregnant women are more at risk of developing anaemia than married women.

The outcome on level of education was another item of interest since the less educated were found to have lesser chances of being anaemic during pregnancy than the more educated pregnant women. This situation was observed in all the trimesters which made it robust to the stage of pregnancy. Actually, the opposite was expected. The findings could still be explained intuitively. That is, it is a general believe among health practitioners that the more a person is educated the more he/she may comply with prescription vice versa. That is, if pregnant women would listen and follow the instructions of health professionals, then their own level of education may matter in their ability to achieve positive health outcome. Also, the outcome could be the

tendency for more educated pregnant women to be in a more stress related job than the less educated and could explain their higher tendency to be anaemic during pregnancy. The observation that less educated pregnant women have lower probability of being anaemic supported the views of Novivanti et al. (2019) but contradicted the views of Nwizu et al. (2011). They showed that

anaemia was lowest among those with tertiary education but highest with pregnant women with no formal education but this study observed the opposite.



CHAPTER FIVE

SUMMARY. CONCLUSION AND RECOMMENDATIONS

The purpose of the study was to investigate the factor that influence anaemia among pregnant women attending antenatal clinics in the Nkwanta North and Adaklu Districts. This is made up of the summary of the study, conclusion and recommendation. The summary gives or presents general overview of the study.

Summary

The purpose of the study was to investigate the factors influencing maternal anaemia in the Nkwanta North and Adaklu Districts. A quantitative study method was used with retrospective observational study design. The study group comprised 300 pregnant women (15-49 years) with 150 from each district and with at least two antenatal visits and a record of Hb concentration in their antenatal cards. The first visit was in the first trimester and the second visit was in the second trimester of pregnancy. The last Hb record was taken for the third trimester. The researcher adapted a questionnaire, which was used to collect the data. Data on the pregnant women was collected based on the first, second and third trimesters. The data was analysed with SPSS version 21.0. The descriptive statistic used included frequencies, percentages. Logistic regressions analysis was also done.

Key Findings

The findings on the prevalence of anaemia among pregnant women indicated that there is a difference in the distribution of maternal anaemia between the two districts. Thus, Adaklu District had higher rate of anaemia in pregnancy than Nkwanta North District. The overall prevalence of maternal anaemia in the Nkwanta North over the three trimesters was 68% while that of

Adaklu District was 78%. Again, anaemia occurred in all the three trimesters with the most common occurrence in the third trimester of pregnancy. The findings on the knowledge level of pregnant women on anaemia in the Nkwanta North and Adaklu Districts was that though there was increased knowledge level on maternal anaemia in both districts, the prevalence of anaemia was still high. This could mean that sometimes, high knowledge level may not be translated into action or may not be applied due to culture barriers. For example, pregnant women in Adaklu District are aware that snail is rich in protein and consumption of snail would boost their haemoglobin levels. Unfortunately, in Adaklu District, it was a taboo to eat snail, so the pregnant women would not consume snail which may contribute to anaemia in pregnancy. Also, the implication on the high knowledge could be the type and the nature of the training provided by the health professionals. It might be the case that the training given to the pregnant women were more theoretical than practical which might end up producing unproductive knowledge.

The findings on perceived barriers to maintain appropriate haemoglobin level among pregnant women in the Nkwanta North and Adaklu Districts was that some of the pregnant women did not take egg and snail due to cultural beliefs. Another potential barrier is long distance to the health facility. Per the finding, it could be concluded that the barriers were found to be more common in Adaklu District than Nkwanta North District. The outcome on the component of health education the pregnant women received at ANC revealed that most of the pregnant women in the Nkwanta North and Adaklu Districts agreed that they received health education in all the components except few of the pregnant women who disagreed with some of the statements. The reason for the majority of the pregnant women did agreed

that they were given health talk at antenatal clinic may be that the Health Workers are committed to rendering antenatal services to the pregnant women.

Factors that predict maternal anaemia in both districts are: maternal age, marital status, educational level, number of pregnancies and income level significantly predicted the anaemic status during pregnancy. Occupation was a significant predictor of anaemia in the Nkwanta North District and not in the Adaklu District. This could be that most of the pregnant women in the Nkwanta North District are farmers. Again, Adaklu District is very close to the Volta Regional capital, Ho so the tendency to find pregnant women in diverse occupations.

Conclusion

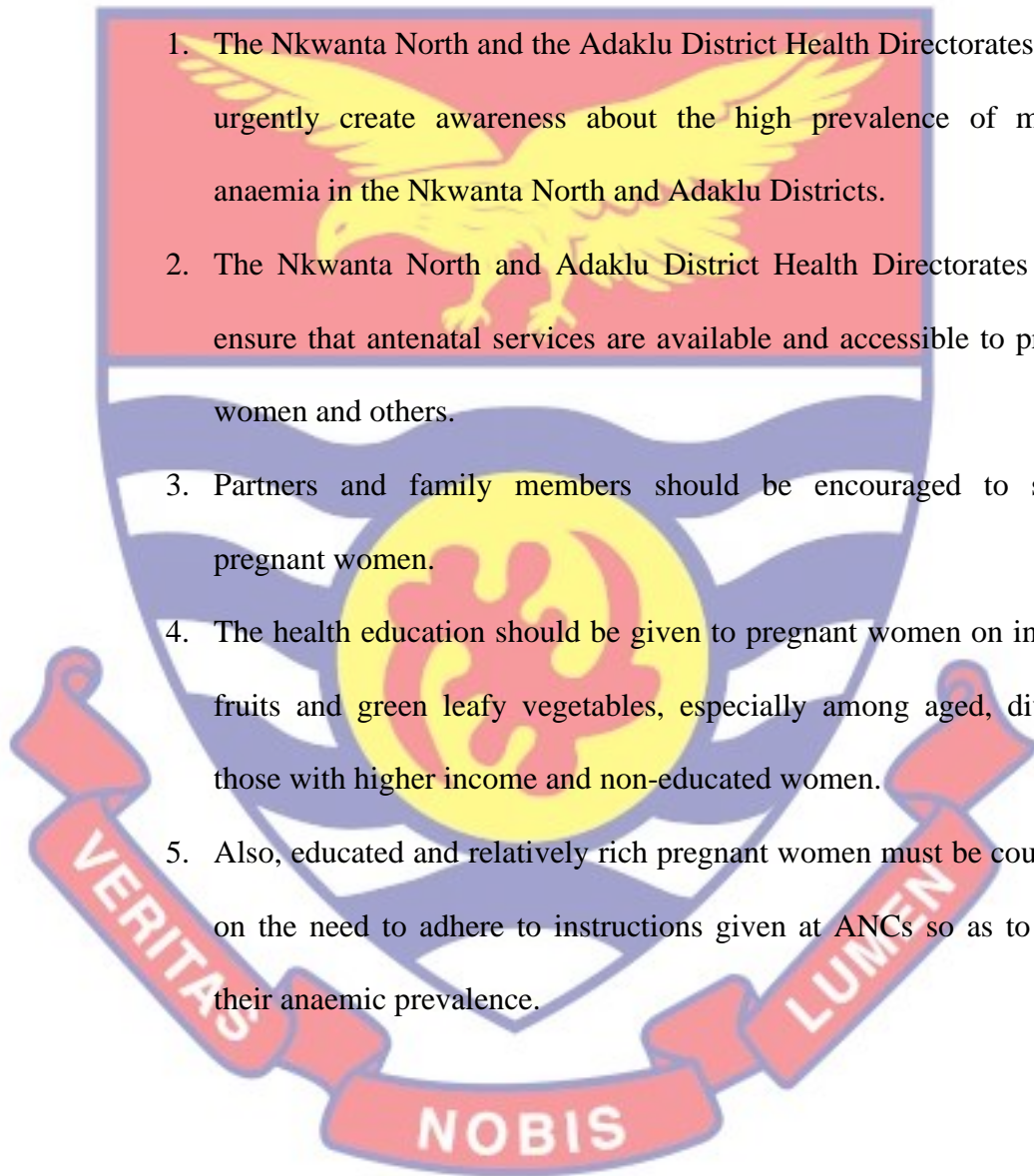
Anaemia is a serious public health issue in less advanced countries. Anaemia is quite prevalent among the pregnant women in all trimesters in both Nkwanta North and Adaklu Districts. This high prevalence of anaemia put the pregnant women in both districts at risk of miscarriage, low birth weight, maternal and infant mortality. Again, the pregnant women had a higher level of knowledge on anaemia which implies that the health care providers are hardworking. The perceived barriers in maintaining appropriate haemoglobin level among pregnant women were long distance from the health facilities and some pregnant women did not eat egg and snail. Lack of accessibility and sociocultural beliefs can increase possibility of a pregnant woman to develop anaemia. Furthermore, most of the pregnant women received health education at ANC, which implies that the health care providers are hardworking. Maternal age, marital status, number of pregnancies, educational and income levels were significant determinants of the anaemia

status during pregnancy in both districts. It implies that the health care providers should continuously educate the pregnant women.

