

Dietary diversity and preferences among pregnant women and its association with anaemia

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Abstract

Purpose – This study aims to assess dietary choices of pregnant women and its relationship with their anaemia status.

Design/methodology/approach – A mixed-method study comprising a survey and three focus group discussions (FGDs). The survey included 380 adult pregnant women with data collected on food choices, preferences and haemoglobin (Hb) status.

Findings – More than 50% of women in the study had Hb concentration < 11.0 g/dl; mean Hb was 10.24 g/dl (SD = 1.59). Univariate analysis was used to generate descriptive tabulations for socio-demographic characteristics of respondents, dietary choices for women and anaemia status. T-test and bivariate analysis between dietary diversity score of the women among the food groups consumed as well as their anaemia (Hb) status. This showed that women with high dietary diversity score had improved Hb status ($P = 0.003$), and those who consumed meat and fish as well as dark leafy vegetables had significantly high diversity scores ($P = 0.031$ and $P = 0.049$). Thematic analysis was used for analysing qualitative data.

Research limitations/implications – The sample used in the study is unlikely to be fully representative of pregnant women in the Accra Metropolis. In addition, this study used a cross-sectional study design, making it difficult to establish causal associations between nutritional status and food choice of pregnant women. It does not also show variation in dietary practices by seasons of the year. The scope of the study did not allow for a detailed analysis, and this should be considered in future studies. Also, the study did not explore an obstetric factor like past bleeding history as well as the menstrual cycle of these pregnant women, as these factors are likely to interfere with the anaemia status of the pregnant women.

Originality/value – This paper contributes significant value by specifically focusing on and clarifying the complex relationship between dietary choices and anaemia among pregnant women. It also provides insights into the distinct dietary patterns and preferences of pregnant women, which may be contributing to the high prevalence of anaemia. The results of the study can inform the development of localized, evidence-based interventions to address this critical public health concern, ultimately leading to improved maternal and foetal health outcomes.

Keywords Dietary diversity, Pregnancy, Anaemia, Dietary preferences

Paper type Research paper



Introduction

Pregnant women require extra nourishment to support the growth and development of the baby. Optimal nutrition throughout pregnancy is crucial for promoting the well-being of both the expectant woman and the developing foetus. Anaemia is a widely observed nutritional deficiency among pregnant women on a global scale (Bhadra and Deb, 2020). Anaemia, a condition marked by a reduction in red blood cells or haemoglobin (Hb), has the potential to negatively impact both the mother and the developing foetus (Wallace and Thibodeaux, 2022). Iron deficiency is a prevalent condition among women of reproductive age globally, contributing to almost half of all cases of anaemia (Stevens *et al.*, 2013). According to the World Health Organization (2014), over 50% of pregnant women globally experience anaemia, with the highest prevalence observed in Africa and south-eastern Asia. The prevalence of anaemia during pregnancy is a significant public health concern in low- and middle-income nations (Victora *et al.*, 2021). According to Egbi *et al.* (2020), there has been a reduction in the occurrence of anaemia among pregnant women (aged 15–49 years) in Ghana over the past six years, with the prevalence decreasing from 59% to 56.3%. However, it is important to note that despite this decline, the prevalence of anaemia among pregnant women in Ghana still remains at a high level. Inadequate dietary practises and suboptimal food selection among pregnant women, particularly in the context of Ghana, have been identified as significant contributors to the prevalence of anaemia (Egbi *et al.*, 2020).

The correlation between dietary preferences and the occurrence of anaemia during pregnancy has been extensively examined in several geographical regions. In Ethiopia, Azene *et al.* (2021) found that pregnant women who ate a range of food categories had a lower incidence of anaemia than those who ate a monotonous diet. Other studies relate diversified diets to higher Hb levels in pregnant women (Kiboi *et al.*, 2017; Kang *et al.*, 2018; Shrestha *et al.*, 2021). These findings emphasise the importance of a diverse and balanced diet for avoiding anaemia during pregnancy. Food quality and diversity are essential to avoiding anaemia. A high-quality diet, characterized by the inclusion of nutrient-dense foods, plays a pivotal role in maintaining overall health, including iron status. Dietary diversity is also associated with a broader spectrum of essential nutrients, including iron. Consuming a variety of foods from different food groups increases the likelihood of meeting nutritional needs, promoting better iron absorption. Including a mix of animal and plant-based iron sources, such as meats, legumes, nuts and leafy green vegetables, enhances dietary diversity and supports iron intake from different bioavailable sources (Blanco-Rojo and Vaquero, 2019; Nair *et al.*, 2016). A systematic review and meta-analysis on the prevalence and determinants of anaemia among pregnant women in sub-Saharan Africa found that women who had low dietary diversity scores were 3.59 times more likely to develop anaemia compared to those who had high dietary diversity scores (Fite *et al.*, 2021). Also, a study investigating seasonal variations in dietary diversity and nutrient intakes of women in rural Ghana found that the proportion of women consuming diets with high dietary diversity scores increased from 36.4% to 52.4% between two seasons (Waswa *et al.*, 2021). These studies suggest that improving diet quality and diversity can help reduce the prevalence of anaemia in women.

