

RESEARCH ARTICLE

ANAEMIA AND COMORBIDITIES IN PREGNANT WOMEN ROUTINELY SUPPLEMENTED WITH HAEMATINICS – A CROSS-SECTIONAL STUDY AT THE AWUTU MUNICIPALITY OF GHANA

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ABSTRACT

Background: Anaemia, thrombocytopenia and cardiovascular disease are major public health problems especially in women of childbearing age and have significant effect on pregnancy outcomes. Supplementation with haematinics such as iron, folic acid and/or multivitamins in pregnancy is targeted at reducing the incidence and/ or severity of anaemia, however, these also influence platelet production and occurrence of obesity. **Aim:** The aim of the study was to assess anaemia, prolonged bleeding tendency and cardiometabolic risk in pregnant women routinely supplemented with haematinics, attending the Kasoa Polyclinic at the Awutu municipality of Ghana. **Methods:** The study was a cross-sectional design involving consented pregnant women who were routinely administered haematinic supplements such as iron and folic acid, from their first antenatal visit at the hospital. Socio-demographic data was collected using structured questionnaires. In addition, anthropometrics including body mass index (BMI) was obtained. EDTA anticoagulated venous blood samples were obtained for haemoglobin (Hb) and platelet count estimation using automated full blood count analyzer (Sysmex XP 300, USA). Bleeding time assay and stained thin blood films were examined for platelet disorders. The data was analyzed using SPSS version 22.0, and p-value <0.05 was considered statistically significant. **Results:** The prevalence of anaemia was 53 (51.4%), with 26 (25.2%)-mild and 27 (26.2%)-moderate cases. Likewise, 39 (37.9%) were overweight whereas 40 (38.8%) were obese, whereas 4 (3.9%) had thrombocytopenia. Among the pregnant women utilizing the antenatal care, 98 (95%) confirmed absolute compliance with the haematinic supplementation schedule. Employment and education were significantly associated with compliance. Anaemia prevalence was significantly associated with thrombocytopenia in the pregnant women. **Conclusion:** The study revealed that although there was high compliance with the haematinic supplementation, the prevalence of anaemia was high and was associated with thrombocytopenia and cardiometabolic risk.

KEYWORDS

Haematinics, pregnancy, anaemia, thrombocytopenia, cardiometabolic risk

1. INTRODUCTION

Anaemia continues to pose as a global public health burden in low and high-income countries, among diverse group of individuals including pregnant women, female adolescents as well as infants younger than five years (Maulide Cane, et al., 2022). Anaemia in pregnancy, marked by haemoglobin concentration beneath 11 g/dl, is largely the consequence of iron deficiency. The incidence and severity of anaemia in pregnancy have been widely associated with adverse consequences in both expectant mothers and babies. The mechanisms underlying the development of anaemia during pregnancy are predominantly attributed to increased demand of the haematinics (iron, folic acid and vitamin B12) as well as haemodilution, which cause a decline in haemoglobin levels at the first and second trimesters of normal pregnancies. In Africa, high prevalence of anaemia were recently reported at various parts of countries such as South Africa (31%), Ghana (72.1%) and Eastern Sudan (68.0%) (Abdelbagai et al., 2022; Dorsamy et al., 2022; Adokiya et al., 2022). In

Ghana, both anaemia overweight/ obesity cases were recently reported to be concurrently prevalent (6.7%) in non-pregnant women of reproductive age, with discrete prevalence of overweight /obesity and anaemia estimated to be 39% and 22% respectively (Christian et al., 2022). Likewise, hypertension and prolonged bleeding tendency, associated with poor pregnancy outcomes, are common. About 15% of primigravida pregnancies are affected by pregnancy-induced hypertension (PIH), which in turn is associated with thrombocytopenia especially with increasing severity of the former (Sage, 1990). Among 9.9% prevalent thrombocytopenia cases in pregnant Ethiopian women, about 72.4% were mild, 17.2% moderate and 10.4% severe (Ebrahim et al., 2022).