Recommendations

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

1. The Nkwanta North and the Adaklu District Health Directorates should urgently create awareness about the high prevalence of maternal anaemia in the Nkwanta North and Adaklu Districts.
2. The Nkwanta North and Adaklu District Health Directorates should ensure that antenatal services are available and accessible to pregnant women and others.
3. Partners and family members should be encouraged to support pregnant women.
4. The health education should be given to pregnant women on intake of fruits and green leafy vegetables, especially among aged, divorced, those with higher income and non-educated women.
5. Also, educated and relatively rich pregnant women must be counselled on the need to adhere to instructions given at ANCs so as to reduce their anaemic prevalence.



Suggestions for Further Research

Based on the recommendations from my research findings, future research should:

1. Assess the factors that hinder daily intake of iron supplement among pregnant women.

2. Find out the factors that improve antenatal patronage.



REFERENCES

- Abay, A., Yalew, H. W., Tariku, A., & Gebeye, E. (2017). Determinants of prenatal anaemia in Ethiopia. *Archives of Public Health*, 75(1), 51-61.
- Abiselvi, A., Gopalakrishnan, S., Umadevi, R., & Rama, R. (2018). Socio-demographic and obstetric risk factors of anaemia among pregnant women in rural Tamil Nadu. *International Journal of Community Medicine and Public Health*, 5, 721-725.
- Abriha, A., Yesuf, M. E., & Wassie, M. M. (2014). Prevalence and associated factors of anaemia among pregnant women of Mekelle town: A cross sectional study. *BNC Research Notes*, 7(1), 1-6.
- Abu-Ouf, N. M., & Jan, M. M. (2015). The impact of maternal iron deficiency and iron deficiency anaemia on child's health. *Saudi Medical Journal*, 36(2), 146-149.
- Acheampong, K., Appiah, S., Baffour-Awuah, D., & Arhin, S. Y. (2018). Prevalence of anaemia among pregnant women attending antenatal clinic of a selected hospital in Accra, Ghana. *International Journal of Health Science Research*, 8(1), 186-193.
- Adam, I., Khamis, A. H., & Elbashir, M. I. (2005). Prevalence and risk factors for anaemia in pregnant women of eastern Sudan. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 99(10), 739-43. <http://doi.org/10.1016/j.trstmh.2005.02.008>
- Adam, Y. (2015). *Efficacy of nutrition education with an emphasis on Consumption of iron-rich foods on haemoglobin levels of pregnant women: A randomized trial in Gomoa East District of the Central Region of Ghana*. Unpublished Masters Thesis, University of Ghana, Accra.

Adznam, S. N., Sedek, R., & Kasim, Z. M. (2018). Assessment of knowledge, attitude and practice levels regarding anaemia among pregnant women in putrajaya, Malaysia. *Pakistan Journal of Nutrition*, 17(2), 578-585.

Agus, Y., & Horiuchi, S. (2012). Factors influencing the use of antenatal care in rural West Sumatra, Indonesia. *BMC Pregnancy and Childbirth*, 4, 12-19.

Ahenkorah, B., Nsiah, K., & Baffoe, A. (2016). Sociodemographic and obstetric characteristics of anaemic pregnant women attending antenatal clinic in Bolgatanga Regional Hospital. *Scientifica*, 5(1), 46-73.

Al Kahtani, M. A., AlQahtani, M., Alshebaily, M. M., Abd Elzaher, M., Moawad, A., & AlJohani, N. (2012). Morbidity and pregnancy outcomes associated with sickle cell anemia among Saudi women. *International Journal of Gynecology & Obstetrics*, 119(3), 224-226. doi: <http://dx.doi.org/10.1016/j.ijgo.2012.07.008>.

Alemu, T., & Umeta, M. (2015). Reproductive and obstetric factors are key predictors of maternal anaemia during pregnancy in Ethiopia: Evidence from demographic and health survey. *Anaemia*, 3, 2-13.

Amengo, M. W. B. Owusu, I., & Akanmori, B. D. (2005). Determinants of anaemia in pregnancy in Sekyere West District. *Ghana Medical Journal*, 39 (3), 2-9.

American Journal of Clinical Nutrition, 72(1), 212–240.

Amoakoh-Coleman, M., Klipstein-Grobusch, K., Agyepong, I. A. Gbenga, A., Kayode, D. E. G., & Ansah, E. K. (2016). Provider adherence to first antenatal care guidelines and risk of pregnancy complications in public

sector facilities: A Ghanaian cohort study. *BMC Pregnancy Childbirth* 16, 369.

Andrew, E.V.W., Pell, C., Angwin, A., Auwun, A., Daniels, J., & Mueller, I. (2015). *Knowledge, attitudes, and practices concerning malaria in pregnancy: Results from a qualitative study in Madang, Papua New Guinea.*

Anlaakuu, P. (2015). *Anaemia in Pregnancy among Antenatal Attendants at the Sunyani Municipal Hospital.* Unpublished Master Thesis. University of Ghana, Accra.

Anlaakuu, P., & Anto, F. (2017). Anaemia in pregnancy and associated factors: A cross sectional study of antenatal attendants at the Sunyani Municipal Hospital, Ghana. *BMC Research Notes*, 10(1), 402.

Azu, T. D. (2016). Factors influencing anaemia in pregnancy in the Cape Coast Metropolis. *International Journal of Innovation Sciences and Research*, 5(1), 574-581.

Baby, A., Venugopal, J., D'silva, R., Chacko, S., Vineesha, P. V., & Kumary, T. V. (2014). Assessment of knowledge level of pregnant women on anaemia in Putrajaya. A descriptive study. *Archive of Medical Health Sciences*, 2(1), 140-144.

Balarajan, Y., Ramakrishnan, U., Ozaltin, E., Shankar, A. H., & Subramanian, S. V. (2011). Anaemia in low-income and middle-income countries. *The Lancet*, 378(9), 2123–2135.

Barnett, V. (2002). *Sample survey: Principles and methods* (3rd ed.). London: Arnold.

Bendich, A. (2008). Nutrition and health in developing countries. *Journal of Chemical Information and Modeling*, 53(2), 31-40.

Berg, J. Tymoczko, J. L., & Stryer, L. (2002). *Biochemistry*. USA: San Francisco

Bilenko, N., Yehiel, M., & Inbar, Y. (2007). The association between anemia in infants, and maternal knowledge and adherence to iron supplementation in southern Israel. *Israel Medical Association Journal*, 9, 521–524.

Black, R. E., Allen, L. H., Bhutta, Z. A. Caulfield, L. E., De Onis, M., Ezzati, M., & Rivera, J. (2008). Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet*, 371(9608), 243–260.

Boardman, J. D., Powers, D. A., Padilla, Y. C., & Hummer, R. A. (2002). Low birth weight, social factors, and developmental outcomes among children in the United States. *Demography*, 39, 353-368.

Bodeau-Livinec, F., Briand, V., & Berger, J. (2011). Maternal anaemia in Benin: prevalence, risk factors, and association with low birth weight. *The American Journal of Tropical Medicine and Hygiene*, 3(85) 414–420.

Bothwell, T. H. (2000). Iron requirements in pregnancy and strategies to meet them. *The American Journal of Clinical Nutrition*, 72(1), 257–264.

Breyman, C. Honegge, C., & Holzgreve, W. (2010). Diagnosis and treatment of iron-deficiency anaemia during pregnancy and postpartum. *Archives of Gynecology and Obstetrics*, 282(5) 577.

Brooker, S., Hotez, P. J., & Bundy, D. A. P. (2008). Hookworm-related anaemia among pregnant women: A systematic review. *PLoS Neglected Tropical Disease*, 2(9), 291-234.

Brown, L. S. (2010). *Life cycle nutrition: An evidence-based approach. Supplement: Nutrition requirements during pregnancy*. Sudbury, MA:

Jones and Bartlett Publishers.

Buseri, F. I., Uko, E. K., Jeremiah, Z. A., & Usanga, E. A. (2008). Prevalence and risk factors of anaemia among pregnant women in Nigeria. *The Open Haematology Journal*, 2(1), 14–19.

Casey, G. J., Jolley, D., Phuc, T. Q., Tinh, T. T., Tho, D. H., Montresor, A., & Biggs, B. A. (2010). *Long-term weekly iron-folic acid and de-worming is associated with stabilised haemoglobin and increasing iron stores in non-pregnant women in Vietnam*. Retrieved from <https://doi.org/10.1371/journal.pone.0015691>

Chandyo, R. K., Henjum, S., Ulak, M., Thorne-Lyman, A. L., Ulvik, R. J., & Shrestha, P. S. (2015). The prevalence of anaemia and iron deficiency is more common in breastfed infants than their mothers in Bhaktapur, Nepal. *European Journal of Clinical Nutrition*, 70(1), 456-462.

Chandyo, R. K., Henjum, S., Ulak, M., Thorne-Lyman, A. L., Ulvik, R. J., Shrestha, P. S., & Strand, T. A. (2016). The prevalence of anaemia and iron deficiency is more common in breastfed infants than their mothers in Bhaktapur, Nepal. *European Journal of Clinical Nutrition*, 70(4), 456–462.