Although these studies illuminate the link between dietary choices and pregnant anaemia, there is little study at the Accra Metropolis in Ghana. Due to the unique cultural and culinary background of this region, pregnant women's diets and anaemia prevalence must be studied. This study aimed to investigate the dietary patterns and preferences of pregnant women and examine the potential relationship between these factors and the occurrence of anaemia.

Methods

Study population and design

A cross-sectional study design with mixed study methods was used to examine the dietary choices and preferences of the Pregnant women. Healthy adult pregnant women aged 18–49 who were in their second and third trimesters were eligible for this study at the antenatal clinic in different Hospitals.

Eligibility criteria

Pregnant women in their first trimesters or who had any disease condition (e.g. human immunodeficiency virus, tuberculosis, malaria, etc.) were excluded from the study. Eligible women who provided consent were invited to participate in the study during regular visits to the antenatal clinics. Sample size was determined using a method by [Naing et al. \(2006\)](#).

Sample size determination

An estimated proportion of 42% of pregnant women with anaemia in Ghana (RCH/GHS, 2013) was used for sample size calculation. With a precision of 5% and 95% confidence level, the minimum sample size for the study was 380 pregnant women.

Data collection

For the qualitative study, three focus group discussions (FGDs) were conducted. One at each of the selected hospitals. After excluding 20 participants for not meeting the eligibility criteria, a face-to-face, semi-structured interview was conducted with each of the 380 eligible participants ([Figure 1](#)). A semi-structured questionnaire was developed from standard instrument and the National Demographic and Health Survey report 2010, which was pretested and used to conduct the dietary assessment. The questionnaire consisted of anthropometric data, a semi-quantitative food frequency questionnaire (FFQ) (a food consumption frequency questionnaire covering the last one month) and supplement intake during pregnancy and the FFQ. In this study, a FFQ containing a list of 55 food items which were divided into six food groups was developed on the basis of a FFQ by Nti C and the GHS (2008). The food groups included starchy roots and plantain, cereal and cereal products, animal products, legumes, fats and oils, fruits and vegetables. The questionnaire contained a series of frequencies such as “never,” “daily,” “weekly,” “monthly” and “occasionally.” Women were asked the frequency with which they ate each food on the supplied list under each food group. The questionnaires used both open- and close-ended questions on demographic characteristics, dietary choices and preferences, and what influences their dietary choices. For the dietary diversity score, the mean number of the food groups was calculated. Those who scored above the mean had higher dietary diversity scores, and those who scored below had low scores. After signing an informed consent, capillary blood samples were taken from each woman to be measured by HemoCue meter 201 +, blood samples were collected by finger prick in the middle finger of left hand, and after cleaning and massaging the finger to facilitate blood flow, they were analysed immediately by HemoCue meter and recorded. The metre measures the Hb concentration and displays the result on the screen.

Women above 18 years old meeting the eligibility criteria for the survey were invited to participate in the qualitative data collection once they give their consent. Thirty women participated in three FGDs. Each FGD had up to 10 women. All the FGDs were conducted using an interview guide designed for the study and questions on dietary choices and preferences, as well as what influences their dietary choices. FGDs were facilitated by a trained interviewer and assisted by a note-taker. The facilitator led the groups to discuss perceptions of food choices. Each FGD lasted about 90 min. Interviews were tape-recorded,

