

PREVALENCE OF ANAEMIA IN PREGNANCY: A HOSPITAL-BASED STUDY IN PRESTEA IN THE WESTERN REGION OF GHANA IN THE WEST AFRICA SUB-REGION

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Abstract

Introduction: Anaemia in pregnancy is a significant public health concern, particularly in developing countries, as it increases maternal and fetal health risks. This study investigated the prevalence of anaemia in pregnancy and its associated factors among pregnant women in the Prestea-Huni Valley Municipality in Ghana.

Objectives: The primary objective of the study was to assess the prevalence of anaemia among pregnant women and identify socio-demographic and trimester-specific factors contributing to its occurrence.

Method: A cross-sectional design was employed, involving 278 pregnant women. Data collection involved structured questionnaires to gather socio-demographic details and clinical assessments for haemoglobin measurement using a well-calibrated haematology analyser. Anaemia was defined as haemoglobin levels below 11 g/dL per World Health Organization (WHO) criteria. Informed consent was obtained from all participants.

Results: The study revealed that 41.7% of participants were anaemic, with haemoglobin levels below 11 g/dL. An additional 25.9% exhibited borderline haemoglobin levels (11-12 g/dL), while 32.4% had normal levels (>12 g/dL). Anaemia was observed among women (ages 16-25, $p=0.045$; 26-35, $p=0.032$ and 36-45, $p=0.021$); those with no formal or primary education levels ($p=0.005$ and 0.018 respectively) and those who are unemployment or self-employed ($p=0.023$ and 0.036 respectively). Trimester distribution showed the prevalence of anaemia was highest in the first trimester (43.1%), followed by the second trimester (33.6%), and lowest in the third trimester (23.3%).

Conclusion: Anaemia remains a prevalent health issue among pregnant women in the Prestea-Huni Valley Municipality, with socio-demographic factors and pregnancy trimesters significantly influencing its occurrence.

Keywords: Anaemia, Pregnant woman, Haemoglobin, Trimester, Socio-demographic factors.

INTRODUCTION

1.1 Background

Anaemia, referred to as low levels of haemoglobin (Hb) in the blood, is a global public health problem that affects low, middle, and high-income countries, with adverse effects on the health of [1]. Anaemia is defined as a Hb level lower than 11.0 g/dl ($Hb < 11.0$ g/dl) in pregnant women, and a Hb level lower than 10.0 g/dl ($Hb < 10.0$ g/dl) in postpartum mothers [2]. Though the condition affects everyone, pregnant and non-pregnant women as well as children are most vulnerable [3]. Anaemia is multifactorial in aetiology but is mainly caused by iron deficiency [4]. Anaemia can be dangerous to the health of both a pregnant woman and her baby if left untreated as it increases the risk of maternal and child mortality and has a significant negative effect on both the cognitive and physical development of the child [5].

Global anaemia prevalence is estimated by the WHO to be 38% in pregnant women and 29% in all women of reproductive age. According to WHO cut-off points for the significance of anaemia, a prevalence of $\geq 40\%$ is considered severe public health issue. In Africa, a 2013 cross-sectional study conducted among 384 pregnant women in Northwest Ethiopia found the

prevalence of anaemia to be 22% [6]. A 2016 study conducted by Bekele, Tilahun and Mekuria among 332 pregnant women in the same country, however, found anaemia prevalence to be 33%, an indication that the problem was on the ascendancy [7]. Furthermore, a cross-sectional secondary data analysis on anaemia prevalence among post-partum mothers in the same country found a 22% prevalence rate, lower than the prevalence rates among pregnant women [8].

In Ghana, a report by the Family Health Division (FHD) of the Ghana Health Service (GHS), showed that anaemia among pregnant women at first antenatal clinic visit marginally increased by 1% in the year 2015 as compared to the previous year [9]. The report further stated that the prevalence of anaemia in pregnant women at 36 weeks of pregnancy also increased marginally from the year 2015 to 2016 [10]. The Volta Region has been identified as the region with the highest prevalence (49%) of anaemia among women in their reproductive age (15–49 years) in the country [11]. As such, it is the region with the highest proportion of antenatal clients having anaemia from 2014 to 2016, with prevalence rates of 46%, 46%, and 47% in 2014, 2015 and 2016 respectively [10].