Checkley, W., West, K. P., Wise, R. A., Baldwin, M. R., Wu, L., LeClerq, S. C., & Sommer, A. (2010). Maternal vitamin A supplementation and

lung function in offspring. *The New England Journal of Medicine*, 362(19), 1784–94.

Chowdhury, H. A., Ahmed, K. R., Jebunessa, F., Akter, J., Hossain, S., & Shahjahan, M. (2015). Factors associated with maternal anaemia among pregnant women in Dhaka city. *BMC Women's Health*, 15(1), 77-83.

Christakos, S., Hewison, M., Gardner, D. G., Wagner, C. L., Sergeev, I. N., Rutten, E., & Bikle, D. D. (2013). Vitamin D: Beyond bone. *Annals of the New York Academy of Sciences*, 12(87), 45–58.

Clerk, C. A., Bruce, J., Greenwood, B., & Chandramohan, D. (2009). The epidemiology of malaria among pregnant women attending antenatal clinics in an area with intense and highly seasonal malaria transmission in Northern Ghana. *Tropical Medicine & International Health*, 14(6), 68-95.

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education* (7th ed.). Abingdon, Oxon. New York: Ebooks Corporation.

De Benoist, B., McLean, E., Egli, I., & Cogswell, M. (2008) *Worldwide Prevalence of Anaemia 1993-2005: WHO Global Database on Anaemia*. World Health Organization, Geneva.

Derbyshire, L. (2012). Strategies to improve iron status in women at risk of developing anaemia. *Nursing Standards*, 26(2), 51-57.

Dhange, P., Breeze, A. C. G., & Kean, L. H. (2013). Routine antenatal management at the booking clinic. *Obstetrician Gynaecology and Reproductive Medicine*, 23, 45–52.

Diamond-Smith, N. G., Gupta, M., Kaur, M., & Kumar, R. (2016).

Determinants of persistent anemia in poor, urban pregnant women of Chandigarh City, North India: A mixed method approach. *Food and Nutrition Bulletin*, 37(2), 132–143.

Dibley, M. J, Zeng, L., & Cheng, Y. (2012). Impact of micronutrient

supplementation during pregnancy on birth weight, duration of gestation, and perinatal mortality in rural western China: Double blind cluster randomised controlled trial. *Bio-Medical Journal*, 2(1), 337-342.

Dickson, K. S. Darteh, E. K. M. & Kumi-Kyereme, K. (2017). Providers of

antenatal care services in Ghana: Evidence from Ghana demographic and health surveys 1988–2014. *BMC Health Service Research*, 17(1), 203-207

Dickson, P. (2016). *Knowledge and perception of risk of anaemia during pregnancy among pregnant women in Ablekuma South*. Unpublished Master Thesis, University of Ghana, Accra, Ghana.

Dudek, S. G. (2001). *Nutritional essentials for nursing practice* (4th ed.). Philadelphia: Lippincott.

Duko, B., Tadesse, B., Gebre, M., & Teshome, T. (2017). Awareness of anaemia and associated factors among pregnant women attending antenatal care, South Ethiopia. *Journal Women's Health Care*, 6(1), 409-417.

Dwumfour, A. B. (2013). Anaemia awareness, beliefs and practices among pregnant women: A baseline assessment at Brosankro community in Ghana. *Journal of Natural Sciences*, 15(3), 22-31.

Ekstrom, F. P., Kavishe, J. P., Habicht, E. A., Frongillo, K. M., Rasmussen, L., & Hemed, A. (2008). Adherence to iron supplementation during pregnancy in Tanzania: Determinants and hematologic consequences.

The American Journal of Clinical Nutrition, 64(13), 368–374.

Ezeruigbo, C. (2013). Selected clients' characteristics as determinants of use of maternal health services in two communities of Enugu State, Nigeria. *Nursing and Midwifery Council of Nigeria Research Journal*, 1(2), 6-12.

Fiedler, J. D'Agostino, A., & Sununtnasuk, C. (2014). *Nutrition Technical Brief: A Rapid Initial Assessment of the Distribution and Consumption of Iron-Folic Acid Tablets through Antenatal Care in Benin*. Arlington, VA: USAID/Strengthening Partnerships, Results and Innovations in Nutrition Globally. (SPRING), Project.

Freire, W. B., Kahn, G. S., McGuire, J., & Post, L. G. (2003). Anaemia Prevention and Control; What Works. Retrieved from <http://www.a2zproject.org/pdf/Anemia%20Prevention%20and%20Control-%20Program%20Guidance,%20Part%20I.pdf>

Fried, J., Sunderji, A., Birch, S., & Eyles, J. (2013). The reason that I did not go: Determinants of the use of antenatal care services in South Africa, two decades after the end of apartheid. *Canadian Journal of African Studies*, 47(1), 27-50.

Gajida, A. U., Iliyasu, Z., & Zoakah, A. I. (2010). Short Report Malaria among antenatal clients attending primary health care facilities in Kano state. *Annals of African Medicine*, 9(3), 188–193.

Gajida, A. U., Iliyasu, Z., & Zoakah, A. I. (2010). Short Report Malaria among antenatal clients attending primary health care facilities in Kano state. *Nigeria. Annals of African Medicine*, 9(3), 188–193.

Gamble, C., Ekwaru, P. J., Garner, P., & Ter, K. F. O. (2007). Insecticide-treated nets for the prevention of malaria in pregnancy: *A systematic review of randomised controlled trials. PLOS Medicine*, 4(3), 107-113.

Gerein, N., Mayhew, S., & Lubben, M. (2003). A framework for a new approach to antenatal care. *International Journal of Gynecology and Obstetrics*, 80(2), 175–182.

Getachew, M., Yewhalaw, D., Tafess, K., Getachew, Y., & Zeynudin, A. (2012). Anaemia and associated risk factors among pregnant women in gilgel gibe Dam area, Southwest Ethiopia. *Parasites Vectors*, 5(1), 296-302.

Ghana Demographic Health Survey. (2010). *Anaemia recording high prevalence rate in children and pregnant women*. Accra: Ghana Statistical Service, Ghana.

Ghana Demographic Health Survey. (2014). *Children and pregnant women recording high prevalence rate in anaemia*. Accra: Ghana Statistical Service, Accra, Ghana.

Ghana Demographic Health Survey. (2016). *Prevalence rate of Anaemia among pregnant women in the Volta Region*. Accra: Ghana Statistical Service, Ghana.

Ghana Demographic Health Survey. (2017). *Prevalence rate of Anaemia among pregnant women in the Volta Region*. Accra: Ghana Statistical Service, Ghana.

Ghana Health Service. (2016). *FHD Annual Report*. Retrieved from <https://www.moh.gov.gh/wp-content/uploads/2017/09/2016-Annual-Report.pdf>

Ghana Health Service. (2010). *The health sector in Ghana: Facts and figures*. Accra: Ministry of Health, Ghana

Glover-Amengor, M. W. B., Owusu, B. D., & Akanmori, B. D. (2005). Determinants of anaemia in pregnancy in Sekyere West District. *Ghana Medical Journal*, 39(3), 3-11

Gogoi, M., & Prusty, R. K. (2013). Maternal anaemia, pregnancy complications and birth outcome: Evidences from North-East India. *Malaysian Journal of Public Health Medicine*, 11(2), 13-21.

Goonewardene, M., Shehata, M., & Hamad, A. (2012). Anaemia in pregnancy. *Best Practice Research, Clinical Obstetrics and Gynecology*, 26(1), 3-24.

Grieger, J. A., & Clifton, V. L. (2014). A review of the impact of dietary intakes in human pregnancy on infant birth weight. *Nutrients*, 7(1), 153-178.

Gropper, S., Smith, J., & Groff, J. L. (2009). The water-soluble vitamins. *Advanced Nutrition and Human Metabolism*, 4(1), 358-363.

GSS. (2010). *Ghana Population and Housing Census*. Accra: Ghana.

GSS. GHS & ICF International. (2015). *Demographic and health survey*. Rockville, MD.

Gulen, H., Hanimeli, O., Karaca, O., & Taneli, F. (2012). α -Thalassemia frequency and mutations in children with hypochromic microcytic anaemias and relation with β -thalassemia, iron deficiency anaemia. *Paediatric Haematology and Oncology*, 9(3), 241-612.

Haas, J. D., & Brownlie, T. (2001). Iron deficiency and reduced work capacity: A critical review of the research to determine a causal relationship. *The Journal of Nutrition*, 131(1), 676-690.

Haggaz, A. D., Radi, E. A., & Adam, I. (2010). Anaemia and low birth weight in Western Sudan. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 104(1), 234-236.

Henderson, S. A., & Lenders, C. M. (1999). *Nutrition in-common recommendation for the mother is to drink a-pregnancy and lactation*. MA: Blackwell Science.

Hildingsson, I., Haines, H., Cross, M., Pallant, J., & Rubertsson, C. (2013). Women's satisfaction with antenatal care: Comparing women in Sweden and Australia. *Journal of Australian College of Midwives*, 26(1), 9-14.

