

UNDERSTANDING THE KNOWLEDGE, ATTITUDE AND RISK FACTORS OF ANAEMIA AMONG PREGNANT WOMEN ATTENDING THE ANTENATAL CLINIC OF TUMU MUNICIPAL HOSPITAL IN THE SISSALA EAST MUNICIPALITY OF GHANA

Clement Tiimim Yanbom¹, Best Ordinioha², Alex Bapula¹, Benjamin Tiezooli¹, Saani Nyuasun¹, Samuel Malogae Badiekang¹, Salome Chinoso Ogbuleka², Azumah Badam Yanbom¹, Cecilia Dasaah¹, Abubakari Deika¹ and Kunkoi Baah¹

Affiliations: ¹Ghana Health Service

²School of Public Health, University of Port Harcourt, Nigeria

Corresponding Author: Clement Tiimim Yanbom (the Principal Investigator)

Email: ytiimim@yahoo.co.uk

Citation: Yanbom, C.T., Ordinioha, B., Bapula, A., Tiezooli, B., Nyuasun, S., Badiekang, S.M., Ogbuleka, S.C., Yanbom, A.B., Dasaah, C., Deika, A., and Baah, K. (2025). Understanding the knowledge, attitude and risk factors of anaemia among pregnant women attending the antenatal clinic of Tumu Municipal Hospital in the Sissala East municipality of Ghana. *Frontline Professionals Journal*, 2(2), 1–23

ABSTRACT

Background: Anaemia is when the amount of red blood cells or their oxygen carrying capacity is insufficient to meet physiologic requirements. According to WHO recommendations, the minimal tolerated haemoglobin level during pregnancy is 11 g/dl. In 2011, the prevalence rate was 38.2% worldwide and 56% in underdeveloped nations. This study sought to ascertain the Understanding knowledge, attitude and risk factors of anaemia among pregnant women attending the antenatal clinic of Tumu Municipal Hospital in the Sissala East municipality of Ghana

Methods: This cross-sectional study included 401 pregnant women who were randomly selected at Tumu Municipal Hospital. The data collected included demographic and secondary data of haemoglobin levels. Haemoglobin levels were categorized using the WHO criteria; normal (≥ 11 g/dl), mild anaemia (10-10.9g/dl), moderate anaemia (7-9.9g/dl), severe anaemia (< 7 g/dl). The data was analyzed using STATA (version 16).

Results: The majority (69.07%) of the participants were aged below 31 years with mean age being 27.9576 ± 6.2439 years. A higher proportion of them were; married (96.76%), Muslims (80.30%), pregnant for < 3 times (55.11%), with a low economic background (87.53%). Anaemia prevalence was 43.45%. The majority of the respondents had good knowledge (84.28%), good attitudes (97.26%), and good practices (77.69%) towards anaemia control. Maternal anaemia was significantly associated with birth interval (AOR: 0.24(C.I:0.09–0.64) $p=0.004$), maternal age (COR: 0.42(C.I:0.17–0.99) $p=0.048$), antenatal care attendance (AOR: 0.49(C.I:0.28–0.86) $p=0.013$), diet diversification (AOR: 0.37(C.I:0.19–0.73) $p=0.004$), and knowledge (AOR: 0.39(C.I:0.22–0.70) $p=0.002$).

Conclusion: Anaemia among pregnant women is still a challenge and I recommend sensitization to improve knowledge and preventive practices anaemia thus curtailing its risk factors

Keywords: Anaemia, prevalence, 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 is the primary screening tests for identifying anaemia but are nonspecific for identifying specific causes. Laboratory test results characteristics of iron deficiency anaemia are a microcytic, hypochromic anaemia with evidence of depleted iron stores, low plasma iron levels, high total iron-binding capacity, low serum ferritin levels, and increased levels of free erythrocyte protoporphyrin (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 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, 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 (Oliver & Olufunto, 2012; Nutrition Policy, 2016). Anaemia in pregnancy is still a global problem affecting pregnant women in almost every country. Though a worldwide challenge, anaemia is more predominant in underdeveloped nations than developed countries. Some findings of studies conducted across several countries have revealed that anaemia is still a problem among women during pregnant. The WHO (2015) estimated that 38.2% of pregnant women over the world have anemia. The same report indicated that the prevalence was as low as 24.3% in the Western Pacific Region whilst very high in the South-East Asian Region. Anaemia prevalence among pregnant women was 41.82%, with significant country-to-country variation, ranging from 23.36% in Rwanda to 57.10% in Tanzania, according to a multi-analysis of 1 demographic and health survey report in East Africa (Liyew *et al.*, 2021). In Ghana, a study conducted by Konlan *et al.*, (2020) in a rural farming district of the Western Region revealed that, anaemia prevalence among expectant mothers was 88.4%. Also, a study carried out in the Sunyani Municipality indicated that, 40.8% of the antenatal 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 the study (Anlaakuu & Anto, 2017). Additionally, a study conducted in Tamale Teaching Hospital in Northern Ghana found that 50.8% of pregnant women had anaemia at the time of the study (Wemakor, 2019). The prevalence of anaemia among pregnant women receiving antenatal treatment at Savelugu Municipal Hospital was found to be 66.3% (Duut, 2018). The data of routine antenatal care services indicated that the prevalence of anaemia within Sissala East Municipality in 2020 at registration was 37.4% and at 36 weeks of gestation was 31.4% (GHS-Sissala East, 2021). This prevalence was higher than the nationally acceptable limit of $\leq 25\%$. The knowledge level of pregnant women is one of the important factors that influence anaemia prevalence among that vulnerable group in society. The results of an Indian study showed that none of the pregnant women had adequate awareness of anaemia, while 17% of them had moderate knowledge and 83% had an inadequate understanding of iron deficiency anaemia (Johncyarani & Arulappan, 2018). Also, findings of a study conducted in Lahore (Pakistan) revealed that 57% of the pregnant women knew about anaemia, 8% knew anaemia in pregnancy can affect the growth of the fetus, only 4% said pregnant women should take iron supplements in addition to intake of the healthy diet. In the same study, it was revealed that 53.4% said excessive consumption of tea/coffee can lead to iron deficiency anaemia, 1.5% said intake of iron supplements along with food reduces side effects, and 52.7% of them had some level of awareness about their haemoglobin status (Habib, 2018). Another study

conducted in Tanzania revealed that, only 35.0% of the study participants were able to provide correct definition of anaemia. About 36.7% of them were able to mention the causes of anaemia as poor diet, parasitic infestations, genetic factors and chronic infections, meanwhile only 36.7% were able mention some of the iron rich foods /food sources which included green leafy vegetables, fruits and protein rich foods that are recommended for anaemia treatment and prevention. Only 35.9% of the respondents were knowledgeable about anaemia and its effects for both health of mother and foetus, while a high proportion (64.1%) of the respondents were unable to provide correct responses on complications of anaemia during pregnancy. In general, 23% and 35% of respondents had little and high understanding on anemia respectively, while 42% had no knowledge at all. (Margwe & Lupindu, 2018). Findings of a study conducted in Baghdad indicated that only 24.5% of respondents had good knowledge about anaemia in pregnancy with the remaining 60% and 15.5% having fair and poor knowledge respectively (Al-sattam *et al.*, 2022). Another research came out with similar findings which revealed that only 19.7% of the pregnant women had good knowledge with the remaining 80.3% having moderate knowledge, and none of the respondents had poor knowledge (Zani *et al.*, 2020).

