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Nutritional Patterns and Health of Pregnant Women in Nertiti Locality, Sudan

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Abstract

This study aimed to analyze dietary patterns among pregnant women, assess the prevalence of anemia and malnutrition, explore correlations between anemia and factors such as pregnancy spacing, education, and socioeconomic status, and to evaluate the effect of locally available foods on hemoglobin levels in anemic women. This cross-sectional study was conducted among 100 pregnant women from Nertiti Rural Hospital, Khour Ramla Hospital, and three Tear fund centers. Data were collected by using structured questionnaires and interviews, and descriptive statistics, including means ± standard deviations (SD) and frequencies, were analyzed by using SPSS software. Most participants were illiterate (82%), engaged in traditional agriculture (90%), and from low-income households. High rates of anemia (33%), bleeding (31%), poor appetite (70%), and low body weight (90% under 60 kg) were observed. Dietary habits included food avoidance (74%), unusual consumption of clay or coal (43%), poor intake of essential foods, and inadequate meal frequency (71%). Hemoglobin levels in anemic women improved significantly (6-9 g/dL to 12-14 g/dL) with locally available foods. Anemia was strongly associated with education level, pregnancy spacing, and socioeconomic status. The study highlights the pressing need for nutritional education and targeted interventions to address anemia and malnutrition among pregnant women in Nertiti Locality. Utilizing locally available resources and promoting improved dietary practices could significantly enhance maternal health outcomes.

KEYWORDS: Dietary patterns; Pregnancy; Nutritional status; Anemia; Maternal health; Socioeconomic factors; Rural health.

1. Introduction

The nutritional patterns and health of pregnant women in Nertiti Locality, Central Darfur State, Sudan, are crucial for positive pregnancy outcomes. Studies in Sudan have shown that pregnant women often have inadequate micronutrient intake, increasing the risk of deficiencies such as anemia, vitamin A deficiency, and zinc deficiency (Nahla et al., 2022; Shommo et al., 2015). Undernutrition is also prevalent, exacerbated by insufficient antenatal care visits (Eljack & Niel, 2015). Proper nutrition education, particularly on the importance of consuming fruits and legumes, is essential to reduce the risk of pregnancy-induced hypertension and improve health outcomes for mothers and babies (Swareldhab et al., 2021). Efforts to improve micronutrient status through food fortification, supplements, and counseling during antenatal care are critical in addressing these nutritional challenges (Hassan et al., 2022).

During pregnancy, adequate nutritional status is vital for healthy outcomes. Poor nutrition increases the risk of diseases and mortality, heavily influenced by food availability (Williamson, 2006). In cases of food insecurity, meeting increased nutritional needs becomes difficult, exacerbated by infections like malaria, HIV, and gastrointestinal parasites (Marshall et al., 2022; Organization, 2020). Early health and nutritional care starting before pregnancy can prepare girls for family life, benefiting from adolescent health programs. Proper care during pregnancy results in healthy children and maintains maternal health, enhancing their ability to manage potential health issues.

Many pregnant women suffer from malnutrition due to incorrect diets and frequent pregnancies that hinder proper breastfeeding. Scientific research indicates that good nutrition before and during pregnancy reduces miscarriages, premature births, complications, and diseases. Severe malnutrition can lead to low birth weight and babies with low mineral and vitamin stores, endangering their lives (Cetin et al., 2022). The impact of malnutrition depends on the type of nutrient deficiencies and the fetus's growth stage (WHO, 2020). A child's nutritional future starts with the mother's health during adolescence and pregnancy. Poor maternal nutrition can result in low birth weight and inadequate fetal growth. Globally, about 18 million low-birth-weight infants (LBWI) are born annually, representing 14% of all live births, facing infections, weakened immunity, learning disabilities, and growth disorders. In severe cases, they may die shortly after birth. Moreover, chronic malnutrition in mothers during youth increases the likelihood of LBWI, perpetuating the generational cycle (Sherer & Bello Trujillo, 2023).