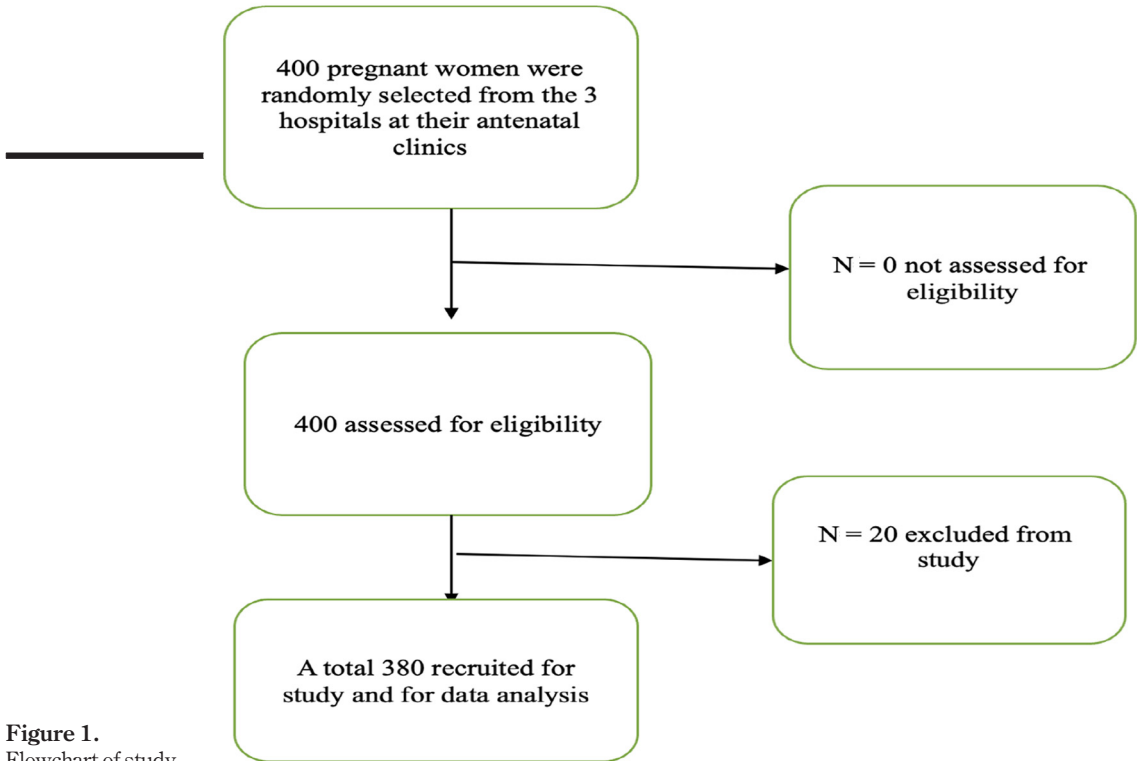
Study flowchart

Figure 1.
Flowchart of study
data collection phase

Source: Authors' own creation

and detailed notes were also taken. All respondents endorsed written informed consent before the interviews were conducted.

Data analysis

Quantitative data obtained from the survey were entered into excel and imported into STATA (Statistics and Data) for statistical analysis. Descriptive statistics such as means and standard deviation were used to summarize and present the respondents' demographic data. Univariate analysis was used to generate descriptive tabulations for socio-demographic characteristics of respondents, dietary choices for women and anaemia status. The key outcome variable was anaemia status, which was modelled with socio-demographic characteristics and dietary choices and preferences as explanatory variables. Pearson chi-square statistics were used to determine explanatory variables that were statistically significant. P -value < 0.05 was used to indicate significance. Data obtained from both the FGDs were analysed manually by translating and transcribing the tape recordings. Two independent investigators manually read the transcripts and hand-written notes, coded, cross-referenced and compared them across the three FGDs. Unique numbering was used to

code the themes. The frequency of the coded text was considered as an indication of thematic unit significance. Their unique codes were checked for consistency and to arrive at a consensus on the emergent themes. Dietary diversity scores were created by summing the food groups consumed over the reference period. The study was ethically approved by the Ghana Health Service Ethical Review Committee (ID GHS-ERC 38/12/15). All subjects endorsed written informed consent before the study participation.

Results

Socio-demographic characteristics of the women

This study included 380 women in the survey and 30 women in the FGD, all aged 18–49 years. Majority (74%) of them were married, with 92.9% having completed at least basic education; about a third (36.3%) had secondary education. (Table 1) About half of the women were engaged in trading (41%). 13.7% were employed in public institutions, and another 23.4% were self-employed, mostly engaging in hairdressing, dressmaking, bead making and other vocations.