Supplementation with micronutrients, such as iron (60 mg) and folic acid (400 µg) daily, is widely recommended to avert the incidence of anaemia in pregnancy as well as improve both maternal and birth outcomes (Maina - Gathigi et al., 2013). Also, supplementation with multivitamins comprising folic acid and vitamin D is recommended to minimize the risk

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of developing neural tube defects (NTD) in pregnancy (Kuroda et al., 2021). Iron and folic acid play key roles in bone marrow proliferation as well as red blood cells and haemoglobin biosynthesis. Deficiency in folic acid is associated with bone marrow hypo-proliferation leading to pancytopenia which might increase bleeding risk due to reduction in platelet levels (Chiravuri and De Jesus, 2022; Depuis et al., 2022). Recent evidence have also shown an association of folic acid deficiency with cardiometabolic disorders including obesity and adverse lipid profiles (Mlodzik-Czyzewska et al., 2020). Anaemia during pregnancy is common in Ghana and leads to increase morbidity and mortality. Even though, the World Health Organization recommends daily intake of haematinics during pregnancy, it appears that pregnant women are very much at risk of anaemia, prolonged bleeding risk and cardiovascular disease. To combat this challenge, the Ghana Health Service introduced a policy to improve haemoglobin levels in pregnancy via haematinics supplementation, health education on nutrition, ensuring quality of care, prevention of malaria infection by intermittent preventive treatment and inhibition of helminthes infestation using albendazole. Beyond these efforts, anaemia in pregnancy is still a major problem across various regions of the country.

The current study therefore aimed to assess the prevalence of anaemia, prolonged bleeding tendency and cardiometabolic risk in pregnant women routinely supplemented with haematinics at the Awutu Municipality of Ghana.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

The current research utilized a cross-sectional design in combination with descriptive as well as quantitative method. This was useful for one-point estimation for the desired outcomes (anaemia, cardiometabolic risk and prolonged bleeding tendency) in pregnant women who were supplemented with haematinics from the first day of initiating antenatal care services at Kasoa Polyclinic. The study was conducted at the Kasoa Polyclinic, which is a 20-bed facility. The clinic provides antenatal services, diabetic clinic, ears nose and throat (ENT) specialized services and general medical services. Approximately 55% of patients access the clinic's laboratory daily.

2.2 Study Population

The study targeted pregnant women routinely supplemented with the key haematinics recommended for pregnant women such iron (60 mg/daily) and folic acid (400 µg/daily). All participants at the time of the study were residing in various the communities of Kasoa at the Awutu Municipality of Ghana.

2.3 Inclusion and Exclusion Criteria

Inclusion criteria: Pregnant women supplemented with haematinics, who were ≥18 years of age at the time of visit to the Kasoa polyclinic.

Exclusion criteria: Pregnant women below <18 years of age; pregnant women administered chemotherapy or antibiotics and pregnant women with chronic diseases including AIDS, liver and kidney diseases.

2.4 Ethical Consideration

Ethical approval was obtained from the Research Ethics Committee (REC) of the University of Health and Allied Sciences. Likewise, approval and clearance were also obtained from the research management committee of the Kasoa Municipal Council before commencement of the study. The background, aim and objectives of the study were explained to the participants in the local language before obtaining consent from each respondent using a consent form. Participants were made to understand that they could willingly withdraw from the study. Confidentiality was ensured throughout the study.

2.5 Sample Size and Sampling Method

The sample size estimation was done using the formula recommended for a homogenous population (Kiesh and Leslie, 1969). One hundred and three (103) pregnant women were sampled. Pregnant women who had initiated antenatal care service and were routinely supplemented with haematinics, were recruited by simple random technique for the study.

2.6 Socio-Demographic and Anthropometric Data

The study included questionnaire administration to the pregnant women that consist of questions related to demography, occupation, age, level of education, history of blood transfusion or blood product and gestational

period. Questionnaires for the participants were interpreted when required in the language understood by the participant. The height (m) and weight (kg) of each participant was measured for body mass index (BMI) assessment.

2.7 Laboratory Assay of Anaemia, Platelet Count and Bleeding Time

EDTA-anticoagulated blood samples (4 mL) were obtained by venipuncture from consented pregnant women and utilized for analysis. Quantitative haemoglobin (Hb) and platelet counts were measured using the automated full blood count (FBC) analyzer (Sysmex XP-300, USA).