Factors like food shortages, lack of rest, smoking, infections, and incorrect dietary habits negatively affect maternal health during pregnancy. Pregnant women often work long hours without considering their health conditions. Proper timing and spacing of pregnancies are critical (WHO, 2020). Pregnancy involves building tissues over nine months, relying on the mother's intake of nutrients. The fetus depends on the mother's nutrition, and insufficient intake depletes the mother's reserves, leading to malnutrition, low birth weight, poor vitality, and early death of newborns. Improving maternal nutrition enhances fetal health (de Souza et al., 2022). In the Darfur States, particularly in Nertiti Locality, increasing maternal deaths, bleeding, miscarriages, preterm births, and neonatal deaths are significant public health issues. High rates of malnutrition and severe anemia among pregnant women necessitate a comprehensive investigation to determine the underlying causes and address the declining health and nutrition of this vulnerable population.

2. Materials and methods

2.1. Study design and setting

This control-case study was conducted at three healthcare facilities in Nertiti Locality, Sudan: Nertiti Rural Hospital, Khour Ramla Hospital, and three Tearfund centers in 2015. The study aimed to assess the dietary patterns of pregnant women in this region. The selection of these facilities was based on their accessibility and the willingness of the administrative staff to participate in the study.

2.2. Study population

The study involved 100 pregnant women receiving antenatal care at healthcare facilities in Nertiti Locality, Sudan. The included facilities were Nertiti Rural Hospital, Khour Ramla Hospital, and three Tear fund centers. Women who were currently pregnant and willing to participate were eligible for inclusion. Those with pre-existing chronic illnesses that could impact dietary patterns were excluded. After removing incomplete questionnaires and participants who refused to provide data, the final sample size was 96 women.

2.3. Data collection

Data were collected using a structured questionnaire designed to capture demographic information, dietary habits, health status, and socio-economic factors. The questionnaire covered key areas such as age, literacy levels, economic status, employment, marital and reproductive history, dietary habits during pregnancy, health issues (anemia, bleeding, appetite, body weight),

food avoidance, consumption of unusual items, and nutritional intake of specific food groups and beverages.

2.4. Questionnaire administration

The questionnaire was administered by trained healthcare workers and volunteers who received specific training on conducting interviews and accurately recording responses. Participants were interviewed during routine antenatal visits at their respective healthcare facilities.

2.5. Validation and reliability of the questionnaire

2.5.1. Content validity tests

Content validity testing of the scale statements involved evaluating the validity of the concept and the clarity of its questions. The questionnaire was presented to academic and specialized statisticians (two arbitrators) to analyze the content of the scale statements and assess the level of agreement between them. Based on their feedback, some statements were accepted and modified to align with the study conditions.

2.5.2. Reliability tests

The reliability of the scales refers to the degree of freedom from errors, specifically the degree of internal consistency between different statements measuring a variable. The reliability of the questionnaire was tested using the split-half method on a sample of ten individuals for exploration. The Spearman correlation coefficient was calculated, resulting in a reliability coefficient of 0.71, indicating high reliability. The self-validity was calculated to be 0.84.

2.6. Effect of locally available foods on hemoglobin levels

A sub-study was conducted on six pregnant women with iron deficiency anemia: three in the second trimester and three in the third trimester. Locally available foods rich in iron, protein, B-complex vitamins, and vitamins A and C were provided to them for six weeks. They were instructed to consume eggs and milk daily. Hemoglobin levels were measured before and after the intervention to evaluate changes.

2.7. Ethics statement

The study was approved by the ethics committee of Nertiti Rural Hospital. Informed consent was obtained from all participants before the questionnaire was administered. Participants were assured of the confidentiality of their responses and their right to withdraw from the study at any time without affecting their healthcare services.