Haemoglobin levels of the pregnant women

More than 50% of the women in the study recorded Hb levels less than 11.0 g/dl, with a mean Hb concentration of $10.24 \text{ g/dl} \pm 1.59$, a maximum of 13.9 g/dl and a minimum of 7.8 g/dl.

Dietary diversity and frequency of food group consumption

The dietary diversity score ranged from 4 to 7, out of the eight possible food groups, with a median of 4. About 68.7% of the pregnant women who consumed starchy staples had high dietary diversity score, and 31.3% had low dietary diversity scores, but there was no statistical difference. Among those who consumed dark leafy vegetables, 88.3% of them had high dietary diversity score, and 11.7% of them had low dietary diversity score at a *P* value of 0.031. Also, there was a statistical difference in the dietary diversity scores of those who consumed meat and fish. About 80% of those who consumed meat and fish had high dietary diversity score, and about 20% had low dietary diversity score. However, there was no statistical difference in the dietary diversity scores among those who consumed from the other food groups, as shown in Table 2.

Participants in the FGD gave detailed accounts, indicating that starchy staples were consumed frequently by all women. On the other hand, other fruits and vegetables, fish and meat and other protein were less frequently consumed:

Most of the time we pregnant women like to eat corn meal, pounded casava and plantain rice and beans meal, rice, fried yam and Casava meal with Taro soup. As for me what I eat most when I am pregnant is cassava meal. (FGD respondent)

As for me I don't like meat and fish at all when I am pregnant. When I eat it, it makes me vomit. I can't stand the smell. So, I eat a lot of beans and groundnut. The midwife says it is also good for me. (FGD respondent)

4.5 Food frequency consumption

Table 3 describes consumption patterns of four food groups, namely, starchy roots and plantain, cereals and cereal products, animal products and legumes. The main starchy staples consumed were plantain, yam and cassava, with plantain being the most frequently consumed, followed by yam. Also, 13.4% of the women consumed plantain on daily basis,

Characteristic	No. (%)
<i>Hospital where women were recruited</i>	
Legon	100 (26.3)
Ridge	122 (32.1)
La General	158 (41.6)
<i>Religion</i>	
Christian	312 (82.10)
Muslim	66 (17.4)
Traditional	2 (0.5)
<i>Marital status</i>	
Married	281 (74.0)
Single	41 (10.8)
Cohabiting	58 (15.3)
<i>Educational level completed</i>	
None	27 (7.1)
Basic	128 (33.7)
Secondary	138 (36.3)
Tertiary	87 (22.9)
<i>Current employment status</i>	
Employed	294 (77.4)
Unemployed	86 (22.6)
<i>Current income-earning activity</i>	
Housewife	80 (21.1)
Salary worker	52 (13.7)
Trader	159 (41.8)
Other	89 (23.4)
<i>Ethnicity</i>	
Akan	182 (47.9)
Ga Adangme	41 (10.8)
Ewe	92 (24.2)
Northern	55 (14.7)
<i>Age groups (years)</i>	
20–24	79 (20.8)
25–29	147 (38.7)
30–34	125 (32.9)
35–39	27 (7.1)
40–44	2 (0.50)
<i>Monthly income (cedis)</i>	
<100	70 (18.4)
100–500	141 (37.1)
500–1,000	63 (16.6)
1,000–2,000	84 (22.1)
>2,000	22 (5.8)
<i>Gestational age (weeks)</i>	
13–27	128 (33.7)
28–40	252 (66.3)
<i>Number of children born to woman</i>	
No child	81 (21.5)
1 child	174 (45.7)
2–3 children	120 (31.5)
>3 children	5 (1.3)

Table 1. Socio demographic and obstetric characteristics of the women surveyed in the three selected hospitals $n = 380$

Note: Data are presented as frequency (percentage)
Source: Authors' own creation

while 7.4% and 4.7% consumed yam and cassava, respectively, on daily basis. Cocoyam, sweet and white (Irish) potatoes were mostly consumed on occasional basis by these women.

Almost three quarters of the women consumed maize on daily basis. The second most frequently consumed food in the cereal group were rice and bread, by 34.5% each. On weekly basis, rice was consumed by most women (39.5%). About 20.3% did not include millet in their diet.

