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FACTORS CONTRIBUTING TO ANAEMIA IN CHILDREN UNDER FIVE YEARS IN THE GA EAST MUNICIPALITY, GHANA

BY

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DECLARATION

I, **Lucy Ofori**, hereby declare that apart from specific references which have been duly acknowledged, this dissertation is my own work put together under the supervision of Dr. Steve Manortey and that this work has not been presented in part or whole for the award of any other degree.

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DEDICATION

This Thesis is entirely dedicated to the Lord Almighty for being my source and hope. Also, to my family, because their contribution to my success is invaluable.

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LIST OF ABBREVIATIONS/ACRONYMS

BMC	Bugardo Medical Center
CBC	Complete Blood Count
GHS	Ghana Health Service
ITNs	Insecticide Treated Nets
MOH	Ministry of Health
RBC	Red Blood Cell
TFR	Total Fertility Rate
UNICEF	United Nations Children's Fund
W.H.O	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Caregiver: A family member or a paid helper who looks after or takes care of a child, a sick, elderly or disabled person.

Empirical Framework: This is one of the ways of acquiring knowledge. It can be done by direct or indirect means through observation or experience.

Faltering growth: It usually refers to a slower rate of weight gain in childhood than expected for sex and age.

Fortification: It means the addition of vitamins and minerals to foods to help increase their nutritional value.

Haematocrit: It is the proportion by volume of the blood that consists of red blood cells. Haematocrit is expressed as percentage. An example is a haematocrit of 25% means that there are 25 millilitres of red blood cells (RBCs) in 100 millilitres of blood.

Microcytic Hypochromic Anaemia: This simply means the red blood cells have few or less haemoglobin than normal. The low level of red blood cells makes the colour pale.

Neoplasms: These are new abnormal growth of tissues in the body, especially as one of the characteristics of cancer. An example is a Carcinoma of the cervix; a common neoplasm in women.

Prophylaxis: It is usually a form of treatment given in order to prevent the occurrence of a disease.

Reticulate Count: It is a blood test that measures how fast red blood cells called reticulates are made by the bone marrow and released into the blood. Reticulates stay in the blood for two days before developing into mature red blood cells (Reticulate Count/ Michigan Medicine).

Serum ferritin: It is a protein which contains iron and is the primary form of iron stored in cells. The small amount of ferritin that is released and circulated in the blood is a reflection of the total amount of iron stored in the body (Ferritin test: MedlinePlus Lab Test Information).

Thalassemia: This is a blood disorder that is usually inherited and it inhibits the body's ability to produce haemoglobin and red blood cells (RBCs).

Theoretical Framework: This is the structure that can actually support a theory of a study. It also introduces and describes the theory that explains why a research problem under study exists.

ABSTRACT

Background: Children under the age of five years are very vulnerable to so many conditions, including anaemia. Anaemia affects all nations globally and has significant adverse health consequences as well as adverse impacts on social and economic development. It is a major global public health problem with serious effects on human health and has affected over two (2) billion people worldwide. The main objective of this study was to assess the factors that contribute to the high prevalence of anaemia among children less than five years in the Ga East Municipality of Ghana.

Methods: The study employed a cross-sectional design where quantitative data were collected. The study took place in some selected communities in the Ga East Municipality. A well-structured questionnaire was used as a tool for collecting data. The study population included all mothers with children under- five years of age and are residents in the selected communities. A sample size of 282 mothers with children under five years was selected. Multistage sampling technique was used in selecting the sample. The multiple logistic regression models were used to assess the influence of demographic factors on knowledge and prevalence of anaemia. All significant associations and influence were determined at a 0.05 level of significance.

Results: The prevalence of anaemia in children was found as 47.9% (95%CI: 42%-54%). Also, family history of anaemia was 49.7% of the respondents. Bivariate analysis showed a significant association among almost all the variables and the anaemia condition in children except for the mother's age (p=0.486), the number of children (p=0.60) and delivery status (p=0.271).

Factors that were statistically significant were mother's education, mother's occupation, family type and family income ($p<0.001$). Again, other factors such as father's occupation and religious affiliation also had a p-value of <0.01. Child's birth weight was also significant with p-value=0.037.

Conclusions: It was noted that the high awareness of childhood anaemia among caregivers or mothers does not necessarily translate to high knowledge levels. More than half of the participants had poor knowledge on the signs and symptoms, complications and management of childhood anaemia. The formal high school attainable levels among the respondents also did not reflect on their knowledge level. Additionally, mothers or caregivers from the nuclear family and those who have a family history of childhood anaemia were the only groups found to have a significant association with high knowledge level.

The prevalence of anaemia in children was also slightly high as nearly half of the children were diagnosed with the condition.

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background of the Study

All over the world, children who are not up to five years old are much exposed to health problems like malaria. Anaemia is a condition in which the number of red blood cells or their ability to carry oxygen is not enough to meet the physiological needs of a person. It impacts low, middle and high income countries and has negative health consequences as well as negative effects on economic and social development (World Health Organization, 2011). It is a major global health problem with serious effects on human health and has affected over two (2) billion people worldwide. Among these affected populations, children under-five are one of the most vulnerable groups (Wenlong *et al.*, 2013).

The global estimate of childhood anaemia indicates that around 293.1 million children under the age of five, 43 percent are anaemic globally and 28.5 percent of these children reside south of the Sahara (Sidhu et al., 2009). It is considered a significant public health problem with a prevalence of 67 percent, or about 83.5 million children in sub-Saharan Africa. Anaemia is one of the main causes of infant mortality. Even when transfusion is available, there is a significant case fatality rate of 6-18 percent (Schellenberg et al., 2003).

About 75% of children less than five years in East Africa have anaemia and the prevalence rates are between 44% and 76% (Chatterjee *et al.*, 2010). Anaemia risk factors differ with different settings and these may include having parasites in the intestines, malaria, being

infected with HIV, deficiencies in nutrition and taking tea with meals, haematological malignancies and protracted illnesses like sickle cell disease (Magalhaes *et al.,* 2011). Factors like poor socioeconomic status and the health of mothers, including the presence of iron deficiency anaemia can result in childhood anaemia (Schellenberg *et al.,* 2003). Anaemia in children is of great significance because it alters children's mental, physical and social makeup, as well as behavioural and cognitive states, resulting in poor academic performance and capacity for work later (Ewusie *et al.,* 2014). Iron deficiency is seen as the most common cause of anaemia in children less than five years old, with a smaller part caused by other micronutrient deficiencies like Vitamin A, B12 and folate.

Anaemia is characterized by a reduced number of red blood cells, often followed by a decreased level of haemoglobin. Children may have mental and motor problems (Kassebaum *et al.,* 2014). It is typically associated with severe consequences that include retardation of growth, impaired motor and cognitive development and increased morbidity and death. Causes of anaemia can be numerous and frequently correlate, but a diet with insufficient iron sources is the primary cause; iron deficiency causes an estimated 50 percent of cases of anaemia worldwide (World Health Organization 2010). In Haiti, the national representative survey for 2005-2006 showed that 60.6 percent of children aged 6-59 months (about 610,000 children) and 75 percent of children aged 6-23 months were anaemic (Mohamed et al., 2013).

Approximately 60 per cent of African children under the age of five have anaemia. The prevalence of anaemia among preschool children in sub-Saharan Africa ranges from 42 per cent in Swaziland to 91 per cent in Burkina Faso. Studies in Cape Verde, however, showed that the prevalence of anaemia in children under the age of 5 is approximately 50%. A children's anaemia research along the Tanzanian coast reported a prevalence of 74 percent. Another Democratic Republic of Congo research reports a prevalence of 43 per cent (Ewusie et al., 2014). In addition, another research performed in Nigeria on children under the age of five revealed a high prevalence of iron deficiency in non-anaemic children under the age of five present at the Outpatient Department and Emergency Room of a tertiary health facility in Enugu. It found that 49 (27.5 percent) of the sample population of 178 respondents was iron deficient (Ekwochi et al., 2013). Anaemia remains a public health concern in all parts of the world (Centre for Biotechnology Information, 2016). It is estimated that 293.1 million children under-five years globally are suffering from anaemia, and 28.5 percent of these children are from Sub-Saharan Africa (Oscar & Nwambi 2015). In Ghana, the latest nutritional survey conducted by the Ghana Health Service indicates that children were anaemic (Demographic and Health Survey 2015).

1.2. Problem Statement

Exactly 66 percent of children aged 6 to 59 months in Ghana have some degree of anaemia; 27 percent are slightly anaemic, 37 percent are moderately anaemic and 2 percent are seriously anaemic (Ghana Demographic Health Survey 2014). It is necessary that issues of anaemia in children under five years which are easily preventable but have high morbidity and mortality rates are looked at from a broader perspective in Ghana.

Severe Anaemia positively correlates with the risk of preterm labour, low birth weight baby, child and maternal mortality (Kassebaum *et al.,* 2014). It has a huge impact on the economy of the affected child's family as parents have to spend huge sums of money if the child is hospitalized. It also threatens national development as it keeps claiming the lives of the young ones who are the future leaders for the entire country. A study by Roland *et al.,* (2006) revealed spatial variation in the prevalence of anaemia in children across Ghana. The incidence of anaemia was 84 per cent and 68 per cent respectively in rural and urban areas. The Upper West and Upper East regions had the highest incidence of anaemia in children of 88 percent and 89 percent accordingly, whereas the Greater Accra Region had a prevalence rate of 62 percent (Roland et al . 2006).

In general, several studies on anaemia have been performed in Ghana, but household characteristics have not been fully studied. The major gaps in Ghana's study of anaemia include; incomplete descriptions of spatial differences in rural-urban areas of Ghana, the explanations for regional variations have also not received much attention, and household variables such as family structure, heads of households, size of households, housing and form of households in which children are living and household feeding practices have not been well explored as factors that may be correlated with childhood anaemia (Van et al., 2002).

The WHO (2008), is of the view that the role of other factors in the development of anaemia, rather than the iron deficiency, is not well considered by public health officials because anaemia has long been associated with iron deficiency anaemia. It has driven the creation of methods and programs for regulating the immediate causes of anaemia, while the number of remote causes remain untouched (WHO, 2008).

Morbidity rate of Anaemia in Ghana for the year 2013 was 3.19%. It was the cause of Hospital admission for children under-five years in 2013. The mortality rate for Anaemia in the above-mentioned year was 4.05% in Ghana (Demographic and Health Survey 2014).

Anaemia cases recorded in 2018 in the Ga East Municipality in the Greater Accra Region of Ghana was 4,291(Ga East Municipal Health Directorate, unpublished). It was the eighth (8th) case among the top ten diseases in the Ga East Municipality in 2016 but the fifth (5th) on the list in 2018. The Municipality did not record any death related to Anaemia in 2018 despite the increase in cases in the Ga East Municipality. The Municipality however recorded one death related to Anaemia in 2019. It is based on the above-mentioned problems that this study sought to assess the factors contributing to anaemia in children less than five years in the Ga East Municipality in Ghana.

1.3. Rationale of the study

The findings of this research will help identify the factors that contribute to the cause of anaemia among children under-five years and suggest to responsible and appropriate authorities the possible ways of helping mothers and caregivers to prevent it. This study was very necessary because it will also help the management of health institutions within the study area to identify some of the factors that contribute to anaemia so they can equip their institutions in order to manage anaemia cases well. This study will also help the Ministry of Health (MOH) and Ghana Health Service as well to enhance the maternal and child Health programmes. Other stakeholders in the health industry will also be able to rely on it to plan, organize and distribute resources equitably. Students and lecturers will also gain because it will serve as a source of information for teaching and learning respectively. Researchers in this study area can also rely on this study for future research.