According to the findings of a study conducted by Konlan *et al.*, (2020) in the rural district of the Western Region of Ghana, 27.7% of expectant mothers (respondents) indicated that nutritional deficiency is a common cause of anaemia in pregnancy whilst 72.3% said they did not know the causes of anaemia. Also in same study, 27.7% mentioned worm infestations as a cause of anaemia. Regarding signs associated with anaemia, 8.9% mentioned white nail beds, 17.9% pallor of conjunctiva, while 54.5% of the respondents could not identify any sign of anaemia. Furthermore, only 18.7% of the pregnant women could identify appropriately at least one sign of anaemia in pregnancy. 28% of the pregnant women indicated that anaemia could affect labour, 36% were not certain, while 36% disagreed on that assertion. Majority (72%) of the respondents indicated that anaemia could lead to maternal mortality. A study of pregnant women receiving antenatal care in the Juaboso District of Ghana's Western-North Region found that 13.5% of them had a good understanding of anaemia, compared to 58.4% who had fair knowledge and 28.1% who had low knowledge (Appiah *et al.*, 2020). Furthermore, only 24.5% of prenatal mothers had a high understanding of anaemia, according to a study done in the Tamale Teaching Hospital (Wemakor, 2019). About 55.7% of pregnant women receiving antenatal care at Savelugu Municipal Hospital had an adequate understanding of anaemia in pregnancy, while the remaining ones scored below the mean (Duut, 2018). One of the main causes of anaemia in pregnancy is the attitude of the pregnant woman. Some expectant women fail to sign up for antenatal care services as soon as possible, while others ignore dietary advice or the guidelines for vitamin consumption. Also, some pregnant women do not comply with the malaria and worm infestation preventive recommendation and these contribute to anaemia prevalence among them. Studies from various countries revealed some attitudes of pregnant women that help in anaemia prevention or facilitate its occurrence. Some of these findings are as stated below;

According to the findings of a study conducted in Lahore (in Pakistan), only 25.2% of antenatal women agreed that there was a need for regular antenatal care checkups during pregnancy. In the same study, it came out that only 68.5% think it is essential to take a special diet during pregnancy, only 3.1% agreed that prenatal women need to take iron supplements in addition to a healthy diet, and none of the pregnancy women agreed that there was the need to space pregnancies as a way of preventing anaemia. The overall positive attitude regarding antenatal checkups and prevention of anaemia among antenatal mothers was 48.7% (Habib, 2018). A study carried out in Nigeria revealed that compliance with regards to micronutrient intake to avoid anaemia in pregnancy was low among the antenatal women assessed (only 59.8% complied by taking the supplements for at least 90 days before delivery). Compliance was higher (60.4%) among individuals who lived close to health facilities than among those who lived far away (44.3%) ($\chi^2 = 24.638$; $p < 0.001$). Compliance was higher among those with a post-secondary degree (58.4%) than among those with a secondary (51.4%) or primary (41.7%)

education (both $z = 7.600$; $p = 0.022$). The higher the women's age, the higher their compliance ($z = 12.653$; $p = 0.049$) (Onyeneho *et al.*, 2016).

According to the findings of a study conducted in the Uthungulu health district of KwaZulu-Natal in South Africa, only 1.8% of antenatal women registered for prenatal care services within the first trimester of gestation (gestational age less than 13 weeks). More than half (57.7%) of these pregnant women visited health facilities for antenatal care registration within the second trimester (between 13 and 28 weeks of gestation). A similar greater percentage (40.5%) of pregnant women were in the third trimester of gestation when they registered for prenatal care (Hoque *et al.*, 2007). To add to the above mentioned attitude of pregnant women, findings of a study conducted among Aboriginal and Torres Strait Islander women of Far North Queensland indicated that, most mothers (78.9%) had at least five antenatal healthcare visits during pregnancy and more than half (57.1%) of them smoked tobacco products during pregnancy (Leonard *et al.*, 2018). According to research conducted in Sunyani Municipal Hospital on anaemia in pregnancy, it was revealed that, 15.5% consumed clay, 6.3% never took eggs during their pregnancy, 6.0% never consumed fish or snails and 4.4% never consumed vegetables (Anlaakuu, 2015). Another study conducted in Tamale Teaching Hospital revealed that the majority (29.0%) of pregnant women registered for antenatal care services after their first trimester. Same study indicated that some of the pregnant women practised some forms of pica which include chewing the following; sticks, cola nuts, chalk, clay, and toothpaste. 75% of them took tea/coffee and 4.2% of them took alcoholic drinks during pregnancy (Wemakor, 2019). For Sissala East Municipality, the existence of anaemia among pregnant women during their first antenatal care visit (at registration) and at 36 weeks of pregnancy was recorded as 31.4% and 37.4% respectively which is higher than the national acceptable limit set at 25% or less (GHS-Sissala East, 2021). The study seeks to ascertain the understanding of the knowledge, attitude and risk factors of anaemia among pregnant women attending Tumu Municipal Hospital

Specific objectives

1. To assess the knowledge of pregnant women attending Tumu Municipal Hospital of anaemia prevention measures
2. To assess the attitude of pregnant women attending Tumu Municipal Hospital towards anaemia prevention
3. To determine the risk 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. 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 majority are nursing staff (i.e., 57 enrolled nurses, 32 general nurses, 7 psychiatry nurses, 13 midwives, 1 ENT nurses, 1 paediatric nurse and 2 ophthalmic nurses), other cadre of staff include; Doctors, Physician Assistants, Pharmacy staff, Nutritionists, Laboratory Technicians, Disease Control Officers, Health Information Officers,

Administrative and support staff. Demographically, 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. There are two major markets in the Municipal namely Tumu, and Bugubelle including other satellite markets across other parts of the Municipality. Educationally, The Sissala East municipality has low Literacy rate but this is higher in males than females.

Study design: A cross-sectional design was selected for this study

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. The 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:

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

n= Sample size

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

P= Prevalence of anaemia = 50.8%

M= Marginal error (5%) = 0.05.

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 self-developed 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.

Results:

Table 1: Background Characteristics of Respondents

| 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 |
| Mean age = 27.9576 years (± 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 |

