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Food choice, energy and nutrient intake of pregnant women in Afijio and Oyo East Local Government areas of Oyo State, Nigeria

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ABSTRACT

Background: Adequate nutrition during pregnancy is crucial for the health of both the mother and fetus. However, sociocultural factors can significantly influence dietary choices and nutrient intake among pregnant women. Despite the importance of this issue, particularly in regions like South-west Nigeria, research exploring the underlying factors remains limited. **Aims**: This study aimed to investigate the sociocultural factors influencing food choices and nutrient intake among pregnant women in South-west Nigeria. **Methods:** A mixed-methods approach was employed combining quantitative and qualitative methods. A total of 200 pregnant women were randomly selected and administered a semi-structured questionnaire to collect data on socio-demographic and socio-economic characteristics. A 24-hour dietary recall and food choice questionnaire were also administered. Additionally, in-depth interviews were conducted with a random sample of 30 pregnant women to gain deeper insights. **Results**: The mean age of the respondents was 27.2 ± 5.7 years, with most women (53.5%) in their second trimester. The average daily intake of fat, protein, and carbohydrates was 30.71 ± 14.20 g, 70.38 ± 31.61 g, and 314.21 ± 102.02 g respectively. These values deviate from recommended macronutrient distribution ranges, and micronutrient intakes were below recommended levels. Sociocultural factors, including socioeconomic status, cultural beliefs, and food availability, significantly influenced food choices. Factors such as husband's decision-making, cultural acceptability, sensory appeal, perceived naturalness, food restrictions, and food taboos, were identified as key determinants of dietary patterns. Additionally, the high cost of nutritious foods limited access to a balanced diet. **Conclusion**: Inadequate nutrient intake among pregnant women resulted from suboptimal food choices influenced by various factors. To address this issue, intervention programs should be implemented to enhance nutrient intake and promote healthy food choices among pregnant women. Additionally, these programs should aim to reduce social and cultural barriers to healthy eating, thus improving maternal nutrition during pregnancy.

Keywords: Food choice, socio-cultural drivers, pregnant women, nutrient intake.

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1 Introduction

Nutrition during pregnancy is essential for optimal fetal development and maternal health (Arkkola et al., 2006). Inadequate nutrient intake can lead to maternal anemia, thereby increasing maternal morbidity and mortality (Oguntona & Akinyele, 2002). Pregnant women have higher calorie, protein, and micronutrient requirements compared to non-pregnant women due to physiological changes. These increased nutritional needs can be addressed through modifications in dietary habits during pregnancy (Jouanne et al., 2021; Verbeke & De Bourdeaudhuij, 2007). Dietary choices and habits are aspects of concern for the predominant changes in pregnant women's behavior (Lewallen, 2004). These changes can significantly impact a woman's nutritional status and, consequently, the health of the developing fetus (Perez-Cueto, 2019). Socio-cultural factors can further limit access to adequate and nutritious foods and contribute to high levels of undernutrition (Ahmed et al., 2013). High number of women living in sub-Saharan Africa are exposed to deficiencies in essential micronutrients, including iron, zinc, and vitamin A, which can have detrimental effects on maternal and child health (Chakona & Shackleton, 2019). In several cultures, food taboos constitute a set system of rules that guide several human societies and cut across every individual ranging from

children to adults to pregnant and breastfeeding women (Abere & Azene, 2023). These taboos restrict the consumption of certain foods, particularly for women and children (Chakona & Shackleton, 2017) and are rooted in cultural beliefs and misconceptions. Furthermore, they can limit the intake of essential nutrients, such as carbohydrates, iron, animal proteins, and micronutrients derived from meat, fish, eggs, and legumes (Ekwochi et al., 2016).

However, limited research has explored sociocultural factors influencing maternal nutrition and weight gain during pregnancy. While studies have highlighted the impact of cultural beliefs and social norms on dietary practices (Black et al., 2013; Kavle & Landry, 2018), further investigation is needed to identify specific drivers of food consumption among pregnant women (Malek et al., 2016; Opara et al., 2011). Understanding the sociocultural factors influencing dietary choices is crucial for developing effective interventions to improve maternal and child health (Blake et al., 2023). There is a paucity of data on issues relating to sociocultural factors affecting the dietary and nutrient intake of pregnant women, especially in regions such as South-west Nigeria (Adeoye & Okekunle, 2022; Jembi et al., 2023; Oluleke et al., 2016). Hence, the aim of this study was to examine the socio-cultural drivers of food choice as well as the nutritional status of pregnant women in the region.