1.4. Hypothesis

1.4.1. Null Hypothesis

Factors such as low iron diets, low birth weight, prematurity and socio-economic status are some of the factors that contribute to anaemia in children under-five years.

1.4.2. Alternate Hypothesis

Factors such as low iron diets, low birth weight, prematurity and socio-economic status of parents are not some of the factors that contribute to anaemia in children under-five years.

1.5. Research Questions

1. What is the knowledge level of mothers and associated factors on anaemia among children under five (Signs and symptoms, causes and complications).
2. What is the knowledge level of mothers on the effects of anaemia on children under-five years?
3. How do mothers prevent anaemia among children under-five years?
4. How do mothers manage children less than five years with anaemia?

1.6. General Objective

The main objective of this study was to assess the factors that contribute to the high prevalence of anaemia among children under-five years in the Ga East Municipality in the Greater Accra Region of Ghana.

1.7. Specific objectives

The specific objectives were;

- To assess mothers' knowledge and associated factors on anaemia among children under five (Signs and symptoms, causes and complications).
- To determine the prevalence of anaemia among children under five and the associated factors
- To examine the management of anaemia by mothers with children under five years.
- To assess caregivers' anaemia prevention practices for children under five.

1.8. Profile of study area.

Located in the northern part of the Greater Accra region, the Ga East Municipality occupies a total area of around 166 km2. Abokobi is the administrative seat of the Municipality of Ga East. It is boarded by the Municipality of Ga West to the west, by the Municipality of Adentan to the east, by the Metropolis of Accra to the south, and by the District of Akuapim South to the north. The area is lowland with temperature ranging from 32℃ to 27 ℃ with the area experiencing major rainfall patterns. The northern part has a semi rainforest with deciduous trees but is gradually transforming into grassland because of the activities of humans and animals.

The Municipality's population would be around 175,245, with a growth rate of about 2.3 per cent in 2018. (Municipal Health Directorate Ga East; not published). It presently consists of five sub-districts namely, the sub-districts of Dome, Abokobi, Taifa, Haatso, and Ashongman. There are 83 communities consisting diverse settlements, that is to say urban, peri-urban and rural areas. Two-thirds of all settlement in the district are peri-urban and rural.

The predominant religion in the Municipality is Christianity, and a sizeable percentage of the population also practise Islam and traditional religion. The predominant economic activity there is trading.

Politically, there is an elected Member of Parliament, a Municipal Chief Executive and Assembly members who govern it. Most of the communities have chiefs who govern them traditionally.

The Municipality has a total of seventy-eight health facilities. Some of the health facilities are private, quasi and public. All public health facilities provide in-patient and out-patient services. More serious cases are referred to hospitals outside the Municipality.

The Municipal Health Directorate in the Municipality is responsible for the delivery of health services. There is a Municipal Health Management Team that consists healthcare professionals and some key people in the community. They are responsible for smooth delivery of healthcare services to specified areas and population. In the different communities there are traditional birth attendants; only a couple are given training. Other health care providers such as traditional healers, pharmacy dealers and maternity homes work in the Municipality. Health workers such as doctors, general nurses, community health nurses, midwives, physician assistants, pharmacists and supporting staff are at the various health care centres and hospitals to see to the health needs of the residents.

The top ten diseases in the municipality are malaria, hypertension, upper respiratory tract infection, typhoid fever, anaemia, rheumatism, skin diseases, Diarrhoea, Acute Urinary Tract Infection and diabetes mellitus in descending order (Ga East Municipal Health Directorate, Unpublished).

Portable water supply to most communities of the Municipality has been a major challenge; as a result, most people depend on tanker services and hand-dug wells.

The rate at which human and industrial waste is generated has assumed an alarming proportion, and this could be a result of an increasing number of people migrating into the municipality. There is adequate housing in the municipality.

1.9. Scope of the study

Anaemia is one of the leading causes of mortality in children, and therefore, it needs to be looked at holistically. Since this research is time-bound, it has been limited to assessing the factors contributing to anaemia. This is so because once the actual causes and risk factors are known, better solutions and management options can be sought.

1.10. Organization of report.

The report is organised into six (6) main chapters. Chapter One gives an introduction to the topic. It also discusses the background of the study, statement of the problem, the rationale of the study, hypothesis or conceptual framework, research questions, objectives of the study, profile of study area, scope and organization of the study. Chapter Two presents a review of some works by other researchers on the topic. It reviews the relevant literature on the topic.

Chapter Three deals with the research methods and design, techniques and tools for data collection. While Chapter Four presents the Results of the studies in tables and charts, chapter Five presents the discussion of findings. The last chapter, Chapter Six, includes a summary of the major findings, recommendations and topics that need further research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section seeks to explore other research and related studies in line with the topic; Factors contributing to Anaemia among children under-five years. This section classified into two main areas. These are; theoretical framework and empirical framework.

2.1 Theoretical review

2.1.1 Overview of anaemia

Anaemia is caused by a reduction in the total amount of red blood cells (RBCs) or haemoglobin in the blood, or a decline in the oxygen carrying capacity of the blood (Kassebaum et al . , 2014) (WHO 2011). When anaemia slowly progresses, the symptoms are often unclear and can include feeling tired, fatigue, shortness of breath or reduced exercise capacity. Anaemia that also develops rapidly has more signs that can involve distress, feeling as though one is about to faint (Magalhães & Clements 2011). Until a person becomes visibly pale anaemia has to be severe.

Depending on the underlying cause further symptoms can occur. Symptoms of anaemia can evolve depending on the underlying cause. The condition of anaemia in Ghana is thought to be distant from all other parts of Africa and from the world. It has gained a foothold in diet and parasite infections (Malaria and Hookworm) due to inadequacy of iron and nutrients such as folic acid and Vitamin B12. Haemoglobin is a pigment which binds to oxygen within the red blood cells. It is an integral part of the red blood cells (RBCs), and low levels result in reduced haemoglobin absorption into red blood cells. About 12 percent of all women of

child-bearing age in the United States have an iron deficiency. Research findings have also shown iron deficiency in adolescent girls without anaemia leading to poor school performance and reduced IQ (WHO 2011).

Since haemoglobin is the only structure that carries oxygen to the tissues, a reduction in its normal level will have serious consequences on the body as a whole and life-threatening because without oxygen there will be no life.

2.1.2 Causes of anaemia

According to Ewusie (2014), blood loss due to gastrointestinal bleeding, gynaecological complications, trauma or surgery, peptic ulcers or persistent blood loss are among the causes of childhood anaemia (Tarkan et al . , 2019) Decreased blood cell development, which is an Iron deficiency, lack of vitamin B12, thalassemia, and a number of bone marrow neoplasms. Greater red blood cells break down due to a variety of genetic disorders, including sickle cell anaemia, infections such as malaria and certain autoimmune diseases (WHO, 2008).

Maternal factors like birth age, parity intervals, and birth rates are also causes of anaemia. A mother's age is an elevated health risk for mother and child alike. This can be attributed to old age or below 40, or a woman's aging that comes with mortality risk factors (Villamor et al., 2012).

High fertility rates are detrimental to the nutritional status of children particularly when followed by short birth intervals. Families in most Sub-Saharan Africa have limited income to provide their children with adequate nutrition and healthcare.

If the number of children per parent rises, there are fewer resources available for each child in the family. High fertility does have a negative effect on maternal health, thereby impacting the capacity of a mother to provide proper care for the children. The most commonly used indicator of current fertility is the Total Fertility Rate (TFR), which is defined as the number of children a woman would have at the end of her reproductive years if she were to proceed through those years of childbearing at the age-specific rates currently observed.

Knowledge about the duration of birth cycles gives insight into patterns of birth spacing. Research shows that children born too soon after a preceding birth are at greater risk of anaemia and higher mortality risk, especially when that period is less than 24 months. According to Osório (2002) these are referred to as biological factors that could emerge from many factors that could make anaemia significant for both the mother and the baby along with increased risk of morbidity and mortality (Osorio 2002, Bagchi 2004). Environmental pollution, as one of the determinants, involves the severity of crowding in the home, water contamination, and contamination of the household food or possible faecal contamination. These indicators may also affect child health, particularly in the aspect of diarrhoea and worm infection which could lead to childhood anaemia (Boadi & Kuitunen 2005). The source of drinking water for a household is connected to their socioeconomic background. Households that are poor are more likely to use polluted sources such as surface water or open wells.

Without sufficient water supply, the risks of food pollution, diarrheal disease and malnutrition are increasing. Children from households without a private tap are at greater risk of anaemia than those of the homes with this amenities and facilities. Thirty percent of the households surveyed with children under the age of five use pipe-borne water, 46 percent get their drinking water from a well, and 25 percent use surface water. Lack of sanitation facilities lead to a higher risk of diarrheal disease that mostly contributes to childhood anaemia.

In Ghana, 63 percent of households sampled have access to a latrine with at least one child under five years of age, 30 percent have no such facilities and only 7 percent of the households sampled have access to a flush toilet. The nutritional deficiency regarding the availability of nutrients to an infant or mother during pregnancy and breastfeeding was established as a potential factor which might influence child survival (Osorio 2002).

It is very common in developing countries as a consequence of chronic malnutrition and under-nutrition that has resulted in over 50 percent of the world's iron deficiency anaemia. The most common type of nutritional deficiency worldwide is iron deficiency anaemia. This form of nutritional deficiency progresses slowly and will not show any symptoms until the extreme anaemia. Diets that heavily rely on one grain or starch as the primary staple frequently lack adequate iron intake. Iron can be found in beef, poultry, fish, grains, a few cereals and dark green leafy vegetables including spinach. Foods which are high in vitamin C improve absorption of iron into the blood. Tea, coffee, and whole-grain cereals will impede the absorption of iron. Anaemia is prevalent in children aged 6-24 months who solely eat a milk diet, and in women during gestation and breastfeeding. Iron deficiency anaemia is associated with impaired cognitive growth in infants, diminished adult work ability and

limited infant survival chances. Extreme cases are related to low birth weight, perinatal and maternal mortality.

Data on the incidence of anaemia worldwide suggest that regular dietary consumption of iron is inadequate to cover a large proportion of pregnant women for these increased requirements. One of the most commonly implemented public health interventions to prevent and treat anaemia is the distribution of iron supplements to pregnant women during this crucial time span. Nutrition has been found to be the root cause of 3.5 million infant deaths contributing to 35 percent of disease burden worldwide (Boah et al., 2019)). Again, mother and child under nutrition account for 11 percent of the overall disease burden worldwide (WHO, 2003). Black et al. (2000), also confirmed that 10 million children die from malnutrition worldwide each year (WHO 2020).

Malnutrition is one of Ghana's most serious health and welfare issues among infants and young children. It is caused by insufficient consumption of food and by sickness. Inadequate food consumption is a result of insufficient household food available, poor feeding practices, or both. Improper methods of feeding include both the quality and quantity of food provided to young children and the timing. Improper feeding habits are important determinants of anaemia besides diarrheal disease. The WHO and UNICEF suggest that all children be breastfed exclusively from birth to six months old (WHO & UNICEF 2015).

In other words, children can only be given breast milk in the first six months of their lives. In Ghana, liquids such as water, sugar water, juice, formula, and solid foods are introduced earlier than the average six month period. For a variety of factors this activity has detrimental

effects on nutritional status. Firstly, the provided liquids and solid foods are nutritionally lower than breast milk. Second, the ingestion of liquids and solid foods decreases the intake of breast milk for the infant, which will in turn reduce the availability of milk from the mother. Third, feeding liquid and solid foods to young children increases their susceptibility to pathogens, thus placing them at greater risk of diarrheal disease leading to anaemia.