Bleeding time was performed using the Ivy method explained by (Mielke et al., 1969). Briefly, a blood pressure cuff was tied around the arm of the participants and adjusted to 40 mmHg. At a clear, 70% ethanol-disinfected region on the lower arm, two small horizontal incisions were made with a lancet. The time taken for blood to completely stop flowing at the site of incisions was recorded using a stopwatch.

2.8 Statistical Analysis

The data was analyzed using Statistical Package for Social Sciences (version 22.0; IBM SPSS Inc., Chicago, IL, USA), and Pearson chi-square analysis was used to determine the association or relationship between desired outcomes in different groups of pregnant women. P-value <0.05 was considered as statistically significant.

3. RESULTS

3.1 Socio-Demographic Characteristics of Respondents

The study revealed that 7 (6.8%) of the respondents were <20 years old and majority of the respondents, 43 (41.7%), were within the ages of 20-30 years. Also, 28 (27.2%) of the respondents were within the ages of 20-25 years, 20 (19.4%) were between 31-35 years while 5 (4.9%) were >35 years of age. Majority, 78 (75.7%), of the respondents were married, whereas 19 (18.4%) were single and 6 (5.8%) were cohabiting. About the educational level of the respondents, 18 (17.5%) attended primary school, 25 (24.3%) attended JHS, 51 (49.5%) attended SHS whereas 9 (8.7%) obtained tertiary level of education. The majority of the respondents 96 (93.2%) were employed while the remaining 7 (6.8%) were unemployed (Table 1).

3.2 Gynaecological, Obstetric Haematinics Administration History

Majority of the participants, 54 (52.4%), were in the first trimester whereas 31 (30.1%) were within the second trimester stages respectively during their first antenatal visit, indicating that there was early initiation of antenatal care in the majority (82.5%) of participants. Again, 100 (97.1%) of the respondents indicated that they had no history of blood loss during pregnancy. Also, 102 (99%) indicated they had never received transfusion of blood or blood products during pregnancy. All 103 (100%) of the respondents in the study were given haematinics such as iron, folic acid and multivitamins. Out of the total number given the haematinics, 98 (95%) adhered strictly to the haematinics' administration schedule. About 96 (93.2%) of the respondents confirmed that they were administered the haematinics daily, 5 (4.9%) administered it weekly while 2 (1.9%) did not take it regularly. Likewise, 35 (34%) of the respondents visited the antenatal care only once, 25 (24.3%) visited twice and 14 (13.6%) visited three or more times (Table 2).

3.3 Anaemia, Cardiometabolic Risk and Prolonged Bleeding Risk

The overall prevalence of anaemia / low haemoglobin (Hb) among the pregnant women was 53 (51.4%). Among these, 26 (25.2%) were mild (Hb: 10.0 -10.9 g/dL) and 27 (26.2%) were moderate (Hb: 7.0 -9.9 g/dL), however, none 0 (0%) was severe. Also, 50 (48.5%) of the respondents had Hb levels within the normal range, therefore, presenting with no anaemia. Assessing the quantitative platelet disorders, 4 (3.9%) presented with mild thrombocytopenia (Platelet count: 101-149 x 10⁹/L) with none presenting with moderate or severe thrombocytopenia. However, majority 99 (96.1%) presented with normal platelet count (150 - 450 x 10⁹/L). The bleeding time (BT) of all the 103 (100 %) expectant mothers were found to be normal (1-9 min). Assessment of cardiometabolic risk by measurement of body mass index (BMI, kg/m²) in participants showed that; 2 (1.9%) were underweight (BMI <18.5 kg/m²), 22 (21.4%) were within the normal range (BMI: 18.5-24.9 kg/m²), 39 (37.9%) were overweight (BMI: 25.0-29.9 kg/m²) and 40 (38.8%) were obese (BMI >30.0 kg/m²) (Table 3).