2 Subjects and Methods

2.1 Study design and setting

This study employed a descriptive cross-sectional study design, utilizing a mixed-methods approach. The study was carried out in Oyo East and Afijio Local Government Areas (LGAs) of Oyo State. Oyo East LGA has 28 public and private health facilities and an estimated population of 123,846 people spread across 10 wards. Afijio LGA has 30 public and private health facilities and an estimated population of 134,173 people spread across 10 wards (Adeoye, 2020; "Afijio," 2024). The two LGAs are mainly dominated by Yoruba and have vast agricultural land that favors the cultivation of food crops such as maize, guinea corn, yam, cassava, cowpea, soybeans, fruits, tomatoes, and cash crops such as groundnut, cocoa, oil-palm, kola nuts, coffee and oranges (List of Coded Health Facilities in Oyo State, 2016).

2.2 Subjects, sampling, and sample size determination

A total of 200 pregnant women completed the study and this was based on the minimum sample size of 96 calculated using Cochran's formula ($N= [Z\alpha^2 \times p(1-p)/ d^2]$) (Cochran, 1977) for estimating minimum sample size for descriptive studies, assuming standard normal deviate ($Z\alpha$) at 95% (1.96), assumed proportion of pregnant women (50%), 10% level of precision, 5% non-response rate and value was approximated to the nearest hundred. One hundred pregnant women were selected from each of the two local government areas, making a total of two hundred respondents. Respondents were selected using a multi-stage sampling technique. In the first stage, two wards were randomly selected per Local Government Area (Afijio: Ilora II and Aawe I; Oyo East: Owode/Araromi and Apaara), and in the second stage, three Primary Health Centers (PHCs) were randomly designated across the selected wards in the Local Government Areas (Afijio: Ilora PHC, Idi-Igba Health Post and Aawe Maternity Center; Oyo East: Araromi Health Center, Araromi PHC, and Oba Adeyemi PHC). The third stage involved random sampling of pregnant women across the three trimesters of pregnancy. All consenting and apparently healthy pregnant women, without a prior history of pregnancy complications and dietary prescriptions, who were attending antenatal care services during the study period were eligible to participate.

2.3 Data collection and tools

Qualitative and quantitative research methods were employed to collect data.

2.3.1 Quantitative method

A pre-tested, semi-structured questionnaire was administered to collect data on socio-demographic characteristics, food choice, and dietary intake. The Food Choice Questionnaire, adapted from Lindeman & Väänänen (2000), was used to assess respondents' food choice motives. These motives were categorized into nine dimensions: health, mood, convenience, sensory appeal, natural content, price, weight control, ethical concerns, and familiarity. Health consideration included perceived nutritional value, health benefits, and the food's potential to promote well-being. Mood-related factors included feeling associated with the food, its role in stress management, life satisfaction, and relaxation. Convenience factors involved the ease of preparation, accessibility, and time required for preparation. Sensory appeal included the pleasantness of taste, texture, and aroma, while natural content referred to a preference for natural ingredients and the avoidance of additives and artificial components. Cost considerations included affordability and perceived value for money. Weight control factors reflected the food's contribution to reducing calorie and fat intake. Familiarity referred to an individual's longstanding exposure to the food, often from childhood, whereas ethical concerns took into account the country-of-origin and environmental sustainability of the food's packaging. Additional factors/drivers influencing food choice included the husband's preference, cultural acceptability, advertising, and information from family and friends.

Dietary intake including food, water, and beverage consumption along with portions sizes was collected using an interviewer-administered multi-pass 24-hour dietary recall. A day dietary recall was conducted for all participating pregnant women. Energy and nutrient intake were analyzed using the locally adapted ESHA's Food Processor® Nutrition Analysis software version 11.7.1 (Salem, OR, USA). Mean intake distributions of energy and nutrients were estimated and compared to dietary reference intakes. Percentile distribution of energy and nutrients intakes were calculated, and the prevalence of inadequacy was assessed based on relevant dietary reference intake thresholds (Institute of Medicine, 2006). Group inadequacy prevalence was determined as the proportion of individuals with intakes below the Estimated Average Requirement (EAR), using the EAR cut-point method. Macronutrient intakes were evaluated as a percentage of total energy intake, with intakes classified as inadequate or excessive intake was classified as inadequate or excessive if they fell below the lower limit or exceeded the upper limit of the Acceptable Macronutrient Distribution Ranges (AMDR).