Although there is provision of iron and folic acid to postnatal mothers from the day of delivery up to the sixth week in Ghana

(WHO, 2015), anaemia remains the leading cause of hospital admissions and maternal deaths in the country [12]. In the Hohoe Municipality, the prevalence of anaemia in pregnant women attending antenatal care was reported to be 60.3% with 64% among new registrants and 58% among those with multiple visits. This prevalence is higher than the regional prevalence of 49%.

Despite the available evidence on anaemia in pregnant women in Prestea-Huni Valley Municipality and its consequences [13], the paucity of information on the anaemia status of this vulnerable group in the municipality poses a weakness of the health system as no or little information is available to guide health professionals in ensuring the good health of pregnant mothers. We, therefore, examine the prevalence and associated risk of anaemia among pregnant women attending Prestea-Huni Valley Municipality Hospital so that a holistic approach to addressing maternal anaemia in the municipality, the region, and the country could be adopted.

1.2 Problem Statement

Anaemia during pregnancy is a significant public health concern, particularly in developing countries, where it contributes to maternal morbidity and mortality. According to the World Health Organization (WHO), anaemia affects approximately 41.8% of pregnant women worldwide, with the highest prevalence in Africa and Southeast Asia (World Health Organization, 2021). Anaemia during pregnancy is often associated with adverse outcomes, including preterm delivery, low birth weight, and increased risk of maternal death [14]. The condition is primarily caused by nutritional deficiencies, particularly iron deficiency, but can also be exacerbated by infectious diseases, chronic conditions, and socio-economic factors [15].

In many resource-limited settings, the prevalence of anaemia among pregnant women remains alarmingly high despite efforts to improve maternal health through antenatal care services. In Ghana, studies have reported varying prevalence rates of anaemia among pregnant women, with some regions showing rates as high as 60% [16]. The high prevalence of anaemia in pregnant women poses a significant challenge to achieving the Sustainable Development Goals (SDGs), particularly Goal 3, which aims to ensure healthy lives and promote well-being for all at all ages.

Given the significant health risks associated with anaemia in pregnancy, there is an urgent need to understand the current prevalence and contributing factors within specific local contexts. This study investigates the prevalence of anaemia among pregnant women attending antenatal clinics at a selected hospital in Ghana. By identifying the prevalence and associated risk factors, this study aims to provide insights that can inform targeted interventions to reduce the burden of anaemia among pregnant women in the region.

1.3 Significance of the Study

Anaemia during pregnancy is a critical issue that impacts both maternal and fetal health, particularly in developing countries where healthcare resources are often limited. Understanding the prevalence and risk factors associated with anaemia in pregnant women is essential for devising effective public health strategies and interventions. This study's significance lies in its potential to contribute to the reduction of anaemia-related complications during pregnancy, which can have profound implications for maternal and child health.

Firstly, this study aims to provide up-to-date data on the prevalence of anaemia among pregnant women in a specific hospital setting in Ghana. While previous studies have highlighted the high prevalence of anaemia in various regions of the country, there is a need for continuous monitoring to assess the effectiveness of current interventions and identify areas that require additional attention. The findings of this study will help to fill this gap by offering insights into the status of anaemia among pregnant women in the study area.

Secondly, by identifying the socio-economic, nutritional, and health-related factors that contribute to anaemia during pregnancy, this study can inform the development of targeted interventions aimed at reducing the incidence of anaemia. These interventions could include improving access to nutritional supplements, enhancing antenatal care services, and implementing educational programmes to raise awareness about the importance of maternal nutrition and health.

Moreover, the study's findings could have broader implications for public health policy in Ghana and similar settings. By highlighting the specific challenges and risk factors associated with anaemia in pregnancy, the study may provide evidence that supports the allocation of resources to maternal health programmes and the design of policies that address the root causes of anaemia. This could ultimately contribute to the achievement of national and global health goals, including the Sustainable Development Goals (SDGs) related to maternal and child health.

1.4 Aim of the study

To assess the anaemia in pregnant women in Prestea-Huni Valley Municipality.

1.5 Objectives of the study

1. To assess the prevalence of anaemia among pregnant women attending antenatal care clinics in the Prestea-Huni Valley Municipality.
2. To identify associated factors contributing to anaemia in pregnant women in the study area.
3. To determine the trimester in which anaemia is most prevalent.

MATERIALS AND METHODS

2.1 Study Design

This study was a cross-sectional design aimed at assessing the prevalence of anaemia among pregnant women in the Prestea-Huni Valley Municipality. Cross-sectional studies allowed for the collection of data at a single point in time, providing a snapshot of anaemia prevalence and associated factors within the study population.