3.4 Awareness of Anaemia and Thrombocytopenia

Majority, 102 (99%), confirmed that they had some knowledge about

anaemia, whereas all the participants 103 (100%) were completely unaware about thrombocytopenia. Also, all the participants 103 (100%) confirmed they normally ate a balance diet. Whereas, 95 (92.1%) of the respondents ingested meat as the primary source of protein, 3 (2.9%) ingested eggs, whereas 5 (4.9%) were strict vegetarians (Table 4).

3.5 Prevalence of Anaemia in Relation to Socio-Demographic Characteristics

Anaemia was observed to be more prevalent (39.1%) in women aged between 20-30 years, 29.7% in women <20 years of age and 29.9% in those >30 years. However, age was not a significant predictor of anaemia (p-value 0.290). Anaemia prevalence was higher in mothers who had

attained secondary and college/university levels of education, accounting for 33.5% and 37.5% respectively, as compared to 29.0% prevalence in women whose highest level was primary education. However, this difference was not statistically significant (p-value 0.598). Occurrence of anaemia was higher in the single women (42.1%) as compared to the married women (35.1%), however, the association of marital status with the frequency of anaemia was not statistically significant (p-value 0.822). Majority of the pregnant women (93%) indicated that they were employed, whereas only a few (7%) were unemployed while assessing antenatal care at the hospital. Anaemia was slightly prevalent in those who were gainfully employed (39%) as compared to those who were unemployed at (33%). However, this difference was not statistically significant (p-value 0.599) (Table 5).

Table 1: Socio-Demographic Characteristics

Variable	Frequency (n)	Percent (%)
Age of client (years)		
< 20	7	6.8
20-25	28	27.2
26-30	43	41.7
31-35	20	19.4
>35	5	4.9
Marital status		
Single	19	18.4
Married	78	75.7
Cohabiting	6	5.8
Level of education		
Primary	18	17.5
JHS	25	24.3
SHS	51	49.5
Tertiary	9	8.7
None	0	0.0
Occupation		
Employed	96	93.2
Unemployed	7	6.8

Table 2: Gynecological, Obstetric and Haematinics Administration History

Variable	Frequency (n)	Percent (%)
Trimester of pregnancy		
1 st Trimester	54	52.4
2 nd Trimester	31	30.1
3 rd Trimester	18	17.5
Have you lost any pregnancy through excessive bleeding		
Yes	3	2.9
No	100	97.1
Have you been given blood or blood product		
Yes	1	1
No	102	99
Are you on Haematinics		
Yes	103	100
No	0	0
What kind of Haematinics are you on?		
Folic acid	103	100
Iron	103	100
Do you stick to Haematinics plan?		
Yes	98	95
No	5	5
How frequent do you take Haematinics?		
Daily	96	93.2
Weekly	5	4.9
Not regular	2	1.9

Table 3: Anaemia, Cardiometabolic and Prolonged Bleeding Risk

Variable	Frequency (n)	Percent (%)
Number of ANC visits		
1	35	34
2	25	24.3
3	14	13.6
4	14	13.6
≥ 5	15	14.6
Hb(g/dl)		
Mild Anaemia (10-10.9g/dl)	26	25.2
Moderate Anaemia (7-9.9g/dl)	27	26.2
Severe Anaemia (<7g/dl)	0	0.0
No Anaemia	50	48.5
Gestational Age (weeks)		
1-4	63	61.2
5-8	38	36.9
≥9	2	1.9
BMI=kg/m²		
Underweight (<18.5)	2	1.9
Healthy weight (18.5-24.9)	22	21.4
Overweight (25.0-29.9)	39	37.9
Obese (>30.0)	40	38.8
Bleeding time		
Normal (1- 9 minutes)	103	100
Moderate (9 - 15 minutes)	0	0.0
Severe (< 15 minutes)	0	0.0
Thrombocytopenia		
Normal (150-450x10 ⁹ /L)	99	96.1
Mild (101-149x10 ⁹ /L)	4	3.9
Moderate (51-100x10 ⁹ /L)	0	0.0
Severe (21-50x10 ⁹ /L)	0	0.0
Very Severe (≤20x10 ⁹ /L)	0	0.0