Almost half of the women consumed fish daily as their main source of animal protein. Egg was the second most consumed animal protein on daily basis. Poultry and egg were consumed at least two to three times a week by the women. Snails and sea foods (crabs, lobster and shrimps) were not consumed by 47.1% and 30.3% of the women respectively.

Most of the women consumed legumes on weekly basis. Almost 50% of the women consumed palm nuts on weekly basis.

4.5a Food frequency for fruits, vegetables and fats and oils and other foods. The most eaten fruits weekly were orange, pineapple, watermelon and avocado pear. Grapes, coconut and tangerine were least eaten. Women ate tomatoes and onions every day. Monthly, green leafy vegetables (cocoa yam and taro leaves) were eaten. Weekly stews and soups included okro and carrots. However, 35.0% and 44.2% of women did not eat garden eggs or cabbages.

Over 50% of women consumed refined vegetable oil daily. Tea was consumed every day by 32.6% of women, followed by soft drinks (26.3%) and toffee (22.8%). Women said they ate most of these meals to fulfil cravings, as shown in [Table 4](#).

Influence of food choice on anaemia status

[Figure 2](#) shows a T-test analysis between dietary diversity score of the women in the study and their anaemia status. Women without anaemia fed on four or more food groups compared to those who had anaemia and fed on less than four food groups. This was statistically significant ($P = 0.003$).

4.13 Food preferences of pregnant women

From the FGD, the women were of the view that they preferred to eat starchy staples such as maize, rice and cassava products:

I like to eat corn meal and corn porridge a lot during pregnancy. Apart from that too I eat rice because it is always available. (FGD participant)

Food groups	Low dietary diversity (n%)	High dietary diversity (n%)	<i>p</i> -values
Starchy staples	31.3	68.7	0.18
Dark green leafy vegetables	11.7	88.3	0.031*
Vitamin A rich foods	19.7	80.3	0.40
Other fruits and vegetables	24.4	75.6	0.36
Meat and fish	22.2	79.8	0.049
Eggs	18.7	81.3	0.93
Milk and milk products	9.0	91.0	0.66
Legumes, nuts and seeds	11.5	88.5	0.23

Notes: Data are presented as frequency (percentage) using frequency test and crosstabulation test, Tables shows bivariate analysis between frequency of consumption and dietary diversity, *p* values are significant at $p < 0.05$. The *p* values are comparing frequency of consumption of various food groups to dietary diversity scores. *Indicates significant *p* value

Source: Authors' own creation

Table 2.
Association between dietary diversity and frequency of consumption of various food groups among pregnant women

NFS

Food groups	% Response				
	Daily	Weekly	Occasionally	Monthly	Never
<i>Starchy staples</i>					
Cassava	4.7	28.7	7.4	28.4	30.9
Yam	7.4	36.3	8.7	30.0	17.6
Plantain	13.4	24.2	4.0	40.0	18.4
Cocoyam	1.8	24.7	22.6	38.7	12.1
Sweet potatoes	2.4	24.7	17.6	42.1	13.1
White potatoes	0.0	1.3	17.6	0.0	81.1
Maize	79.7	4.0	0.8	4.7	0.8
Millet	11.1	30.3	21.1	17.4	20.3
Rice	39.5	35.8	8.7	25.3	0.0
Bread	34.5	30.8	8.7	25.3	0.8
Biscuit	9.2	25.0	36.8	25.5	3.4
<i>Animal products</i>					
Red meat	7.6	20.0	27.1	10.7	0.5
Fish	45.0	34.0	9.0	7.9	4.2
Poultry	11.3	46.1	12.4	13.9	17.4
Sea food	0.0	1.6	39.5	28.7	30.3
Eggs	12.9	45.3	7.4	11.1	23.4
Milk	6.8	51.3	12.4	4.2	25.1
Snails	0.0	0.0	26.6	26.3	47.1
<i>Legumes, nuts and seeds</i>					
Palm nut	0.3	42.9	5.3	28.7	22.9
Agushie	0.0	16.1	12.9	24.2	46.8
Beans	0.0	7.9	3.7	5.8	82.6
Soy beans	0.0	23.2	5.5	10.3	61.1
Tigernuts	1.3	1.1	15.8	4.5	77.4
Neri seeds	0.0	0.3	6.8	1.8	91.0

Table 3.
Food frequency table
of staples, animal
products and
legumes

Note: Data are presented as frequency (percentage) using frequency test % food consumption on daily, weekly, monthly and occasionally
Source: Authors' own creation