2.3.2 Qualitative method

The qualitative component of the study consisted of in-depth interviews with 30 pregnant women, who were randomly selected from various primary healthcare centers. The interviews focused on exploring concepts related to food choice, healthy food selection, food taboos and restrictions, barriers and facilitators of healthy food choices, and strategies to improve healthier dietary choices among pregnant women.

The interviews were conducted in person with pregnant women at primary healthcare facilities. All interviews were conducted in either Yoruba or English, depending on the respondents' preference, recorded, transcribed verbatim, and analyzed thematically. Of the participants, 27 were interviewed in Yoruba and three (3) in English. The first theme "*understanding concepts of food choice*" included questions on respondents' opinions regarding food choice, factors influencing their choices, and their most prioritized influencer. The second theme "*healthy food choice*", involved questions about motivations for healthy and unhealthy food choices, characteristics of healthy food, and potential complications of unhealthy food choices. The third theme "*food taboos and restrictions*", covered questions related to specific food taboos, sources of information regarding these taboos, reasons behind them, respondent's opinions, and additional barriers to healthy eating. The fourth theme focused on questions related to strategies to promote healthy food choices during pregnancy.

2.4 Data analysis

Data were analyzed using IBM Statistical Package for the Social Sciences version 20.0. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were computed. The chi-square test was applied to examine relationships between socio-demographic and socioeconomic variables, and the drivers of food choice. Results were considered statistically significant at $p < 0.05$.

Ethical approval for the study was obtained from the University of Ibadan/University College Hospital Research and Ethics Committee with Approval Number UI/EC/18/0545. Participation was voluntary and informed consent was obtained from all respondents. The study adhered to the ethical principles outlined in the Declaration of Helsinki for research involving human subjects. Respondents were informed of their right to withdraw from the study at any time without fear of repercussions.

3 Results

3.1 Sociodemographic characteristics of respondents

A total of 200 respondents participated in the study. The sociodemographic characteristics of the pregnant women are presented in Table 1. Respondents' mean age was 27.2 ± 5.7 years, with 47.0% being between 26-35 years, 44.5% were ≤ 25 years and 8.5% were ≥ 36 years. Only 29.5% of the pregnant women had tertiary education, 37.5% had secondary education as their highest form of education while 24.5% had only primary education. Likewise, respondents' spouses with no more than secondary education constituted 45.0%, 29.5% had tertiary education while 12.5% had only primary education. Major occupations among the pregnant women included artisanship (32.5%), trading/business (31.0%), civil service (12.0%), and farming (13.5%) while 5.5% were unemployed. Respondents' spouses were largely traders (36.0%) and artisans (26.5%) while 19.5% were unemployed. About 45% of the respondents earned N20,000 or less monthly, 25.0% earned between N21000 and N40000 monthly, and 16.0% earned N40,000 per month or higher. The majority of the respondents' spouses (55.5%) earned N20,000 or less monthly, 20.0% earned between N21000 and N40000 monthly, and 16.5% earned N40,000 per month or higher. The mean gestational age among the pregnant women was 23.1 ± 7.4 weeks, respondents in the first, second, and third trimester constituted 9.5%, 53.5%, and 37.0% respectively.

3.2 Drivers of food choice among participants

The drivers of food choice among pregnant women are presented in Figure 1. The majority of respondents indicated that their food choices were primarily influenced by health considerations (98.9%), convenience (98.9%), and sensory appeal (98.9%). Other significant factors included mood (97.1%), the natural content of food (96.2%), price (94.2%),

Table 1. Basic characteristics of respondents and respondents' spouses

Characteristics	Pregnant women N	Pregnant women %	Respondent's spouse N	Respondent's spouse %
Age (years)				
≧ 25	89	44.5	-	-
26-35	94	47.0	-	-
≦ 36	17	8.5	-	-
Mean ± SD	27.2 ± 5.7		-	
Educational status				
No formal education	17	8.5	25	12.5
Primary education	49	24.5	26	13.0
Secondary education	75	37.5	90	45.0
Tertiary education	59	29.5	59	29.5
Occupation				
Unemployed	11	5.5	39	19.5
Farming	27	13.5	16	8.0
Trading/Business	62	31.0	72	36.0
Artisan	65	32.5	53	26.5
Civil service	24	12.0	13	6.5
Others	11	5.5	7	3.5
Monthly Income (Naira)				
≤20000	89	44.5	111	55.5
21000-40000	50	25.0	40	20.0
>40000	32	16.0	33	16.5
Don't know/can't say	29	14.5	16	8.0
Religion				
Christianity	107	53.5	-	-
Islam	84	42.0	-	-
Traditionalist	9	4.5	-	-
Gestational Age				
First trimester	19	9.5	-	-
Second trimester	107	53.5	-	-
Third trimester	74	37.0	-	-
Mean (weeks)	23.10±7.4		-	

