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# **Original Article**

# HOLISTIC APPROACH TO CAUSES, PREVENTIVE MEASURES OF ANAEMIA AND ITS ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING THE ANTENATAL CLINIC OF TUMU MUNICIPAL HOSPITAL GHANA

Clement Tiimim Yanbom<sup>1</sup>, Best Ordinioha<sup>2</sup>, Alex Bapula<sup>1</sup>, Benjamin Tiezooli<sup>1</sup>, Saani Nyuasun<sup>1</sup>, Samuel Malogae Badiekang<sup>1</sup>, Salome Chinoso Ogbuleka<sup>2</sup>, Azumah Badam Yanbom<sup>1</sup>, Cecilia Dasaah<sup>1</sup>, Abubakari Deika<sup>1</sup>, and Kunkoi Baah<sup>1</sup>

Affiliations: <sup>1</sup>Ghana Health Service <sup>2</sup>School of Public Health, University of Port Harcourt, Nigeria

**Corresponding Author:** Clement Tiimim Yanbom (the Principal Investigator) **Email:** ytiimim@yahoo.co.uk

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#### ABSTRACT Background

Anaemia is a major health issue worldwide, especially among prenatal women and has a lot of consequences on both women and their unborn babies. The risk of anaemia among prenatal mothers is increased due to a disproportionate increase in plasma volume compared to red cell mass which happens after the first trimester. The consequences of anaemia in pregnancy to the mother include; decreased body resistance to infections, pre-term labour, puerperal sepsis, late abortions, impaired involution of uterus, pre-eclampsia, and death. Consequences to the fetus include; Intra-Uterine Growth Retardation, Intra-Uterine Fetal Defects, birth asphyxia, immatured immunity This study sought to ascertain the Holistic approach to preventive measures of Anaemia and its related factors among pregnant women attending the antenatal clinic of Tumu municipal hospital of Ghana

## Methods

This cross-sectional study included 401 pregnant women who were randomly selected at Tumu Municipal Hospital using a systematic sampling technique. The researcher used three (3) trained research assistants to help in the collection of data for the study. Data was gathered through face-to-face administration. The data collected included demographic and secondary data of haemoglobin levels. Haemoglobin levels were categorized using the WHO criteria; normal ( $\geq 11g/dl$ ), mild anaemia (10-10.9g/dl), moderate anaemia (7-9.9g/dl), severe anaemia (<7g/dl). Analysis Data was managed/cleaned using SPSS version 20 and analyzed using STATA version 16. Descriptive statistics was used to ascertain the frequency distribution, mean, and

standard deviation and ethical approval was obtained from the Ethics Review Committee of the University of Port Harcourt (School of Public Health) with a protocol number UPH/CEREMAD/REC/120

## Results

The haemoglobin level at antenatal registration ranged from 7.1g/dl to 16.7g/dl with the mean haemoglobin being 11.3g/dl ( $\pm$ 1.3 standard deviation). 32.2% of the respondents were anaemic at registration which was made up of 27.2% with a mild form of anaemia (haemoglobin level from 9 to 10.9 g/dl) whilst the remaining 5.0% had moderate. Factors associated with anaemia among pregnant women include; birth interval, age, antenatal care attendance, and diet diversification. Findings revealed that mothers with intervals of three years and beyond were 76% less likely to have anaemia compared to others whose birth intervals were less than two years (AOR: 0.24 (C.I: 0.09 – 0.64) p= 0.004), pregnant women aged 21 to 25 years were 58% less likely to be anaemic compared to those who were less than 20 years (COR: 0.42 (C.I: 0.17 – 0.99) p= 0.048), pregnant women who have attended the antenatal care clinic for at least 4 times were 51% less likely to be anaemic (AOR: 0.49 (C.I: 0.28 – 0.86) p= 0.013), and mothers who consume diversified diet were 63% less likely to become anaemic (AOR: 0.37 (C.I: 0.19 – 0.73) p= 0.004).

# Conclusion

Findings of this study revealed that anaemia in pregnancy is high as 43.45% of the pregnant women were anaemic after 28 weeks. The anaemia status at antenatal care registration was better than the status after 28 weeks of gestation since the prevalence was 32.17% at registration but increased to 43% after 28 weeks of gestation which should not have been the case.

Keywords: Holistic approach, preventive measures of Anaemia, associated factors, pregnant women

# INTRODUCTION

Anaemia is a condition in which the amount of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by gender, age, and pregnancy status. Measurements of serum haemoglobin concentration are the primary screening tests for identifying anaemia but are nonspecific for identifying specific causes(American College of Obstetricians and Gynecologists, 2008). Anaemia is a major health issue worldwide, especially among prenatal women and has a lot of consequences on both women and their unborn babies. The risk of anaemia among prenatal mothers is increased due to a disproportionate increase in plasma volume compared to red cell mass which happens after first trimester (WHO, 1993). The consequences of anaemia in pregnancy to the mother include; decreased body resistance to infections, preterm labour, puerperal sepsis, late abortions, impaired involution of uterus, pre-eclampsia, and death. Consequences to the fetus include; Intra-Uterine Growth Retardation, Intra-Uterine Fetal Defects, birth asphyxia, and immature immunity (Oliver & Olufunto, 2012; Nutrition Policy, 2016).