UNICEF and the WHO advocate the introduction of solid foods to infants over the age of six months, as breast milk alone is no longer adequate to sustain optimum development for a child at six months and beyond (WHO 2020), so all infants over the age of six months should obtain solid foods along with breast milk. Breast milk is also an important source of energy, protein, and micronutrients for older infants and toddlers. Research has shown that breast milk is the most significant source of vitamin A and fat in children over the age of 12 months in certain populations (Newman 2019). Breastfeeding of older infants often lowers their risk of infection, especially diarrhoea. In addition, breastfeeding for up to 24 months can help lower the fertility of a woman, especially in areas where contraception is minimal.

Other variables that may impact children and potentially contribute to anaemia are injury and personal illness control in the area of the use of preventive services such as immunisation, malaria prophylactics or antenatal services and the use of curative measures for particular conditions (Mosley 1999). It is estimated that Measles kills two million children every year, all in developing countries. It is one of the most prevalent diseases in areas with poor vaccine coverage during childhood. Not only does Measles raise the risk of death but it is also a source of anaemia. The incidence of measles is associated with faltering development, vitamin A deficiency and immune suppression, in poor environments. Though infants are not protected by their mother's breast milk from measles after birth, they are covered by their

mother's measles antibodies while in the womb. These antibodies can last up to fifteen months in infants but in children in less developed countries, due to malnutrition, it only lasts eight to nine months. Consequently, vaccination against measles is an effective technique for children's wellbeing.

2.1.3 Types of anaemia in children

According to (Scholl & Reilly 2000) anaemia is a common problem in children. About 20 percent of children are diagnosed with anaemia at some point (Lao *et al.*, 2000). A child who has anaemia does not have enough red blood cells or haemoglobin. Haemoglobin is a type of protein that allows red blood cells to carry oxygen to other cells in the body. There are many types of anaemia; a child may have one of the following:

- **Iron deficiency anaemia**: Too little iron in the blood. Iron is needed to form haemoglobin. This is the most common cause of anaemia.
- **Megaloblastic anaemia**. Red blood cells are too large. One type of megaloblastic anaemia is pernicious anaemia. In this type, there is a problem absorbing vitamin B12, which is important to making red blood cells.
- **Haemolytic anaemia**. Red blood cells are destroyed. There are many causes, such as serious infections or certain medications.
- **Sickle cell anaemia**. An inherited type of anaemia with abnormally shaped red blood cells. It is a type of haemolytic anaemia.
- **Cooley's anaemia (thalassemia).** Another inherited type of anaemia with abnormal red blood cells.
- **Aplastic anaemia.** Failure of the bone marrow to make blood cells.

Also, Institute of Medicine (2008) noted that children’s anaemia can be classified by the size of their red blood cells;

- **Microcytic anaemia**: this means that the child's red blood cells are smaller than normal. The most common cause is iron deficiency.
- **Normocytic anaemia**: this means the child's red blood cells are normal in size. This type of anaemia has many causes and may require other special types of blood tests
- Macrocytic anaemia: this means the child's red blood cells are larger than normal. This is the rarest type of anaemia in children and it is caused by vitamin B12 deficiency (Pressman *et al.,* 2016) (University of Rochester Medical Centre 2016).

2.1.4 Diagnosis

These blood tests can diagnose most anaemia in children: haemoglobin, and haematocrit. Sometimes this is the first screening test in children, for anaemia (Makubi et al., 2012). It tests the blood level of haemoglobin, and the amount of red blood cells in the blood sample. These blood tests can be used to diagnose most anaemia in children.

Complete Blood Count (CBC): A full blood count can be performed if haemoglobin or haematocrit is not normal. This measure provides vital blood details like the number of red blood cells referred to as the mean corpuscular volume (MCV).

Peripheral smear: This test involves a blood smear on a slide being examined under a microscope. By looking at the blood cells of a child under a microscope, a laboratory specialist might be able to identify a form of anaemia that causes an irregular growth or development of the red cells.

Reticulocyte count: Immature blood cells are reticulocytes. A reticulocyte count tests the amount of red blood cells that are freshly produced in the child's blood sample. Anaemia caused by inadequate red blood cells results in a low count of reticulocytes (Kotey 2012). Anaemia caused by the depletion of too many red blood cells, produces a large number of reticulocytes and thus its count.

2.2 Empirical research

2.2.1 Factors that contribute to the prevalence of anaemia in under 5 years

Valkov et al . , (2014), conducted a cross-sectional study on the prevalence of anaemia in children under five in three remote areas of northern Kazakhstan. The study showed that the total prevalence of anaemia in the counties of Aktobe, Pavlodar and North Kazakhstan was 48.6 percent, 44.9 percent and 40.0 percent, respectively. The prevalence of moderate and extreme anaemia in Aktobe was 17.9percent and 1.6 percent, in Pavlodar 20.3percent and zero percent (0-1.4) and in North Kazakhstan counties 15.2percent and 0.8percent.

No disparity was found in the prevalence of anaemia between urban settings of 44.7 percent and rural settings of 43.9 percent, and they conclude that almost half of the less than five years old children in northern Kazakhstan counties have anaemia, which is comparable to other developing settings. Younger children were more susceptible to anaemia. No geographic or urban-rural differences in the prevalence of anaemia were reported. Measures to prevent and manage anaemia, including programs for supplementation and fortification, are required to better the condition (Valkov et al., 2014).

A cross-sectional household-based study was carried out in Cape-Verde to assess the prevalence of anaemia among children less than five years. The study revealed that worse household conditions of families were strongly associated with anaemia among their children as compared to children whose families were living under better conditions. However, unfavourable living and sanitary conditions can expose children to parasitic infections and consequently diarrhoea and loss of iron through their faeces. Thus, actions to improve housing and sanitation of the population should be taken into consideration (Samedo, et al., 2013). From Ewusie et al . , (2014) the study done in Ghana, mainly in rural areas; beef, eggs and other haeme-containing foods (meat) are added only after weaning, to children's diet, which is mostly after 18–24 months. The anaemia determinants look identical with little difference by geographic area. A research conducted in Tanzania showed a positive correlation between anaemia and malaria, malnutrition, dietary deficiencies, HIV infection, and low socioeconomic status (Villamor et al., 2000). Studies in Kenya, Ghana, Burkina Faso and Mali obtained similar results (Magalhaes et al., 2011). Aside from these factors, a Brazilian study showed that anaemia was associated with a short breastfeeding time. In Burkina Faso, Mali and Ghana, Helminthes and Schistosoma infections were further factors (Netto et al., 2011).

Other descriptive and cross-sectional studies were performed in 2005, 2008, and 2011 on children 6–59 months old. The levels of haemoglobin were calculated to diagnose anaemia (haemoglobin < 110 g / L) and data were collected on independent variables such as age, sex, residential area (urban or rural), day care center enrolment, birth weight, breastfeeding history and anaemia during pregnancy.

In children aged 6–23 months, the incidence was higher than in those aged 24–59 months. In all three years, day care enrolment has emerged as a preventive factor. The prevalence of exclusive breastfeeding increased over the study period for six months; in 2005, a lack of

breastfeeding was reported as associated with anaemia. A major risk factor in 2011 was maternal anaemia at the onset and during pregnancy (Pita et al., 2014).

"Simbauranga et al . , (2015)" researched the prevalence and factors associated with extreme anaemia among children less than five years hospitalized in Bugando Medical Center, Mwanza, Tanzania's Pediatric Wards. A total of 448 children under five were sampled for the study. The total prevalence of anaemia was 77.2 percent (346/448) of which 16.5, 33 and 27.7 percent were mild, moderate and extreme anaemia respectively. Also 37.5 per cent of children with anaemia reported microcytic hypochromic anaemia. Of the 239 children with moderate to serious anaemia, 22.6 percent (54/239) had iron deficiency anaemia of less than 12 mg / ml based on serum ferritin.

The study found that parent unemployment, malaria parasiteaemia and the presence of sickle haemoglobin were factors correlated with extreme anaemia (Simbauranga et al., 2015).

However, for younger children less than 2 years, the prevalence among those who were still being breastfed was significantly higher, 87.3percent, than those who had been weaned, 74.2percent (Ewusie *et al.,* 2014). Common causes of anaemia in Ghana according to GHS among all age groups are through infection such as malaria, malnutrition, hookworm infestation, heavy menstrual bleeding and severe haemorrhage result from trauma or injury (Yiadom 2014).

2.2.2 Prevention of anaemia

It has been established that steps to prevent and control anaemia should be continued and reinforced: initiatives for women of childbearing age, supporting exclusive breastfeeding of infants through their sixth month, and facilitating compliance with recommendations on

complementary feeding according to Cuba's dietary guidelines for children < 2 years of age (Pita et al . 2014).

In malaria-endemic areas where iron deficiency often appears to be widespread, the public health effect of anaemia is possibly the highest. Clinical studies were performed to compare the various therapies for anaemia. In Ifakara Tanzania, the use of ferrous sulphate and antimalarial has been extended for three months and enhanced enforcement has benefited anaemic children in malaria-endemic areas, as the amount of packed cells is substantially increased (Schellenberg et al . , 2003). Additionally, low-dose micronutrient supplementation including polyvisol containing vitamins A, D, E, C, B1, B2, Niacin and B6 with either iron or prophylaxis SP leads to a substantial increase in haemoglobin (Ekvall et al., 2001). In Kenya, children with complicated malaria who were transfused according to WHO guidelines at discharge, the mean haemoglobin was low similar to non-transfused children and most of them remained moderate to severely anaemic. Transfusion does not influence a higher increase in haemoglobin concentration (Akech *et al.*, 2008). At BMC the recommended management of mild and moderate anaemia includes oral haematinics. In patients with severe anaemia apart from blood transfusion, oral haematinics are also recommended (BMC 2011).

In the war against malaria one of the best tools is the use of insecticide-treated mosquito nets (ITNs) while sleeping. Research has shown that incidence rates for malaria decrease significantly with the use of ITNs. More people living in Afram Plains in Ghana are reportedly sleeping under bed nets, whether treated or untreated due to the high prevalence of mosquitoes and malaria in the region (Crookson et al., 2006). A randomized control trial in Ghana's Kasena-Nankana district found that 70 percent of women who had bednets regularly used the bednets out of 80 percent.

"(Binka et al . , 2001)" suggested that 87 percent of respondents were interested in the potential use of treated nets, mainly because they felt it would provide them with better mosquito protection. 'Otchere et al., (2011)' studied the frequency of use of ITN among pregnant women and children under the age of five; it was recorded that 162(90 per cent) of those who approved and owned the net frequently hang their nets on the bed while 17(10 per cent) were not hanging on the bed (Otchere et al., 2011).

In Kenya a survey was conducted to determine the prevalence and risk factors of anaemia among children aged 6 months to 14 years. This study used data from 11,711 children in Kenya, from 6 months to 14 years of age, who provided blood samples for testing. In this age group, in Kenya, the prevalence of anaemia among children was estimated at 28.8 per cent (Oscar & Nwambi 2015). The findings of this study will provide insights into the two-pronged way of designing policies for anaemia intervention.

Maternal education is first. Maternal education has been described as having a protective effect on anaemic risk.

The government should concentrate on giving young mothers appropriate nutrition information for their young babies. Food product knowledge, including indigenous African foods which contain relevant vitamins and iron, will go a long way in reducing the prevalence of anaemia in the country.

Second, growing malaria initiatives and ensuring that such initiatives reach most parts of the world would lead to a reduction in cases of anaemia (Ngesa & Mwambi 2014). "Ewusie et al. (2014)" researched the prevalence of anaemia in Ghanaian population of children under 5. The total prevalence of anaemia was 78.4percent; with extreme anaemia in 7.8percent of children, moderate in 48percent, and mild anaemia in 22.6percent. This study showed that

children from low-income households had a substantially higher prevalence of anaemia than those from high-income households.