the desire for weight control (89.9%), familiarity with the food (88.7%), ethical consideration (81.7%), and decisions made by the family head (67.3%). Less influential factors, as reported by the respondents, included information from family and friends (57.3%), cultural acceptability (50.3%), and advertisement (47.5%).

3.3 Understanding of the food choice and healthy food choice concepts

Key insights from the qualitative discussions with participants are summarized in Figure 2. Food choice is described as a daily routine that involves conscious decision-making and various processes; however, respondents' feedback suggests that only a few fully understood these concepts and their relevance to pregnancy outcomes. Overall, respondents demonstrated a general understanding of healthy food choice and its benefits, however, numerous many struggled to

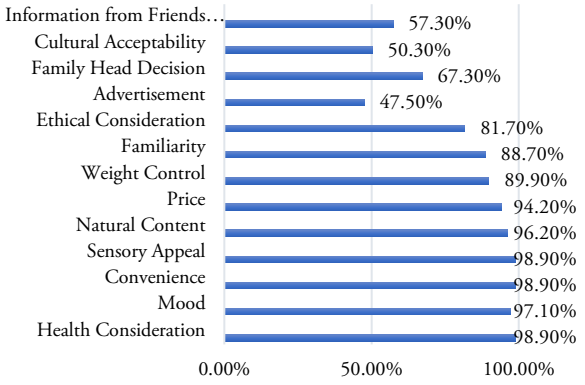

Figure 1. Drivers of food choice among the sampled pregnant women

combine locally available and affordable foods to achieve balanced and nutritious dietary options.

"*Choosing food is very difficult. It depends on what one has, and the type of work is doing. It involves critical thinking and sometimes takes a long time to conclude on what to eat*" – P7, 28 years.

"*Food choice involves many difficult processes. The thought of thinking on the food available at home, how to prepare it, how long will it last the family and how much food money available at hand can buy*" –P15, 33 years.

Inadequate nutrition during pregnancy has numerous complications and consequences. Respondents pointed out several potential complications associated with poor dietary intake among pregnant women. One respondent noted:

"*It is not advisable for pregnant women not to eat well. The consequence is not far-fetched, there will be low blood level and the baby will have deformities when born*" -P27, 40 years.

"*Not eating well during pregnancy may lead to death of the mother and the child in particular. I was an eye-witness of a case in the clinic the day I came to get drugs. The nurses were running helter-skelter to save the life of this pregnant woman and the unborn baby. They discovered that she really had low blood and also did not have enough strength during labor*" – P14, 39 years.

"*Healthy food choice is eating nutritious food to improve quality of life. To eat healthy food means to eat food in all the food classes, especially protein, vitamins, and minerals. Protein is important for bodybuilding of me and my unborn child and vitamins to fight against diseases*" – P30, 23 years.

There is a need to make antenatal nutrition education a context-specific, interactive, and skill-based learning process to ensure that the information disseminated leads to meaningful dietary changes among pregnant