Hofmeyr, G. J., & Mentrop, L. (2015). Time for 'basic antenatal care plus' in South Africa? *South African Medical Journal*, 105(11), 902-903.

Hulin, C., Netemeyer, R., & Cudeck, R. (2001). Can a reliability coefficient be too high? *Journal of Consumer Psychology*, 10(1), 55-58.

Hurrell, R., & Egli, I. (2010). Iron bioavailability and dietary reference values. *American Journal of Clinical Nutrition*, 91, 1461-1467.

Igbokwe, C. C. (2012). Knowledge and attitude of pregnant women towards antenatal services in Nsukka Local Government area of Enugu State, Nigeria. *Journal of Research in Education and Society*, 3(1), 1-7.

Innis, S. M., & Friesen, R. W. (2008). Essential omega-3 fatty acids in pregnant women and early visual acuity maturation in term infants. *The American Journal of Clinical Nutrition*, 87(3), 548-557.

James, J. N. (2017). Retrospective cohort study: Strengths and weaknesses. *Journal of Nutrition*, 131(2), 697-700.

Jufar, A. H., & Zewde, T. (2014) Prevalence of anemia among pregnant women attending antenatal care at tikur anbessa specialized hospital, Addis Ababa Ethiopia. *Journal Haematol Thromb Diseases*, 2(1), 125-

129

K4Health. (2016). *The knowledge for health*. Retrieved from: <https://www.k4health.org/toolkits/anaemia-prevention>.

Kalosa, K. M., & Weismiller, D. G. (1997). Nutrition during pregnancy. *American Family Physician*, 56(1), 205-211.

Kapsalis, C. (2010). *Bridging logistic and OLS regression*. MPRA Paper No. 27706, Munich Personal RePEc Archive. Retrieved from: <https://mpra.ub.uni-muenchen.de/27706/>

Karaoglu, L., Pehlivan, E., Egri, M., Deprem, C., Gunes, G., Genc, M. F., & Temel, I. (2010). The prevalence of nutritional anemia in pregnancy in an east Anatolian province, Turkey. *BMC Public Health*, 10(1), 329-232.

Kassa, G. M., Muche, A. A., Berhe, A. K., & Fedadu, G. A. (2017). Prevalence and determinants of anaemia among pregnant women in Ethiopia; A systematic review and meta-analysis. *BMC Haematology*, 7(2), 17-26.

Kefiyalew, F. (2014). Anaemia among pregnant women in Southeast Ethiopia: Prevalence, severity and associated risk factors. *Bio-Medical Council Research Notes*, 7(7), 71-77.

Kinzie, B., & Gomez, P. (2004). *Basic maternal and new-born care: A guide for skilled providers*. Baltimore: Maternal and Neonatal Health.

Kozuki, N., Lee, A. C., & Katz, J. (2012). Moderate to severe, but not mild, maternal anaemia is associated with increased risk of small-for-gestational-age outcomes. *Journal of Nutrition*, 142(1), 358-362.

Kumar, K. J., Asha, N., Murthy, D. S., Sujatha, M., & Manjunath, V. (2013). Maternal anaemia in various trimesters and its effect on newborn weight and maturity: An observational study. *International Journal of Prevation and Medicine*, 4(2), 193–199.

LaMorte, W. (2013). *Prospective and Retrospective Cohort Studies*. Boston University College of Public Health. *Overview of Analytic Studies*, 2(1), 3-7.

Leyla, K., Pehlivan, E., Egri, M., Deprem, C., Gunes, G. M., Genc, F., & Temel, L. (2010). The prevalence of nutritional anaemia in pregnancy in an east Anatolian province. *Journal of Public Health*, 10(1), 329-233.

Long, S. (2016). *New methods of interpretation using marginal effects for nonlinear models*. Departments of Sociology and Statistics, Indiana University, Mexican Stata Users Group.

Mahamuda, B., Feroza, W., & Shamim, A. (2011). Original article Effects of maternal anaemia on neonatal outcome – A study done in the specialised urban hospital set up in Bangladesh, 10(3), 31-37.

Mangla, M., & Singla, D. (2016). Prevalence of anaemia among pregnant women in rural India: A longitudinal observational study. *International Journal of Reproductive Contraceptive, Obstetric and Gynecology*, 5, 35-50.

Margwe, J. A., & Lupindu, A. M. (2018). Knowledge and attitude of pregnant women in rural Tanzania on prevention of anaemia. *African Journal of Reproductive Health*, 22(3), 71-79.

Marijke, S. (2015). *Guidelines for the conduct of registry based studies using the ebmt database*. *Guidelines for the Conduct of Registry Studies*, 4(1), 1-6.

Mbule, M. A., Byaruhanga, Y. B., Kabahenda, M. & Lubowa, A. (2013). *National Journal of Community Medicine*, 4(1), 454-456.

McClure, E. M., Meshnick, S. R., Mungai, P., Malhotra, I., & King, C. L. (2014). The association of parasitic infections in pregnancy and maternal and foetal anaemia: A cohort study in coastal Kenya. *PLoS Neglected Tropical Disease*, 8(2), 27-24.

McKinlay, A. (2011). Behaviour and Development *Longitudinal Research. Encyclopedia of Child*. Boston: Springer.

McLean, E., Cogswell, M., Egli, I., Wojdyla, D., & Benoist, B. D. (2008). Worldwide prevalence of anaemia. *WHO Vitamin and Mineral Nutrition Information System*, 1(1) 1993–2005.

Messina, J. P., Mwandagalirwa, K., Taylor, S. M., Emch, M., & Meshnick, S. R. (2013). Spatial and social factors drive anaemia in Congolese women. *Health and Place*, 24(1), 54–64.

Moosa, K. & Zein, Z. A. (2011). *Assessment of iron status and dietary intakes of pregnant women in Bahrain*. Unpublished Master Thesis, University of Nairobi, Nairobi, Kenya.

Muhe, L., Oljira, B., Degefu, H., Jaffar, S., & Weber, M. W. (2000). Evaluation of clinical pallor in the identification and treatment of children with moderate and severe anaemia. *Tropical Medicine & International Health*, 5(11), 805-810.

Mulepati, S., & Chaudhary, T. K. (2017). Determinants of anaemia among pregnant women attending in a tertiary level hospital, Kathmandu. *Medical Phoenix*, 2(1), 24–33.

Munasinghe, S. (2014). Anaemia in pregnancy in Malawi. A review. *Tropical Medicine*, 3(1), 1–27.

National Institute of Nutrition. (2009). Nutrient requirements and recommended dietary allowances for Indians. *Hyderabad*, 1(1), 3-9.

Ndukwu, G. U., & Dienye, P. O. (2013). Prevalence and socio-demographic factors associated with anaemia in pregnancy in a primary health centre in Rivers State, Nigeria. *African Journal of Primary Health*, 4(1), 328-235.

Neetu, P. K., & Anoldeep, A. U. (2017). Prevalence of anaemia and Knowledge of risk factors of anaemia in pregnant women: A study at primary health centres in rural areas of North India. *European Journal of Biomedical and Pharmaceutical Sciences*, 5(1), 12-19.

Nguyen, P. H., Gonzalez-Casanova, I., Nguyen, H., Pham, H., Truong, T. V., Nguyen, S., & Ramakrishnan, U. (2015). Multicausal aetiology of anemia among women of reproductive age in Vietnam. *European Journal of Clinical Nutrition*, 69(1), 107– 113.

Nisar, Y. B., Aurangzeb, B., Dibley, M. J., & Alam, A. (2016). Qualitative exploration of facilitating factors and barriers to use of antenatal care services by pregnant women. *BMC Pregnancy Childbirth, 16*, 42-49.

Nivedita, K., & Shanthini, F. N. (2016). Knowledge, attitude and practices of pregnant women regarding anaemia, iron rich diet and iron supplements and its impact on their haemoglobin levels. *International Journal of Reproductive, Contraceptive and Obstetric Gynecology, 5*, 25-31.

Noncung, T. M. (2017). *Investigating health education needs of pregnant women in their first antenatal visit at primary health care facilities in Khayelitsha Western Cape*. Unpublish Master Thesis. University of the Western Cape, Cape Town, South African.

Noronha, J. A., Bhaduri, A., Vinod Bhat, H., & Kamath, A. (2010). Maternal risk factors and anaemia in pregnancy: A prospective retrospective cohort study. *Journal Obstet Gynaecol, 30*, 132-136.

Noviyanti, B., Harry, C., Simanjuntak, E. S., Hutasoit, P., Silitonga, H. A., & Julianto, E. (2019). The relationship between social economic levels and anaemia events in pregnant women in Glugur Darat Health Centre. *Journal of Maternal and Child Health, 4*(6), 48-56.

Nwizu, E. N., Iliyasu, Z., Ibrahim, S. A., & Galadanci, H. S. (2011). Socio-demographic and maternal factors in anaemia in pregnancy at booking in Kano. *African Journal of Reproductive Health, 15*(4), 3-9.

O'Leary, Z. (2014). *The essential guide to doing your research project*. London: SAGE.