Understanding the varied and complicated etiology of anaemia is essential for developing successful interventions that target the context-specific causes of anaemia (Chaparro & Suchdev, 2019). Birth spacing (WHO, 2015), nutrition counseling, micronutrient supplementation, deworming, and avoidance of malaria are some strategies used to reduce the prevalence of anaemia among pregnant women (Nutrition Policy, 2016). In the prevention of malaria in pregnancy as one of the means to prevent anaemia, it is recommended that pregnant women be issued Insecticide Treated Net (ITN) and encouraged to sleep under it every night to protect them against mosquito bites and subsequently malaria. On the basis of this, every pregnant woman is

often given a net at the point of antenatal care registration and counseled on the appropriate way of using it to effectively prevent malaria. Also, sulphuroxine pyrimethamine (SP) is often given monthly as intermittent preventive treatment (IPT) starting at 16 weeks of gestation to protect pregnant women against malaria parasites infection (Alhassan, 2021).

Helminth infestation is among the causes of anaemia. Helminths are parasitic worms that harm humans and/or animals by causing sickness and mortality. Roundworms (Ascaris lumbricoides), whipworms (Trichuris trichiura), hookworms (Necator americanus/Ancylostoma duodenale), tapeworms (Taenia spp., Hymenolepis spp.), and flukes are among the helminths that are regularly found. In impoverished nations with poor access to potable water and adequate environmental sanitation, helminth infestation is common among pregnant women.

Prenatal helminthic infections prevent the fetus from growing and developing normally. Additionally, because of the normal immune reaction to pregnancy, women are more susceptible to parasite infections (Shiferaw et al., 2017). Deworming procedures can be carried out once or twice a year in places where helminths are prevalent, including deworming for pregnant women after 16 weeks of gestation to lower severe maternal anaemia, increase birth weight, and lower infant mortality.

The dewormers used include mebendazole (400 mg) and albendazole (500 mg) (Maternal Health Division of India, 2014). The micronutrient deficiencies that have the greatest impact on anaemia in pregnant women are those of iron and folic acid. These essential micronutrients are provided to pregnant women during antenatal care to take daily in addition to what is taken through diet to prevent anaemia as a deficiency disorder in order to maintain appropriate level among prenatal mothers (Nutrition Policy, 2016). Counseling on the consumption of four-star diet (diet containing; stapple, animal protein, legume, and fruit/vegetables) is another way of improving the micronutrient levels of the individuals especially prenatal mothers to meet their physiological needs (UNICEF, 2012).

In Sissala East, there is high prevalence of anaemia among antenatal attendants at registration and at 36 weeks of gestation which is one of the major problems facing the municipality as captured in the 2020 annual report. All interventions that have been recommended for prevention of anaemia are implemented in Sissala East, yet there is high prevalence of anaemia among prenatal mothers.

The interventions that are being implemented by the staff of health facilities in Sissala East to prevent anaemia among prenatal mothers include; malaria prevention through distribution of Long Lasting Insecticidal Treated Nets (LLINs) and administration of Intermittent Preventive Therapy (IPT) using Sulphadoxine Pyrimethamine (SP), counseling of prenatal mothers on diet, distribution of iron and folic acid tablets to pregnant women, administration of antihelminthics to control worm infestation among pregnant women. There is currently no published scientific/research findings on anaemia in Sissala East Municipality where Tumu happens to be the capital. This revelation came when I could not retrieve a single article online regarding anaemia situation in Tumu (Sissala East Municipality).

Practices of prenatal women such as intake of routine drugs, sleeping under the LLIN, intake of antihelminths, intake of recommended diet, regular ANC attendance, and IPT uptake could lead to improvement in the dietary intake of nutrients and prevention of diseases/infections. However, if all the recommended practices are not adhered to, either infections or inadequate dietary intake of nutrients may set in which could lead to anaemia.



Figure 1 Conceptual Framework

At a biological level, anaemia results from an imbalance between erythrocyte production and loss; this can be brought on by excessive erythropoiesis loss or inadequate erythropoiesis (caused, for example, by nutritional inadequacies, inflammation, or hereditary Hb abnormalities) (due to breakdown of red blood cells, blood loss, or both). Anaemia is frequently categorized using the biological mechanism of causation (for example, IDA, hemolytic anaemia, and anaemia of inflammation (AI))and/or the RBC shape (Chaparro & Suchdev, 2019). Anaemia can be caused by a variety of things, including nutrient deficiencies, illness, inflammation, and abnormal haemoglobin. These factors are related in some ways. Poor socioeconomic status is linked to an increased risk of anemia in women and children and it is among the key determinants of nutrition and overall health. Similar to how anaemia and education levels are related (Chaparro & Suchdev, 2019).

#### Nutritional anaemia: deficiency of iron, vitamins B12, folate, and riboflavin

Nutritional anaemia happens when hematopoietic nutrient concentrations (those involved in RBC formation or maintenance) are insufficient to meet the needs. Some of the main causes of nutrient deficiency include inadequate dietary intake, increased nutrient losses (such as haemorrhage from parasites, childbirth, or heavy menstrual losses), impaired absorption (such as a lack of intrinsic factor to aid vitamin B12 absorption, a high phytate intake, or a Helicobacter pylori infection that inhibits iron absorption), or altered nutrient metabolism (e.g., vitamin A or riboflavin deficiency affecting mobilization of iron stores) are some of the main causes of nutrient deficiency. Nutrient supplementation is very crucial in the prevention and management of nutritional anaemia (Chaparro & Suchdev, 2019).