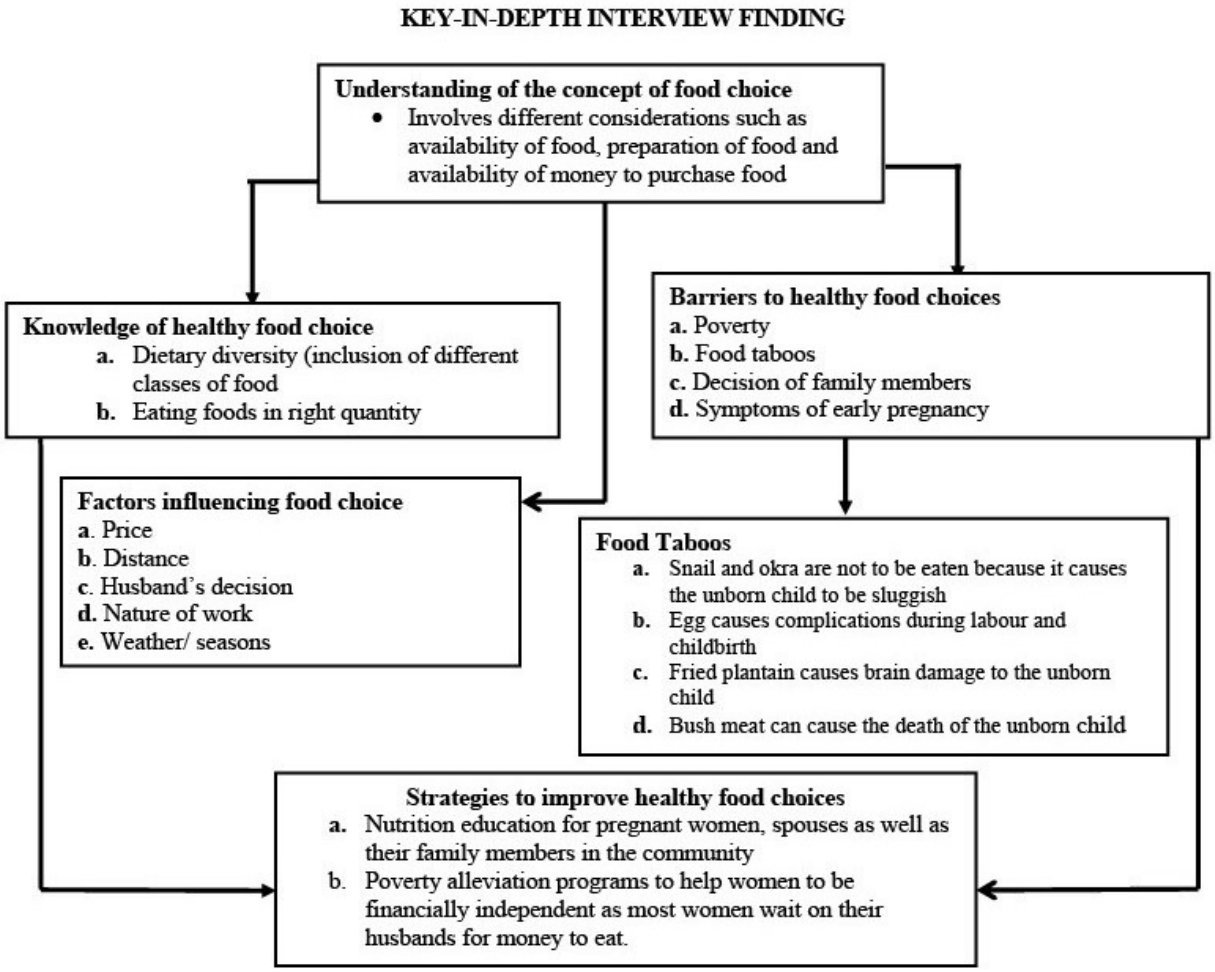

Figure 2. Understanding of food choice among pregnant women in Afijio and Oyo East Local Government Areas

women. In addition, incorporating locally available and affordable food resources in antenatal nutrition education is increasingly important, underscoring the need for regional or agroecological tailored nutrition education programs.

3.4 Influencers of food choice

Decisions regarding food choice are influenced by factors such as food availability and accessibility, weather conditions, food prices, daily activities, preparation methods and time, and economic accessibility (affordability). This decision-making process is often viewed as complex process time-consuming. Additionally, food choices are frequently influenced by other household members especially the husband and mother-in-law, as a gesture of respect or courtesy. Additional factors such as loss of appetite, early pregnancy symptoms, and cultural food restrictions or taboos, further limit healthy food choices among pregnant women.

"*Many factors inspire my food choice. One of them is my husband. My husband determines what I eat. This is because he is the one who gives me money to eat. It is with the little he gives me that I make food choices from*"- P9, 37 years.

"*I do not choose food on my own but I try to convince my mother-in-law concerning the food I eat, yet her choice most times comes established. My mother-in-law watches everything I eat in this condition. She dictates what I'm to eat and not to eat. But when she is not around, I (s)tick to the food prescribed by the health workers in the hospital*" – P13, 30 years.

"*The nature of the work I am doing does not give room for much time to spend on cooking. So, I prepare foods that take little or no time. Though sometimes, I try to wake up early to cook foods that will take time if I really crave them*" – P19, 27 years.