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

Table 2: Socio-Demographic Characteristics

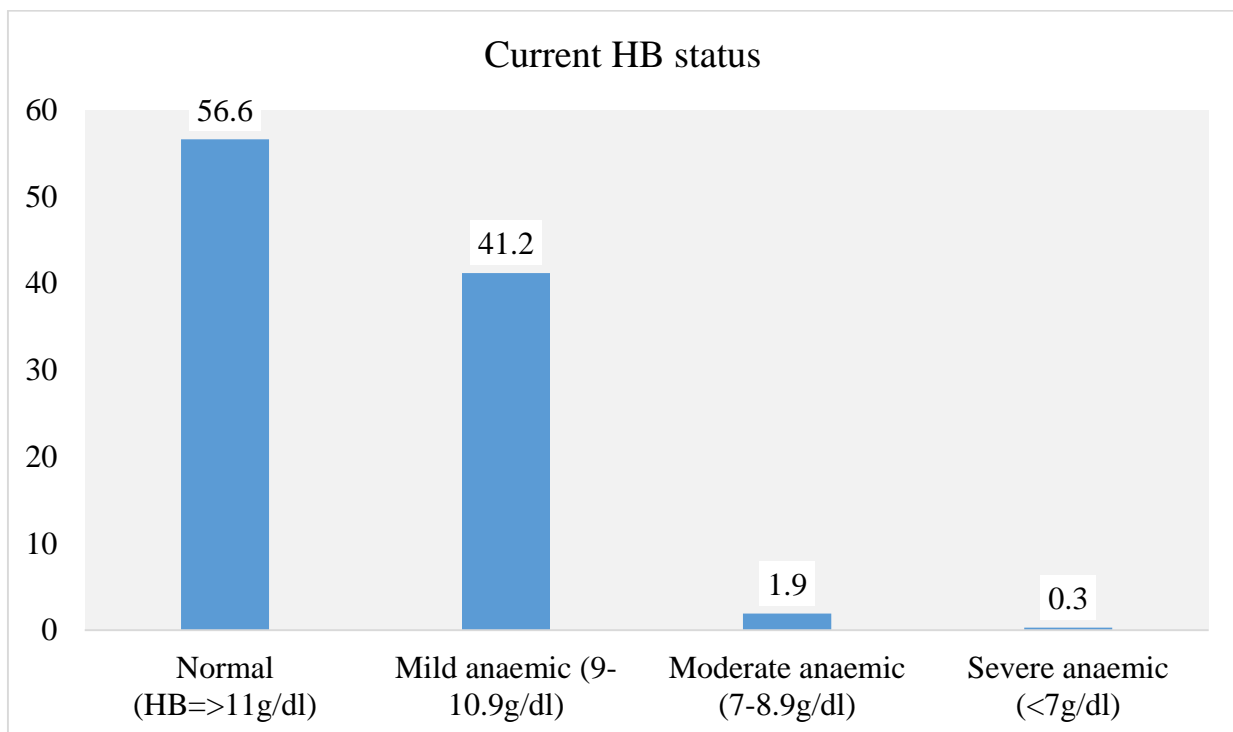
| ATTRIBUTE | FREQUENCY (N=401) | PERCENTAGE |
|--|-------------------|------------|
| Interval between births | | |
| Less than two years | 46 | 11.5 |
| Two to three years | 144 | 35.9 |
| Three years and beyond | 102 | 25.4 |
| Not applicable (first pregnancy) | 109 | 27.2 |
| Gravida (Number of pregnancies) | | |
| 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 |

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

Table 3: Classification of the anaemic respondents

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

The haemoglobin 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 (≥ 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 ≤ 7 g/dl).

**Figure 1: Current haemoglobin level of respondents**

The haemoglobin level at antenatal registration ranged from 7.1g/dl to 16.7g/dl with the mean haemoglobin being 11.3g/dl (± 1.3 standard deviation). 32.2% of the respondents were anaemic at registration which was made up of 27.2% being with mild form of anaemia (haemoglobin level from 9 to 10.9 g/dl) whilst the remaining 5.0% were with moderate anaemia (7 to 8.9 g/dl)

Knowledge of Respondents about Anaemia

Majority (84.3%) of the respondents said they heard of anaemia prior to the data collection.

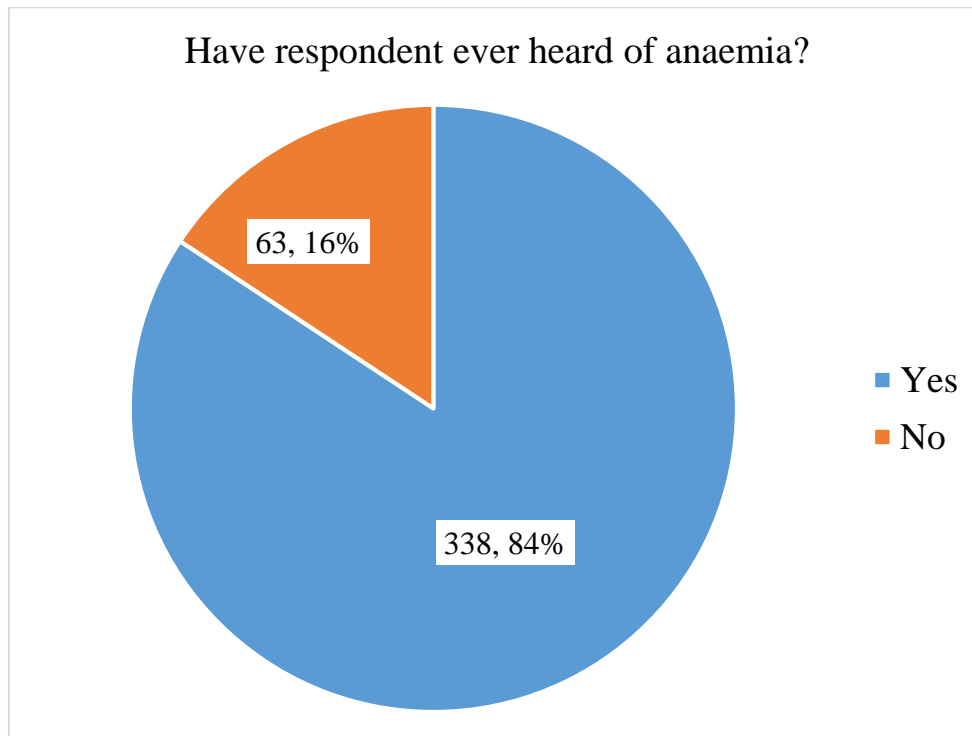
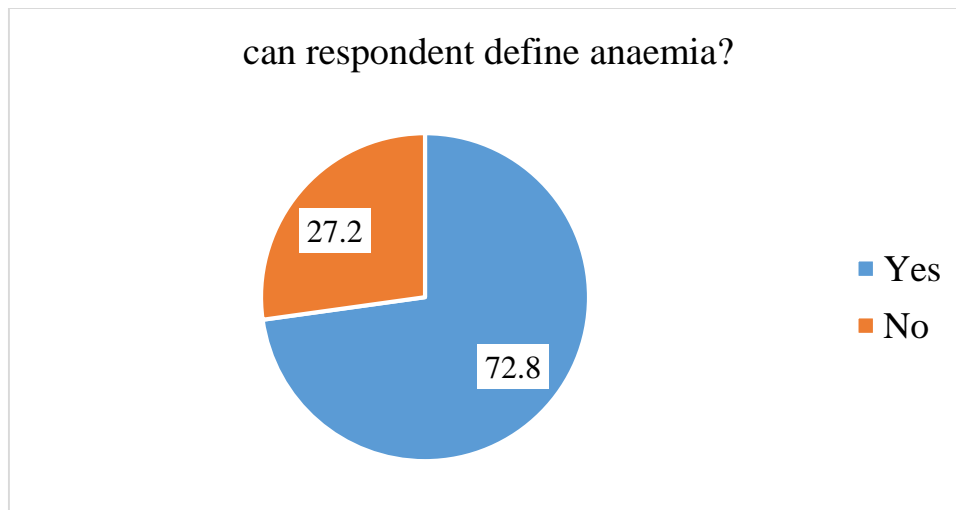


Figure 2: Awareness of anaemia

The majority (72.8%) of the respondents said they knew what anaemia was and could give definition or explanation



Of all the risk factors of anaemia, majority (63.4%) 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