#### Soil-transmitted helminth infections

The hookworm is the most prevalent parasite that spreads through the soil and is connected to anaemia (Necator americanus and Ancylostoma duodenale). The loss of blood (and iron) brought on by hookworms feeding on the intestinal mucosa can lead to anaemia. Hookworms are particularly common in areas with poor infrastructure, water, sanitation, and hygiene in Southeast Asia and sub-Saharan Africa. The chance of blood loss and subsequent anaemia depends on the level of infection, the kind of hookworm, and whether other parasites are also present (Chaparro & Suchdev, 2019). Intake of routine anti-helminthics is necessary in the control of worm infestations.

## Malaria

Malaria brought on by Plasmodium parasites can have many negative side effects, including fatality, as well as induce severe anaemia. The majority of malaria-related deaths in Africa are brought on by Plasmodium falciparum, which is the most prevalent type of the disease. Children under the age of three and pregnant women are among those most at risk of contracting malaria and getting very ill from it. Iron deficiency is also common in areas with high rates of malaria. Through hemolysis, the release of heme, poor erythropoiesis, excess iron in macrophages, and decreased iron absorption, malaria adversely affects iron metabolism and distribution. Iron is necessary for the parasite to flourish. Although the mechanism for malaria-related anaemia is multifaceted and involves increased hemolysis of parasitized red blood cells as well, increased hemolysis of non-parasitized red blood cells is the fundamental cause in the development of anemia in malaria. Anaemia develops during and for days or weeks after a severe malaria attack due to increased red cell clearance, decreased erythrocyte survival, decreased red blood cell production (suppressed erythropoiesis), and other factors (Chaparro

& Suchdev, 2019). On the basis of these, malaria preventive strategies such as intake of IPT during pregnancy and sleeping under ITN should be adhered to.

#### Increased risk of anaemia during pregnancy

When iron, folic acid, and proteins are not increased at a rate that matches the growth in blood volume during pregnancy, the level of hemoglobin decreases. It is known that only 10% of iron is absorbed, and that the amount needed during pregnancy triples from the first to the third trimester. Therefore, in order to maintain the required haemoglobin levels throughout pregnancy, additional iron and folic acid are needed (ACOG Committee on Practice Bulletins, 2008).

Practices of pregnant women can either prevent them from becoming anaemic or facilitate their likelihood of becoming anaemic. Some practices such as the intake of recommended micronutrient supplements during pregnancy, consumption of iron-rich foods, intake of fruits and vegetables, prevention of malaria and worm infestations could lead to the prevention of anaemia. However, intake of tea which inhibits iron absorption, and the intake of non-nutritive items such as clay and dirt could also facilitate the occurrence of anaemia in pregnant women. Findings of several studies came out with findings regarding the practices of antenatal women that either contribute to anaemia prevention or otherwise. Some of these findings are indicated below. A study conducted in Nigeria revealed that, 79.1% of pregnant women took micronutrient supplements to avert anaemia (Onyeneho et al., 2016). Another study conducted in Ethiopia found out that, in terms of eating habits, more than half of the research respondents (57.24 %) said they ate green vegetables once a week, while the majority (78.42 %) said they ate meat occasionally (Mekonnen et al., 2018). A case-control study conducted among anaemic (cases) and non-anaemic (controls) pregnant women in the Somali Region of East Ethiopia revealed that, 7.0% anaemic pregnant women and 25.4% of the controls consumed red meat every day. 72.8% of anaemic respondents and 53.5% of controls never ate fish, and 98.2% of anaemic group and 86% the controls did not consume white meat at all. 14.0% of an anaemic group of respondents and 41.2% of controls consumed green vegetables every day. 92.1% of the anaemic respondents and 85.1% of controls never consumed nuts, while 98.2% of the anaemic group and 99.1% of controls consumed grains daily. 36.8% of the cases and 32.5% of controls never consumed pulse. Regarding tea and coffee consumption, 84.2% of cases and 67.5% of the controls consumed tea every day (Osman et al., 2020).

Findings of a study conducted in urban Pakistan among pregnant women revealed that only 43.3% consumed red meat two times or more a week during the pregnancy, only 66.3% consumed fruits two or more times a week during the pregnancy, only 25.01% consumed eggs two or more times a week during the pregnancy, only 10.6% took iron supplement during the pregnancy. Whereas in the same study, as much as 91.2% of the pregnant women consumed tea with 2.8% consuming more than three times a day and 47.2% consuming nonfood/ nonnutritive items such as clay and dirt According to results of a survey of pregnant women in urban Pakistan, only 43.3% of them ate red meat twice or more per week, only 66.3% ingested fruits twice or more per week, only 25.01% consumed eggs twice or more per week, and only 10.6% supplemented their iron intake throughout pregnancy. Contrarily, in the same study, 47.2% of the pregnant women consumed non-food/non-nutritive things like clay and dirt, while as much as 91.2% of the pregnant women drank tea, with 2.8% drinking it more than three times day (Baig-ansari et al., 2008). Another study in Rural Pakistan (in Lahore) indicated that, only 3.1% of the pregnant women were taking iron supplements regularly and 38.9% often take it after meals. Of those who were not taking the iron supplements regularly, 3.1% said it was forgetfulness

whilst 29.8% said it was due to side effects. About 67.2% of the pregnant women were found not to be taking iron supplements at all (Habib, 2018).