Ogundipe, O., Hoyo, C., Ostbye, T., Oneko, O., Manongi, R., Lie, R. T., & Daltveit, A. K. (2012). Factors associated with antenatal folic acid and iron supplementation among 21,889 pregnant women in Northern Tanzania: A cross-sectional hospital-based study. *BMC Public Health*, *12*, 48-55.

Ononge, S., Campbell, O., & Mirembe, F. (2014). Haemoglobin status and predictors of anaemia among pregnant women in Mpigi, Uganda. *BMC Research Notes* *7*, 7-12.

Ouedraogo, S., Koura, G. K., Accrombessi, K., Bodeau-Livinec, F., Massougbodji, A., & Cot, M. (2012). Maternal anaemia at first antenatal visit: Prevalence and risk factors in a malaria-endemic area in Benin. *The American Journal of Tropical Medicine and Hygiene*, *87*(3), 418–424.

Patil, V. (2013). A cross sectional study to assess certain determinants correlated with anaemia in pregnant women attending antenatal clinic at rural health training centre in Western. *Journal of Public Health*, *4*(3), 454–457.

Pearl, M., Braveman, P., & Abrams, B. (2001). The relationship of neighborhood socioeconomic characteristics to birthweight among 5 ethnic groups in California. *American Journal of Public Health*, *91*, 1808-1814.

Pender, N. J. (2002). *Health promotion model manual*. Michigan. <http://deepblue.lib.umich.edu/bitstream/handle/202>

Pender, N. J. (2011). *Health promotion model manual*. USA:Michigan.

Perry, K. G. J., & Morrison, J. C. (2004). *Anaemia associated with pregnancy in gynaecology and obstetrics* (1st ed.). Lippincott Williams & Wilkins mid-term evaluation.

Raj, P. B. U., & Mangasuli, V. (2016). Retrospective study on prevalence of anaemia among pregnant women at booking in a health care centre in Yadwad, Dharwad, Karnataka, India. *International Journal of Community Med Public Health*, 3, 50-62.

Rao, R., & Georgieff, M. K. (2007). Iron in fetal and neonatal nutrition. *In Seminars in Foetal and Neonatal Medicine*, 12(1), 54-63.

Reveiz, L., Gyte, G. M. L., & Cuervo, L. G. (2007). Treatments for iron-deficiency anaemia in pregnancy. *Cochrane Database of Systematic Reviews*, 3094(2), 6-13.

Rodriguez-Bernal, C., Rebagliato, M., & Ballester, F. (2012). Maternal nutrition and foetal growth: The role of iron status and intake during pregnancy. *Nutrition and Dietary Supplements*, 4, 25-37.

Rosliza, A. M., & Muhamad, H. J. (2011). Knowledge, attitude and practice on antenatal care among orang asli women in Jempol, Negeri Sembilan. *Malaysian Journal of Public Health Medicine*, 11(2), 13-21

Rush, D. (2000). Nutrition and maternal mortality in the developing world.

Sakraida, T. J. (2010). *Health promotion model, nursing theorists and their work*. Maryland Heights, MO: Mosby Elsevier.

Satyam, P., & Khushbu, Y. (2015). *Maternal anaemia in pregnancy: An overview*. Unpublished Masters Thesis. University of Ghana, Accra.

Scholl, T. O., & Johnson, W. G. (2000). Folic acid: Influence on the outcome of pregnancy. *The American Journal of Clinical Nutrition*, 71(5), 1295-1303.

Sedgwick, P. (2013). *Prospective cohort studies: Advantages and disadvantages reader in medical statistics and medical education*.

University of London: Centre for Medical and Healthcare Education,
St George's,

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalised causal influence*. Boston:

Houghton-Mifflin.

Siekmans, K., Roche, M., Kungu, J., Desrochers, R., & De-Regil, L. M. (2018). Barriers and enablers for iron folic acid (IFA) supplementation

in pregnant women. *Journal of Maternal and Child Nutrition*, 5(5), 3-9.

Silva, J. F., Pimentel, A. L., & Camargo, J. L. (2015). Effect of iron deficiency anaemia on HbA1c levels is dependent on the degree of anaemia.

Clinical Biochemistry, 10, 10-16.

Simon, M. K. (2011). *Dissertation and scholarly research: Recipes for success*. Seattle, W.A.: Dissertation Success LLC.

Sobhy, S., Rogozinska, E., & Khan, K. S. (2016). Accuracy of onsite tests to detect anaemia in antenatal care: A systematic review. *International Journal of Gynaecology Obstetrics*, 139(2), 130-136.

Soma-Pillay, P., Nelson-Piercy, C., Tolppanen, H., & Mebazaa, A. (2016). Physiological changes in pregnancy. *Cardiovascular Journal of Africa*,

27(2), 89–94.

Stevens, G. A., Finucane, M. M., De-Regil, L. M., Paciorek, C. J., Flaxman, S. R., Branca, & Ezzati, M., (2013). Global, regional, and national

trends in haemoglobin concentration and prevalence of total and severe

anaemia in children and pregnant and non-pregnant women for 1995–2011: A systematic analysis of population-representative data. *Lancet Global Health*. 1(1), 16–25.

Stoltzfus, R. J. (2001). Iron-deficiency anemia: Reexamining the nature and magnitude of public health problem. Summary implication for research and programs. *Journal Nutrition*, 131(2), 697-700.

Sudha, S., Vrijesh, T., Rajvir, S., & Harsha, S. G. (2012). Clinical study evaluation of haematological parameters in partial exchange and packed cell transfusion in treatment of severe anaemia in pregnancy. *Hindawi Publishing Corporation Anaemia*, 7, 23-29.

Sullivan, M. G., & Artino, A. R. (2013). Analyzing and interpreting data from likert-type scales. *Journal of Graduate Medical Education*, 5(4), 541-542

Tadesse, S. E., Seid, O., Gariam, Y., Fekadu, A., Wasihun, Y., & Endris K, (2017). Determinants of anemia among pregnant mothers attending antenatal care in Dessie town health facilities, northern central Ethiopia, unmatched case–control study. *PLoS ONE*, 12(3), 173.

Tapiero, H. Gate, L., & Tew, K. D. (2001). Iron: Deficiencies and requirements. *Biomed Pharmacother*, 55, 324-332.

Ter, K. F., Terlouw, D. J., Phillips-Howard, P. A., Hawley, W. A., Friedman, J. F., Kariuki, S. K., & Nahlen, B. L. (2003). Reduction of malaria during pregnancy by permethrin-treated bed nets in an area of intense perennial malaria transmission in western Kenya. *American Journal Trop Med Hyg*, 68(4), 50-60.

Thomas, B., & Bishop, J. (2007). *Manual of dietetics practice. British dietetics association*. London: Blackwell Publishing.

Threapleton, D. E., Greenwood, D. C., Evans, C. E., Cleghorn, C. L., Nykjaer, C., Woodhead, C., & Burley, V. J. (2013). Dietary fibre intake and risk of cardiovascular disease: Systematic review and meta-analysis. *Bio-Medical Journal*, 347, 68-79.

Titaley, C. R., Dibley, M. J., Roberts, C. L., Hall, J., & Agho, K. (2010). Iron and folic acid supplements and reduced early neonatal deaths in Indonesia. *Bulletin of the World Health Organisation*, 88(7), 500–508.

UNICEF. (2002). *Republics and Kazakhstan anaemia prevention and control*.

Van Belle, G., Fisher, L., & Heagerty, P. J. (2004) *Biostatistics: A methodology for the health sciences. Longitudinal data analysis*. New York: John Wiley and Sons.

Van den Broek, N. (2003). Anaemia and micronutrient deficiencies: Reducing maternal death and disability during pregnancy. *British Medical Bulletin*, 67(1), 149–160.

Wardlaw, G. M. (2000). *Contemporary nutrition issues and insights*. MacGraw–Hill Companies.

Weiner, E. A. Billamay, S., Partridge, J. C., & Martinez, A. M. (2011). Antenatal education for expectant mothers results in sustained improvement in knowledge of newborn care. *Journal of Perinatol*, 31(2), 92–97.

Whitney, E. N., Rolfes, S. R., Crowe, T., Cameron-Smith, D., & Walsh, A. (2009). Understanding nutrition. *International Journal of Public Health*, 3(1), 2-9.

WHO. (2003). *Anaemia during pregnancy in West African, prevalence and associated factors*. Geneva: WHO Press.

WHO. (2005). *Worldwide prevalence of anaemia*. WHO global database on anaemia. Geneva: WHO Press.

WHO. (2009). *Global prevalence of vitamin A deficiency in populations*. Geneva: WHO Press.

WHO. (2011a). *The global prevalence of anaemia*. Geneva: WHO Press.

WHO. (2011b). *Weekly iron folic acid supplementation (WIFS) program for women of reproductive age (WRA): An analysis of best program practices*. Geneva: WHO Press.

WHO. (2012). *Worldwide prevalence of anaemia*. Geneva: WHO Press.

WHO. (2013). *Recommendations on health promotion interventions for maternal and newborn health*. Geneva: WHO Press.