2.8. Statistical analysis

Data were analyzed using SPSS version 16 (SPSS Inc., Chicago, IL, USA). continuous variables Were summarized as means ± standard deviations (SDs) and categorical variables as frequencies and percentages. Statistical analysis was performed using analysis of variance (ANOVA) followed by Tukey's post hoc test using Statistix Software (version 8.1, USA), with a significance threshold set at $p < 0.05$. Figures were created using OriginPro version 2024b (Origin Lab, Northampton, MA, USA).

3. Results and discussion

1. Age, educational level, age at marriage, pregnancy period, number of children, daily consumption of certain foods, rejected foods, and unusual foods.

Table. 1 presents the age and educational level of the study 149 sample. Notably, 64.6% of the study sample are aged between 20–29 years, 20.8% are aged between 30-39 years, and 14.6% are less than 20 years old. This indicates that the women in the sample can be classified as highly fertile. The table also shows that 82% of the sampled women are completely illiterate, 8% completed primary education, 7% completed secondary education, and 3% have university-level education or higher. These results are similar to the findings of Idris Nour et al. (2023) in Kassala State and Kauda area of South Kordofan State, where a significant number of pregnant women were uneducated. This indicates a low educational level in the Darfur, Eastern Sudan, and Kordofan regions. Fallah et al. (2013) mentioned that nutrition education interventions can significantly improve pregnant women's nutritional awareness, from 3% before intervention to 31% after, regardless of age or literacy level. Mitran et al (2024) stated that the level of nutritional knowledge in pregnant women was highly dependent on their achieved education level. Although illiteracy does not necessarily mean a lack of health and nutritional awareness, these two factors are often correlated.

According **to Table. 1** presents the age and educational level of the study 46% of the women in the sample married between the ages of 15-19 years. Additionally, 30% married between 20-24 years, 17% married under the age of 15 years, and 4% married between 25-29 years. This indicates that 66% of the study sample married before the age of 20, with 17% marrying as minors under the age of 15 years. This suggests that they were not fully physically and mentally mature. It is important to note that early marriage can pose challenges for mothers in handling pregnancy and childbirth, as they are not fully physiologically developed and require larger

quantities of nutrients. This can impact adolescent mothers who often face physical and psychological challenges due to their bodies not being fully developed, leading to high-risk pregnancies, childbirth complications, physical illnesses, depression, and emotional distress (Humaira & Kartini, 2023). Additionally, the data also indicates that 49% of the study sample is in the pregnancy period of 4-6 months, while 51% are in the period of 7-9 months. This suggests that pregnant women in the early months of pregnancy may not prioritize regular check-ups, potentially leading to missed opportunities for monitoring and preventing difficulties. A study by Ulfah & Anggraeni (2023) has shown a significant relationship between pregnant women's attitudes and subjective norms regarding antenatal care and their intention to attend early pregnancy check-ups, such as K1 visits. Table 3 also shows that 36.4% of the study sample has more than 5 children, 31.3% has between 3-5 children, 27.1% has between 1-2 children, and 5.2% has no children.

Table. 1 presents the age and educational level of the study shows that 36% of the women in the study sample consume one main meal a day, 35% consume two main meals a day, and 29% consume three main meals a day. The number of meals determines the adequacy of food that satisfies a person, regardless of the food's nutrient content. The majority of women (71%) consume between one and two meals, which is a higher percentage compared to those who consume three meals (29%). This difference in meal frequency may be due to the low monthly incomes of all families. Gotine et al. (2022) found that pregnant women who eat less than three meals a day may struggle to get enough vitamins and minerals, which can lead to vitamin B12 deficiency. Additionally, Table S2 also shows that 42% of the women consume one snack a day, 35% do not consume snacks, 20% consume two snacks a day, and 3% consume three snacks a day. Cuj-Laines et al. (2018) mentioned that snacks cannot adequately replace three main meals, as they provide large amounts of calories but lack vitamins and minerals. Therefore, consuming snacks between the three main meals is a suitable diet for underweight women. The table also reveals that 64.6% of the women did not change their dietary habits during pregnancy, while 35.4% did. This change in dietary behavior may be influenced by societal status or a lack of knowledge about nutritional requirements during pregnancy. Customs and traditions in Darfur society play a significant role in dietary practices, particularly among families with low levels of education. It is important to consider these factors when recommending specific dietary plans for pregnant women. Incorrect social beliefs and practices, such as reducing food intake during

pregnancy, can contribute to malnutrition in mothers and their children, regardless of the mother's level of education.