A few also report preferring fish, egg and beans over most protein products:

During pregnancy I don't tolerate meat and chicken at all because it makes me vomit. Usually I take fish during this time. But even with the fish it has to be smoked or fried dry before I can eat it. (FGD participant)

With fruits and vegetables, most of the women preferred the local vegetables, such as tomatoes, onions and pepper, because they are available. The fruit most preferred was mango because they crave for it; some like the taste and smell as well, but they do not eat it because it is expensive:

Vegetables are very expensive, so we eat it once in a while. As for the local ones we add it to our food everyday whether or not they are in season. As for fruits, I usually prefer mangoes because I like the smell. I eat a lot of it when I have money, otherwise I don't buy it at all because it is very expensive at times. (FGD participant)

Some of the pregnant women also mentioned the fact that they had a strong preference for sugary foods, tea, coffee, spicy foods and salty foods:

Dietary
diversity

Food group	% Response				
	Daily	Weekly	Occasionally	Monthly	Never
<i>Fruits</i>					
Orange	0.3	25.3	16.8	24.4	30.7
Mango	2.4	9.0	7.1	15.3	66.3
Pineapple	1.3	21.3	14.0	26.7	36.8
Pawpaw	0.0	7.6	17.1	21.3	54.0
Banana	2.4	9.0	7.1	15.3	63.7
Watermelon	4.2	15.3	13.2	22.4	45.0
Grapes	0.0	2.4	15.3	5.5	76.8
Coconut	0.0	0.5	7.1	3.2	89.2
Avocado pear	0.2	14.0	13.0	29.5	43.4
Apples	0.8	0.0	8.7	16.8	73.7
Tangerine	0.0	0.0	8.7	0.5	90.8
<i>Vegetables</i>					
Onions	71.6	15.8	0.0	0.0	12.6
Tomatoes	87.1	12.9	0.0	0.0	0.0
Leafy vegetables	5.8	12.4	16.6	61.3	4.0
Okra	0.53	44.5	12.4	31.1	11.6
Garden egg	2.1	2.4	5.5	33.4	35.0
Carrots	0.3	34.5	8.2	32.1	25.0
Cabbage	0.0	14.2	9.2	32.4	44.2
<i>Fats and oils</i>					
Palm oil	3.2	32.1	23.4	36.8	4.5
Groundnut oil	0.0	0.0	0.79	0.0	99.2
Palm kernel oil	0.0	0.0	0.5	0.0	95.0
Coconut oil	0.3	4.7	9.0	6.7	79.5
Refined vegetable oil	60.0	36.1	1.1	2.9	0.0
Butter	0.0	0.0	5.0	1.3	93.7
Margarine	0.0	8.4	14.7	8.7	68.2
Shea butter	0.0	0.0	0.3	0.3	99.5
Soya bean oil	0.5	2.1	1.6	3.7	92.1
<i>Other foods</i>					
Chocolate drink	2.4	36.1	10.9	24.4	26.2
Coffee	3.5	9.1	10.1	14.2	63.1
Soft drinks	26.3	34.2	18.2	16.1	5.2
Tea	32.6	21.2	11.8	13.2	21.2
Ice cream	12.6	13.2	38.2	6.8	29.2
Candy	22.8	21.1	14.1	6.1	35.9

Table 4.
Food frequency table
for fruits, vegetables,
fats and oils and
other foods

Note: Data are presented as frequency (percentage). % food consumption on daily, weekly, monthly and occasionally using frequency test

Source: Authors' own creation

Ok now I have this strong liking for sugary foods like ice cream, yoghurt, biscuits and apple drink. It was not like that before this pregnancy. When we come to the hospital the dietician comes to advise us against this food but the truth is, sometimes I can't avoid it. But I have tried to reduce the intake. (FGD participant)

Discussion

Food choices and dietary consumption among pregnant women

The FGD showed that most pregnant women preferred starchy staples like maize, rice and cassava products because they are readily available and a major part of their traditional diet