According to research conducted in Ghana's Western Region, 37% of pregnant women said they did not routinely attend ANC as advised by medical practitioners. 35.7% registered during the first trimester, 17.9% registered during the second trimester, and 14.1% registered during the third trimester of the 63% of pregnant women who routinely received prenatal care. Some of the pregnant women (46%) did not take IPT medications that are typically administered during antennal service delivery. The majority of expectant mothers (72%) claimed they typically slept under insecticide-treated bed nets, whereas 37.0% said they didn't take the malaria treatment prescribed to them at the antenatal clinic. Regarding their eating habits, 54.5% eat by doctors' advice. The view that prenatal care attendance was not important (18.8%), financial issues (17.9%), the facility's distance from their house (18.8%), and others' claims that they did not have enough time to spend at the clinic (44.5%) were among the causes of irregular ANC attendance. Lack of funds (45.5%), a perception that dietary recommendations aren't as important as they should be (8.9%), and difficulty accessing the appropriate foods (9.8%) were cited as causes for non-adherence to dietary advice from health care providers. Lack of knowledge (18.7%) and a desire for natural therapy options were the main causes of the nonuse of preventive anti-malarial prophylaxis (Konlan et al., 2020). According to research conducted in Sunyani Municipal Hospital on anaemia in pregnancy, although 88.0% of pregnant women own insecticide-treated bed nets, only 60.8% of them slept under it the night before data collection interview. Also, 24.1% and 23.4% of the pregnant women interviewed had received antihelminthic and intermittent preventive treatment for malaria respectively (Anlaakuu, 2015).

Another study conducted at Tamale Teaching Hospital discovered that 24.3 % of pregnant women utilized insecticide-treated bed nets, with the majority (98.3%) using iron and folic acid-containing multivitamin drugs. Furthermore, whereas the majority of respondents (94.5%) ate flesh meals or foods high in iron (i.e., meat, poultry, fish) and vegetables (96.8%), less than half (43.8%) ate legumes/pulses (beans, peas, and lentils), dairy (35.3%), or dark green leafy vegetables (44.5%). However, most of the respondents (80.3%) were meeting the minimum dietary diversity of consuming at least five of the ten food groups (Wemakor, 2019). The study seeks to holistically approach the preventive measures of Anaemia and its related factors among pregnant women attending the antenatal clinic of Tumu Municipal Hospital of Ghana Specific objectives

1. To assess the anaemia preventive practices of the pregnant women attending Tumu Municipal Hospital

2. To determine the factors associated with anaemia in pregnancy among the women attending Tumu Municipal Hospital

## METHODOLOGY

**Study area:** The study was conducted in Tumu Municipal Hospital located in the Sissala East Municipality of Ghana. The Sissala East Municipality is one of the eleven Municipals in the Upper West Region. Tumu which was the capital of the Sissala & Sissala East District is still maintained as the capital of the Sissala East Municipal. The main occupation of the people in the Municipality is agriculture (both crops and livestock rearing). A small number of people, especially women are

involved in trading. These people visit several markets within and outside the Municipality to buy and sell maize, yam rice etc which are some of the food crops that are produced in large quantities in the Municipality. Educationally, The Sissala East municipality has a low Literacy rate but this is higher in males than females.

Tumu Municipal Hospital was established as a District Hospital in the year 1992 having commenced initially as a health post in the 1950s. Currently, the hospital serves the entire population of the Municipality made up of 71,755 inhabitants as the only public hospital (GHS-Sissala East, 2021). It is also the highest referral point in the Municipality and receives referrals from seven (7) health centres, 52 CHPS zones, three (3) private clinics and one (1) private hospital all within the Municipality. It also serves as a facility of choice and a referral destination for clients from neighbouring districts such as Sissala West and Wa East districts as well as neighbouring Burkina Faso. The hospital has a bed capacity of 104 spread across four wards made up of an emergency unit, general ward, paediatric ward and maternity ward. It has an average OPD attendance of 120 per day with a bed occupancy rate of 52.5%. The hospital has a staff strength of 215 of which the majority are nursing staff (i.e., 57 enrolled nurses, 32 general nurses, 7 psychiatry nurses, 13 midwives, 1 ENT nurse, 1 paediatric nurse and 2 ophthalmic nurse), other cadre of staff include; Doctors, Physician Assistants, Pharmacy staff, Nutritionists, Laboratory Technicians, Disease Control Officers, Health Information Officers, Administrative and support staff.

## Study design: A cross-sectional design

**Study population:** The study population were pregnant women accessing antenatal care services at the Tumu Municipal Hospital.

**Inclusion criteria:** All pregnant women attending antenatal care at the Tumu Municipal Hospital who are mentally sound and willing to participate in the study by signing the informed consent form were included in the study.

**Exclusion Criteria:** Those pregnant women attending antennal care at the Tumu Municipal Hospital who refused to sign the informed consent form and/or were not mentally sound were excluded from the study. Others who traveled in and have not stayed in Tumu for at least three months were excluded from the study.