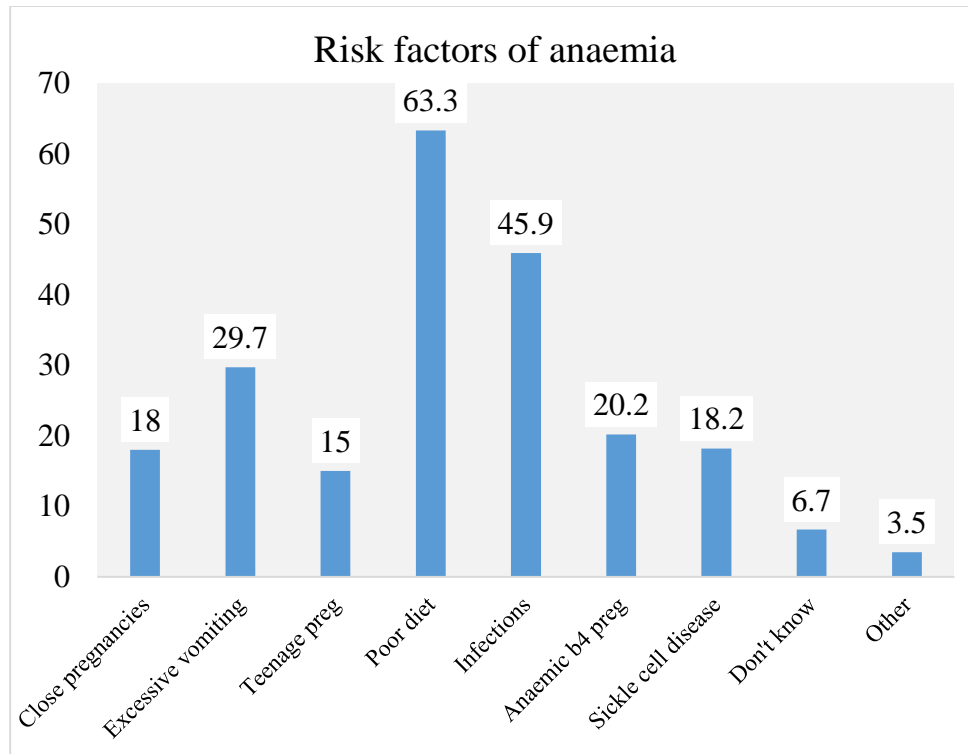


Figure 3: Risk factors of anaemia

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

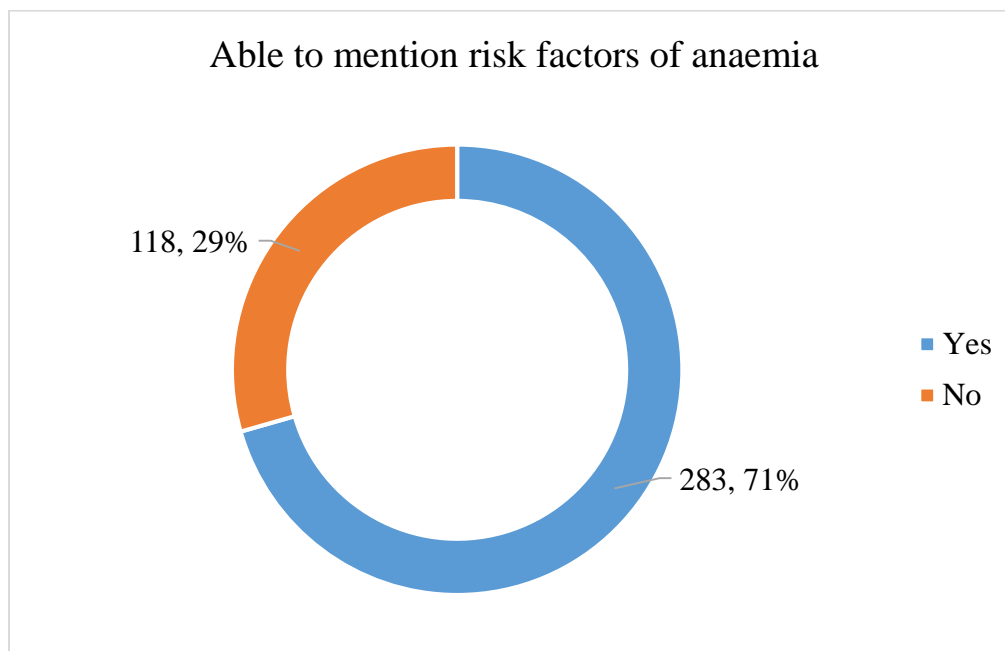


Figure 4: Proportion of respondents that could mention risk factors of anaemia

Regarding the signs and symptoms of anaemia, 54.9% of them mentioned pallor (pale skin, nails and lips), 44.1% mentioned pale conjunctiva, 18.7% mentioned rapid heartbeat, 23.4% mentioned shortness of breath,

38.7% mentioned headache, 12.5% mentioned trouble concentrating or poor concentration, 57.1% mentioned dizziness, and 43.4% said feeling tired or weak is a symptom of anaemia

Table 4: Respondents knowledge about signs and symptoms of anaemia

| ATTRIBUTE | FREQUENCY | PERCENTAGE |
|--|-----------|------------|
| Pale skin, lips, and nails as signs of anaemia | 220 | 54.9 |
| Pale conjunctiva as sign of anaemia | 177 | 44.1 |
| Rapid heartbeat as a symptom of anaemia | 75 | 18.7 |
| Shortness of breath as a symptom of anaemia | 94 | 23.4 |
| Headache as a symptom of anaemia | 155 | 38.7 |
| Trouble concentrating as a symptom of anaemia | 50 | 12.5 |
| Dizziness as a symptom of anaemia | 299 | 57.1 |
| Feeling tired or weak as a symptom of anaemia | 174 | 43.4 |

Out of the 401 respondents that were interviewed, 288 (71.8%) of them were able to mention some of the signs and symptoms of anaemia in pregnancy

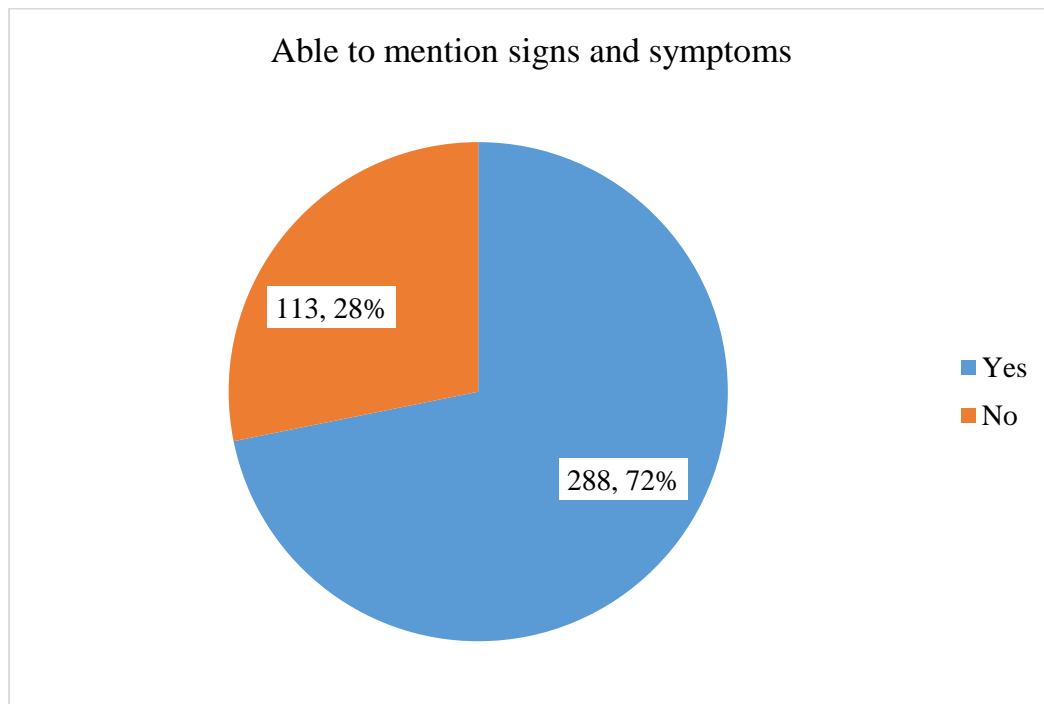


Figure 5: Proportion of respondents that could mention signs and symptoms of anaemia

The overall knowledge level of the respondents was good since more than half (73%) of them had good score when the overall knowledge score was generated

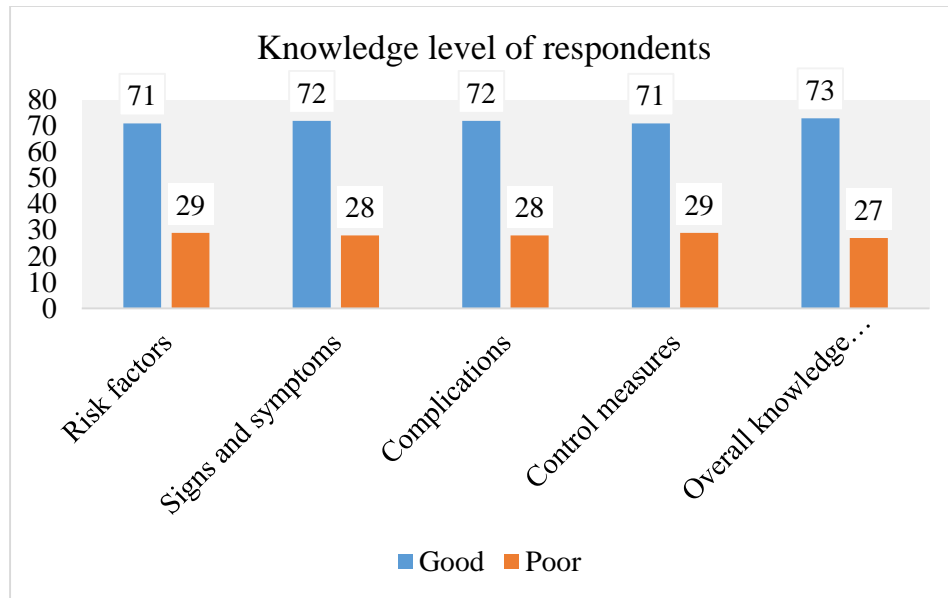


Figure 6: Overall knowledge level of respondents

Attitude of Pregnant Women

Almost all the respondents (97.3%) had positive attitude towards prevention and control of anaemia in pregnancy

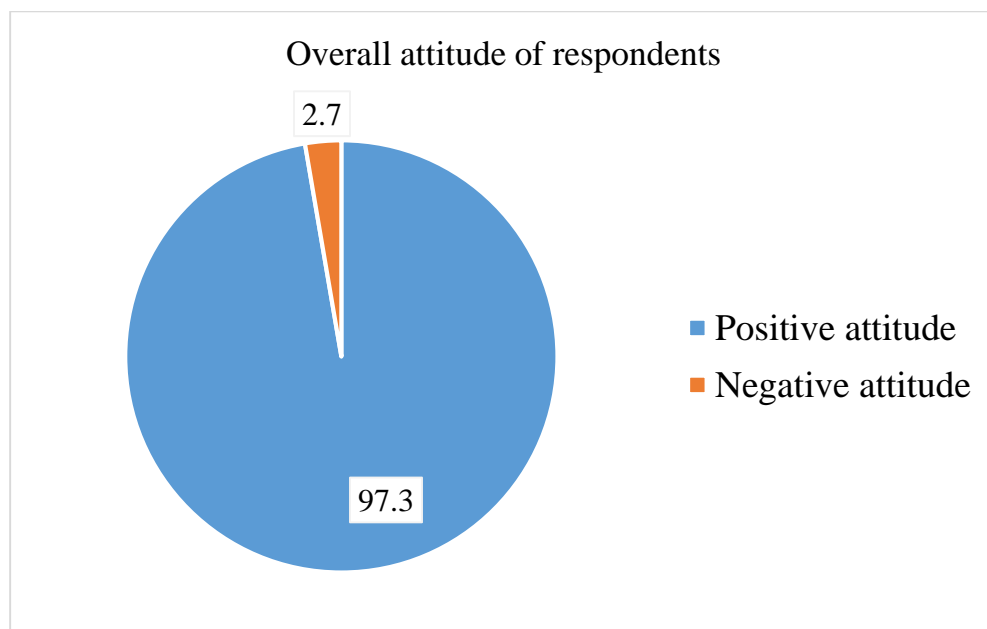


Figure 7: Overall attitude of respondents towards anaemia control

397 (99%) of the respondents agreed that pregnant women need to attend antenatal care clinics regularly, 97.8% agreed that pregnant women need to take their routine iron and folic acid (IFA) supplements, 87.0% disagreed that pregnant women should take tea/caffeine containing beverages, and 98.5% agreed that pregnant women should eat fish/ meat of which 46.1% said it should be eaten every day

Also, 99.3% said pregnant women should eat fruits and vegetables of which 41.0% said it should be eaten every day. Furthermore, 388 (96.8%) of the respondents disagreed that pregnant women should take alcohol, 88.5% disagreed that pregnant women should things that have no nutritive value (clay, chalk, etc), and 98.8% disagreed that pregnant women should smoke

Table 5: Attitude of respondents towards prevention of anaemia in pregnancy

| ATTRIBUTE | FREQUENCY | PERCENTAGE |
|---|-----------|------------|
| State whether you agree or disagree with the following statements; | | |
| Pregnant woman needs to attend ANC regularly | | |
| Agree | 397 | 99.0 |
| Indifferent | 1 | 0.3 |
| Disagree | 4 | 0.7 |
| Pregnant woman need to take routine IFA | | |
| Agree | 392 | 97.8 |
| Indifferent | 5 | 1.2 |
| Disagree | 4 | 1.0 |
| Pregnant woman should take tea/caffeine beverage | | |
| Agree | 12 | 3.0 |
| Indifferent | 40 | 10.0 |
| Disagree | 349 | 87.0 |
| Pregnant woman should eat meat/fish | | |
| Agree | 395 | 98.5 |
| Indifferent | 2 | 0.5 |
| Disagree | 4 | 1.0 |
| If you agree, how often should she eat meat/fish? | | |
| Every day (7 days a week) | 182 | 46.1 |
| Five to six days a week | 32 | 8.1 |
| Two to four days a week | 117 | 29.6 |
| Less than twice per week | 64 | 16.2 |
| Pregnant woman should eat fruits and vegetables | | |
| Agree | 398 | 99.3 |
| Indifferent | 3 | 0.7 |
| Disagree | 0 | 0.0 |

Table 6: Association between prevalence of anaemia and knowledge, attitude, and practices of Respondents

| ATTRIBUTE | ANAEMIA STATUS | | Chi-Square | COR (95% CI) | AOR (95% CI) |
|--------------------------------------|----------------|----------------|--------------------|--------------------------|---------------------------------|
| | Normal (%) | Anaemic (%) | (P.Value) | P.Value | P.Value |
| Knowledge level of respondent | | | | | |
| Poor knowledge | 27 (38.57) | 43 (61.43) | 12.1238 (0.000) | Base | Base |
| Good knowledge | 150 (61.98) | 92 (38.02) | | 0.39 (0.22 – 0.67) 0.001 | 0.39 (0.22 – 0.70) 0.002 |
| Attitude of respondent | | | | | |
| Poor attitude | 3 (27.27) | 8 (72.73) | 3.9770 (0.046) | Base | |
| Good attitude | 174 (57.62) | 128 (42.38) | | 0.28 (0.07 – 1.06) 0.061 | |
| Practice of respondent | | | | | |
| Poor practice | 26 (41.94) | 36 (58.06) | 7.8390 (0.005) | Base | Base |
| Good practice | 142 (61.74) | 88 (38.26) | | 0.45 (0.25 – 0.79) 0.006 | 0.50 (0.28 – 0.89) 0.019 |

Findings indicates that the practices of pregnant women have influence on their anaemia status. It indicates that, pregnant women who have attended the antenatal care clinic for at least 4 times were 51% less likely to be anaemic compared to those who attended the antenatal care clinic for less than 4 times and this was still found to be statistically significant after it was adjusted for confounding variables (AOR: 0.49 (C.I: 0.28 – 0.86) $p=0.013$). It also revealed that mothers who consume 4-star diet (meal containing carbohydrate, animal protein, legume, and fruits/vegetables) were 63% less likely to become anaemic compared to those who consume poorly diversified diet and this was still statistically significant after being adjusted for confounding variables (AOR: 0.37 (C.I: 0.19 – 0.73) $p=0.004$). it is also revealed a higher proportion (57.65%) of pregnant women who attend antenatal care clinic regularly, 57.53% of those who take their routine IFA, 56.94% of those who take IPT regularly, 57.68% of those who have ITN, 59.16% of those who sleep under ITN, 58.12% of those who take antihelminthes, 56.33% of those who take meat/ fish, and 58.50% of those who said they consume fruits/ vegetables were less likely to be anaemic though none of these showed any statistically significant association.

DISCUSSION

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 to build stores of nutrients and improve her haemoglobin level. More than half (55.1%) of the study subjects were pregnant 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 (GH¢500.00/<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. Knowledge, attitude, and practices were good though only knowledge and practices were significantly associated with the occurrence of anaemia as prevalence was more likely to occur among those with poor knowledge and practices.

Among the sociodemographic factors studied, the age of pregnant women, ethnicity, and interval between the youngest child and the current pregnancy were found to be significantly linked with the occurrence of anaemia in pregnancy.

Knowledge of Respondents about Anaemia

It is expected that as knowledge of pregnant women on anaemia increases, practices will be influenced which should in turn impact the haemoglobin levels of those pregnant women. From the current study, the majority (84.3%) of the respondents said they were aware of anaemia of which 73% had a good knowledge level. Similar to this are the findings of the study conducted in Lahore (Pakistan) which revealed that 57% of the pregnant women knew about anaemia (Habib, 2018). The current findings are also similar to the findings of another study conducted among pregnant women attending antenatal care services at Savelugu Municipal Hospital which revealed that about 55.7% of them had a good knowledge level regarding anaemia in pregnancy whilst the rest of them scored below the mean score (Duut, 2018). Though the findings of these earlier studies showed a high knowledge level, it was low compared to the findings of the current study. From the current study, 72.8% of the respondents were able to provide the correct definition of anaemia which is an improvement over the findings of a study conducted in Tanzania from which it was discovered that, only 35.0% of the respondents were able to provide the correct definition of anaemia. Contrary to the findings of the current study, a research conducted in India revealed that, 83% of prenatal women had poor knowledge on iron deficiency anaemia, 17% of them had moderately adequate knowledge and none had adequate knowledge on anaemia (Jhancyrani & Arulappan, 2018). Another contrary findings were results of studies conducted in Tanzania which revealed that, only 35% had high knowledge (Margwe & Lupindu, 2018). Findings of another research conducted in Baghdad also revealed a relatively low knowledge level as it revealed that only 24.5% of respondents had good knowledge about anaemia in pregnancy with the remaining 60% and 15.5% having fair and poor knowledge respectively (Al-sattam *et al.*, 2022). Another study conducted in which findings were relatively low was the study conducted by Zani *et al.*, (2020) which revealed that only 19.7% of the antenatal women had good knowledge with the remaining 80.3% having moderate knowledge, and none of the respondents had low knowledge. Another contrary finding which revealed a low knowledge level was from a study conducted in Juaboso District in the Western-North Region of Ghana among antenatal women attending antenatal care facilities found that only 13.5% of the pregnant women had high knowledge of anaemia, while 58.4% and

28.1% of them had fair knowledge and low knowledge, respectively (Appiah *et al.*, 2020). Furthermore, a study conducted in the Tamale Teaching Hospital revealed that only 24.5% of pregnant women had high knowledge about anaemia (Wemakor, 2019). These other findings with relatively low knowledge level are indications that the current knowledge status is good. However, until all the respondents have good knowledge level, education and sensitization should be continued since knowledge could influence anaemia preventive practices.

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.

Out of the 401 respondents that were interviewed from the current study, 288 (71.8%) of them were able to mention some of the signs and symptoms of anaemia in pregnancy. Signs and symptoms of anaemia mentioned by respondents include; headache (38.7%), 54.9% of them mentioned pallor (pale skin, nails and lips), 44.1% mentioned pale conjunctiva, 18.7% mentioned rapid heartbeat, 23.4% mentioned shortness of breath, 12.5% mentioned trouble concentrating or poor concentration, 57.1% mentioned dizziness, and 43.4% said feeling tired or weak is a symptom of anaemia. The current findings are consistent with those of a study by Konlan *et al.*, (2020), which found that only 18.7% of pregnant women could correctly identify at least one indication of anaemia in pregnancy. That study was conducted in the rural region of Ghana's Western Region.

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).

Attitude of Pregnant Women

Attitude is one of the attributes of a person that influence their practice of a behavior either positively or negatively. From the current study, almost all the respondents (97.3%) had good attitude towards prevention and control of anaemia in pregnancy and this is contrary to the findings of the study conducted in Lahore (in Pakistan) which revealed that the overall positive attitude regarding antenatal checkup and prevention of anaemia among the pregnant women was 48.7% (Habib, 2018). Early antenatal care registration is very key and often contribute positively to improved haemoglobin level of the pregnant women. Among the respondents of the current study, majority (85.8%) registered in the first trimester, whilst the remaining 13.0% and 1.3% registered in the second and third trimesters respectively. The current findings are not in agreement with the findings of a study conducted in the Uthungulu health district of KwaZulu-Natal in South Africa which revealed that only 1.8% of pregnant women registered for antenatal care services within the first trimester of gestation (gestational age less than 13 weeks) and more than half (57.7%) of them visited health facilities for antenatal care registration within the second trimester (between 13 and 28 weeks of gestation) and the remaining 40.5% registered during the third trimester (Hoque *et al.*, 2007). The current findings were also contrary to the findings of another study conducted in Tamale Teaching Hospital which revealed that, only few (29.0%) of the pregnant women registered for antenatal care services within their first trimester (Wemakor, 2019). Early registration alone is not enough to guarantee good health outcome of the pregnant women and their foetus but regular attendance is key to offer the health workers the opportunity to assess and provide the needed interventions to the clients. From the current study, 397 (99%) of the respondents agreed that pregnant women need to attend antenatal care clinics regularly which support the findings of a study conducted among Aboriginal and Torres Strait Islander women of Far North Queensland which indicated that, antenatal care attendance among respondents was regular since most of the mothers (78.9%) had at least five antenatal healthcare visits during pregnancy (Leonard *et al.*, 2018). Also, findings of a study in Lahore (in Pakistan) had a contrary level of attitude towards frequency of antenatal care visits where only 25.2% of pregnant women agreed that there was the need for regular antenatal care checkup during pregnancy (Habib, 2018).

From the current study, 97.8% of the respondents agreed that pregnant women need to take their routine iron and folic acid (IFA) supplements which is one of the preventive measures of anaemia in pregnancy. The current findings were in not agreement with the findings of a study conducted in Pakistan by Habib, (2018) which revealed that only 3.1% of the pregnant women agreed that there was the need to take iron and folic acid during pregnancy. Other positive attitudes from the current study were that; 98.5% agreed that pregnant women should eat fish/ meat of which 46.1% said it should be eaten every day, 99.3% said pregnant women should eat fruits and vegetables of which 41.0% said it should be eaten every day, 87.0% disagreed that pregnant women should take tea/caffeine containing beverages, 388 (96.8%) of the respondents disagreed that pregnant women should take alcohol, 88.5% disagreed that pregnant women should things that have no nutritive value (clay, chalk, etc), and 98.8% disagreed that pregnant women should smoke. On the basis of the above, the overall attitude of the respondents was very good as higher proportions were agreeing to positive attitudes in all attitude related variables that were studied.

Association between anaemia prevalence and the level of knowledge, attitude, and practice

The knowledge level of respondents, attitude, and practices were measured against their anaemia status and the findings revealed that, knowledge and practices were significantly associated with the anaemia status of the respondents. Results of multivariate analysis from this study indicated that, respondents who had good knowledge about anaemia were 61% less likely to have anaemia compared to those who had poor knowledge and it was still found to be statistically significant after it was adjusted for confounding variables (AOR: 0.39 (C.I: 0.22 – 0.70) $p= 0.002$). This results were in agreement with the findings of a study conducted in Juaboso District in the Western-North Region of Ghana among pregnant women revealed that pregnant women who

had high knowledge of anaemia (AOR: 3.88, 95% CI: 1.32-7.93, $p = 0.001$) were 3.8 times more likely to adhere to anaemia prevention strategies than women who had low or fair knowledge of anaemia prevention strategies (Appiah *et al.*, 2020). Another similar finding was a study conducted in Tamale Teaching Hospital of Northern Ghana which revealed that, pregnant women who had poor knowledge on anaemia in pregnancy were 2.63 times more likely to develop it compared to those who had high knowledge (AOR = 2.63, 95% CI: 1.50–4.61, $p = 0.001$) (Wemakor, 2019). This implies that, continuous sensitization is required if the issue of anaemia in pregnancy needs to be dealt addressed.

CONCLUSIONS

Knowledge level of respondents about anaemia was high, majority of them had positive attitude towards anaemia prevention, and anaemia preventive practices among respondents were good.

Age, birth interval, knowledge level, practices such as attendance to antenatal care clinic, and consumption of diversified diet were significantly associated with 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. 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.
3. Further studies that would be aimed at enhancing knowledge level and family support to pregnant women and its impact on anaemia in pregnancy.

Declaration of Conflict of Interest and Funding: There was no conflict of interest of any kind to the study. No sponsorship was secured for this study. It was solely funded by the researcher.

REFERENCES

- ACOG Committee on Practice Bulletins. (2008). Clinical management guidelines for Obstetrician-Gynecologists: Anemia in Pregnancy. *Obstetrics and Gynecology*, 112(95), 201–207.
- Al-sattam, Z., Hassan, S., Majeed, B., & Al-attar, Z. (2022). Knowledge about Anemia in Pregnancy among Females Attending Primary Health Care Centers in Baghdad. *Journal of Gynecology and Obstetrics*, 10, 785–792.
- American College of Obstetricians and Gynecologists. (2008). Clinical management guidelines for obstetrician-gynecologists. *Obstetrics and Gynecology*, 112(95), 201–207.
- Anlaakuu, P. (2015). Anaemia in pregnancy among antenatal attendance at Sunyani Municipal Hospital. *University of Ghana Http://Ugspace.Ug.Edu.Gh*, 10506633.
- Anlaakuu, P., & Anto, F. (2017). Anaemia in pregnancy and associated factors : a cross sectional study of

- antenatal attendants at the Sunyani Municipal Hospital , Ghana. *BMC Research Notes*, 4–11.
<https://doi.org/10.1186/s13104-017-2742-2>
- Chaparro, C. M., & Suchdev, P. S. (2019). Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. *Annals of the New York Academy of Sciences*, 1450(1), 15–31.
<https://doi.org/10.1111/nyas.14092>
- Cochran, W. G. (1977). *Sampling techniques* (3 rd Editi). John Wiley & Son's Inc.
- Degu, G., & Yigzaw, T. (2006). *Research Methodology*. University of Gondar.
http://ypeda.com/attachments/article/144/ln_research_method_final.pdf
- Dodzo, C. R., Ogunsakin, E. R., & Ginindza, G. T. (2022). Prevalence and associated risk factors for anaemia amongst pregnant women attending three antenatal clinics in Eswatini. *African Journal of Primary Health Care & Family Medicine*, 14(1), 1–9. <https://doi.org/10.4102/phcfm.v14i1.3339>
- GHS-Sissala East. (2021). *Ghana Health Service 2020 Annual Report for Sissala East Municipal Health Directorate*.
- GHS-Sissala East. (2022). *Ghana Health Service 2021 annual report for Sissala East Municipal Health Directorate*.
- Habib, A. (2018). Knowledge , Attitude and Practices of Pregnant Women Regarding Iron Deficiency Anemia in A Rural Area of Lahore. *Journal of Health, Medicine and Nursing*, 50, 58–62.
- Hoque, M., Kader, S., & Hoque, E. (2007). Prevalence of anaemia in pregnancy in the Uthungulu health district of KwaZulu-Natal , South Africa. *South African Family Practice*, 49(6).
- Ilboudo, B., Traoré, I., Méda, C. Z., Hien, A., Kinda, M., Dramaix-wilmet, M., & Traoré, I. (2021). *Prevalence and factors associated with anaemia in pregnant women in Cascades Region of Burkina Faso in 2012*.
- Johnncyroni, R., & Arulappan, J. (2018). Assessment of Knowledge of Antenatal Mothers Regarding Selected Health Problems of Complicated Pregnancy- A Cross Sectional Study. *Biosciences Biotechnology Research Asia*, 15(September), 561–566.
- Jufar, H. A., & Zewde, T. (2013). Prevalence of Anemia among Pregnant Women Attending Antenatal Care

- at Tikur Anbessa Specialized Hospital, Addis Ababa Ethiopia. *Journal of Hematology & Thromboembolic Diseases*, 02(01), 2–7. <https://doi.org/10.4172/2329-8790.1000125>
- Kara, W. S. K., Chikomele, J., Mzigaba, M. M., Mao, J., & Mghanga, F. P. (2020). Anaemia in pregnancy in Southern Tanzania : Prevalence and associated risk factors. *African Journal of Reproductive Health*, 24(3r), 154–160. <https://doi.org/10.29063/ajrh2020/v24i3.17>
- Kare, A. P., & Gujo, A. B. (2021). Anemia among Pregnant Women Attending Ante Natal Care Clinic in Adare General Hospital , Southern Ethiopia : Prevalence and Associated Factors. *Health Services and Insights*, 14, 1–9. <https://doi.org/10.1177/11786329211036303>
- Kejela, G., Wakgari, A., Tesfaye, T., Turi, E., Adugna, M., Alemu, N., & Jebessa, L. (2020). Prevalence of anemia and its associated factors among pregnant women attending antenatal care follow up at Wollega University referral hospital , Western Ethiopia. *Journal of Contraception and Reproductive Medicine*, 9, 1–8.
- Konlan, K. D., Amoah, R. M., Saah, J. A., Abdulai, J. A., Mohammed, I., Konlan, K. D., & Doat, A. R. (2020). Knowledge of pregnant women on the factors that influence anaemia in pregnancy in a rural farming district of the Western Region of Ghana. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 9(6), 2370. <https://doi.org/10.18203/2320-1770.ijrcog20202314>
- Leonard, D., Buttner, P., Thompson, F., Makrides, M., & Mcdermott, R. (2018). Anaemia in pregnancy among Aboriginal and Torres Strait Islander women of Far North Queensland : A retrospective cohort study. *Nutrition and Dietetics*, 75, 457–467. <https://doi.org/10.1111/1747-0080.12481>
- Lin, L., Wei, Y., Zhu, W., Wang, C., Su, R., Feng, H., & Yang, H. (2018). Prevalence , risk factors and associated adverse pregnancy outcomes of anaemia in Chinese pregnant women : a multicentre retrospective study. *BMC*, 1–8.
- Liyew, A. M., Tesema, G. A., Alamneh, T. S., Worku, M. G., Teshale, A. B., Alem, A. Z., Tessema, Z. T., & Yeshaw, Y. (2021). Prevalence and determinants of anemia among pregnant women in East Africa; A multi-level analysis of recent demographic and health surveys. *PLoS ONE*, 16(4 April 2021), 1–15. <https://doi.org/10.1371/journal.pone.0250560>
- Margwe, J. A., & Lupindu, A. M. (2018). Anaemia in Rural Pregnant Women Knowledge and Attitude of

- Pregnant Women in Rural Tanzania on Prevention of Anaemia Methods Study area. *African Journal of Reproductive Health*, 22(September), 71–79. <https://doi.org/10.29063/ajrh2018/v22i3.8>
- Maternal Health Division of India. (2014). *National Guidelines for Deworming in Pregnancy*. December.
- Mekonnen, F. A., Ambaw, Y. A., & Neri, G. T. (2018). Socio-economic determinants of anemia in pregnancy in North Shoa Zone , Ethiopia. *PLoS ONE*, 13(8), 1–10. <https://doi.org/10.1371/journal.pone.0202734>
- Nessa, Z., MI, R., Yeasmin, S., Mh, R., & Cfmm, R. (2017). A study on prevalence of anaemia in pregnancy among the women reporting for antenatal care in combined military hospital, Dhaka Cantonment. *Journal of Dhaka Medical College*, 26(2), 103–110. <https://doi.org/http://dx.doi.org/10.3329/jdmc.v26i2.38824>
- Nutrition Policy. (2016). *Ghana National Nutrition Policy*. <https://www.unicef.org/ghana/reports/national-nutrition-policy>
- Olatunbosun, O. A., Abasiattai, A. M., Bassey, E. A., James, R. S., Ibanga, G., & Morgan, A. (2014). Prevalence of Anaemia among Pregnant Women at Booking in the University of Uyo Teaching Hospital , Uyo , Nigeria. *BioMed Research International*, 2014. <http://dx.doi.org/10.1155/2014/849080>
- Oliver, E., & Olufunto, K. (2012). *Management of anaemia in pregnancy: Vol. i* (D. Donald & Silverberg (eds.)). In Tech. <http://www.intechopen.com/books/anemia/management-of-anaemia-in-pregnancy>
- Onyeneho, N. G., Aronu, N. I., Chukwu, N., Agbawodikeizu, U. P., Chalupowski, M., & Subramanian, S. V. (2016). Factors associated with compliance to recommended micronutrients uptake for prevention of anemia during pregnancy in urban , peri-urban , and rural communities in Southeast Nigeria. *Journal of Health, Population and Nutrition*, 1–18. <https://doi.org/10.1186/s41043-016-0068-7>
- Osman, M. O., Nour, T. Y., Bashir, H. M., Roble, A. K., Nur, A. M., & Abdilahi, A. O. (2020). Risk Factors for Anemia Among Pregnant Women Attending the Antenatal Care Unit in Selected Jigjiga Public Health Facilities , Somali Region , East Ethiopia 2019 : Unmatched Case – Control Study. *Journal of Multidisciplinary Healthcare*, 769–777.
- Sabina, S., Iftequar, S., Zaheer, Z., Khan, M. M., & Khan, S. (2015). *An Overview of Anemia in Pregnancy*. 2.

- Shiferaw, M. B., Zegeye, A. M., & Mengistu, A. D. (2017). Helminth infections and practice of prevention and control measures among pregnant women attending antenatal care at Anbesame health center , Northwest. *BMC Research Notes*, 6–10. <https://doi.org/10.1186/s13104-017-2609-6>
- Stephen, G., Mgongo, M., Hashim, T. H., Katanga, J., Stray-pedersen, B., & Msuya, S. E. (2018). *Anaemia in Pregnancy : Prevalence , Risk Factors , and Adverse Perinatal Outcomes in Northern Tanzania. 2018*. <https://doi.org/10.1155/2018/1846280>0AResearch
- Sunguya, B. F., Ge, Y., Mlunde, L., Mpembeni, R., Leyna, G., & Huang, J. (2021). High burden of anemia among pregnant women in Tanzania : a call to address its determinants. *Nutrition Journal*, 1–11. <https://doi.org/10.1186/s12937-021-00726-0>
- Turawa, E., Awotiwon, O., Dhansay, M. A., Cois, A., Labadarios, D., Bradshaw, D., & Wyk, V. P. (2021). *Prevalence of Anaemia , Iron Deficiency , and Iron Deficiency Anaemia in Women of Reproductive Age and Children under 5 Years of Age in South Africa (1997 – 2021) : A Systematic Review*.
- UNICEF. (2012). *Community Infant and Young Child Feeding Counseling Package* (Issue September).
- Wemakor, A. (2019). Prevalence and determinants of anaemia in pregnant women receiving antenatal care at a tertiary referral hospital in Northern Ghana. *BMC Pregnancy and Childbirth*, 5, 1–11.
- WHO. (1993). *Maternal Health and Safe Motherhood Programme: Prevention and management of severe anaemia in pregnancy*.