Table 2. Distribution of energy and nutrient intake in pregnant women

Age groups	EAR/ AMDR	AI	UL/AMDR	Mean ±SD	Percentile					% above/below EAR/AMDR/AI
					10th	25th	50th	75th	90th	
Energy (Kcal)				1790.83 ± 577	1029.08	1369.19	1792.77	2135.70	2590.24	
Total fat (%)	20*	-	25**	15.74 ± 6.16	8.67	10.77	15.77	19.27	21.91	80.3% < AMDR
Fat (g/d)	-	-	-	30.71 ± 14.20	14.05	19.33	29.12	39.23	50.51	
Protein (%)	10*	-	35**	15.40 ± 4.29	10.21	12.44	15.19	18.51	20.88	10.7% < AMDR
Protein (g/kg/day)	-	-	-	70.38 ± 31.61	29.44	46.97	69.36	90.6	111.58	
CHO (%)	45*	-	65**	70.30 ± 6.50	60.48	67.3	71.54	74.39	76.57	49.5% > AMDR
CHO (g/d)	135	-	-	314.21 ± 102.02	171.64	247.32	319.69	383.28	446.01	
Total fiber (g/day)	-	28	-	15.26 ± 12.59	1.23	3.16	13.21	26.72	29.4	
Vitamins										
Thiamin (mg/day)	1.2	-	-	0.99 ± 0.70	0.15	0.45	1	1.31	1.89	67.9% < EAR
Riboflavin (mg/day)	1.2	-	-	0.99 ± 0.71	0.16	0.43	0.85	1.39	2	66.1% < EAR
Niacin (mg/day)	14	-	35	11.47 ± 6.68	3.08	6.91	10.9	16.05	20.21	66.1% < EAR
Vitamin C (mg/day)	70	-	2000	11.44 ± 10.51	0.6	1.71	8.24	18.18	25.9	99.9% < EAR
Vitamin A (mcg/day)	550	-	3000	3060.166 ± 438	126.8	510.19	1201.1	2379.39	12452.36	28.6% < EAR
Vitamin B_6(mg/day)	1.6	-	100	0.54 ± 0.31	0.12	0.34	0.51	0.74	0.97	99.9% < EAR
Vitamin B_{12} (mcg/day)	2.2	-	-	2.98 ± 2.15	0.69	1.16	2.58	4.6	5.92	45.5% < EAR
Folate (mcg/day)	520	-	-	243.17 ± 171.67	28.2	86.03	258.03	314.56	459.6	93.8 < EAR
Minerals										
Calcium (mg/day)	800	-	2500	276.14 ± 161.79	70.41	128.2	266.34	385.05	498.7	99.9 < EAR
Phosphorus (mg/day)	580	-	3500	562.39 ± 281.63	233.2	349.69	538.61	718.93	965.131	52.7% < EAR
Iron (mg/day)	22	-	45	18.22 ± 7.05	7.943	13.56	18.03	22.96	27.22	67.0% < EAR
Sodium (mg/day)	-	1500	2300	995.97 ± 687.04	119.89	392.24	987.49	1391.38	1922.805	12.5% < AI
Zinc (mg/day)	9.5	-	40	12.29 ± 6.59	5.14	8.23	10.77	15.2	20.24	35.7% < EAR
Magnesium (mg/day)	290	-	350	143.98 ± 60.48	70.58	108.15	142.85	173.44	221.333	98.2% < EAR
Potassium (mg/day)	-	5100	-	664.35 ± 342.41	217.422	463.98	632.84	829.62	1071.56	100.00% < AI

EAR: Estimated Average Requirement; AMDR: Acceptable Macronutrient Ranges; AI: Average Intake; UL: Upper Limit

3.5 Barriers to healthy food choices among pregnant women

"*I will say the main cause of making bad choices of food during pregnancy is poverty. Lack of money is very rampant in our community. This is due to low income and lack of good jobs we have.*"- P4, 35 years.

"*Distance to where I will get food to buy really matters. Pregnancy is a stressful period. I always look for where is close by, so I can buy and eat what I want to eat quickly.*" – P23, 29 years.

"*Symptoms of early pregnancy especially in the first three months can prompt a pregnant woman to make unhealthy food choices. When I was pregnant with my firstborn, I couldn't eat good food, all I could eat was sweet junk like noodles, puff puff, chocolate, and biscuits. It was after the first three months I started eating good food*" – P17, 35 years.