**Sample Size:** Cochran (1977) sample size determination formula was used to estimate the sample size for the study. Using a confidence interval of 95% with a marginal error of 5%, thus an alpha level of 0.05 with an equivalent Z-value of 1.96. Prevalence of anaemia among pregnant women conducted in the Tamale Teaching Hospital was found to be 50.8% (Wemakor, 2019). Below is a calculation of the sample size:

$$n = \underline{z^2 p (1-p)}{m^2}$$

n= Sample size

Z=Z-score at 95% confidence interval = 1.96

P= Prevalence of anaemia = 50.8%

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M= Marginal error (5\%) = 0.05.
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Therefore, substituting the values into the formula above, gives the following.

 $n = \frac{1.96^2 \times 0.508(1 - 0.508)}{0.05^2} = \frac{3.8416 \times 0.2415}{0.0025}$ =371.10

The calculation yielded a sample size of 371 respondents to be studied. A non-response rate of 10% and other unexpected events such as dropouts and incomplete questionnaire were factored in the sample size determination and so the final sample size was adjusted to 408.

**Sampling technique:** Systematic sampling technique as described by Degu & Yigzaw (2006) as one of the probability sampling techniques was used in this study as it gave all participants equal opportunity to partake in the study. Daily average antenatal care attendance at Tumu Hospital was 65 (including referrals) from the lower facilities (mainly for ultrasound scan and laboratory investigation). The maximum number of questionnaires a data collection assistant administered per day was 7 and three (3) data collection assistants were used for the data collection. Since the daily attendance was 65 and 21 samples were required each day, a sampling interval of 3 ( $65 \div 21=3.09$ ) was used. On each day of the data collection, the data collection team usually wait until at least three pregnant women were at the antenatal care clinic. From the first three attendants, one was randomly selected using the simple random sampling technique where their unique identification numbers were written on pieces of paper, folded, kept in a box then mixed and one was randomly picked. The randomly sampled respondent becomes first and every third attendant was selected until 21 respondents were interviewed each day. This method was repeated each day of the data collection until all the required respondents were recruited.

**Data Collection:** The researcher used three (3) trained research assistants to help in the collection of relevant data for the study. Data was gathered through face-to-face administration with trained research assistants at the hospital premises. Workers in the hospital were not selected to be part of the research assistants in order to minimize bias. The research assistants explained the purpose of the study to the participants and those who were willing to take part in the study signed informed consent forms before participating. An online questionnaire was developed for the data collection using google form which prevented the data collectors from having access to the data after submission. It is only accessible by the researcher and any other person permitted to have access since it is linked to his google account.

**Validity and Reliability:** The data was collected from respondents of this study using a selfdeveloped semi-structured questionnaire. To ensure validity and reliability of the information gathered by the questionnaire, it was pre-tested at Sakai Health Centre which is located within the Sissala East Municipality. Inhabitants of Sakai and Tumu share similar features such as languages spoken, cultural belief system, feeding and health seeking behaviours. During the pre-test, questionnaires were administered to 30 respondents and all questions with ambiguities were noted and reframed to portray the meaning/understanding the researcher wish to express to respondents. All forms of ambiguities were removed after the pre-test to ensure that the data collection tool gives same results when repeated multiple times. The pre-test helped the researcher to edit the questionnaire to ensure it is able to answer the objectives of the study **Methods of Data Analysis:** Analysis Data was managed/cleaned using SPSS version 20 and analyzed using STATA version 16. Descriptive statistics was used to ascertain the frequency distribution, mean, and standard deviation where appropriate. Comparison of anaemia status at registration and that of 28 and 36 weeks were done to ascertain the impact of public health interventions towards anaemia prevention and control of anaemia in pregnancy. A composite score was generated for all seven knowledge related questions after which those who had positive responses upto 50% and above were coded to have good knowledge and those who had less than 50% were coded to have poor knowledge. Similar scores were generated and coded to determine the overall attitude and practices of the respondents. Chi-square tests was used to test for the relationship between independent and dependent variables.

A p-value of 0.05 was set for statistical significance at 95% confidence interval. Logistic regression was used to determine the strength of association at 95% confidence interval. All independent variables (subject characteristics) were considered to be statistically significant when P-values were less than or equal to 0.05. Results were presented in tables and charts.

**Ethical considerations:** Ethical approval for the study was obtained from the Ethics Review Committee of the University of Port Harcourt (School of Public Health) with a protocol number UPH/CEREMAD/REC/120 as attached in appendix IV. Also, permission to conduct the study was obtained from the hospital management. Respondents were assured of anonymity and confidentiality of information entrusted.

Moreover, written as well as verbal assurances were given to respondents to withdraw from the study at any time of their choice without any penalty. Respondents were made to consent to participate in the study by signing informed consent forms. Cultural values, norms and beliefs of respondents were duly respected and observed.

**Risk and Benefit** Apart from the time participants spent filling the questionnaires, there was no physical risk associated with this study. The benefit of this study is that it will aid policy making and interventions with regards to preventing/reducing anaemia among pregnant women.

**Privacy and Confidentiality** Participants were given assurance that under no circumstance will their identity, particularly names or addresses be linked to the data analysis, reporting, and dissemination of the findings of the study. Participants were also assured that, data storage, analysis, reporting and dissemination of all data will be done in formats that will not expose their identity. Names of respondents were not recorded during data collection, codes were assigned to respondents and used to represent those respondents.