Table. 1 shows that 74% of the women in the study reject certain foods, while 26% do not reject these foods. The table suggests that the study sample experiences a dislike or rejection of certain types of foods due to changes in their dietary habits caused by cravings or specific beliefs in their communities. Additionally, the table reveals that 11% of the women chose not to answer the question, while 9% rejected kawal, yogurt, and okra, and 5% rejected fish and meat, despite the high biological value of these protein-rich foods. The table indicates that a significant percentage of the women in the study changed their attitudes towards these foods to rejection, even though they consumed them before pregnancy. This change negatively impacts their ability to obtain essential nutrients during this stage. Furthermore, the table reveals that 57% of the women consume regular foods, 17% consume coal and clay, and 6% consume haloub and unripe mangoes. These results indicate a shift in dietary behavior among pregnant women, who unfortunately prefer foods with no nutritional value over foods that are rich in proteins and vitamins. Some studies conducted by the Organization (2020) have even established a link between iron deficiency anemia and the craving for non-food items such as ice and clay.

Table 1: Age, educational level, age at marriage, pregnancy period, number of children, daily consumption of certain foods, rejected foods, and unusual foods.

Educational level, age, and pregnancy period			Age at marriage and number of children		
Educational level	Frequency	Percentage	Age at marriage	Frequency	Percentage
Illiterate	79	82%	< 15	17	17.0%
Primary	8.0	8%	15 – 19	46	46.0%
Secondary	7.0	7%	20 – 24	29	30.0%
University and above	2.0	3%	25 – 29	4.0	4.00%
Age			Number of children		
< 20	14	14.6%	0	5.0	5.20%
20 – 29	62	64.6%	1– 2	26	27.1%
30 – 39	20	20.8%	2 – 3	30	31.3%
Pregnancy period (Months)			> 5	35	36.4%
4 – 6	47	49%			
7– 9	49	51%			
Daily consumption of certain foods			Rejected and unusual foods		
Daily consumption of foods	Frequency	Percentage	Rejected and Unusual Foods	Frequency	Percentage
Milk (≥2 cups)			Rejecting some foods		
Yes	27	28%	No	71	74%
No	69	72%	Yes	25	26%

Fresh vegetables (twice)			Types of rejected foods		
Yes	24	25%	Kawal, yogurt, okra	9.0	9.0%
No	72	75%	Fish, meat	5.0	5.0%
Fruit juice (≥2 cups)			Abstainers	11	11%
Yes	37	39%	Unusual foods		
No	59	61%	Clay, coal	25	17%
Starchy foods			Unripe mango	16	26%
Yes	25	26%	None	55	57%
No	71	74%			

2. **Meal consumption, tea & coffee intake, acceptance of certain foods, monthly income, wife's occupation, and husband's occupation**

Table 2 reveals that 82.6% of women in the study always eat with family, 9.4% never, and 8% sometimes, a cultural practice in Darfur that may lead to inadequate nutrition for women as they prioritize their children's needs. Additionally, 42% rarely eat at specific times, 38% always, and 20% sometimes, affecting their nutritional status. Regarding tea and coffee intake, 89% drink them immediately after meals, which reduces calcium levels, spoils appetite, causes insomnia and irregular heartbeat, and hinders iron absorption, leading to anemia, preterm birth, and postpartum depression. Caffeine exposure can lead to adverse outcomes such as neonatal low birth weight, apnea, and even caffeine withdrawal syndrome in newborns (Rashed et al., 2019). Therefore, to mitigate these risks, it is advisable for pregnant women to reduce or avoid consuming caffeinated drinks to promote a healthier pregnancy and ensure optimal fetal development. Furthermore, 72% of women accept yogurt, a crucial source of protein and calcium, though it is skimmed. Fried foods have medium acceptance by 61%, weak by 23%, and high by 16%, with fats providing essential energy reserves but excessive intake, especially of saturated fats, threatens heart and artery health, making it advisable to reduce their intake.