3.6 Food Taboos among Pregnant women

"*In my husband's family, I was told I should not eat snails and that my child when born would be salivating. I have no choice but to avoid snail.*" – P19, 22 years.

"*Pregnant women are not to eat eggs, especially the yolk of an egg even though I don't know the reason. So, I have to abide by this.*" – P10, 27 years.

"*I was told not to eat fried plantain; this is because the child will develop spaces in the brain called 'okà orí'. So, I avoided fried plantain.*" – P5, 29 years.

The circle of influence on food choice among pregnant women extends beyond the current target audience of antenatal nutrition education. This underscores the importance of broadening the coverage of health and nutrition information intended to promote behavioral changes among pregnant women. Findings from this study highlight the necessity of including mothers-in-law and spouses as part of the target audience for antenatal nutrition education. Furthermore, preparing women early on for the dietary behavior adjustments associated with hormonal changes during pregnancy is essential, although platforms to support such a strategy are limited. The study also reveals that food taboos persist in the study area though not pronounced and are often associated with family background.

3.7 Strategies to improve healthy food choices

Key strategies proposed by respondents to enhance food choices include broadening the scope and reach of nutrition education to include husbands and mothers-in-law of pregnant women, employing additional platforms beyond the health facilities for delivering nutrition education, and providing economic empowerment or food assistance to support pregnant women facing financial hardship.

"*Educating the women during pregnancy is important. Education should not be limited to the walls of the health centers. Education can be taken to the streets so that the husbands, mothers-in-law and other members of the family can benefit.*" – P1, 25years

"*Rendering help through cash or kind to pregnant women in the community that are known to have financial issues or other issues that serve as barriers to not eating healthy foods during pregnancy.*"- P8, 28 years

3.8 Energy and nutrient intake and percentage of inadequacies among pregnant women

Table 2 presents the energy and nutrient intake as well as the proportion of pregnant women with inadequate intake levels. Average daily energy intake was 1790 ± 575.99 kcal. The mean daily intake of fat, protein, and carbohydrate intake was 30.71 ± 14.20 g, 70.38 ± 31.61 g, and 314.21 ± 102.02 g, respectively. Macronutrient intake did not align with the acceptable macronutrient distribution range, with 80.3% of participants deriving less than 25% of their energy from fats, and 10.7% obtaining less than 35% from protein. For vitamins, mean daily intake was as follows: thiamin (0.99 mg), riboflavin (0.99 mg), niacin (11.47 mg), ascorbic acid (11.44 mg), folate (243 mcg), cyanocobalamin (2.98 mcg), vitamin B6 (0.54 mg), and vitamin A (3060 mcg). The proportion of respondents with inadequate intake was significant, with 67.9% deficient in thiamin, 66.1% in riboflavin, 66.1% in niacin, 99.9% in ascorbic acid, 93.8% in folate, 45.5% in cyanocobalamin, 99.9% in vitamin B6 and 28.6% in vitamin A. with mean daily intakes of calcium (276 mg), phosphorus (562 mg), iron (18.22 mg), and zinc (12.3 mg). The prevalence of inadequate intake was 99.9% for calcium, 52.7% for phosphorus, 67.0% for iron, and 35.7% for zinc, indicating substantial deficiencies in these essential nutrients.

4 Discussion

Food choices of women during pregnancy are critical for ensuring optimum maternal health, reducing the risk of birth complications, and mitigating malnutrition and other adverse long-term outcomes. This study set out to identify the factors influencing food choices among pregnant women and to assess their nutrient intake.

Key factors influencing food choices among pregnant women included health considerations (such as perceived nutritional value, health benefits, and the food's health-promoting potential), convenience (ease of preparation, accessibility, and time required for preparation), sensory appeal (pleasantness of taste, texture, and aroma), mood (emotional association with food, stress management, and relaxation), natural content (preference for natural ingredients and avoidance of additives and artificial ingredients) cost (affordability and perceived value for money), influence of family members (especially husband and mother-in-law), and weather conditions. Similarly, in a study among low-income African American pregnant women, knowledge of the benefits of healthy eating during pregnancy, taste, cost, and convenience were reported as influential factors in food choice (Sinclair et al., 2014). This study further revealed that despite understanding the importance of healthy eating, numerous women continued to select foods high in fats and sugars due to taste, cost, or convenience (Sinclair et al., 2014). Asma and colleagues, in their study, found that health, religious beliefs, and convenience were the primary factors in food choices, with sensory appeal, ethical concerns, and familiarity being less important. Interestingly, unlike the findings in the current study, where price was a significant factor, Asma et al. reported that price was not a key determinant in food choice (Asma et al., 2010).