This literature has been examined in order to decide what studies have already been done on Anaemia. The acquired knowledge helped shape this report and also built up expertise in this area.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Research method and Design

For this research a quantitative cross-sectional research design was employed. The reason for the approach was to gain information on the factors leading to anaemia in Ga East Municipality in children under five years of age and also to save time and expense.

3.2. Data Collection techniques and tools.

Data collection is a series of interrelated tasks aimed at collecting information to respond to emerging research questions / problems (Creswell et al., 2004). Due to its capability to gather a lot of information, the questionnaires were used to collect data. Its use saved a lot of time and money, and it was easy to analyze the data generated. In this case, the research participants used both open and closed-ended structured questionnaires to gather information. A questionnaire is a research instrument consisting of a collection of questions that the researcher has designed to collect information from the respondents (Brink 2006).

The questionnaire was administered by qualified field assistants after completing training on the essence of the research, confidentiality, voluntary participation and how to collect the quantitative data. The instrument consisted of 32 items which were split into four parts. Section 'A' aimed at obtaining participant demographic information, such as age, gender, educational status, marital status, occupation, monthly expenses, etc. Section 'B' aimed to learn about the awareness of mothers about factors that cause anaemia in children under-five. Section 'C' also aimed to explore how anaemia was handled by mothers in children under five.

3.3. Sampling method

Multi-stage sampling approach was employed to pick the respondents. This method includes the use of probability sampling techniques where the sampling takes place in many stages, such that the sample size at each stage is reduced. This approach was selected as it is versatile and cost-effective, helping to reduce the population into smaller groups.

3.4. Study population.

Frankel (2000) described the study population as the researcher's interest group, the group to which the researcher would like to generalize the study's findings (Frankel & Kelley 2000). Bordens (2002) also asserts it is the inclusion of all individuals in a definable group within a population. This means that a population may be of any size and will have at least one (and sometimes several) recognizable characteristics which will set it apart from any other population. The research population for this specific project consisted of the Ga East Municipality of the Greater Accra Region of Ghana resident mothers and guardians of children under five years.

3.5. Study Variables.

The following were the variables that were investigated under the study:

1. Dependent variable – Anaemia in children under five years.

2. Independent variable(s) - marital status, religion, socio-economic factors, age, educational level, factors that contributed to anaemia, mothers knowledge on anaemia prevention measures, mothers' knowledge on the management of anaemia and mothers' knowledge on effects of Anaemia.

3.5.1. Sample size determination

A total of two hundred and eighty-two (282) mothers with children under- five years were selected for the study. The sample size was obtained using Cochran's formula for sample size calculation.

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

Where,

Z= 95% Confidence Interval = 1.96

e = Margin of Error = 0.06

p = Prevalence = 60% = 0.6 (Parbey *et al.,* 2019)

q= 1-0.6 =0.4s

Therefore,

$$n = \frac{(1.96)(1.96)x(0.6)x(0.4)}{(0.06)(0.06)}$$

n = 256

A 10% non-response rate was added to the sample size bringing the total up to 282.

3.5.2 Sampling technique

The study employed a multistage sampling where the entire municipality was sub-grouped into five sub-districts (clusters). One community was each randomly selected from the five sub-districts. To select households, convenience sampling was therefore used to select the households. Depending on the inclusion criteria, qualified mothers and guardians with their children were approached, and the research procedure was explained to them. Those who agreed to be part of the research were selected. The same procedure was used until the required sample size for each community was achieved.

3.6. Pre-Testing

A pre-testing was done in order to evaluate the clarity of the questionnaires and do necessary amendments where applicable to the final questionnaires. The pre-testing helped in finding out how feasible the study was, how valid the data collection tool was and how possible it was to process and analyse the data collected. The pre-testing was done at Sowutuom, a suburb of Accra because it has similar characteristics as the communities in the Ga East Municipality. The pre-testing was done in a day.

3.7. Data Handling

Data were using a structured questionnaire. Participants were informed of the purpose of the study by so doing, their consent was sought, and the questionnaires were administered to them to answer appropriately. Research assistants were trained in collecting the data. Guidance was provided where necessary. Fifteen (15) days were used in collecting the data. The reliability of the tool was ensured by the accurate and careful phrasing of each question to avoid ambiguity. This was done to discover potential challenge which was removed before the tool was deployed. Respondents were educated on the need to respond truthfully.

3.8. Data Analysis.

Data analysis is the method by which statistical and/or logical methods are systematically applied to define, explain, condense, recap and analyze data. (Tobias, 2001 et al.). The researcher has categorized, compiled, coded and analyzed data collected from the field using the 2016 version of Microsoft Excel and the statistical software package, STATA (StataCorp.2007.Statistical Software. Release 14. StataCorp LP, College Station, TX, US). The use of numerical methods such as percentages, ratios, and cross-tabulations were included in the statistical analysis. The Chi-Square tests were also used to determine the level of correlations between the outcome variable and the selected explanatory variables.

Multivariate analyses have been used to further pick out possible associations among independent variables and to predict factors that influence anaemia significantly, respectively. It was seen as statistically significant, a p-value of less than 0.005 or a confidence level of 95 percent.

3.9. Ethical Consideration.

Casley (1998) describes ethics as the systematic thinking about the moral consequences of decisions. He notes that the value of ethics in research is that it promotes its intent, such as honesty, information and error avoidance, for example prohibitions against the creation, falsification or misrepresentation of research data that promote actual fact and avoid error (Resnik B 2015). Permissions to conduct this study were duly obtained with the aid of the requisite documentation, including the use of both assent and consent forms.

Administrative approvals were also obtained from the offices that have jurisdiction over the participatory communities. The researcher and assistants introduced themselves to potential respondents and sought permission first before asking them to respond to the questionnaire. Respondents were assured of anonymity and confidentiality of their responses, due to the sensitivity of some information such as the monthly income of respondents.

The Ensign College of Public Health Ethics Review Board gave an ethical approval that was requested by the student/researcher. The submitted information was not shared with anyone who was not part of the study. No reward was given for participating in the study. Finally, the reference list properly recognized all documentation such as technical and scholarly articles and other published papers, which have been used or compiled by the researcher.

3.10. Limitations of the study.

There were surely some limitations to this study. The main challenge encountered was the difficulty in getting information on the income of households. Another was information bias since most people were not knowledgeable about the question but wrote something so as to not leave the questionnaire blank. Some could not recall some information off-head.

Despite these anticipated limitations, a very good attempt was made to present a true picture of Anaemia in children under-five in the Ga East Municipality of the Greater Accra Region.

3.11. Assumptions.

The following assumptions were made that;

1. Respondents were objective with their answers.
2. The sample size was a true representation of the population of the study.
3. All selected respondents participated fully for a better and correct assessment to be made.
4. Responses from respondents were a true situation in the Ga East Municipality.

3.12. Expected Outcome

The study was expected to reveal the underlining factors responsible for the high prevalence of anaemia among children less than five years in the study area. It was also expected to show the knowledge level of mothers and guardians on anaemia and its related factors. It was again expected to facilitate policy direction for effective intervention to control the incidence of anaemia among children in the study area.

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents the results obtained from the analysis of the study data. The presentation is done to follow the order of the objectives of the study. A univariate, bivariate, as well as multivariate inferential analyses, were performed. The results are presented in tables, graphs and charts. In all, 282 valid questionnaires were administered, and responses on all were obtained, resulting in a 100% response rate.

4.1 Demographic characteristics of respondents

The average age of respondents was 31±6.36 years with the distribution ranging from 19 to 55 years. Majority of them were within the age group of 19-39 years, representing 49.3% of the total sample. The educational status of the respondents shows that those who have Secondary/High school education were the majority (39.4%) with Primary school level education being 30.9%. In terms of their religion, most of them were Christians (84.8%). Muslims and traditionalists formed less than 15.0%. Mothers' occupation was found as Government employees (52.5%) and private employees (38.7%). Nearly 50% of the study participants had a history of anaemia in their family and over 80% also a normal delivery or delivered at term. (See **Table** 4.1).

Table 4.1*: Socio-demographic characteristics of respondents*

Variable	Frequency	Percentage
Age of mother		
19-29	139	49.3
30-39	111	39.4
40-55	32	11.4
Education of mother		
No formal education	33	11.7
Primary	87	30.9
Secondary/High School	111	39.4
Tertiary	51	18.1
Occupation of mother		
Homemaker	25	8.9
Private Employee	109	38.7
Government employer	148	52.5
Religion Affiliation		
Christian	239	84.8
Muslim	36	12.8
Traditionalist	7	2.5
Family type		
Nuclear family	44	15.6
Extended Family	238	84.4
Monthly family income		
<500 Ghc	26	9.2
500-1000 Ghc	131	46.5
Above 1000	125	44.3
No. of children		
1-2	204	72.3
3-6	78	27.7
No. of under-five children		
One	206	73.0
Two	76	27.0
Delivery status		
Preterm	46	16.3
Term	236	83.7
Birth weight (kg)		
< 2.5	200	70.9
≥ 2.5	82	29.1

Data source: *Field data, 2020*

Regarding the working status of the fathers, it was found from the data that most of them representing about 72.3% were Government sector employees. Whiles 13.1% and 14.5% were private-sector employees and unemployed, respectively (Figure 4.1).

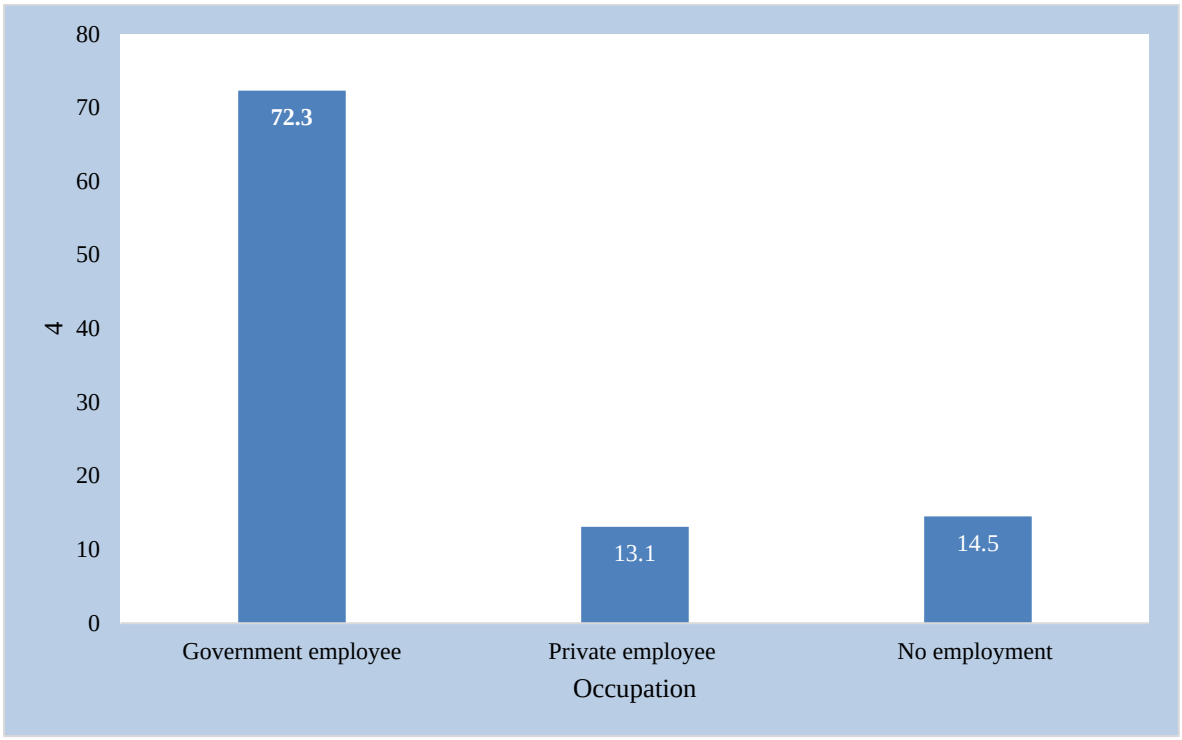

Figure 4.1: *Employment of fathers*

4.2 Level of Knowledge and awareness of anaemia in children among mothers

As part of the objectives of this study, the knowledge and awareness of anaemia among children were assessed among mothers and caregivers. The assessment was done on the signs and symptoms, causes and complications. A set of questions (***Appendix A***) were used in this assessment.