2.2 Study Setting

The study was conducted in the Prestea-Huni Valley Government Hospital, situated in the Prestea-Huni Valley Municipality within the Western Region of Ghana. The hospital serves as the primary healthcare facility in the municipality, providing medical services to a diverse population that includes both urban and rural communities. The Prestea-Huni Valley Municipality is geographically diverse, encompassing a range of environments from densely populated urban centres to sparsely populated rural areas. The hospital is strategically located in Prestea, the municipal capital, which is a hub for economic activities, particularly in the mining industry. This location makes the hospital accessible to a wide range of patients,

including those involved in mining and related activities, as well as those from more remote, agrarian communities. The diverse socioeconomic backgrounds of the population served by the hospital allowed for the examination of anaemia prevalence across different demographic groups, including varying levels of income, education, and access to healthcare.

The study setting, therefore, not only offered insights into the prevalence of anaemia among pregnant women but also provided a context for understanding how environmental and occupational factors might contribute to health outcomes in this population.

2.3 Sample Size

278 Pregnant women were recruited for the study

2.4 Sampling Technique

A simple random sampling method was employed to recruit participants from antenatal care clinics within the government hospital in the Prestea-Huni Valley Municipality. This technique ensured that every pregnant woman attending antenatal care during the study period had an equal chance of being selected, minimizing selection bias and enhancing the generalisability of the study findings (Kumar, 2019). Pregnant women attending antenatal care appointments were approached consecutively and invited to participate in the study until the desired sample size was achieved. The sample size was determined based on the prevalence of anaemia in similar populations, accounting for an acceptable margin of error and confidence level (Cochran, 1977). This approach provided a robust representation of the population, allowing for reliable estimates of anaemia prevalence among pregnant women in the municipality.

2.5 Data Collection

Data collection was conducted by trained research assistants using structured questionnaires and clinical assessments. The structured questionnaire was designed to capture comprehensive socio-demographic information, including age, education, occupation, and marital status, which are known to influence health outcomes during pregnancy (Pell et al., 2013). Clinical assessments focused on the measurement of haemoglobin levels, a key indicator of anaemia. The research assistants were thoroughly trained in the administration of the questionnaire and the correct procedures for clinical assessments, ensuring the accuracy and reliability of the data collected (Bolarinwa, 2015). Informed consent was obtained from each participant before data collection, in line with ethical guidelines for research involving human subjects (World Medical Association, 2013).

2.6 Measurement of Haemoglobin Levels

Haemoglobin levels were measured using standard techniques, utilizing well-calibrated and controlled haematology analyzers, such as automated blood cell counters, which are widely recognized for their precision and reliability (International Council for Standardization in Haematology, 2015). Blood samples were collected via finger prick or venipuncture, following strict infection control procedures to ensure the safety of both the participants and the research team.

The haemoglobin levels were recorded in grams per deciliter (g/dL), with anaemia defined as haemoglobin levels below 11 g/dL, per World Health Organization (WHO) criteria for pregnant women (WHO, 2015). The use of standardized measurement techniques ensured that the results were comparable with other studies and aligned with global health standards (Jelliffe & Maddocks, 1964).

2.7 Data Analysis

Data analysis was conducted using appropriate statistical software packages, such as SPSS (25 version), which is widely used in epidemiological research for its comprehensive suite of tools for data management and analysis. Descriptive statistics were employed to summarize the demographic characteristics of the study population and the prevalence of anaemia, providing a clear overview of the data distribution and key patterns within the population. Inferential statistics, such as chi-square tests or logistic regression analysis were used to examine associations between anaemia prevalence and socio-demographic or clinical factors. These statistical methods are robust in identifying significant relationships and potential risk factors associated with anaemia, allowing for a deeper understanding of the factors influencing health outcomes. A p-value of less than 0.05 was considered statistically significant, adhering to the conventional threshold for determining the likelihood that observed associations were not due to chance.

RESULTS AND INTERPRETATION

3.1 Demographic Characteristics of Participants

In the current study, 278 pregnant women were recruited. The age distribution shows that most participants (42.1%) were between 26 and 35 years old, indicating that this is the predominant childbearing age group in the sample. This is followed by women aged 36 to 45 years (33.1%), while 14.0% were aged 46 and above, and 10.8% were in the 16 to 25 years age bracket. In terms of educational background, a notable proportion of the participants (36.0%) had primary education, followed by 32.0% who had secondary education. Interestingly, 18.0% of the women had attained tertiary education, while 14.0% had no formal education (Table 3.1)

Regarding occupation, more than half of the women (50.7%) were employed, suggesting that many of the participants are involved in formal or wage-earning jobs. Meanwhile, 29.5% were self-employed, which may include those in informal businesses, while 19.8% were unemployed. Marital status shows that the clear majority (70.1%) of the women were married, while 16.9% were single, and 12.9% were divorced or widowed. The majority of the pregnant women were in their first trimester (41.0%) and few were in the third trimester (26.3%) (Table 3.1).