Barriers to healthy food choices among pregnant women identified in this study included poverty, food taboos, influence from family members, and pregnancy related-symptoms. A study among pregnant women in Australia similarly identified the high cost of healthy foods and of early pregnancy symptoms – such as fatigue, nausea, and vomiting, which affect the ability to prepare meals – as significant barriers to healthy food choices (Zinga et al., 2022). In the Democratic Republic of Congo, factors such as food taboos, poverty, and gender norms were found to contribute to poor dietary choices among pregnant women (Maykondo et al., 2022). Additionally, cultural prohibition, limited knowledge of maternal nutrition and gaps in knowledge among health professionals have been reported as barriers that interfere with healthy dietary practices during pregnancy (Demilew et al., 2020).

Findings from this study indicate that food taboos persist in the study area, though they are less pronounced and primarily linked to family traditions. Food taboos have been observed across several communities in Nigeria and some other Sub-Saharan African countries, especially among pregnant women in rural communities (Ea, 2016; Ekwochi et al., 2016; Maykondo et al., 2022; Riang'a et al., 2017). A significant

consequence of food taboos is the inadequate nutrient intake observed among pregnant women in affected communities.

Pregnant women of lower socioeconomic status in developing countries often experience insufficient protein and energy-rich food intake (Beydoun & Wang, 2008; Wright et al., 2010). In this study, the mean energy intake, folic acid, calcium, iron, and sodium and other nutrients were found to be inadequate, with intake levels below recommended daily requirements. Sholeye et al., (2014) reported similar results among pregnant women from rural and urban communities in Ogun State, south-western Nigeria noting that the mean energy intakes, Vitamin A, folic acid, calcium, iron, and sodium were below recommended values with a large proportion of respondents showing micronutrient deficiencies. This aligns with the findings of Blumfield et al., (2013) who found that pregnant women often consume suboptimal levels of vitamin D, folate, iron, and calcium. Similarly, among urban pregnant women in China, studies have reported imbalanced macronutrient distributions with excessive energy from fat and low intakes of Vitamin A, B6, calcium, magnesium, and selenium falling below the Chinese Recommended Nutrient Intake (RNI) and Estimated Average Requirements (EARs) across all trimesters (Liu et al., 2015). However, the mean protein value in this study contrasts with findings from Gao et al., (2013), which reported higher protein intake among pregnant women. This discrepancy may be due to the Gao et al. study's focus on a more educated population and its urban setting.

To enhance healthy food choices among pregnant women, antenatal nutrition education must be context-specific, interactive, and skill-based. Such an approach is critical to ensure that the information disseminated leads to meaningful dietary changes among pregnant women. In addition, incorporating locally available and affordable food resources into antenatal nutrition education is increasingly essential, requiring a regionally or agroecologically tailored approach.

Findings from the study revealed that the sphere of influence on food choice among pregnant women extends beyond the immediate target beneficiaries of antenatal nutrition education. Thus, broadening the scope of health and nutrition information to effectively promote behavioral change is necessary. Our findings indicate the importance of including mothers-in-law and spouses of pregnant women as target audiences for antenatal nutrition education. Furthermore, early guidance for pregnant women on adapting to potential dietary changes associated with hormonal shifts is valuable, although the platforms to implement this are limited. A key strength of this study lies in its use of a mixed method approach, combining qualitative and quantitative techniques to assess food choice, as well as energy and nutrient intake among pregnant women.

5 Conclusion

Various factors influence the food choices of pregnant women, encompassing health-related, economic, and socio-cultural considerations, including food taboos, cultural beliefs, and family influences – particularly from husbands and mothers-in-law. Employing targeted strategies to address these influences is essential to promote healthy food choices among pregnant women, thereby reducing maternal malnutrition and mitigating the serious consequences of inadequate nutrition during pregnancy.

Limitations of the study

While the study objectives were achieved, certain limitations must be acknowledged:

- This study exclusively focused on pregnant women attending antenatal clinics at public primary health centers, excluding those attending private hospitals or not attending clinics at all. Future studies should consider these additional population groups to enhance the scope of findings.
- The sample size was relatively small. To improve data precision, future research should aim to include a larger sample of pregnant women.

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