Table 4.2: *Awareness among caregivers on childhood anaemia*

Variable	Frequency	Percentage
Heard about Anaemia before child's admission		
No	70	24.8
Yes	212	75.2
Maternal Anaemia has relationship to child's Anaemia		
True	209	74.1
False	73	25.9
Anaemia causes problems later in life		
True	242	85.8
False	40	14.2

Data source: *Field data, 2020*

As shown in **Table 4.2** above, 75.2% of the caregivers had heard of anaemia before their children were admitted. Almost all the respondents (85.8%) also agreed that anaemia causes problems in later life.

4.2.1 K**nowledge on causes, signs and symptoms and complications of Anaemia in children**

The level of knowledge of caregivers on causes, signs, symptoms and complications of anaemia in children are presented in **Table** 4.3 and **Figure** 4.2.

Table 4.3: *Knowledge on signs and symptoms among caregivers*

Signs & symptoms of anaemia	Yes	No
Palmer pallor	130 (46.1)	152 (53.9)
Reduced physical activity	54 (19.2)	228 (80.9)
Loss of appetite	73 (25.9)	209 (74.1)
Loss of weight	99 (35.1)	183 (64.9)
Complications of anaemia	**Yes**	**No**
Poor growth	194 (68.8)	88 (31.2)
Shortness of breath	49 (17.4)	233 (82.6)
Poor learning capacity	82 (29.1)	200 (70.9)

Table 4.3 presents the results of caregivers' knowledge on the signs, symptoms and complications of anaemia among children. Respondents answered whether "yes" or "no" on the various statements to indicate their understanding. On the signs and symptoms, nearly half of the respondents (46.1%) indicated that palmer pallor is a symptom and only 19.2% indicated reduced physical activity is also a symptom. Loss of appetite and loss of weight were also indicated by only 25.9% and 35.1% respectively.

On complications, the majority indicated poor growth (68.8%) whiles only 17.4% and 29.1% indicated shortness of breath and poor learning capacity respectively.

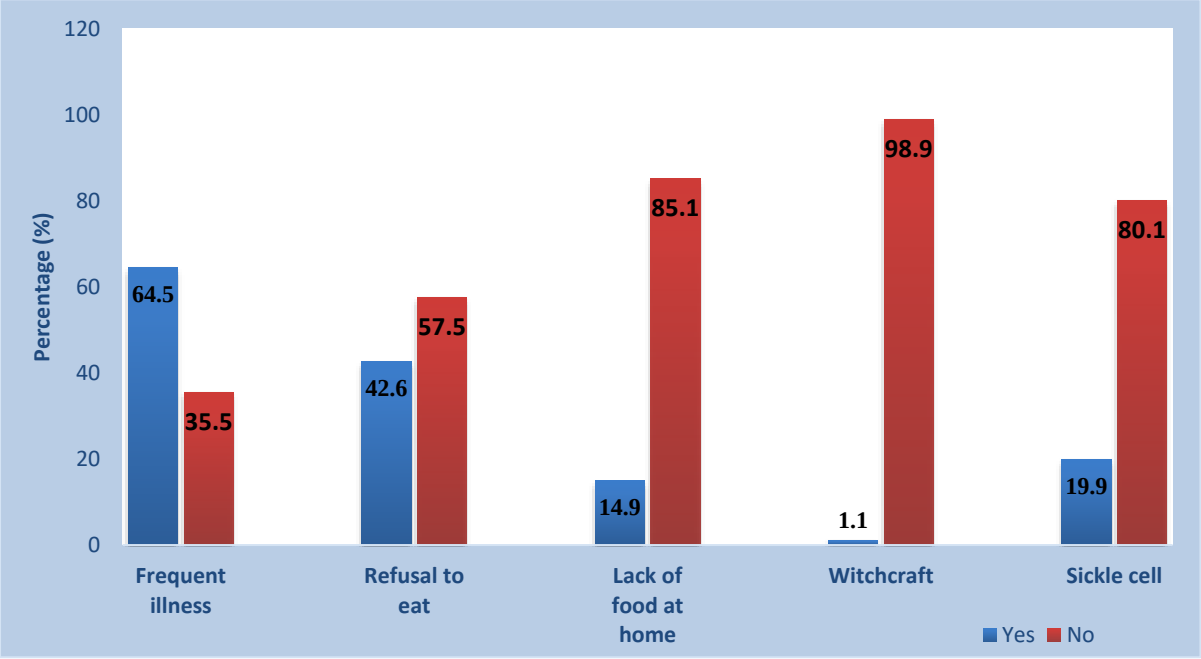

Figure 4.2: *Knowledge on causes of anaemia in children*

As shown in **Figure** 4.2, most of the respondents were of the knowledge that frequent illness on the part of children causes anaemia (64.5%) whiles 42.6 also agreed that refusal to eat also causes anaemia. It was also observed that almost all the respondents did not agree that factors such as lack of food at home, witchcraft and sickle cell are some of the causes of anaemia in children.

4.2.2 Socio-demographic factors associated with knowledge level among caregivers

A set of sixteen questions (**Appendix A**) just as indicated in the section above were used to assess the knowledge level of respondents. A respondent was regarded as having adequate or good knowledge if scored above the average of eight (8) and also regarded as having poor knowledge if scored below the average of eight (8). It was observed that generally, almost 70% of the respondents had poor knowledge on anaemia. This knowledge is with regard to the causes, signs and symptoms, and complications of anaemia in children. (See **Table** 4.4.)

Table 4.4: *Knowledge level among caregivers on anaemia in children*

Knowledge Level	Frequency	Percentage (%)
Good	85	30.1
Poor	197	69.9

4.2.3 Factors associated with knowledge level among respondents

Bivariate analyses were performed using Chi-square tests to determine the socio-demographic factors associated with knowledge level among caregivers. A p-value <0.05 was considered as a significant level. The detailed result is presented in **Table** 4.5.

Table 4.5: *Bivariate analysis of socio-demographic factors with the knowledge level*

Variable	Poor	Good	X^2 (*df*)	P-value
Age of mother			1.44 (2)	0.486
19-29	46 (33.1)	93 (66.9)		
30-39	29 (26.1)	82 (73.9)		
40-45	10 (31.3)	22 (68.8)		
Education of mother				
No formal education	17 (51.5)	16 (48.5)	34.71 (3)	<0.001*
Primary	41 (47.1)	46 (52.9)		
Secondary/High School	22 (19.8)	89 (80.2)		
Tertiary	5 (9.8)	46 (90.0)		
Occupation of mother				
Government employer	3 (12.0)	22 (88.0)	13.815 (2)	<0.001*
Homemaker/House wife	46 (42.2)	63(57.8)		
Private Employee	36 (24.3)	112 (75.7)		
Father's occupation				
Government employee	10 (24.4)	31 (75.6)	9.250 (2)	0.01*
No employment	19 (51.4)	18 (48.7)		
Private employee	56 (27.5)	148 (72.6)		
Religion Affiliation				
Christian	65 (27.2)	174 (72.8)	8.922 (2)	0.012*
Muslim	15 (41.7)	21 (58.3)		
Traditionalist	5 (71.4)	2 (28.6)		
Family type				
Nuclear family	61(25.6)	177 (74.4)	14.740 (1)	<0.001*
Extended Family	24 (54.6)	20 (45.5)		
Monthly family income				
<500 Ghc	17 (65.4)	26 (34.6)	29.837 (2)	<0.001*
500-1000 Ghc	48 (36.6)	83 (63.4)		
Above 1000	20 (16.00	105 (84.0)		
No. of children				
1-2	55 (27.0)	149 (73.0)	3.544 (1)	0.060
3-6	30 (38.5)	48 (61.5)		
The family history of anaemia	17 (12.1)	123 (87.9)	42.776 (1)	<0.001*
Yes	68 (47.9)	74 (52.1)		
No				
Delivery status				
Preterm	17 (37.0)	29 (63.0)	1.212 (1)	0.271
Term	68 (28.8)	168 (71.2)		
Birth weight (kg)				
< 2.5	53 (26.5)	147 (73.5)	4.332 (1)	0.037*
≥ 2.5	32 (39.0)	50 (61.0)		

NB: *: *measured association is statistically significant; **: determined using Fisher's exact; p-value: <0.05*.

Table 4.5 provides the bivariate analysis of factors associated with anaemia on the knowledge level of respondents. The results indicate that some of the variables were significant at p-value<0.05 whiles others were not. The statistically significant factors include the educational level of the mother (p<0.001), occupational status of both mother and the father (p<0.001), and the professed religious believe of the mother (p = 0.012). Also, factors such as monthly family income, family history of anaemia birth weight of the child were significant at p<0.05. On the other hand, factors such as mother's age, delivery status and the number of children were all not significantly associated with the knowledge level at p<0.05.

4.2.3 Multivariate analysis of factors associated knowledge level of respondents

A multivariate logistic regression analysis was performed using factors which were significantly associated with knowledge level at the bivariate stage. This was done to determine the measure of effect of the predictor variable on the likelihood of having an anaemic child. **Table** 4.6 presents the details.

Table 4.6: *Logistic regression output of factors significantly associated with knowledge*

Variable	COR	P>z	95% C.I.	AOR	P>z	95% C.I.
Education of mothers						
No formal education	Ref		1	Ref		1
Primary	1.19	0.669	0.53-2.67	1.25	0.64	0.49-3.14
Secondary/High School	4.30	0.003*	1.80-10.26	3.64	0.01*	1.37-9.70
Tertiary	9.78	0.001*	2.66-35.98	5.27	0.04*	1.08-25.67
Occupation of mother						
Government employee	Ref		1	Ref		1
Homemaker	0.19	0.048*	0.05-0.69	1.87	0.479	0.33-10.61
Private Employee	0.42	0.174	0.12-1.52	1.58	0.583	0.31- 8.01
Father occupation						
Government employee	Ref		1	Ref		1
Unemployed	0.31	0.015*	0.11-0.84	0.84	0.777	0.24-2.88
Private employee	0.85	0.688	0.39-1.86	0.97	0.956	0.37 -2.59
Religion						
Christianity	Ref		1	Ref		1
Muslim	0.52	0.075*	0.25-1.08	0.58	0.227	0.25-1.39
No Religion	0.15	0.010*	0.28-0.81	0.08	0.015*	0.01 - 0.61
Family type						
Extended family	Ref		1	Ref		1
Nuclear family	3.48	0.0001*	1.76-6.87	2.35	0.041*	1.04- 5.36
Monthly family income						
500-1,000 Gh	Ref		1	Ref		1
<500 Ghc	0.30	0.007*	0.12-0.76	0.42	0.102	0.15-1.19
Above 1000	3.04	0.002	1.64-5.61	1.77	0.187	0.76-4.11
Family history of anemia						
No	Ref		1	Ref		1
Yes	6.65	0.001*	3.44-12.83	4.86	0.000*	2.47-9.54
Birth weight (kg)						
< 2.5	Ref		1	Ref		1
≥ 2.5	0.56	0.037*	0.32-0.98	0.83	0.575	.42-1.61
_constant				0.20	0.175	.02-2.06

NB: *: *measured association is statistically significant; p-value: <0.05; ref: reference group*; *COR: Undajusted Odds Ratio; AOR: Adjusted Odds Ratio. CI: Confidence Interval*

In **Table** 4.6, the multivariate logistic regression presents the factors associated with good knowledge level among respondents. It is observed that knowledge level increases with education and this was found to be significant with secondary and tertiary education. Good knowledge was 3.6 times higher among those with secondary education compared to those

with no formal education (p-value=0.01 and 95% CI: 1.37-9.70) when all other covariates have been adjusted for. There is 5.3 times higher odds in those who have tertiary education (p=0.04 and 95% CI: 1.08-25.67). Also, nuclear family status was also associated with increase odds in knowledge level (2.4 times more likely) with a p-value=0.041. With reference to those who had no family records of anaemia, those who had were almost 5 times more likely to have higher knowledge (P<0.001, 95%CI:2.47-9.54) when all other covariates have been adjusted for.