Table 3.1: Demographic Characteristics of Pregnant Women (N = 278)

Variable	Frequency (N)	Percentage (%)
Age groups		
16 – 25	30	10.8
26 – 35	117	42.1
36 – 45	92	33.1
46 and above	39	14
Education Level		
No formal education	39	14
Primary education	100	36
Secondary education	89	32
Tertiary education	50	18

Variable	Frequency (N)	Percentage (%)
Occupation		
Unemployed	55	19.8
Self-employed	82	29.5
Employed	141	50.7
Marital Status		
Divorce/Widowed	36	12.9
Single	47	16.9
Married	195	70.1
Trimester		
First	114	41
Second	91	32.7
Third	73	26.3

3.2 Prevalence of Anaemia

The results in Figure 3.1 show the haemoglobin levels of the 278 pregnant women studied, which are used to assess the prevalence of anaemia in this research. A total of 41.7% of the participants had haemoglobin levels below 11 g/dL, which is the threshold for diagnosing anaemia in pregnant women according to the World Health Organization (WHO). In the study, it was found that 25.9% of the women had haemoglobin levels between

11 and 12 g/dL, which is still considered lower than optimal, though not classified as anaemia. Again, 32.4% of the women had haemoglobin levels above 12 g/dL, indicating that about a third of the participants had normal haemoglobin levels and were not anaemic (figure 3.1)

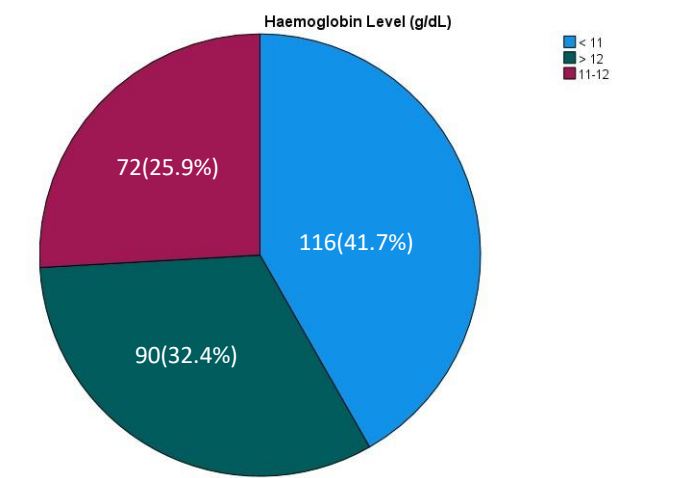


Figure 3.1 A figure showing haemoglobin levels of pregnant women attending Prestea-Huni Valley Government Hospital

3.3 Association Between Socio-Demographic Features of Participants and Haemoglobin Levels

From Table 3.2, none of the socio-demographic features were significantly associated with overall haemoglobin levels.

Table 3.2. Association Between Socio-Demographic Features of Participants and Haemoglobin Levels.

Variable	Haemoglobin Level			p-value
	<11	11--12	>12	
Age groups				0.545
16 – 25	11(9.5)	7(9.7)	12(13.3)	
26 – 35	51(44.0)	33(45.8)	33(36.7)	
36 – 45	42(36.2)	22(30.6)	28(31.1)	
46 and above	12(10.3)	10(13.9)	17(18.9)	
Education Level				0.141
No formal education	11(9.5)	10(13.9)	18(20.0)	
Primary education	46(39.7)	24(33.3)	30(33.3)	
Secondary education	32(27.6)	28(38.9)	29(32.2)	
Tertiary education	27(23.3)	10(13.9)	13(14.4)	
Occupation				0.589
Unemployed	26(22.4)	13(18.1)	16(17.8)	
Self-employed	38(32.8)	19(26.4)	25(27.8)	
Employed	52(44.8)	40(55.6)	49(54.4)	
Marital Status				0.09
Divorce/Widowed	16(13.8)	3(4.2)	17(18.9)	
Single	18(15.5)	14(19.4)	15(16.7)	
Married	82(70.7)	55(76.4)	58(64.4)	
Trimester				0.54
First	50(43.1)	31(34.4)	33(45.8)	
Second	39(33.6)	31(34.4)	21(29.2)	
Third	27(23.3)	28(31.1)	18(25.0)	