Table 2 shows that 73% of the women in the study sample do not know their family's income level, while 17% have unspecified income, and 10% have a monthly income of less than 10 USD. This suggests a low-income level, which can negatively impact the quantity and quality of food consumed by pregnant women. The table also reveals that 90% of the women engage in traditional farming, 5% are students, 3% are freelancers, and 2% are employees. This indicates that all women in the study have some form of employment, as none are unemployed. This aligns with the traditional norms of women in rural Sudan, particularly in regions like Darfur and Kordofan, who play a crucial role in supporting their husbands and households (Bello et al.,

2014). Moreover, the data shows that 52% of their husbands are small-scale farmers, 26% are freelancers, 5% are students, 3% are employees, 3% are workers, and 16% are unemployed. Notably, a significant percentage (16%) of husbands are unemployed, which may be attributed to the inherited traditions in the study area where the wife supports the husband.

Table 2: Meal consumption, tea & coffee intake, acceptance of certain foods, monthly income, wife's occupation, and husband's occupation.

Meal consumption, tea & coffee intake, and acceptance of certain foods			Monthly income, wife's occupation, and husband's occupation		
Eating meals with family	Frequency	Percentage	Monthly income	Frequency	Percentage
Never	9.0	9.4%	< 10 USD	10	10%
Always	79	82.6%	Not specified	16	17%
Sometimes	8.0	8.0%	Don't know	70	73%
Eating at specific times			Wife's occupation		
Always	37	38%	Employee	2.0	2%
Sometimes	19	20%	Farmer	86	90%
Rarely	40	42%	Student	5.0	5.0%
Drinking tea and coffee immediately			Freelancer	3.0	3.0%
No	8.0	8.0%	Husband's occupation		
Yes	85	89%	Employee	3.0	3.0%
Does not drink	3.0	3.0%	Farmer	50	52%
Acceptance of yogurt			Student	5.0	5.0%
Yes	69	72%	Freelancer	25	26%
No	27	28%	Worker	3.0	3.0%
Acceptance of fried foods			Unemployed	15	16%
Medium	59	61%			
High	15	16%			

3. Health aspects of pregnant women, pregnancy, and delivery details

Table 3 shows that 33.3% of the study sample have anemia (iron deficiency), 31% have bleeding cases, 26% have malaria, and 9.3% have typhoid. All women in the study are ill, with many pregnant women suffering from anemia, a major cause of miscarriages and maternal deaths, likely due to inadequate nutrition or lack of knowledge. Anemia is common among pregnant women in developing countries, with an incidence rate of 50% to 70% (Suryanarayana et al., 2017). It is linked to high maternal mortality rates and is exacerbated by poor dietary iron absorption and parasitic diseases. Severe anemia in pregnancy can lead to low iron levels in children, affecting growth and causing potential mental retardation. Iron deficiency anemia is associated with preterm delivery, low birth weight, and poor neonatal health. Pregnant and lactating women often suffer from malaria and intestinal parasites, and many do not take medication due to low economic status and lack of health awareness. A significant number do

not follow up with doctors, indicating a need for better health education and regular check-ups. Poor appetite, inadequate consumption of vegetables and fruits, and lack of weight monitoring are common, leading to underweight conditions and an increased risk of premature birth. Pregnant women should take folic acid and nutritional supplements to prevent anemia and support fetal health. Regular hemoglobin testing is crucial, yet none of the study participants ensured it, highlighting the need for regular laboratory tests during pregnancy.