Table 4: Level of Awareness of Anaemia and Thrombocytopenia Among Respondents

Variable	Frequency (n)	Percent (%)
Have you ever heard of anaemia?		
Yes	102	99.0
No	1	1
Types of food consumed		
Eggs	3	3
Meat	95	92.1
Green vegetables	5	4.9
Do you know the effect of thrombocytopenia?		
Yes	0	0.0
No	103	100
Do you know the effect of anaemia?		
Yes	101	98.1
No	2	1.9
Do you eat balanced diet?		
Yes	103	100
No	0	0.0

Table 5: Prevalence of Anaemia in Relation to Socio-Demographic Characteristics

Socio-Demographic Characteristic	Anaemia N (%)	No Anaemia N (%)	Total	P Value
Age (years)				
<20	1(29.7)	6 (70.2)	7	0.290
20-30	28 (39.1)	43 (60.9)	71	
>30	7 (29.9)	18 (70.1)	25	
Education level				
Primary/JHS	15(34.8)	28(65.2)	43	0.598
SHS/Tertiary	24(40.7)	36 (59.3)	60	
Marital Status				
Married	27 (35.1)	51 (64.9)	78	0.822
Single	8(42.1)	11 (57.9)	19	
Cohabiting	2 (33.3)	4 (66.7)	6	
Patient occupation				
Gainfully employed	37 (39.0)	59(61.0)	96	0.599
Not employed	2 (33.3)	5 (66.7)	7	

Table 6: Prevalence of Anaemia in Relation to Reproductive Characteristics

Reproductive Characteristic	Yes N (%)	No N (%)	Total	p-value
Trimester at booking				
First	5(10.0)	49 (90.0)	54	0.026
Second	12 (39.6)	19 (60.4)	31	
Third	7(37.3)	11 (62.7)	18	

Table 7: Association of Anaemia with Thrombocytopenia

Variables	Normal Platelet Count N (%)	Low Platelet Count N (%)	P-Value
Presence of Anaemia	Yes	22(22.2%)	3(75%)
	No	77(77.8%)	1(25%)

Table 8: Association of Cardiometabolic Risk (Obesity/Overweight) with Anaemia and Thrombocytopenia

		Presence of Overweight/Obesity		P-value
		Healthy weight N (%)	Overweight/Obese N (%)	
Presence of Anaemia	Yes	6 (28.6)	45 (54.9)	0.0314
	No	15 (71.4)	37 (45.1)	
Presence of Thrombocytopenia	Yes	0 (0.0)	4 (5.1)	0.2608
	No	24 (100.0)	75 (94.9)	

3.6 Prevalence of Anaemia in Relation to Reproductive Characteristics

About 85 (82.5%) of pregnant women in this study initiated antenatal visits collectively in the first and second trimesters, with only 18 (17.5%) who initiated antenatal care in their third trimester. The highest percentage of women (39.6%) with anaemia was noted in the second trimester, followed by the third trimester (37.3%). Only 10% of the women in their first trimester had anaemia. There was a significant association between the trimester of pregnancy and the frequency of anaemia (p-value 0.026). Thus, anaemia was observed to be more prevalent in the second and third trimesters of pregnancy (Table 6)

3.7 Association of Anaemia with Thrombocytopenia and Cardiometabolic Risk

The frequency of anaemia among pregnant women with low platelet count was 3 (75%), whereas 1 (25%) of anaemic women had normal platelet count. Pearson chi-square analysis showed that low haemoglobin levels (anaemia) was significantly associated with low platelet count (thrombocytopenia) ($p<0.0158$) (Table 7). Likewise, the frequency of anaemia among overweight/obese women was 45 (54.9%), and chi-square analysis showed that anaemia was significantly associated with cardiometabolic risk (overweight/obesity) ($p<0.0314$). However, the frequency of thrombocytopenia among overweight/obese women was 4 (5.1%), therefore, thrombocytopenia was not significantly associated with cardiometabolic risk (obesity/overweight) ($p<0.2608$) (Table 8).