**Compensation** The respondents did not receive any form of compensation for their participation in the study.

**Data Quality and Security** Data is stored by the researcher alone (principal investigator). The data was made accessible to members of the research team.

**Voluntary Participation and Withdrawal** Participants were informed that participating in this study was voluntary and therefore, they have the right to participate or refuse to participate.

ATTRIBUTE	FREQUENCY (N=401)	PERCENTAGE
Age group of respondents (years)		
20 years and below	42	10.5
21 to 25	129	32.2
26 to 30	106	26.4
31 to 35	75	18.7
36 to 40	37	9.2
Above 40	12	3.0
<b>Mean age</b> = $27.9576$ years ( $\pm 6.2439$ SD)		
Educational level		
None	79	19.7
Basic	143	35.7
S.H.S.	87	21.7
Tertiary	92	22.9
Occupation		
None	55	13.7
Trader	51	12.7
Farmer	165	41.2
Civil/Public Servant	79	19.7
Artisans	51	12.7
Marital status		
Single	12	3.0
Married	388	96.8
Widow/widower	1	0.3
Type of Marriage		
Monogamous	287	75.3
Polygamous	94	24.7
Religion		
Christianity	79	19.7
Islam	322	80.3
Ethnicity		
Sissala	306	76.3
Dagaaba	44	11.0
Mosi	4	1.0
Kassena	26	6.5
Other (specify)*	21	5.2

# **RESULTS: Table 1: Background Characteristics of Respondents**

\*Other tribes include: Basali, Frafra, Fulani, Yoruba, Hausa, Igbo, and Ewe

Data was obtained from 401 respondents of which majority (69.1%) were less than 31 years of age as at the time of the data collection with the mean age being 28.0 years ( $\pm$ 6.2 Standard Deviation). A higher proportion (35.7%) of them had basic level of education as their highest level whilst 19.7% did

not have any form of formal education. Also, a higher proportion (165; 41.2%) of the respondents were farmers. Majority of the respondents (388; 96.8%) were married of which 287 (75.3%) were into monogamous marriage. The main form of religious expression among the participants was Islamic religion (80.3%). They were also predominantly Sissala (76.3%) by tribe with 5% belonging to other minority tribes which were specified as; Basali, Frafra, Fulani, Yoruba, Hausa, Igbo, and Ewe.

ATTRIBUTE	FREQUENCY (N=401)	PERCENTAGE
Interval between births		
Less than two years	46	11.5
Two to three years	144	35.9
Three years and beyond	102	25.4
Not applicable (first pregnancy)	109	27.2
Gravida (Number of pregnancies)		
One	108	26.9
Two	113	28.2
Three	74	18.5
Four	55	13.7
Five	34	8.5
Six	10	2.5
Seven	7	1.8
Parity (Number of deliveries)		
None	111	27.7
One	114	28.4
Two	74	18.5
Three	57	14.2
Four	28	7.0
Five	13	3.2
Six	4	1.0
Economic Status		
500 cedis and below	351	87.5
501 to 1000 cedis	31	7.7
1001 to 1500 cedis	6	1.5
1501 to 2000 cedis	9	2.3
Above 2000 cedis	4	1.0

 Table 2: Socio-Demographic Characteristics

1USD = GHS14.5 as at the time of the data collection

46 respondents (11.5%) had a birth interval of less than two years. More than half (55.1%) of the respondents were pregnant for less than three times (at most twice). 28.4% of them had just a delivery whilst 27.7% had never delivered before (pregnant for the first time). Majority (351; 87.5%) of the

respondents belonged to a low economic class with monthly income less than or equal to five hundred Ghana Cedis (GHØ500.00/<35USD)

Class of anaemia	Number	Percentage
Mild anaemia	129	94.9
Moderate anaemia	6	4.4
Severe anaemia	1	0.7

 Table 3: Classification of the anaemic respondents

The haemoglobbin level at the most recent laboratory investigation prior to the study (both 28 weeks and 36 weeks of gestation) ranged from 6.3g/dl to 13.6g/dl with the mean haemoglobin being 10.9g/dl (1.1 standard deviation). Only 56.6% of the pregnant women had normal haemoglobin level ( $\geq$ 11 g/dl) during the most recent laboratory investigation with the remaining 43.5% having some levels of anaemia; 41.2% with mild anaemia (haemoglobin level 9 to 10.9 g/dl), 1.9% with moderate anaemia (haemoglobin level from 7 to 8.9 g/dl), and 0.3% with severe anaemia (haemoglobin level  $\leq$  7g/dl).



Figure1: Proportion of respondents that could mention risk factors of anaemia Out of the 401 respondents that were interviewed, it was 283 (71%) of them could mention the risk factors of anaemia.