Table 3: Health aspects of pregnant women, pregnancy, and delivery details

Health aspects of pregnant women			Pregnancy and delivery details		
Health aspects	Frequency	Percentage	Pregnancy and delivery	Frequency	Percentage
Health problems			Interval between pregnancies		
Anemia	32	33.3%	1-6 months	8.0	8%
Typhoid	9.0	9.30%	7-12 months	39	41%
Malaria	25	26.0%	13-17 months	27	28%
Bleeding cases	30	31.0%	18-23 months	18	19%
Medication intake			24 months or more	4.0	4.0%
Never	89	93.0%	Previous births		
Sometimes	7.0	7.00%	0	5.0	5.0%
Doctor or midwife follow-up			1-2	9.0	9.0%
No	60	62.5%	3-4	42	44%
Yes	36	37.5%	5 or more	40	42%
Appetite for food			Type of delivery		
Good	26	27.0%	Natural	60	62%
Not good	70	73.0%	Cesarean	22	23%
Weight monitoring			Both natural and cesarean	9.0	9.0%
No	87	91.0%	Abstainers	5.0	6.0%
Yes	9.0	9.00%	Premature births		
Pregnant women's weight (kg)			No	50	52%
40-49	18	19.0%	Yes	41	43%
50-59	68	71.0%	Abstainers	5.0	5.0%
60-69	10	10.0%	Miscarriages		
Folic acid intake			No	37	39%
Yes	62	65.0%	Yes	54	56%
No	34	35.0%	Abstainers	5.0	5.0%

Table 3. also presents the pregnancy intervals observed in the study sample. Among the participants, 41% had intervals of 7-12 months, 28% had intervals of 13-17 months, 19% had intervals of 18-23 months, 8% had intervals of 1-6 months, and 4% had intervals of 24 months or more. These findings suggest that 49% of women conceive within a year of their previous delivery, often due to a lack of awareness about the associated risks. Close pregnancies deplete

maternal iron stores, leading to anemia and low birth weight infants (LBWI). It is recommended that adequate recovery time between pregnancies is crucial in preventing growth and developmental issues in children. Wendt & Ramakrishna (2017) reported that longer birth intervals are linked to a decreased risk of malnutrition, highlighting the importance of spacing pregnancies for maternal and child health. Additionally, the data indicates that 49% of women conceive annually, even though 67.7% of them have four or fewer children, suggesting high rates of miscarriages or premature births. The study also reveals previous birth data: 44% had 3-4 births, 42% had 5 or more, 9% had 1-2, and 5% had no previous births, further indicating high rates of miscarriage and premature birth. Furthermore, 62% of the participants had natural deliveries, 23% had cesarean deliveries, and 9% had both, indicating that 23% of women faced complications with natural deliveries despite their young age. Premature births were reported by 43% of participants, with 56% experiencing miscarriages. Malnutrition, often associated with low income and education levels, is a significant contributor to adverse pregnancy outcomes, such as premature births. Zinc deficiency, a common problem among pregnant women in low- and middle-income countries, has been linked to the risk of preterm birth (Agedew et al., 2022). Nutrition before and during pregnancy is crucial in reducing miscarriage rates. Studies have shown that consuming sufficient amounts of macronutrients and micronutrients, such as iron, magnesium, zinc, vitamin B12, folic acid, and vitamin C, is important for promoting healthy pregnancy outcomes (Khan & Ali, 2023).

4. Daily meals information and daily amount of tea, coffee, sugar, and sources of drinking water

Table 4. shows that 72% of women in the study do not consume two cups of milk daily, while 28% do. Milk is recommended for pregnant women as it provides calcium, protein, and vitamins B12, B2, and phosphorus which are essential for fetal development (Rodrigues Amorim Adegboye et al., 2020). Additionally, 75% do not consume fresh vegetables, while 25% eat one or two servings daily. Fresh vegetables are vital for pregnant women due to their high vitamin and mineral content and fiber, with leafy greens rich in iron, folic acid, vitamin C, and beta-carotene, and root vegetables like carrots high in carotene and thiamine (Mandryk & Węgrzyn, 2023). Despite the availability, most women do not consume these foods, likely due to a lack of nutritional awareness. The table also indicates that 61% do not consume fruit juices, while 39% drink two cups or more daily. In an area abundant with fruit, this low consumption may be due to a lack of awareness of their nutritional benefits, such as essential vitamins, minerals, and energy.