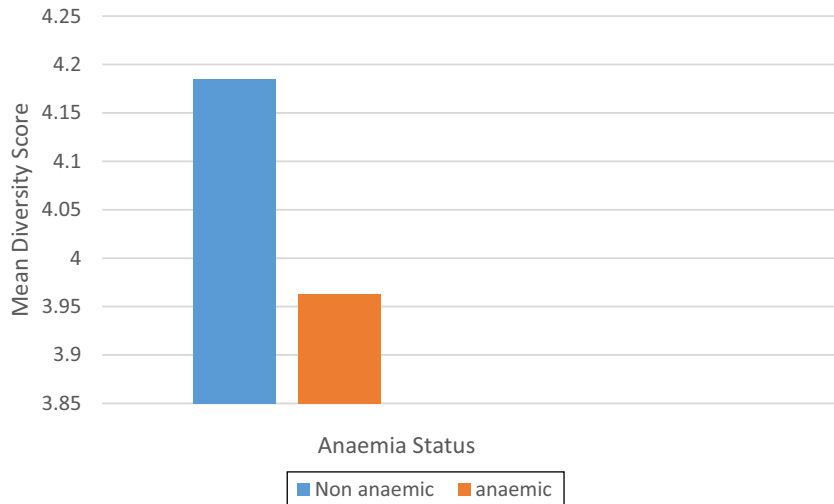


Figure 2.

Influence of dietary diversity on anaemia status of pregnant women ($p = 0.003$)

Note: Graphical presentation of the association between dietary diversity and anaemia using students T test. p values are significant at $p < 0.05$

Source: Authors' own creation

(Aberman *et al.*, 2022). In contrast, pregnant women in Kenya avoided these starchy staples due to increased intake before pregnancy to avoid “baby becoming big” (Kariuki *et al.*, 2017). This may be because the Kenyan research included first-trimester pregnant women, while our study included just second- and third-trimester pregnant women.

Most women consumed fish and beans for protein to avoid vomiting, and owing to cultural beliefs, meat and seafood intake was limited. Research in India found that pregnant women, especially second-trimester women, preferred fish to meat due to food taboos (Catherin *et al.*, 2015). Some women avoided meat products, yet they are healthful and nutritious, so encouraging them to consume them may be beneficial. Due to their harmful impact on pregnant women, social constraints on eating choices should not be ignored. Others enjoyed mangoes because of its flavour. Since tomatoes and onions were in most of their meals, they preferred them to green leafy vegetables. This may be because most traditional meals contain tomatoes and onions. Most women in the FGD said green leafy vegetables are pricey and scarce in Accra.

Some of these women also preferred ice cream, tea, chocolate, spicy cuisine and sweet things. This was consistent with their food intake frequency: 36.2% of women chose tea and 26% preferred soft drinks every day. Fernandez-Gomez *et al.* found similar results in pregnant Spanish women in 2020. Women with high tea, coffee and other beverage consumption had low Hb levels (Lee *et al.*, 2023). The increased anaemia rate in the study women may be due to this.

According to the FFQ data, women in the study ate a lot of corn, rice and bread. Only 37.4% of women ate fruits, whereas 65.8% ate other vegetables (excluding green leafy vegetables) regularly. Other people in the country and emerging countries have similar diets (Musaiger *et al.*, 2016). High carbohydrate consumption among these women is consistent

with research in underdeveloped nations ([Andriamparany et al., 2021](#); [Jia et al., 2022](#)). Most households in developing countries spend most of their income on energy-rich carbohydrates ([Danquah et al., 2013](#)).

Pregnant women consumed 55.8% more protein, perhaps due to higher income. Most women in the research ate fish, eggs, milk or meat, although fish was more common. Fish (dried, smoked, grilled or salted) are readily available and used in most traditional dishes. However, these women ate little meat. This research claims a high consumption of animal protein, whereas another study among pregnant women in South Africa found that dietary taboos cause decreased meat intake ([Chakona and Shackleton, 2019](#)). Women consumed a lot of refined vegetable and palm oil. Possibly, most traditional meals require the use of these oils. Also, 66% of women used vegetable oil and 36.8% used palm oil every day. Among pregnant women, green leafy vegetables and fruits were rarely eaten. [Kariuki et al. \(2017\)](#) found that most pregnant women consumed little due to aversions to green vegetables and fruits and desires for sweet meals. Green leafy vegetables, rich in iron, folate and vitamin C, may contribute to over 50% of women in this research having low Hb levels (<10 g/dl).