4.3 Prevalence of Anaemia among children and associated factors

This study also examined the prevalence of anaemia among children and how caregivers manage the condition. The prevalence of anaemia in children was found as 47.9% (95%CI: 42%-54%). Also, family history of anaemia was also 49.7% of the respondents (**Table** 4.7).

Table 4.7: *Prevalence and family history of anaemia in children*

Variable	**Frequency**	**95% CI**
Diagnosed with Anaemia in children (Prevalence)		
Yes	135 (47.9)	0.42-0.54
No	147 (52.1)	.46-.58
The family history of anaemia		
Yes	140 (49.7)	
No	142 (50.4)	

4.3.1 Factors associated with anaemia in children

Association between anaemia in children and the socio-demographic characteristics of caregivers was performed using a Chi-square test. With a p-value<0.05, a variable is labelled as statistically significant. The detailed result is presented in **Table** 4.8.

Table 4.8: *Bivariate analysis results of factors associated with anaemia in children*

Variable	Diagnosed of Anaemia		X^2 (*df*)	P-value
	No	Yes		
Age of mother				
19-29	79 (56.8)	60 (43.2)	3.68 (2)	0.159
30-39	50 (45.1)	61 (54.9)		
40-45	18 (56.3)	14 (43.8)		
Education of mother				
No formal education	22 (66.7)	11 (33.3)	12.69 (3)	0.005*
Primary	55 (63.2)	32 (36.8)		
Secondary/High School	46 (47.1)	65 (58.6)		
Tertiary	24 (47.1)	27 (52.9)		
Occupation of mother				
Government employer	11 (44.0)	14 (56.0)	10.41 (2)	0.005*
Homemaker/Housewife	70 (64.2)	39 (35.8)		
Private Employee	66 (44.6)	66 (55.4)		
Father occupation				
Government employee	20 (48.8)	21 (51.2)	5.62 (2)	0.06*
Not employed	26 (70.3)	11 (29.7)		
Private employee	101 (49.5)	103 (50.5)		
Family type				
Extended Family	31 (70.5)	13 (29.6)	7.01 (1)	0.008*
Nuclear family	116 (48.7)	122 (47.9)		
Monthly family income				
<500 Ghc	22 (84.6)	4 (15.4)	22.76 (2)	<0.001*
500-1000 Ghc	77 (58.8)	54 (41.2)		
Above 1000	48 (38.4)	77 (61.6)		
Family history of anaemia				
No	112 (78.9)	30 (21.3)	81.99 (1)	<0.001*
Yes	35 (25.0)	35 (75.0)		
Delivery status				
Preterm	22 (47.8)	24 (52.2)	0.41 (1)	0.523
Term	125 (52.1)	111 (47.9)		
Birth weight (kg)				
< 2.5	96 (48.0)	104 (52.0)	4.70 (1)	0.30*
≥ 2.5	51 (62.2)	31 (37.8)		
Iron food item given to child				
No	39 (65.0)	21 (35.0)	5.06 (1)	0.024*
Yes	108 (48.7)	114 (51.4)		

NB: *: *measured association is statistically significant; p-value: <0.05;*

From the results presented in **Table** 4.8, the bivariate analysis shows a significant statistical association among almost all the variables and anaemia in children except for the mother's age (p=0.486), the number of children (p=0.60) and the delivery status (p=0.271).

Factors that were statistically significant were the mother's education and occupation, family type and family income (p<0.001). Again, other factors such as father's occupation and religious affiliation also had a p-value of <0.01. Child's birth weight was also found to be significant with a p-value=0.037.

4.3.2 Multivariate logistics regression analysis of significant factors

A multivariable logistic regression model was fitted with variables that were found to be significant in **Table** 4.8. This was done to adjust for confounding effects of the present on other variables and also to determine the odds ratio of the significant variables. This is shown in **Table** 4.9 with details.

Table 4.9: *Multivariate logistic regression output of factors associated with anaemia in children*

Variable	COR	P>Z	95%CI	AOR	P>z	[95% C.I]
Education of mothers						
No formal education	1			1		
Primary	1.16	0.726	0.50-2.72	0.99	0.982	0.32-0.72
Secondary/High School	2.83	0.011*	1.22-6.53	1.87	0.229	0.65-0.17
Tertiary	2.25	0.080*	0.89-5.71	0.58	0.412	0.12-0.13
Occupation of mothers						
Govt. employee	1			1		
Homemaker/Housewife	0.44	0.063	0.18-1.07	0.99	0.995	0.31- 3.25
Private	0.98	0.956	0.41-2.30	0.92	0.82	0.47- 1.83
Family type						
Extended family	1			1		
Nuclear family	2.51	0.008*	1.24-5.08	1.77	0.202	0.74-4.24
Monthly family income						
<500 Ghc	1			1		
500-1000 Ghc	0.26	0.013*	0.08-0.82	2.38	0.199	0.63-8.92
Above 1000	2.29	0.001*	1.37-3.82	5.15	0.021*	1.28-20.81
Family history anaemia						
No	1			1		
Yes	11.2	0.001*	5.78-21.69	9.65	0.000*	5.23-17.79
Birth weight (kg)						
<2.5	1			1		
≥ 2.5	0.56	0.031*	0.33-0.95	0.78	0.474	.40-1.54
Delivery status						
Preterm	1			1		
Term	0.81	0.523	0.43-1.53	0.57	0.186	0.24 - 1.32
Iron-rich food items						
No	1			1		
Yes	1.96	0.027*	1.08-3.57	1.06	0.898	0.46 - 2.42
_cons				0.09	0.006*	0.01 - 0 .48

NB: **: measured association is statistically significant; p-value: <0.05; ref: reference group; COR: Unadjusted Odds Ratio; AOR: Adjusted Odds Ratio. CI: Confidence Interval*

As shown in **Table** 4.9, after adjusting for variables in the multivariate logistic regression model, family income, and family history of anaemia were the only significant factors. Compared to those who have a monthly family income of less than 500 Ghc, those with income above Ghc 1,000 had five (5) times higher odds of anaemia in children (p-

value=0.021, 95%CI:1.28-28.81). Also, family history of anaemia is highly associated with anaemia in children. Thus, those with history of anaemia were 9.6 times more likely to have children with anaemia with p-value<0.001 (95%CI:5.23-17.79) controlling for the other covariates in the model. Children born at full term were 0.43 times less likely to experience the anaemic condition.

4.4 Management of anaemia in children by mothers/caregivers

Respondents were also examined to determine how they manage anaemia conditions in children. This is presented here in tables and charts.

Table 4.10: *Anaemia management practices by caregivers*

Variables	Frequency	Percentage (%)
How many times was the child fed		
2 times	14	5.0
3 times	202	71.6
4 Times	58	20.6
> 4 Times	8	2.8
Person responsible for feeding the child		
Mother	169	59.9
Self	98	34.8
Siblings	10	3.6
Caregiver	5	1.8
First Drug given to child		
Panadol™ syrup*	74	26.2
Panadol™ syrup* and Anti-malaria	73	25.9
Anti-malaria	51	18.1
None	84	29.8

From **Table** 4.10, most children are fed at most 3 times a day (71.6%) whiles 5.0% and 20.6% are fed 2 and 4 times respectively. In most cases, mothers are those responsible for feeding children (59.9%). First drug given to children included Panadol™ syrup (26.2%), Panadol™ syrup* and Anti-malaria (25.9%).

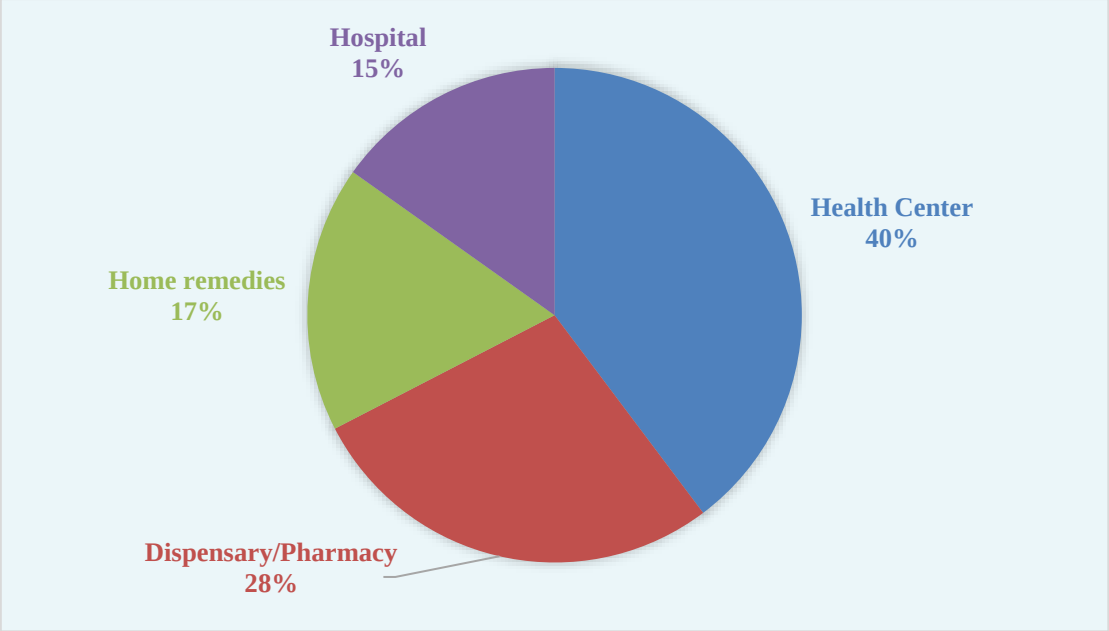

Figure 4.3: *First place of treatment of children with anaemia*

As shown in **Figure** 4.3 above, Health Centres were the major places of seeking care (40%), followed by pharmacy shops (28%) and home remedies (17%). The assigned reasons for the respondents' choice of place for seeking healthcare are presented in **Figure** 4.4.