Fruits like mangoes and citrus are rich in beta-carotene and vitamin C, respectively, aiding in iron absorption and immunity (Rajeswari & Gurumeenakshi, 2017). Furthermore, 74% do not consume starchy foods, while 26% eat one or two servings of potatoes, rice, and pasta daily. These complex carbohydrates provide fiber and various vitamins, with potatoes particularly rich in carbohydrates, fiber, vitamin C, and B6. It is recommended to boil potatoes with their skins to retain nutrients (Robertson et al., 2018).

Table 4: Daily meals information, and daily amount of tea, coffee, sugar, and sources of drinking water

Daily meals information			Daily amount of tea, coffee, sugar, and sources of drinking water		
Daily Meals	Frequency	Percentage	Number of cups of coffee and tea	Frequency	Percentage
Number of main meals			1–2	13	13%
One	35	36.0%	3– 4	65	68%
Two	34	35.0%	5 or more	18	19%
Three	27	29.0%	Number of spoons of sugar		
Number of snacks			2– 4	5.0	5.0%
None	34	35.0%	5–7	11	12%
One	40	42.0%	8–10	73	75%
Two	19	20.0%	≥11	7.0	7.0%
Three	3.0	3.00%	Sources of drinking water		
Change in dietary habits			Well	30	31%
Yes	34	35.4%	Pump	45	47%
No	64	64.6%	Purchase	21	22%

Table 4 also reveals that 68% of the women in the study consume 3-4 cups of tea or coffee daily, while 19% consume 5 or more cups per day, and 13% consume 1-2 cups daily. The table indicates that all study participants frequently consume tea or coffee, despite these beverages having low nutritional value compared to essential foods. This suggests poor dietary habits among the sample, as they are not prioritizing essential and beneficial foods. (Setyarini & Mauludianah, 2022) stated that excessive tea consumption can lead to elevated levels of tannic acid in the body, which can bind with iron and vitamin B12, leading to deficiencies and potentially causing anemia. The data also shows that 75% of the women in the study sweeten their drinks with 8-10 spoons of sugar, while 12% use 5-7 spoons, 7% use 11 or more spoons, and 5% use 2-4 spoons daily. These findings indicate that the study participants consume significant amounts of sugar daily, which can have negative health effects and increase the risk

of diabetes during or after pregnancy. Additionally, the table reveals that 47% of the women in the study obtain their drinking water from pumps, 31% from wells, and 22% purchase it from supermarkets. Despite the availability of pumps and wells in the study area, 22% of the participants buy their drinking water from supermarkets, suggesting limited access to clean and safe water. This lack of access to safe drinking water may increase the likelihood of gastrointestinal infections. Therefore, consuming unsafe water exposes pregnant women to infections that can harm both their health and the health of their fetuses.

4. Conclusions

The study reveals significant nutritional deficiencies and health challenges among pregnant women in Nertiti, Sudan. They have high rates of anemia (33%), bleeding (31%), poor appetite (70%), and low body weight (90% under 60 kg). Many women marry young, resulting in frequent pregnancies and high rates of cesarean (31%), preterm births (43%), and miscarriages (56%). Poor dietary habits are prevalent, with insufficient intake of milk, fresh vegetables, starchy foods, and fruit juices. Additionally, there is high consumption of non-nutritious tea, coffee, and sugar. Improved nutrition with locally available foods has proven effective in increasing hemoglobin levels in anemic women. This highlights the urgent need for nutritional education and interventions to address anemia and malnutrition. Community-based programs should prioritize diverse nutrient-rich diets, regular antenatal visits, and screenings for deficiencies. Promoting locally available nutrient-dense foods and reducing non-nutritious beverage intake while providing supplements and fortified foods through local health centers are essential steps forward.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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