WHO. (2014). *Global nutrition targets 2015 anaemia policy brief. Global nutrition targets 2025*. Geneva: WHO Press.

WHO. (2015a). *The global prevalence of anaemia*. Geneva: WHO Press.

WHO. (2015b). *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System*. Geneva: WHO Press.

WHO. (2015c). *Serum and red blood cell folate concentrations for assessing folate status in populations. Vitamin and mineral nutrition information system*. Geneva: WHO Press.

WHO, (2016). *Worldwide prevalence of anaemia*. Geneva, WHO Press.

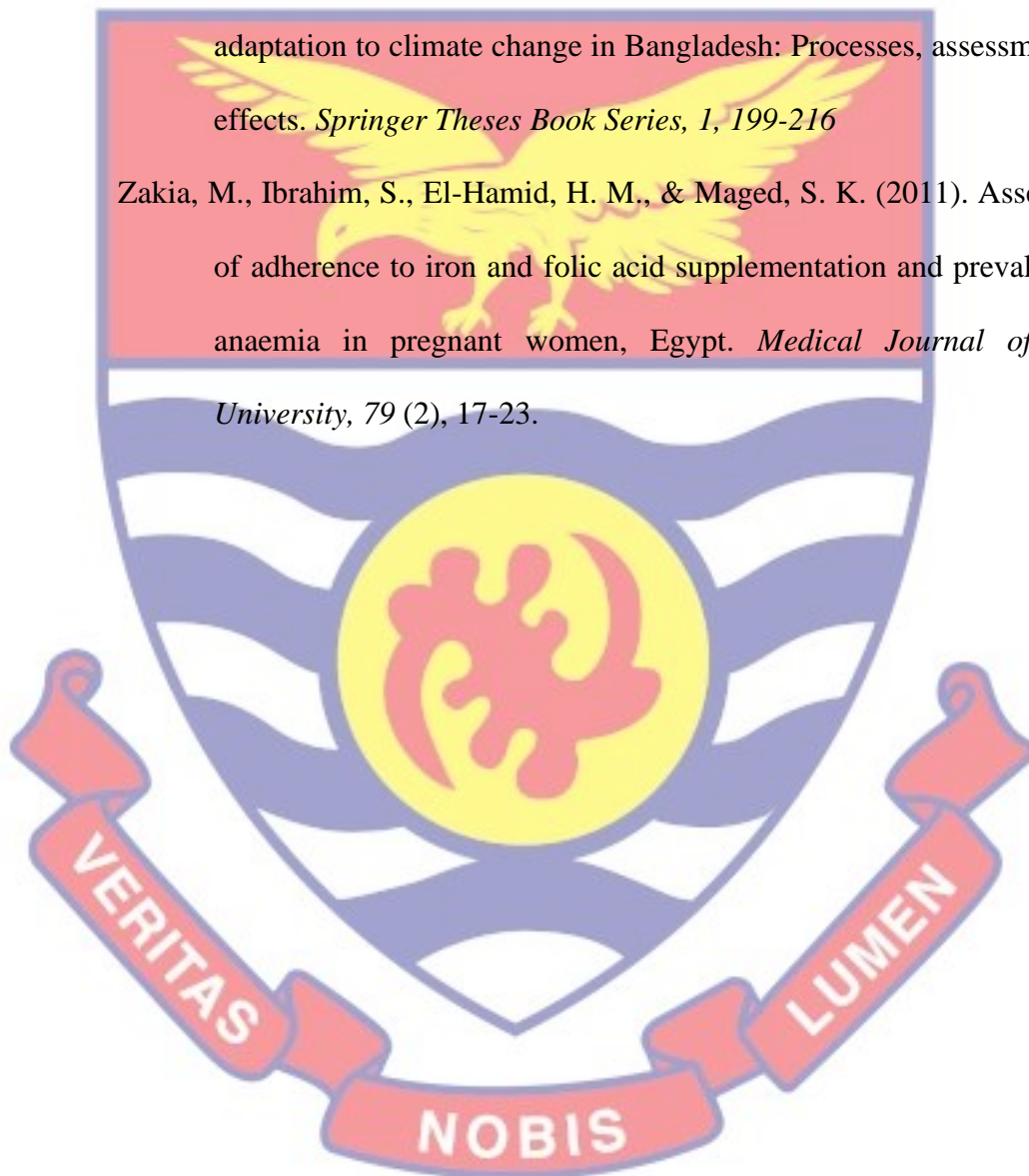
WHO, (2004). *Vitamin and mineral requirements in human nutrition: Report of a joint FAO/WHO expert consultation, Bangkok, Thailand*. Geneva: WHO Press.

Worthington-Roberts, B., & Williams, S. R. (2007). *Nutrition in pregnancy and lactation*. Madison, WI: Brown and Benchmark.

Yadav, R. K., Swamy, M. K., & Banjade, B. P. (2014). Knowledge and practice of anaemia among pregnant women attending antenatal clinic in Prabhakar Kore hospital, Karnataka: A cross sectional study. *Journal of Dental and Medical Sciences*, 13(4), 74-80.

Younus, M. A. F. (2014). Research methodology in vulnerability and adaptation to climate change in Bangladesh: Processes, assessment and effects. *Springer Theses Book Series*, 1, 199-216

Zakia, M., Ibrahim, S., El-Hamid, H. M., & Maged, S. K. (2011). Assessment of adherence to iron and folic acid supplementation and prevalence of anaemia in pregnant women, Egypt. *Medical Journal of Cairo University*, 79 (2), 17-23.



APPENDICES

APPENDIX A

DATA COLLECTION INSTRUMENT

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION &
RECREATION

QUESTIONNAIRE FOR PREGNANT WOMEN

I am Eric Tettegah, a student of the University of Cape Coast, the Department of Health, Physical Education and Recreation. I am conducting a research on the topic: "**Factors influencing anaemia among pregnant women in Nkwanta North and Adaklu Districts.**" All your responses would be kept confidential. The data would be analysed using the computer and the information would be published for upgrading of knowledge of pregnant women on anaemia. I consent to participate as a respondent in this study.

INSTRUCTION: Please tick [] your response as possible.

SECTION A: FACTORS THAT PREDICT ANAEMIA AMONG PREGNANT WOMEN

1. How old are you?
2. What is the gestation age of your current pregnancy?
 - A. First trimester [] B. Second trimester [] C. Third trimester []
3. Are you married?
 - A. Married [] B. Divorced [] C. Single []
4. How many pregnancies have you had?
 - A. 1 [] B. 2-3 [] C. 4-6 [] D. 7 and more []
5. How many children do you have?

- A. No child [] B. 1-3 children [] C. 4-6 children []
6. What is your religion?
- A. Christian [] B. Islam [] C. Traditional []
7. What is your educational level?
- A. No formal education [] B. Primary school/JHS [] C. Vocational

- Technical []
- D. Secondary [] E. Tertiary []
8. What is your average monthly income in Ghana cedis?
- A. less than 300 [] B. 300-500 [] C. 501-700 [] D. 701- 900 [] E. Above 900 []

9. What do you do for a living (occupation)?
- A. Farming [] B. Unemployed [] C. Public servant [] D. Trading []
- E. Student [] F. Retired []
10. Number of times of ANC visits
- A. 1-3 [] B. 4-7 [] C. 8-10 []

SECTION B: PREVALENCE OF ANAEMIA AMONG PREGNANT WOMEN

INSTRUCTION: Please tick $\sqrt{\quad}$ your response.

11. Haemoglobin level in g/dl at first trimester
- A. 1-5 [] B. 6-10 [] C. 11-15 []
12. Haemoglobin level in g/dl at second trimester
- B. 1-5 [] B. 6-10 [] C. 11-15 []
13. Haemoglobin level in g/dl at third trimester
- C. 1-5 [] B. 6-10 [] C. 11-15 []

SECTION C: KNOWLEDGE ON ANAEMIA AMONG PREGNANT WOMEN.

INSTRUCTION: Please indicate your response to the statements below by ticking (√) either Yes or No.

STATEMENTS	YES	NO
What is anaemia?		
14. Anaemia occurs when there is a shortage of red blood cells.		
15. Shortage of fluid in the body refers to anaemia.		
16. Anaemia occurs when the haemoglobin level is low.		
What are the risk factors of anaemia in pregnancy?		
17. Pregnant women are more at risk of anaemia than non-pregnant women.		
18. Teenage pregnancy is a risk factor for anaemia.		
19. Women with heavy bleeding are at risk of anaemia.		
What are the causes of anaemia in pregnancy?		
20. Inadequate intake of iron in the diet during pregnancy can cause anaemia.		
21. Eating of clay or sand predisposes pregnant women to anaemia.		
22. Lack of family planning can cause anaemia.		
23. Worm infestation can cause anaemia.		
24. Malaria can cause anaemia.		
What are the signs and symptoms of anaemia in pregnancy?		
25. The tongue or the face looks pale.		
26. The client feels weak and tired.		
27. The client experiences increased temperature.		
28. The client's experiences dizziness		
What are the effects of anaemia in pregnancy?		
29. The woman can die due to anaemia.		
30. Anaemia can lead to stillbirth.		