4. DISCUSSION

Anaemia in pregnancy is one of the most widespread public health problems especially in developing countries and has important socio-economic and health consequences. The prevalence of anaemia in this study was 51.4%, an indication that anaemia in pregnancy is still a major problem in Ghana. This prevalence is only slightly higher compared with 50.8% prevalence recently reported in the northern region of Ghana (Wemakor, 2019). The variance might be attributed to differences between urban and rural prevalence, probably because of diet differences. The authors of another Kenyan study (Maina-Gathigi et al., 2013) reported that only 23.6% of pregnant women initiated antenatal care service at the first trimester, accounting for folic acid and iron supplementation in 69.3% and 51.2% of the respondents respectively. However, this current study found that 52.4% of pregnant women commenced antenatal care services in the first trimester, whereas 30.1% and 17.5% were initiated at the second and third trimesters, respectively. Likewise, in this study, the prevalence of anaemia was highest in the second trimester (39.6%) followed by the third trimester (37.3%), compared to 10% prevalence observed in the first trimester. The high prevalence of anaemia observed in the second and third trimesters was similar to the evidence reported in a recent study (Karami et al., 2022), likely attributable to the late initiation of antenatal care among some pregnant women. Again, the trimester of initiation of antenatal care, in this study, was associated significantly with the occurrence of anaemia ($p<0.026$). This might have resulted in late detection and correction of the deficiency at the early stages of pregnancy.

Compliance with routine haematinics supplementation in pregnancy requires daily to weekly oral administration of the drug (iron, folic acid and/or multivitamins), a recommendation proposed to avert maternal anaemia, low birth weight, preterm birth and neural tube defects (Samson et al., 2021). In the current study, absolute compliance with the haematinics administration schedule was reported in 95% of the pregnant women, which was relatively higher than 46% compliance observed in a recent Ugandan study (Ssewankambo and Nakaziba, 2022). The association of education and employment with compliance in this study is indubitable as the level of education might be associated with employability. Likewise, poverty (Felipe-Dimog et al., 2021) may be associated with non-compliance due to the hesitation of meeting demands resulting from aggravation in appetite. It implies that employment might result in poverty reduction, which limits this poverty-driven hesitation.

The level of knowledge about certain medication and their benefits is usually an impetus for compliance to that medication. This study reported a high level of awareness and knowledge among pregnant women (98.1%) about anaemia in pregnancy, but not thrombocytopenia. The finding was consistent with a recent study in which most of the pregnant women attending an obstetric clinic had good knowledge about the medications (Undela et al., 2021).

Finally, in this study, among pregnant women with thrombocytopenia, anaemia was observed in 75% of them whereas only 25% had no anaemia. Pearson chi-square analysis showed that the frequency of anaemia in pregnant women was significantly associated with thrombocytopenia ($p<0.0158$). This supports a recent study in which anaemia was shown to be a strong predictor of thrombocytopenia in the target population (Farid et al., 2021). This shows that there is a need to monitor closely the indices of anaemia and thrombocytopenia among pregnant women in order to minimize the incidence of both disorders and their associated complications. Likewise, in pregnant women presenting with high cardiometabolic risk (obesity/overweight), the prevalence of anaemia was 54.9% with a significant association between these categories ($p<0.0314$), whereas thrombocytopenia prevalence was only 5.1% among obese/overweight patients with no significant association. There is increasing evidence that deficiency in haematinics such as folic acid (Casanueva et al., 2000) and vitamin B12 (Sukumar et al., 2016) in are associated with dysregulated lipid levels, obesity and gestational diabetes. Likewise, obesity was recently reported to be a risk factor associated with the development of iron deficiency anaemia (Alshwaiyat et al., 2021). This suggests that although the pregnant women confirmed high compliance with the haematinic administration schedule, the need to routinely monitor circulating levels throughout gestation would help to detect possible deficiencies, and hence the underlying reason for high prevalence of anaemia and cardiometabolic risk.

5. CONCLUSION

There was a high prevalence of anaemia in this study. This shows that anaemia in pregnancy is still a predominant problem as more than half of the women attending antenatal care were found to be anaemic. Majority of pregnant women (95%) utilizing the antenatal care services in this

study adhered completely to the haematocrits administration plan. Employment and education were associated with adherence. Again, the frequency of anaemia was significantly associated with thrombocytopenia and cardiometabolic risk.

CONFLICT OF INTEREST

The authors declare no competing interest

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