Figure 2: Consequences of anaemia in pregnancy

Of all the consequences of anaemia in pregnancy, majority (63.34%) of the respondents mentioned maternal death as a consequence, 51.12% mentioned still birth, 35.66% mentioned pre-term delivery, and 34.41 mentioned low birth weight babies



Figure 3: Control measures of anaemia in pregnancy

Majority (68.83%) of the respondents mentioned good diet as a way of controlling anaemia among pregnant women



Figure 4: Proportion of respondents who were able to mention preventive/control measures of anaemia 70.57% of the respondents were able to mention some of the preventive and control measure of anaemia in pregnancy

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ATTRIBUTE	ANAEMIA STATUS		Chi-	COR (95% CI)	AOR (95% CI)
	Normal	Anaemic	Square	P.Value	P.Value
	(%)	(%)	(P.Value)		
Gravida					
≤3 pregnancies	138	82	21.1960	Base	Base
	(62.73)	(37.27)	(0.000)		
4 to 5	37	41		1.90 (1.13 –	1.00 (0.45 – 2.25)
pregnancies	(47.44)	(52.56)		3.21)0.016	0.995
6 or more	1 (6.67)	14		24.02 (3.10 -	4.72 (0.41 -
pregnancies		(93.33)		186.09) 0.002	53.62) 0.211
Parity					
≤3 deliveries	167	108	19.6330	Base	base
	(60.73)	(39.27)	(0.000)		
4 to 5 deliveries	9 (26.73)	25		4.36 (1.96 – 9.70)	1.45 (0.46 – 4.57)
		(73.53)		0.000	0.530
6 or more	0 (0.0)	4 (100)		1.00	1.00
deliveries					
Interval between b	irths				
Less than two	9 (23.08)	30	26.1085	Base	Base

years		(76.92)	(0.000)		
Two to three	62	54		0.26 (0.11 - 0.60)	0.36 (0.14 – 0.89)
years	(53.45)	(46.55)		0.002	0.026
3 years and	49	28		0.17 (0.07 – 0.41)	0.24 (0.09 - 0.64)
above	(63.64)	(36.36)		0.000	0.004
Not applicable	57	24		0.13 (0.05 - 0.31)	0.27 (0.09 - 0.77)
(first pregnancy)	(70.37)	(29.63)		0.000	0.015
Gestation at ANC	registration				
1 <sup>st</sup> Trimester	161	109	7.7280	Base	Base
	(59.63)	(40.37)	(0.021)		
2 <sup>nd</sup> Trimester	15	26		2.56 (1.30 - 5.06)	1.85 (0.81 – 4.21)
	(36.59)	(63.41)		0.007	0.144
3 <sup>rd</sup> Trimester	1 (50.00)	1 (50.00)		1.48 (0.09 - 23.87)	3.54 (0.19 -
				0.784	66.47) 0.398

52.6% of those who had 4 or more pregnancies (p=0.019) and 73.5% of those who had delivered for 4 times or more (p<0.001) were more likely to be anaemic though not significant when adjusted for confounders

63.4% of those who registered for antenatal care within the second trimester (p=0.007) were more likely to be anaemic compared to others who registered in the first trimester but was not statistically significant when adjusted for confounding variables.

ATTRIBUTE	ANAEMIA		Chi-	COR (95% CI) B Value	AOR (95% CI)
	SIA Normal	Anaemic	Square (P.Value	<b>F</b> .value	r.value
	(%)	(%)	)		
Economic class	of respond	ent			
$\leq$ 500 cedis	146	123	7.8776	Base	
	(54.28)	(45.72)	(0.096)		
501 - 1000	19	8 (29.68)		0.42 (0.17 - 1.02)	
cedis	(70.37)			0.054	
1001 - 1500	5 (83.33)	1 (16.67)		0.24 (0.03 - 2.06)	
cedis				0.192	
1501 - 2000	3 (37.5)	5 (62.5)		1.98 (0.46 - 8.44)	
cedis				0.357	
Above 2000 cedis	3 (100)	0 (0.0)		1.00	

Table 5: Association between economic class of respondent and anaemia

Income level of respondent did not show any association with their anaemia status.

## DISCUSSIONS

Data was obtained from 401 respondents of which majority (69.1%) were young adults aged less than 31 years as at the time of the data collection with the mean age being 27.9 years (±6.2 Standard Deviation). A higher proportion of them attained basic education as their highest level of education (35.7%). Illiteracy is still a major concern since as high as 19.7% did not attain any form of formal education. This implies that more than half (55.4%) of the respondents did not go beyond basic education as their highest level of education. The main form of religious expression among the participants was Islamic religion (80.3%). They were also predominantly Sissalas (76.3%) by tribe with 5% belonging to other minority tribes which were specified as; Basali, Frafra, Fulani, Yoruba, Hausa, Igbo, and Ewe. 46 respondents (11.5%) had a birth interval of their previous baby and current pregnancy not up to two years and that could affect the mother, the unborn baby and the young child. It is often recommended that the a child be weaned from breastfeeding after two years to offer them opportunity to be well nourished within the first two years of their lives which also promotes brain development. The mothers also need to rest for at least six months after weaning the older child from breastfeeding before the next pregnancy to enable her build stores of nutrients and improve her haemoglobin level. More than half (55.1%) of the study subjects were pregnant for less than three times (at most twice) and that was very good since multiple pregnancies is one of the contributory factors of anaemia. 28.4% of them had just a delivery whilst 27.7% had never delivered before (pregnant for the first time). Majority (351; 87.5%) of the respondents belonged to a low economic class with monthly income less than or equal to five hundred Ghana Cedis (GHØ500.00/<35USD) and this could affect health service utilization and adherence to dietary recommendations. The results revealed that, anaemia among pregnant women is really high and worst among those who were more than 28 weeks of gestation compared to status at registration prior to 28 weeks. From the current findings, there is an indication that the haemoglobin level of pregnant women at antenatal care registration was better than the level after 28 weeks which should not have been the case. The anaemia prevalence after 28 weeks of gestation stood at 43.5% which is above the nationally set target of less than 25%. The current findings were worse than the report of the WHO (2015) on the global prevalence of anaemia among pregnant women which was found to be 38.2%.