31. The baby can die.		
32. Anaemia can lead to low birth weight.		
What are the measures to prevent anaemia in pregnancy?		
33. Anaemia can be prevented		
34. Intake of diet rich in iron during pregnancy can prevent anaemia.		
35. Anaemic pregnant women should take iron pills every day to prevent anaemia.		
36. Intake of citrus fruits such as orange before meal can help in the absorption of iron.		
37. Regular medical check-ups during pregnancy are important to prevent anaemia.		

SECTION D: PERCEIVED BARRIERS TO MAINTAIN APPROPRIATE HAEMOGLOBIN LEVEL AMONG PREGNANT WOMEN

INSTRUCTION: Please indicate the extent to which you agree or disagree to each of the statements below by ticking (✓) either SA- Strongly Agree, A- Agree, D- Disagree, SD- Strongly Disagree.

STATEMENTS	SA	A	D	SD
38. My religion accepts blood transfusion.				
39. My partner supports me financially.				
40. My partner allows me to go for antenatal visits.				
41. I am given iron pills for free at the clinic during pregnancy.				
42. I do not take folic acid regularly.				
43. In my community, pregnant women do not take eggs.				
44. In my community, pregnant women do not take snail.				

45. The attitude of the health workers is encouraging.				
46. I do not have a valid National Health Insurance card.				
47. I have taken dewormer during pregnancy.				
48. I was given antimalaria drugs during ANC visits.				
49. Antenatal visit is not beneficial to me.				
50. The distance to the health facility is very far.				

SECTION E: HEALTH EDUCATION GIVEN BY HEALTH PROFESSIONALS TO THE PREGNANT WOMEN

INSTRUCTION: Please indicate your response to the statements below by ticking (✓) either Yes or No.

STATEMENTS	YES	NO
51. Have you been given health talk on anaemia at ANC?		
52. Have you been given health talk on the benefits of good nutrition?		
53. Have you been given health talk on family planning?		
54. Have you been given health talk on how to prevent malaria?		
55. Have you been given health talk on how to prevent worm infestation?		
56. Have you been given health talk on adequate rest?		
57. Have you been give health talk on the benefits of regular medical check-ups?		
58. Have you been given health talk on cleanliness?		
59. Have you been given health talk on birth preparedness?		

60. Have you been given health talk on effects of alcohol use?		
--	--	--

THANK YOU FOR COMPLETING THE QUESTIONNAIRE



APPENDIX B

UNIVERSITY OF CAPE COAST IRB APPROVAL LETTER

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309 / 0244207814

C/O Directorate of Research, Innovation and Consultancy

E-MAIL: irb@ucc.edu.gh

OUR REF: UCC/IRB/A/2016/548

YOUR REF:

OMB NO: 0990-0279

IORG #: IORG0009096



1ST NOVEMBER, 2019

Mr. Eric Tettegah

Department of Health, Physical Education and Recreation
University of Cape Coast.

Dear Mr Tettegah,

ETHICAL CLEARANCE – ID (UCCIRB/CES/2019/14)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for the implementation of your research protocol titled **Factors influencing anaemia among pregnant women in Nkwanta North and Adaklu Districts**. This approval is valid from 1st November, 2019 to 31st October, 2020. You may apply for a renewal subject to submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'ASIEDU'.

Samuel Asiedu Owusu, PhD

UCCIRB Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST

APPENDIX C

INTRODUCTORY LETTER FROM ADAKLU DISTRICT HEALTH

DIRECTORATE

In case of reply the number and the date of this letter should be stated

My Ref No: GHS/AD-DH/HS/4

Your Ref. No.....

Our Core Values
PEOPLE-CENTRED
PROFESSIONALISM
TEAMWORK
INNOVATION/EXCELLENCE
DISCIPLINE
INTEGRITY



ADAKLU DISTRICT HEALTH DIRECTORATE
GHANA HEALTH SERVICE
P. O. BOX
ADAKLU, W/R.

Tel: 0244418560/0201802973
adakludhd@gmail.com

19th JUNE, 2019.

LETTER OF INTRODUCTION – MR. ERIC TETTEGAH STUDENT OF UNIVERSITY OF CAPE COAST

I write to introduce to your outfit Mr. Eric Tettegah a Principal Health Tutor of Nurses' Training College, Ho who is currently pursuing Master of Philosophy in Health Education at University of Cape Coast.

The officer wants to collect data on topic **"Factors influencing Anaemia Among Pregnant Women in the Adaklu District.**

I will be grateful, if your outfit will accord the officer all the needed assistance that will enable him collect the data successfully.

Thank you.

[CHARLES K. AZAGBA]
DIST DIRECTOR OF HEALTH SERVICES
ADAKLU.

All facility in-charges,

Cc;
Mr. Eric Tettegah
Principal Health Tutor
NTC, Ho

APPENDIX D

INTRODUCTORY LETTER FROM NKWANTA NORTH DISTRICT HEALTH DIRECTORY

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

My Ref. No GHS/NNDHD/
Your Ref. No.

Our GHS Core Values:

- PEOPLE-CENTRED
- PROFESSIONALISM
- TEAMWORK
 - INNOVATION/EXCELLENCE
- DISCIPLINE
- INTEGRITY



Nkwanta North District Health Direct
Ghana Health Service
C/O P. O. BOX 5
Kpassa, Volta Region
Ghana, West Africa
Mobile Phone: 233-24-3565495
233-24-2615566

15TH JUNE, 2019

MR ERIC TETTEGAH
PRINCIPAL HEALTH TUTOR
HO NURSING TRAINING COLLEGE
PRIVATE MAIL BAG
HO

RE- REQUEST FOR INTRODUCTION LETTER
MR TETTEGAH ERIC-PRINCIPAL HEALTH TUTOR

Reference is made to your letter No. dated 3rd June 2019 requesting for an introduction letter to carry out a research work on the topic, factors influencing anaemia among pregnant women in the Nkwanta North District as a research topic leading to an award of **MPHIL in Health Education** at the University of Cape Coast.

We would like to inform you that the district is ready to absorb and support you to conduct the research.

Thank you.

Yours faithfully,

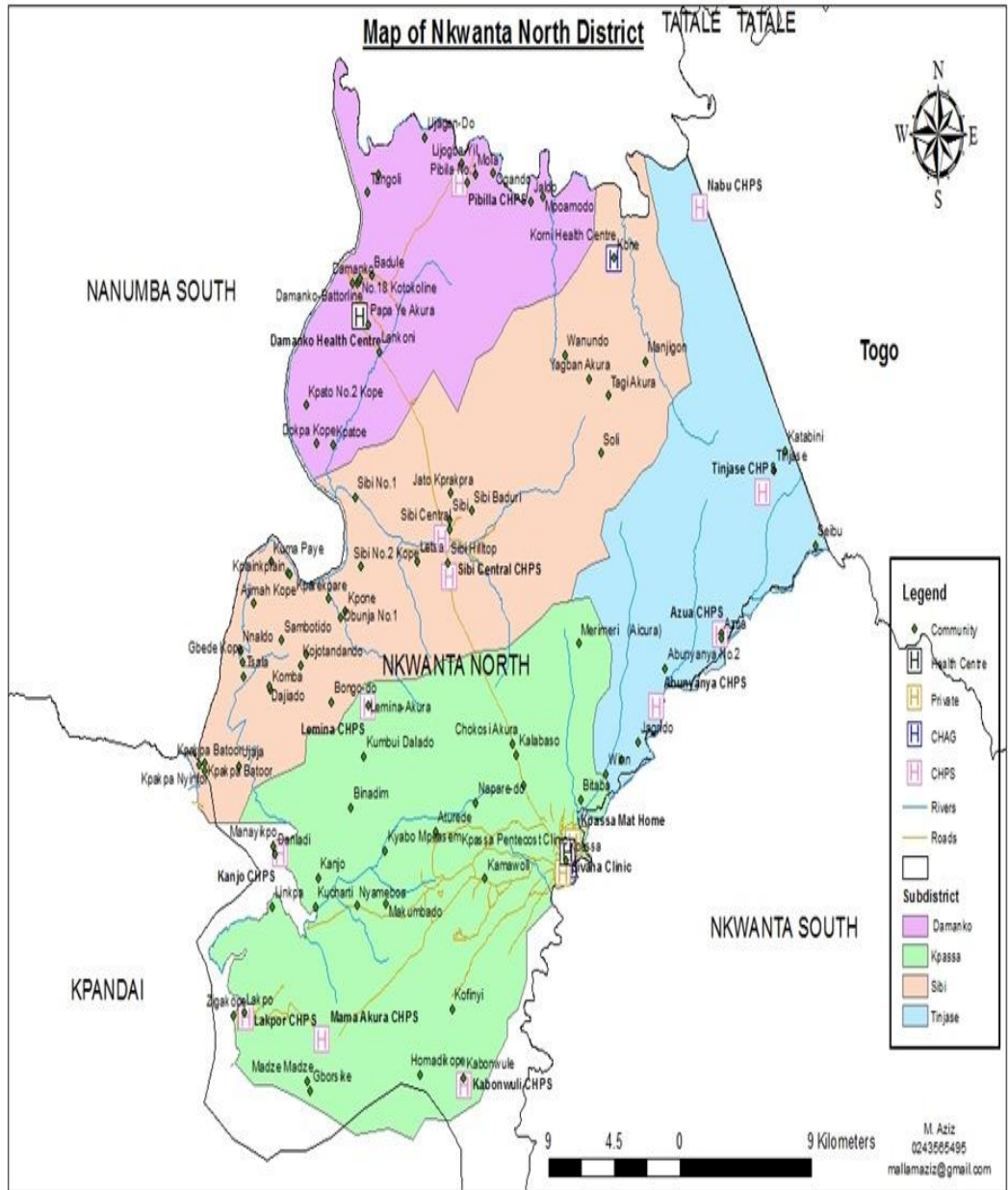
[JOHN KOJO AYIVI]