Nutritional status of pregnant women

The study found that over 63.1% of pregnant women had Hb < 10g/dl, somewhat higher than [Acheampong et al. \(2018\)](#), which found a 51.0% incidence of anaemia among pregnant women in Ghana. Possible causes include pregnancy-related nutritional changes and increased physiological demands to support the mother's rising blood volume and the fast-developing foetus and placenta. In this research, out of the 75.6% who received iron supplements at prenatal checkups, only 21.8% actively took their iron and other multivitamin supplements. This may explain the difference in the rate of anaemia. Some women in the FGD complained about not eating meat, fruits and green leafy vegetables due to food aversions, pricing and beliefs. This may also explain pregnant women's elevated anaemia rates. Iron-rich meat and green leafy vegetables and vitamin C-rich fruits improve iron absorption.

Anaemia and dietary diversity

Dietary diversity is a crucial factor in ensuring adequate nutrition, particularly during pregnancy. It is a proxy for multiple macro- and/or micronutrient sufficiency of an individual's diet. Iron deficiency anaemia is one of the most common nutritional deficiencies during pregnancy ([Abioye and Fawzi, 2020](#)). Dietary diversity, which involves the consumption of different types of foods from different food groups, is an important food-based strategy to meet iron needs ([Nair et al., 2016](#)). Most pregnant women may have inadequate iron intake when their diet lacks diversity and is dominated by starchy staples. The study conducted in Kenya revealed that about 45.7% of the pregnant women were not meeting the recommended daily allowances for dietary iron, and 20.1% were anaemic. A positive significant relationship was found between dietary diversity and Hb levels, between iron intake and dietary diversity and between iron intake and Hb levels ([Mwaniki et al., 2019](#)). The study also found that women who consumed meat and fish, as well as dark green leafy vegetables, had higher dietary diversity scores. This suggests that higher dietary diversity scores correlate with improved diet quality ([Heidari-Beni et al., 2022](#)).

This study, however, discovered that women had low frequency of intake of iron-rich meals such as meat, green leafy vegetables and fruits, which are high in vitamin C to promote iron absorption, leading to anaemia. [Adjei-Banuah et al. \(2021\)](#) found comparable results in pregnant women in northern Ghana. The high rate of anaemia in pregnant women in the research suggests micronutrient deficiency, a major public health issue in underdeveloped nations ([Shubham et al., 2020](#)). The findings were similar to studies in

southern Ethiopia and India, where pregnant women had more than 60% anaemia. (Getahun *et al.*, 2017; Sharif *et al.*, 2023). The study also found a non-significant low mean dietary variety score of 3.96 for anaemic participants and 4.19 for non-anaemic participants. This was in line with a study in eastern India which reported a positive relationship between anaemia and dietary diversity (Unisa *et al.*, 2021). Our findings imply that dietary diversity score among pregnant women was low, intake foods rich in iron was also low and anaemia among them was high. This study recommends that pregnant women are educated and counselled on diversify their meals so as to improve maternal dietary diversity and enhance dietary quality. For instance, a study done in South Africa revealed that pregnant women on food-based supplementation and nutrition education had significantly reduced anaemia levels than those in the control group (Bekele, 2019). Also, nutrition education and counselling have a positive effect on dietary diversity and increased Hb levels among pregnant women in Ethiopia (Delil *et al.*, 2018).

Strengths and limitations of study

This study can be interpreted in light of its strengths and limitations. The use of validated questionnaires in data collection were the strengths of this study. The FFQ used to estimate dietary diversity provides a better assessment of usual nutrient intake of women who met the dietary diversity requirement. The sample used in the study is unlikely to be fully representative of pregnant women in the Accra Metropolis. In addition, this study used a cross-sectional study design, making it difficult to establish causal associations between nutritional status and food choice of pregnant women. It does not also show variation in dietary practices by seasons of the year. The scope of the study did not allow for a detailed analysis, and this should be considered in future studies. Also, the study did not explore an obstetric factor like past bleeding history as well as the menstrual cycle of these pregnant women, as these factors are likely to interfere with the anaemia status of the pregnant women.

Conclusion

Our study showed that the prevalence of anaemia was 63.1%. and there is an association between dietary diversity and anaemia. This indicates that when pregnant women are able to meet their dietary requirement, it may have a positive impact on their anaemia status. Dietary diversity plays a crucial role in maternal nutrition during pregnancy and can influence both the mother's and the baby's health outcomes. It's important for pregnant women to have a diverse diet to meet their nutritional needs and prevent conditions like anaemia and other nutritional deficiencies. There is also a need for further studies to establish the relationship between dietary diversity and anaemia with a tailored intervention.

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