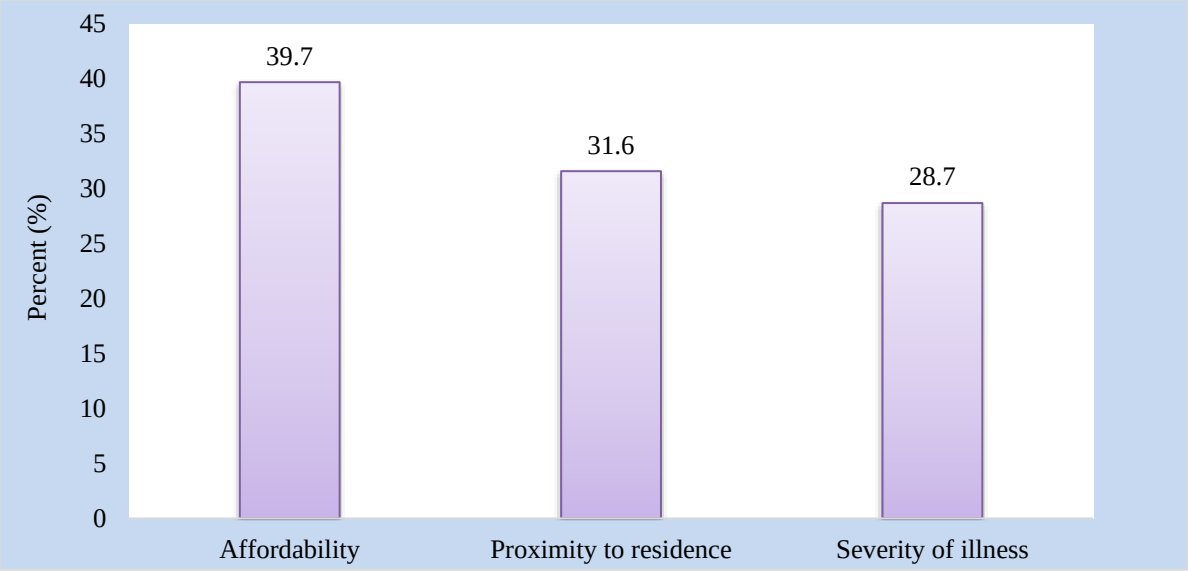

Figure 4.4: Factors influencing place of choice for treatment

Affordability (39.7%) was the major reason for the choice of place for treatment for children with anaemia. This was followed by proximity of the place to the residence (31.6%) and the severity of the illness (28.7%)

4.5 Anaemia in children (under five) prevention practices among caregivers

The final objective of this study looked at caregivers preventive practices towards anaemia in children. This was determined by asking caregivers a set of questions about preventive practices. The results are presented here in Table 4.11 and Figure 4.5.

Table 4.11: *Prevention by caregivers*

No	Variable	Yes	No
1	Use of citrus fruits in the child's diet	203 (72.0)	79 (28.0)
2	Use cheese in the child's diet	144 (51.1)	138 (48.9)
3	Mother satisfied regarding child taking sufficient diet	231 (81.9)	51 (18.1)
4	Use of fruit juice	212 (75.2)	70 (24.8)
5	Continuation of exclusive breastfeeding continue for six months	238 (84.4)	44 (15.6)
6	Spinach is used in cooking	132 (46.8)	150 (53.2)
7	Black grams are used in cooking	122 (43.3)	160 (56.7)
8	Whether the child was taken to hospital for weakness	189 (67.0)	93 (33.0)
9	Iron-rich food items are given to a child	222 (78.7)	60 (21.3)
10	Dried fruits are given to a child	139 (49.3)	143 (50.7)
11	Soya products are used in diet	214 (75.9)	68 (24.1)
12	Non-vegetarian food is used in diet	123 (43.6)	159 (56.4)
13	The child is taken for regular medical check-ups	163 (57.8)	119 (42.2)

Table 4.11 shows that major of the caregivers fed the children with citrus fruits (72.0%) whiles just half (51.1%) fed with cheese in diet. Almost all give children fruit drinks (81.9%) and exclusive breastfeeding was also practiced by 84.4% of the respondents. Soya bean products in diet and regular medical checks were done by 75.9% and 57.8% respondents respectively.

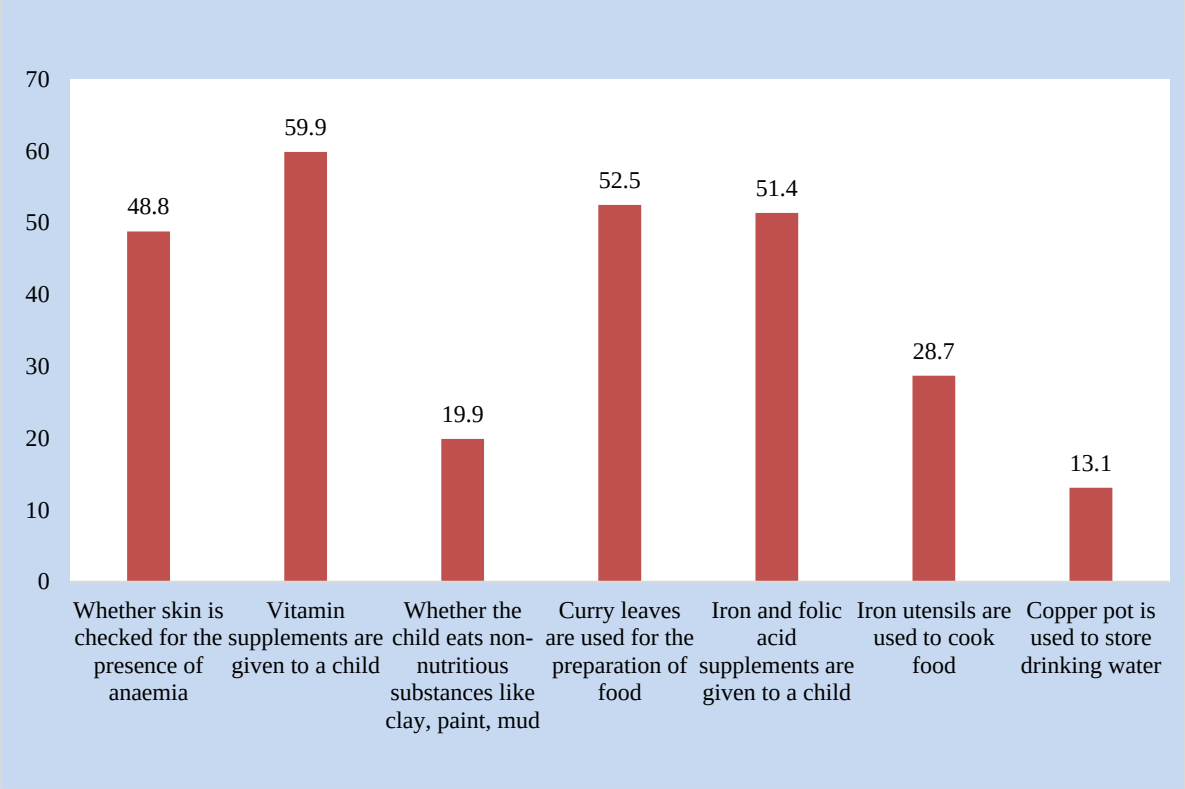

Figure 4.5: *Caregiver's prevention practices towards anaemia in children.*

As shown in **Figure** 4.5, less than half (48.8%) of the respondents checked children's skin for the presence of pallor (anaemia). Also, almost 60% give vitamin supplement to their children whiles iron, and folic supplement are given by 51.1%.

CHAPTER FIVE

DISCUSSIONS

5.0 Introduction

This study was conducted to assess the socio-demographic factors that contribute to the high prevalence of anaemia among children as well as to examine caregivers' knowledge on anaemia. The previous chapter presented the results of the study. In this chapter, the findings from this study are discussed in relation to other previous studies done globally, regionally and locally. The chapter begins with the discussions of the household and demographic characteristics of caregivers. This is followed by the discussions of each of the objectives in the subsequent sub-sections.

5.1 Demographic characteristics of respondents

This current study found a more significant difference in proportion between the young respondents and the older ones. Over 80% of the respondents were under the age of 40 years (19-39). This implies the majority of the respondents fell within the reproductive age group of 15-49 years (WHO 2010). Similar to this finding was a study conducted in Ghana where health facility data on mothers with anaemic children were mainly studied and were showed to be the youthful population (Nikoi and Anthamatten 2013; Ewusie *et al.,* 2014). The difference between the design of these previous studies and the current study is that the previous studies focused only on health data on women and their children. In contrast, this present study studied anaemia among children using caregivers as primary respondents.

In terms of education, it was revealed that at least 80% had some form of formal education, with nearly 60% having attained a higher education (secondary and tertiary) at the time of the study. This could also explain why more than half of the respondents were in public or formal

employment and private sector employment. In Ghana, formal education is one of the requirements for most formal employments. A Ghana Statistical Service annual report also confirms that the majority of the public sector workers in Ghana have a least a secondary education (GSS 2011).

The type of family structure found in this current study reflects what is generally seen in Ghana. Respondents from extended families were more than 80% similar to the common family structure in Ghana, which is the extended family as found by Shenton, Jones & Wilson (2020). Consistent with this, was a study carried out in the Ho Municipality of the Volta Region of Ghana where Parbey *et al.,* (2019) reported that women who were surveyed at the facility level on anaemia were mainly coming from an extended family.

5.2 Level of Knowledge and associated factors of anaemia in children among mothers and caregivers

Knowledge and awareness are vital in ensuring that people become more cognizant of a situation and understand how and when to take action. In terms of a disease condition, creating awareness through sensitization actions help to reduce the spread, vulnerability and fears (Kumari and Dharni 2018). Again, having adequate knowledge also helps to seek early care and management. In this current study, it was revealed that despite the higher proportion (75%) of the respondents who have heard of anaemia in children only 30% of the total sample had good knowledge of the condition and also had poor knowledge on its signs, symptoms and complications. It was interesting revelations because earlier studied among similar population conducted in two areas in Ghana, Greater Accra and Volta Regions found good knowledge and awareness among care caregivers (Nikoi and Anthamatten 2013; Parbey *et al.,* 2019). In India and Tanzania (Kumari & Dharni 2018; Ngimbudzi *et al.,* 2016), there was also a reported high knowledge of childhood anaemia among caregivers and household

heads. This differences in knowledge levels could be attributed to several factors such as education received on the disease, different geographic area, exposure to mass media etc. (Martin, Kimanya and Mosha 2018).

In this current study, caregivers' socio-demographic factors were examined to ascertain their association with the knowledge level of caregivers. Factors such as educational level, age, marital status, number of children, income levels, among others, were assessed. The selection of variables was based on literature and pretesting of the survey. This helped for proper analysis and comparison of results with what already exists in literature. The bivariate analysis of these variables (**Table 4.5**) revealed that the education of mother, occupation of mother, occupation of father, family type, family income and history of anaemia in the family were significantly associated with caregivers' knowledge at p-values <0.05. When the further analysis was performed with a multivariate logistic regression model, it was found that some factors remained significant determinants of knowledge level. These factors were educational level, family type and history of anaemia in the family.

Attainment of formal education plays an essential role in terms of knowledge impact and skills development. Education could also be used as a mechanism to create awareness and understanding of health conditions. This was significantly evident in this study, as increased knowledge level was found to be associated with an increase in educational level. Those with secondary level education were 3.6 times more likely to have a good knowledge level of anaemia compared to those with no formal education. Additionally, the odds of good knowledge increased further to 5.3 times for those with tertiary level education. The study by Ngesa and Mwambi (2014) in Kenya and Ojoniyi (2012) in Tanzania also confirms the positive association between educational level and knowledge on childhood illness among parents and caregivers. However, in a similar study conducted among mothers of children with anaemia in Malawi, Uganda and Cameroun, it was found out that there was no

significant difference in the various educational attainment and knowledge level on anaemia among caregivers (Modestine, Sop and Mananga 2015; Legason *et al.*, 2017; Esan 2019).

The type of family structure that is whether nuclear or extended was also found to be significantly associated with caregivers' knowledge level. This current study found that compared to extended family, caregivers from the nuclear family were more knowledgeable and had 2.4 higher odds of good knowledge on childhood anaemia. This could be attributed to the circumstances surrounding the two types of family structures where there is more closeness and information sharing in nuclear families than in extended families (Regine *et al.,* 2016). It could also be related to the situation that most of these women from nuclear families have attained higher educational levels; thus, the higher level of knowledge on anaemia (**Table 4.5**). Inconsistent with this finding is a pervious study conducted in Kumasi; the Capital of Ashanti region of Ghana, where it was reported that family type was not a significant factor to good knowledge on childhood anaemia among caregivers (Anokye *et al.,* 2018).