3.3 Associated Factors Contributing to Anaemia

The findings indicate that certain socio-demographic factors, particularly age, education level, and occupation, are significantly associated with anaemia among pregnant women. Pregnant women between the ages of 16-25 years, 26-35 years and 36-45 years were significantly associated with anaemia with P-values of (0.045), (0.032), and (0.021) respectively (Table 3.3). Pregnant women with lower levels of education; no formal education and primary education (P-value = 0.005 and 0.018 respectively), are at higher risk of having anaemia (Table 3.3). Self-employment and unemployment were also significantly associated with anaemia (p-value is 0.023 and 0.036 respectively). These insights underscore the need for targeted interventions such as educational programmes on maternal health, increased access to healthcare services, and improved nutrition support, especially for at-risk groups like adolescents, women with lower education, and the unemployed.

Table 3.3: Factors Associated with Anaemia in Pregnant Women

Variable	Prevalence of Anaemia (%)	p-value
Age Group		
16 – 25	11(9.5)	0.045
26 – 35	51(44.0)	0.032
36 – 45	42(36.2)	0.021
46 and above	12(10.3)	0.067
Education Level		
No formal education	11(9.5)	0.005
Primary education	46(39.7)	0.018
Secondary education	32(27.6)	0.091
Tertiary education	27(23.3)	0.067
Occupation		
Unemployed	26(22.4)	0.023
Self-employed	38(32.8)	0.036
Employed	52(44.8)	0.078

3.4 Trimester Distribution of Anaemia

Table 3.4 illustrates the prevalence of anaemia in pregnant women across different trimesters. The total number of anaemia cases in the study was 116. The prevalence of anaemia in the first trimester, second trimester and third trimester are 43.1%, 33.6% and 23.3% respectively.

Table 3.4: Trimester Distribution of Hemoglobin levels

Variable	Haemoglobin Level		
	<11	11—12	>12
Trimester			
First	50(43.1)	31(34.4)	33(45.8)
Second	39(33.6)	31(34.4)	21(29.2)
Third	27(23.3)	28(31.1)	18(25.0)

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

4.1 Discussion

This study revealed that 41.7% of pregnant women had haemoglobin levels below the WHO threshold for anaemia (11 g/dL). This prevalence is comparable to the findings of Geta, who reported a 42% prevalence of anaemia among pregnant women in Ethiopia [17]. However, it is slightly higher than the 37% reported in a study conducted in Southern Nigeria [18]. These variations could be attributed to differences in nutritional patterns, healthcare access, and the prevalence of other risk factors in these regions.

A significant observation in this study is that a substantial proportion (25.9%) of the participants had haemoglobin levels between 11 and 12 g/dL, suggesting that many women may be at risk of developing anaemia as pregnancy progresses. This aligns with the findings by [19], who emphasized that even marginal deficiencies in haemoglobin levels could compromise maternal and fetal health, increasing the risk of adverse pregnancy outcomes.

Age, education, and occupation were identified as significant socio-demographic factors influencing anaemia prevalence. Ages, 16-25(p-value 0.045), 26–35(p-value 0.032) and 35-45(p-value 0.021) were significantly associated with anaemia, consistent with findings from [20] who noted that younger mothers face compounded risks due to the dual demands of physiological growth and pregnancy. This observation underscores the importance of targeted interventions, such as nutritional support and health education programmes for adolescent mothers.

Educational attainment was also a key determinant, with women lacking formal education and those having primary education were significantly associated with anaemia (p-value is 0.005 and 0.018 respectively). This finding aligns with [21], who reported that maternal education significantly impacts health literacy and dietary practices, which in turn influence anaemia outcomes. In contrast, women with tertiary education had no association with anaemia, suggesting that education enables better utilization of healthcare services and adherence to dietary recommendations. Addressing educational disparities through maternal health literacy campaigns could have a significant impact on reducing anaemia rates.

Occupational status was another critical factor, with unemployed women significantly associated with anaemia (p-value is 0.023), whilst employment was not significantly associated with anaemia. These findings echo the observations of [22], where unemployed women had limited access to nutrient-rich foods and antenatal care due to financial constraints. Economic empowerment initiatives, such as vocational training and financial assistance programmes, could indirectly reduce the burden of anaemia by enhancing women's economic stability and access to nutritional resources.

The study also examined the distribution of anaemia across pregnancy trimesters, revealing a declining trend in anaemia as pregnancy progressed. Anaemia was most prevalent in the first trimester (43.1%), followed by the second trimester (33.6%), and the third trimester (23.3%). These findings align with research by [23] who observed a similar trend in Indian women, attributing the decline to physiological adaptations and the introduction of iron supplements during antenatal care.

However, the results differ from some studies that reported higher anaemia prevalence in the third trimester [24]. For instance, [25], found that physiological hemodilution and poor

adherence to supplementation regimens contributed to increased anaemia prevalence in the later stages of pregnancy among Kenya women. The declining trend observed in this study may reflect effective antenatal interventions and improved nutritional practices, suggesting some success in mitigating anaemia risk for pregnancy.

The findings of this study highlight the urgent need for public health interventions to address the high prevalence of anaemia among pregnant women in the Prestea-Huni Valley Municipality. Early antenatal screening for anaemia, routine iron and folic acid supplementation, and community-based education programmes are essential for reducing the burden of anaemia. Targeted support for high-risk groups, such as adolescent mothers and women with low educational attainment, could be particularly impactful.

Additionally, strategies to empower women economically could address some of the underlying socio-demographic determinants of anaemia. For example, integrating nutritional education into vocational training programmes and providing financial subsidies for pregnant women could help mitigate the economic barriers to accessing nutrient-rich foods and healthcare services. This study contributes valuable region-specific data on anaemia prevalence and its associated factors, offering insights for healthcare providers and policymakers. The cross-sectional design allowed for a comprehensive assessment of the current prevalence and key risk factors. However, the observational nature of the study limits causal inferences. Future research employing longitudinal designs could provide a deeper understanding of the progression of anaemia and the long-term effects of targeted interventions.

4.2 Conclusion

The findings of this study reveal a high prevalence of anaemia among pregnant women at Prestia Government Hospital, with 41.4% of participants having haemoglobin levels below the WHO threshold. This prevalence aligns with rates reported in similar studies across sub-Saharan Africa, underscoring the pervasive nature of anaemia as a public health concern in low-resource settings. The identification of a significant proportion of women with haemoglobin levels between 11 and 12 g/dL further highlights the vulnerability of this population to developing anaemia as pregnancy progresses.

Key socio-demographic factors, such as age, education, and occupational status, were significantly associated with anaemia prevalence. Younger mothers, women with low educational attainment, and unemployed women were identified as high-risk groups, requiring targeted interventions to mitigate anaemia-related risks. The observed declining trend in anaemia prevalence across trimesters suggests the positive impact of antenatal care and supplementation but also points to the need for sustained efforts to ensure adherence to interventions throughout pregnancy. Overall, this study highlights the urgent need for region-specific strategies to address the high burden of anaemia among pregnant women. The findings provide valuable insights for healthcare providers, policymakers, and community leaders, emphasizing the importance of early detection, comprehensive antenatal care, and socio-economic support to improve maternal health outcomes.

4.3 Recommendations

4.3.1 Early Screening and Treatment: Establish routine screening protocols for anaemia during the first antenatal visit to identify and manage cases promptly.

4.3.2 Iron and Folic Acid Supplementation: Ensure the availability and distribution of iron and folic acid supplements throughout pregnancy, with follow-up to monitor adherence.

4.3.3 Enhanced Monitoring: Develop antenatal care guidelines that include regular monitoring of haemoglobin levels to track improvements and adjust interventions as needed.

4.3.4 Community Nutrition Education: Organize community-based nutrition programs to educate pregnant women and their families on the importance of iron-rich and balanced diets.

4.3.5 Nutritional Support Programmes: Provide food supplementation for at-risk groups, such as adolescent mothers and women with low incomes, to improve their dietary intake.

4.3.6 Maternal Health Campaigns: Launch educational campaigns to raise awareness about anaemia, its risks, and preventive measures. Use culturally sensitive messaging to ensure wider reach and acceptance.

4.3.7 School-Based Programmes: Integrate maternal health education into secondary school curricula to empower adolescent girls with knowledge about pregnancy health before they conceive.

Ethical Committee Approval was given.

Limitations: The study could not cover all the 16 regions of the country.

Authors Contribution

1. Egote Alexander Kofi, manuscript writing and editing
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Data Availability Statement

Study data is available and will be provided by the authors upon request.

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