Other findings that are similar to the findings of the current study include the study conducted in the Sunyani Municipality which revealed that, 40.8% of the pregnant women were with Hb less than 11.0g/dl at registration and 41.5% of them were found to have Hb of less than 11.0g/dl as at the time of study (Anlaakuu & Anto, 2017). Also, findings of a study conducted in Tamale Teaching Hospital in Northern Ghana revealed that the overall prevalence of anaemia among pregnant women as at the time of the study was 50.8% (Wemakor, 2019). From the current study, majority (63.3%) of the respondents mentioned poor diet as a risk factor for anaemia, 45.9% mentioned infection, 29.7% mentioned excessive vomiting, 20.2% said women who were anaemic before becoming pregnant, 18.2% said pregnant women with sickle cell disease, 18.0% also said pregnancies at close interval, and 15.0% mentioned teenage pregnancy. These findings are similar to the findings of studies conducted in Lahore (Pakistan) which revealed that 53.4% of respondents said excessive consumption of tea/coffee can lead to iron deficiency anaemia (Habib, 2018). Similar findings were also found in a Tanzanian study, which found that 36.7% of the participants could name inadequate food, parasitic infestations, hereditary factors, and chronic infections as causes of anemia (Margwe & Lupindu, 2018). In the Western Region of Ghana, a study by Konlan et al., (2020) found that 27.7% of pregnant women (respondents) indicated that nutritional deficiency is a common cause of anemia in pregnancy,

while 72.3% said they did not know the causes of anemia and 27.7% mentioned worm infestations as a cause of anemia.

In the current study, 81.6% of the respondents were able to describe the complications or effects of anemia in pregnancy, which is an improvement over the results of a study carried out in Tanzania, which showed that only 35.9% of the respondents knew about anemia and its effects on the health of both the mother and the fetus, while a significant portion (64.1%) of the respondents were unable to give accurate answers on the complications of anaemia during pregnancy. (Margwe & Lupindu, 2018). Furthermore, some of the some of the participants of this research knew the consequences of anaemia in pregnancy, majority (63.3%) of them mentioned maternal death as a consequence, 51.1% mentioned still birth, 35.7% mentioned pre-term delivery, and 34.4% mentioned low birth weight babies. This was in line with the results of a research by Konlan et al., (2020), which found that in the rural region of Ghana's Western Region, 28% of pregnant women said anemia may influence labor, and 72% of respondents said it could cause maternal mortality. Anemia in pregnancy is known to cause maternal mortality, which is a common consequence.

Respondents were also assessed regarding their knowledge on the preventive and control measures of anaemia in pregnancy. From this study, 70.6% of the respondents were able to mention some of the preventive and control measure of anaemia in pregnancy; 68.8% mentioned good diet, 47.9% mentioned intake of IFA, 39.2% mentioned sleeping under ITNs, 34.7% mentioned intake of IPTp, 22.0% mentioned routine deworming, and another 22.0% mentioned birth spacing (of at least two years). This is in agreement with findings of the study conducted in Lahore (Pakistan) which revealed that, only 4% said pregnant women should take iron supplement in addition to intake of the healthy diet and 1.5% said intake of iron supplement along with food reduces side effects (Habib, 2018).

Factors associated with anaemia among pregnant women include; birth interval, age, antenatal care attendance, and diet diversification. Findings revealed that mothers with interval of three years and beyond were 76% less likely to have anaemia compared to others whose birth intervals were less than two years (AOR: 0.24 (C.I: 0.09 - 0.64) p= 0.004), pregnant women aged 21 to 25 years were 58% less likely to be anaemic compared to those who were less than 20 years (COR: 0.42 (C.I: 0.17 - 0.99) p= 0.048), pregnant women who have attended the antenatal care clinic for at least 4 times were 51% less likely to be anaemic (AOR: 0.49 (C.I: 0.28 - 0.86) p= 0.013), and mothers who consume diversified diet were 63% less likely to become anaemic (AOR: 0.37 (C.I: 0.19 - 0.73) p= 0.004).

## CONCLUSIONS

In conclusion, anaemia prevalence among pregnant women assessing care at Tumu Hospital in Sissala East was high and anaemia preventive practices among respondents were good. Age, birth interval, practices such as attendance to antenatal care clinic, and consumption of diversified diet were significantly associated with reduced anaemia in pregnancy.

#### RECOMMENDATIONS

1. Health workers who provide antenatal care services to improve on their sensitization to pregnant women about anaemia in pregnancy in order to improve their knowledge level.

2. Adolescent health should be strengthened in order to prevent pregnancies below among girls aged below 21 years.

3. Counseling and provision of post-partum family planning should be enhanced in order to increase birth intervals.

4. Health workers should also improve on their education on the need for regular antenatal care attendance, intake of routine IFA, IPT and consumption of diversified diet.

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