ADMINISTRATIVE MANAGER

**For: DISTRICT DIRECTOR OF HEALTH SERVICES
NKWANTA NORTH-KPASSA**

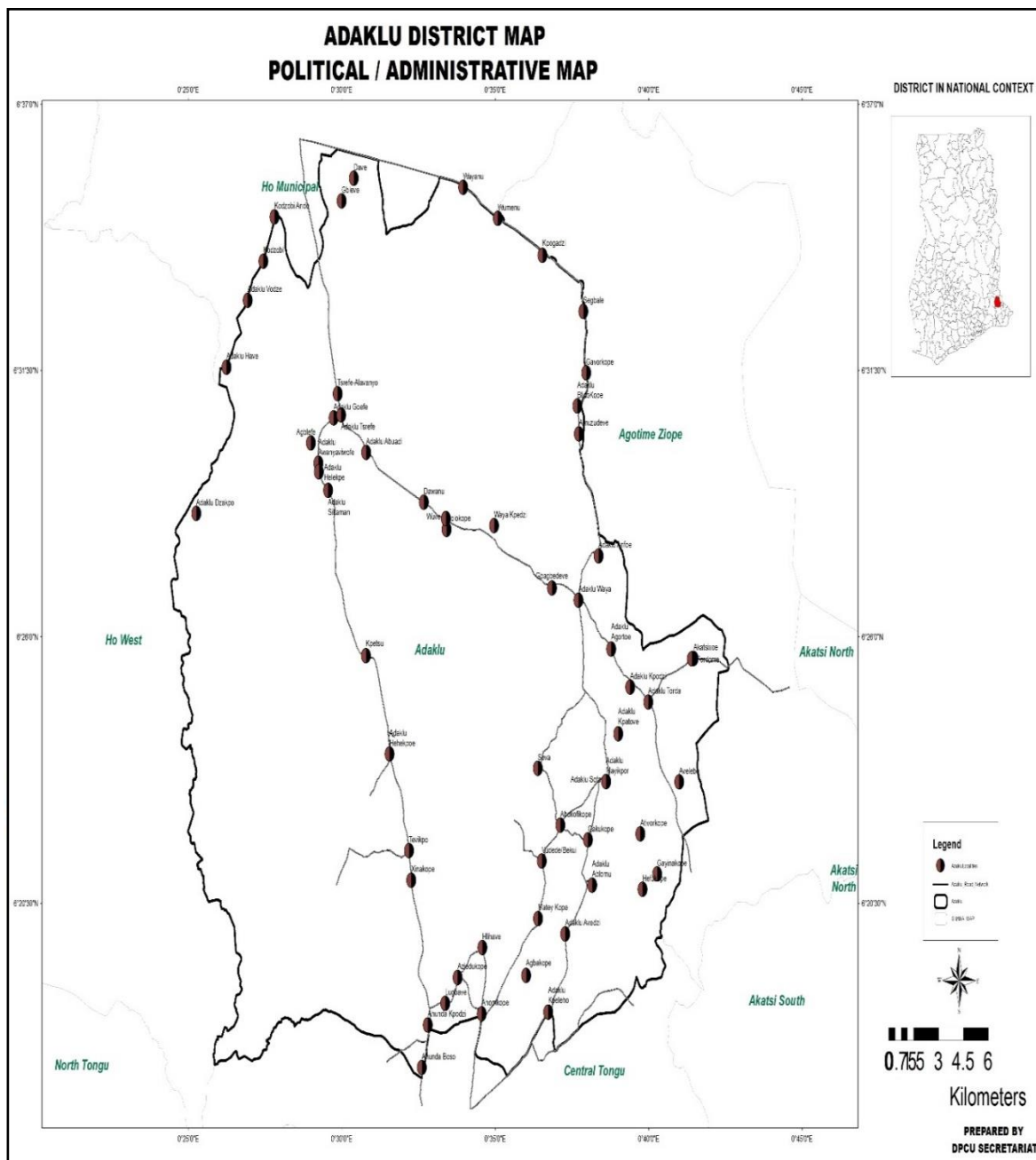
APPENDIX E

ADMINISTRATIVE MAP OF NKWANTA NORTH DISTRICT



APPENDIX F

ADMINISTRATIVE MAP OF ADAKLU DISTRICT



APPENDIX G

INFORMED CONSENT FORM

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION &

RECREATION

QUESTIONNAIRE FOR PREGNANT WOMEN

I am Eric Tettegah, a second year MPhil student of University of Cape Coast, Department of Health, Physical Education and Recreation. My research topic is **"Factors influencing anaemia among pregnant women in the Nkwanta North and Adaklu Districts, Ghana."**

Address: University of Cape Coast
College of Education Studies
Department of Health, Physical Education and Recreation
Cape Coast.

General Information about Research

As part of the academic work, my research topic is factors influencing anaemia among pregnant women in the Nkwanta North and Adaklu Districts, Ghana. The purpose of the study was to investigate the factors influencing anaemia among pregnant women attending antenatal clinics at Nkwanta North and Adaklu Districts. Family Health Division Annual Report (2016), revealed that the Volta Region had the highest prevalence (49%) of maternal anaemia. Also, a critical analysis of 2016/2017 GDHS in the Volta Region on anaemia rate among pregnant women at registration by districts revealed that the prevalence of anaemia among pregnant women in the Nkwanta North and Adaklu Districts is very high. Out of the 25 Districts in the Volta Region,

Adaklu District had the highest percentage of 72.0% in 2016 while Nkwanta North District placed second highest in the same year with a percentage 68.8%. In 2017, Nkwanta North District came first with a percentage of 76.3% while Adaklu District placed second with a percentage of 60.1% which is still considered as a severe public health concern. Based on these statistics, there is

the need to find out the factors influencing anaemia among pregnant women in the Nkwanta North and Adaklu Districts. A structured questionnaire will be used for the data collection. It will take participants approximately 20 to 25 minutes to respond to the questions on the questionnaire.

Participants' involvement

Procedures

You are kindly invited to take part in this research work. You will be asked to respond to questionnaire which will take approximately 20 to 25 minutes. The questionnaire will be answered in the counselling room at the antenatal clinic, so as to ensure privacy. If you cannot read or write, a research assistant will help you to answer the questions.

Possible Risk and Discomfort

The study will not pose any physical, social, financial or emotional risks to you, but you are cautioned that some of the questions may make you uncomfortable.

Possible Benefits

The findings of study will help identify the factors that influence anaemia among pregnant women. It will also help to give adequate education on the causes, prevention and control of maternal anaemia in the Nkwanta North and Adaklu districts. Again, the findings will also influence policy, research and behaviour on prevention of maternal anaemia in the two districts.

Confidentiality

The information you provide will not be disclosed to any third party. You are assured that no personal information will be added identifying information will be included in any reports produced from the study. You also have the right and freedom to decline from participating or withdrawing from the study without suffering penalty for it. Also declining to participate in the study will not affect the quality of care you receive from the antenatal clinic.

Compensation

The study will not involve any invasive procedure. Therefore, you will not receive any form of compensation for being part of the study.

Voluntary Participation and Right to Leave the Research

You have the right to leave or withdraw from the research at any point in time. They will be informed that withdrawing from the research will not affect the quality of care they receive at the healthcare centre.

Contacts for Additional Information

Name: Eric Tettegah 0244815485/0555025025

Your rights as a Participant

This study has been approved by University of Cape Coast, Institutional Review Board (UCCIRB). For further inquiry about this study, contact the Administrator at the IRB Office from 8:00 am to 4:30 p.m. through the phone lines 055809343/0508878309/0244207814. Email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT

This document describing the procedure, benefits and risks for the study title "Factors Influencing Anaemia among Pregnant Women in the Nkwanta North and Adaklu Districts, Ghana" has been understood. I have been given the chance to ask any pertaining to the study answered to my satisfaction.

I agree to participate as a volunteer.

.....

.....

Date

Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the procedures, benefits and risks were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

.....

.....

Date

Name and signature of witness

I certify that the purpose, potential benefits and possible risks linked with involving in this study has been explained to the above individual.

.....

.....

Date

Name Signature of Person Who Obtained Consent