Similar to what was found in other literature (Modestine, Sop and Mananga 2015; Petrucka *et al.,* 2018; Esan 2019), this study also found a significant association between history of anaemia in the family and how knowledgeable caregivers are. Specifically, this study found that mothers or caregivers who have ever experienced childhood anaemia in their families were almost five (5) times more likely to know the condition compared to those with no history. They had good knowledge of the signs and symptoms, complications and treatment protocols. Their high knowledge could be attributed to the fact that they have experienced the condition before, they might have learnt about it from their previous children or any child from the family who had had the condition before or had read about it from other sources. In a previous report by (Ojoniyi 2012), it was found that mothers or caregivers who had experienced more than one childbirth have good knowledge than those who were first-time

mothers. Similarly, (Huang *et al.*, 2018; Martin, Kimanya and Mosha 2018) also found that history of anaemia in a family was associated with high knowledge among respondents in a study carried out in Huaihua, Hunan Province, China and in Arusha District of Tanzania respectively.

5.3 Prevalence of Anaemia among children and associated factors

This study identified and assessed the prevalence of childhood anaemia among respondents. Compared to the prevalence of anaemia found in the literature and those reported in other studies, this study found (47.9%) which is slightly higher than the global prevalence but less than the national prevalence of Ghana. Thus, 47.9% of the children studied were diagnosed with anaemia as at the time of the study. This, however, was less than the overall reported prevalence of anaemia in children under five in Ghana, 78.4% (N = 2168, 95% CI: 76.7-80.2) (Ewusie *et al.*, 2014) and close to the global prevalence of 48% (Shenton, Jones and Wilson, 2020). Furthermore, of the review done from various works of literature, these prevalence were found; in Kenya, it was noted that the prevalence of anaemia among children in this age group was 28.8% (Ngesa and Mwambi, 2014) while in Togo, from a sample of two thousand, eight hundred ninety children aged (6–59months), a prevalence of 70.9% was found (Nambiema, Robert and Yaya, 2019).

In a bivariate analysis to find the associated factors contributing to the high prevalence of anaemia (Table 4.8), several socio-demographic factors were found. These factors were the occupation of mother, occupation of father, family type, monthly income, history of anaemia, birth weight and iron food intake by the child. However, in a further analysis using a multivariate logistic regression model, only family income and history of anaemia were found to be significantly associated with anaemia in children.

Furthermore, it was interesting to know from this study that those with spouses with higher income instead had higher odds of having anaemia in children. A quest to find literature to explain this trend proved futile as almost all the research accessed reported somewhat conflicting findings (Esan, 2019; Nambiema, Robert and Yaya, 2019; Parbey *et al.*, 2019). Again, unlike the findings made in this current study regarding the family income and anaemia status, other studies in Ghana (Nikoi and Anthamatten, 2013), Equatorial Guinea (Ncogo *et al.*, 2017) and Ethiopia (Gebreweld *et al.*, 2019), found that positive anaemia status was high among mothers from lower-income groups. In these studies, low income was also related to the type of employment and whether the respondent lived in a rural or urban area. However, this study did not find any of these relations.

As reported above, the reported family history of anaemia was also found to be significantly associated with anaemia in children. The study found that children from such category had an increased odds of 9.7 compared to those from families with no history of childhood anaemia. This was consistent with other studies conducted in Kenya (Ngesa and Mwambi, 2014) and Malawi (Esan, 2019) respectively, where mothers who experienced anaemia in their previous birth had a higher probability of experiencing childhood anaemia in their subsequent births. In other studies, this was not the case as no association was reported with anaemia and family history (Nikoi and Anthamatten, 2013; Modestine, Sop and Mananga, 2015; Simbauranga *et al.*, 2015).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

As found in the results section presented in this study, it was noted that the high awareness of childhood anaemia among caregivers does not necessarily translate to high knowledge levels. More than half of the participants had poor knowledge on the signs and symptoms, complications and management of childhood anaemia. The formal high school attainable levels among the respondents also did not reflect on their knowledge level. Additionally, mothers or caregivers from the nuclear family and those who have a family history of childhood anaemia were the only groups found to have a significant association with high knowledge level.

The prevalence of anaemia in children was also slightly high as nearly half of the children were diagnosed with the condition. This, however, was found to be far less than the national average and even the prevalence of the condition in some sub-Sahara African countries. Unfortunately, it was not within the scope of this study to investigate the reasons or causes of seemingly high prevalence. A further investigation would be needed in this direction to identify the underlining causes. However, a significant association was found with the family income level, family history of anaemia and prevalence of anaemia in children.

Furthermore, the study found that management and preventive practices of childhood anaemia were done mainly by their mothers rather than any other person. Health Centres were the primary facilities where management of the conditions were done. This calls for more attention for education at these points for mothers since that is where they are likely to meet health personnel. It was also a common practice by caregivers to use some practices to

prevent the condition in their children. Some of these practices include feeding of the children with fruits, iron-rich food items, soya products, among others.

6.2 Recommendations

Various findings have been made from this study and, on this note, some recommendations have been provided for consideration by the appropriate authority.

To the Municipal Health Authority

- The health authority should intensify education on childhood anaemia to the communities and mothers using the health facilities. Education should be detailed and focused on the signs and symptoms as well as management and prevention. These areas need a critical look for mothers to understand the condition well and its impact on the general well-being of their children.
- Since most of the caregivers seek care from the Health Centres, it is important to put up measures to increase how these mothers are educated on the conditions at the health centres; this may include the use of peer "instructors" to help them understand the lesson at the level of their peers.
- The health authority should put in place measures to reduce new cases of the condition and also intensify treatment to reduce the prevalence of childhood anaemia.

Recommendations to the caregivers

- Caregivers from families with a history of anaemia should be aware of their status and put in measures to prevent future occurrence of the condition in the family.
- Caregivers must adhere to the prevention and management measures given them by their health professionals in order to reduce the condition.

Recommendations for further academic studies

- Further research work should focus on examining the underlining causes and reasons for the high prevalence of the condition in the municipality.
- Future research should include qualitative design to gather in-depth details from the perspective of the caregivers and health workers to get a triangulation of data for detailed analysis.

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APPENDICE

Appendix A: QUESTIONNAIRE

Topic: FACTORS CONTRIBUTING TO ANAEMIA IN CHILDREN UNDER- FIVE YEARS IN THE GA EAST MUNICIPALITY, GREATER ACCRA REGION, GHANA

Section A: Socio-demographic characteristics

No.	Questions	Responses	Code
1	Age of mother	……..	
2	Education of mother	1.No formal education 2. Primary 3. Secondary/High School 4. Tertiary	
3	Occupation of mother	1.Homemaker 2.Private Employee 3.Govt.employe 4. Self employed	
4	Father occupation	1.None 2.Private employee 3. Govt. employee 3.Govt. employee 4. Self employed	
5	Religion	1.Christian 2.Muslim 3.Traditionalist 3.Traditionalist	
6	Family type	1.Nuclear family 2.Extended Family	
7	Monthly family income	1.<500 Ghc 2.500-1000 Ghc	

		3.1000-2000Ghc 4. Above 2000	
8	No. of children	……	
9	No. of under-five children	……	
10	The family history of anemia	1.Yes 2.No	
11	Delivery status	1.Preterm 2.Term	
12	Birth weight(kg)	1.< 2.5 2.≥ 2.5	

Section B: K**nowledge of mothers on Anaemia**

No.	Question	Responses	Codes
1	Heard about anaemia before child's admission	1.Yes 2.No	
2	Diagnosed with anaemia in pregnancy	1.Yes 2.No	
3	Signs & symptoms of anaemia ***(Tick as many as applied)***	1.Palmer pallor 2.Reduced physical activity 3.Loss of appetite 4.Loss of weight	
4	Complications of anaemia ***(Tick as many as applicable)***	1.Poor growth 2.Shortness of breath 3.Poor learning capacity	

5	Causes of anaemia in children ***(Tick as many as applicable)***	1.Frequent illness 2.Refusal to eat 3.Lack of food at home 4.Witchcraft 5.Sickle cell 6.HIV	
6	Maternal anaemia has a relationship to child's anaemia	1.True 2.False	
7	Anaemia causes problems later in life	1.True 2.False	

Section C: Anemia management by mothers

Questions	**Responses**	**Codes**
1. How many times the child is fed?	1. 2 times 2. 3 times 3. 4 Times 4. On-demand	
2. Person responsible for feeding the child	1.Mother 2.Self 3.Siblings 4. Caregiver 5. Others	
3. First drug given to child	1.Panadol™ syrup* 2.Panadol™ syrup* and Anti-malarial 3.Vitamin supplement 4. Nothing	

4..First place child taken for treatment	1.Dispensary/Pharmacy 2.Health Center 3.Home remedies 4.Hospital 5. Prayer camp 5.Traditional healer 6. Prayer Camp	
5. Factor that influences choice of place for treatment	1.Proximity to residence 2.Affordability 3.Severity of illness	

Section D: Childhood anaemia prevention by caregivers

Sr. No.	Questions	Responses	Codes
1.	Use of citrus fruits in the child's diet	1.Yes 2.No	
2.	Use cheese in the child's diet	1.Yes 2.No	
3.	Mother satisfied regarding child taking sufficient diet	1.Yes 2.No	
4.	Use of fruit juice	1.Yes 2.No	
5.	Continuation of exclusive breastfeeding continue for six months	1.Yes 2.No	
6.	Spinach is used in cooking	1.Yes 2.No	
7.	Black grams are used in cooking	1.Yes 2.No	
8.	Whether the child was taken to hospital for weakness,	1.Yes 2.No	
9.	Iron-rich food items are given to a child	1.Yes 2.No	

10.	Dried fruits are given to a child	1.Yes 2.No	
11.	Soya products are used in diet	1.Yes 2.No	
12	Non-vegetarian food is used in diet	1.Yes 2.No	
13	The child is taken for regular medical check-ups	1.Yes 2.No	
14	Whether skin is checked for the presence of anaemia	1.Yes 2.No	
15	Vitamin supplements are given to a child	1.Yes 2.No	
16	Whether the child eats non-nutritious substances like clay, paint, mud, soil etc.	1.Yes 2.No	
17	Curry leaves are used for the preparation of food	1.Yes 2.No	
18	Iron and folic acid supplements are given to a child	1.Yes 2.No	
19	Iron utensils are used to cook food	1.Yes 2.No	
20	Copper pot is used to store drinking water	1.Yes 2.No	

Thank you!

APPENDIX B:

INFORMED CONSENT

Introduction

I am **LUCY OFORI,** and I'm conducting a study on the "**Factors contributing to anaemia in children under-five years in the Ga East municipality, Greater Accra Region, Ghana**". I will be explaining all about the study to you, and you will also receive a copy of the leaflet that explains all about this study that you are being asked to participate. Please take all the time you need to read it carefully. You may ask me any questions about anything you do not understand at any time. You are a volunteer, and you can choose not to take part; however, you join, you may decide to quit at any time. There will be no penalty if you decide to do so.

This study will pose minimal or no risk to you. There is no direct benefit to you for being in the study; however, the study outcomes may lead to a better understanding on anaemia among children, which may help in health policy development and programs planning to improve the health status of such people.

CONSENT DECLARATION

The above document describing the benefits, risks and procedures for the research title ***(Factors contributing to anaemia in children under five years in the Ga East municipality, Greater Accra Region, Ghana)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

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

I was present while the benefits, risks and procedures 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 nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent