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Original Article

# Dietary Diversity and Associated Factors among Women of Reproductive Age in Jaja, A Rural Community in Kaduna State, Nigeria

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## Abstract

**Background:** Dietary diversity is an essential concept in the prevention of malnutrition. Nutrient adequacy in the diet is especially crucial in women of childbearing age as it helps to prevent diseases and reduce poor pregnancy outcomes. This study assessed dietary diversity and its associations among women in Jaja, a rural community in Kaduna state, Nigeria.

**Methodology:** This was a cross-sectional descriptive study of women aged 15-49 years selected from each house in the community using a multistage sampling technique. Following informed consent, data were collected using a pre-tested semi-structured interviewer-administered questionnaire. Information on socio-demographic characteristics and dietary patterns of the women was gathered and analysed using IBM SPSS version 26 software. Associations between the Women's Dietary Diversity Score (WDDS) and variables such as level of education, parity, nutrition sensitisation, and ownership of farmlands were tested, and statistical significance was set at p-value <0.05.

**Results:** A total of 371 women were enrolled, predominantly married, Hausa Muslims. Their diet was made up of starchy staple 366(98.7%), Organ Meat 32(8.6%), Fish/Seafood 36(9.7%), Vitamin A rich foods 282(76.0%) and Iron rich foods 69(18.6%). The WDDS was low and had a statistically significant relationship with factors such as the woman's formal education (p-value 0.04), parity (p-value 0.009), geophagia, and having had nutrition sensitization (p-value 0.018) and farmland ownership (p-value 0.022).

**Conclusion:** Dietary diversity was low, with several socio-economic factors identified as its significant predictors among study participants. Multi-layered policies and targeted interventions to improve and sustain dietary practices are recommended.

**Keywords:** dietary diversity, malnutrition, Nigeria, rural, women

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## Introduction

Nutrient intake in adequate amounts is essential for good and healthy living throughout the life course. The adequacy of nutrients in the diet is especially crucial in women of childbearing age as it helps to prevent diseases and reduce the occurrence of poor pregnancy outcomes.[1] Dietary diversity is an essential concept in the fight against malnutrition, as it promotes the consumption of a wide variety of food groups. Dietary diversity is a qualitative measure of food consumption, defined as the number of different food groups consumed over a given period, usually 24 hours.[2] Women experience increased physiologic demand for nutrients during menstruation, pregnancy, and lactation, which puts them at high risk for specific micronutrient deficiencies that can negatively affect their health and that of their foetus or infant.[3] A poorly nourished mother with low intake of energy and protein during pregnancy is at an increased risk of adverse birth outcomes such as a low birth weight or even preterm birth.[4] On the other hand, inadequate micronutrient intake could result in premature birth or neural tube defects.[5] Undernutrition is a serious health problem affecting both mothers and their children worldwide, with higher proportions of women and children from developing countries.[6] The prevalence is significantly higher in sub-Saharan Africa, South Central, and Southeast Asia.[7] Globally, about 2 billion people, most of them women of reproductive age, are also observed to consume inadequately diversified diets.[8] Women from low-and middle-income countries are disproportionately affected, as seen in Kenya, Nepal, and Ethiopia,[9], [10], [11] as diets tend to rely on a large share of calories from rice, wheat, maize, or similar staple foods.[12], [13], [14] which are largely monotonous.

In Nigeria, the nutrition indices are alarmingly poor,[14] about 22% of women of reproductive age are undernourished or thin,[13] while only 51% of mothers have achieved the recommended dietary diversity.[13] Due to the intergenerational effect of malnutrition, and the understanding that maternal diet is a major driver of child and even household diet, understanding maternal dietary diversity is a viable means to achieving food security and attaining Sustainable Development Goal two, to end hunger and food insecurity.[13]

Governments in Nigeria, both at the national and sub-national levels, have proposed and implemented several initiatives to tackle this problem,[15], [16], [17]. Despite these interventions, the magnitude of undernutrition and inadequate dietary diversity remains high among women of reproductive age in Nigeria.[18], [19] This study aimed to determine the dietary diversity and its associated factors among women of reproductive age in the Jaja community, Kudan local government area, Kaduna state. This study will help identify factors that hinder dietary diversity, thus contributing to inform the development of public health strategies that will help improve the nutrition of women during their reproductive years. The results from the study can inform policy towards designing specific nutrition interventions that will target reproductive-age women to improve their health and that of their children.

## Materials and Method

*Ethical consideration*

Ethical approval for this research was granted by the Health Research Ethics Committee of Ahmadu Bello University Teaching Hospital, Shika, Zaria (ABUTHZ/HREC/B40/2024). Permission to enter the community was obtained from the community leaders to carry out this research. Verbal informed consent was obtained from each participant prior to enrolment into the study.

*Study setting and design*

The study employed a cross-sectional design and was conducted in Jaja, a rural community in the Kudan local government area (LGA) of Kaduna state. The study location lies within the tropical wet and dry climate zone, rainfall usually commences in late April and ends in October, while the dry season is between October and April of the following year.[20] It is a predominantly Muslim community with Hausa as the major ethnic group. The people engage mainly in farming (e.g., maize, millet, tomatoes, and onions) and animal rearing, as well as trading to meet their financial needs. There is a health clinic located within the community which offers outpatient services, including maternal and childcare.

*Data collection tools and procedure*

Women of reproductive age group (15-49 years) who were usual residents of the community were enrolled in the study; those who were ill and unable to participate were excluded. An eligible participant was selected from each house, where more than one eligible participant was present in a house; one was selected using simple random sampling by balloting. Trained research assistants collected data from June 22 through 24, 2023, using a pretested electronic semi-structured questionnaire mounted on Kobotoolbox® application on mobile devices. The questionnaire had sections that captured information about the participants, such as socio-demographic characteristics, reproductive profile, dietary diversity, and household food insecurity. It was translated to Hausa language and checked for content validity prior to its administration.

*Women's Dietary Diversity Score (WDDS)*

Women's dietary diversity score assesses vitamin A and Iron in women of reproductive age because these micronutrients are vital for women's health, particularly preventing anaemia and supporting healthy pregnancies, and assessing their intake provides a low-cost proxy for overall micronutrient adequacy and food security in the target population.[21], [22] Prior to beginning data collection, the questionnaire was adapted to the local survey context. Also, adaptation of the food list to the locally available foods and agreement reached on common meanings and translations of terms used to describe key concepts (such as household, meal, and snack). A qualitative 24hour recall of all foods and drinks consumed by respondents was done. Each woman was asked about all foods that she consumed the previous day, inside and outside the home. Dietary diversity scores were calculated by summing the number of food groups consumed by the individual respondents over the last 24-hour recall period.[23] The following steps are included in creating the WDDS: New food groups were created by aggregating some food groups on the dietary diversity questionnaire for those food groups that needed to be aggregated. For example, in the WDDS, the food group "Starchy staples" is a combination of "Cereals" and "White roots and tubers". Values for the dietary diversity variable were computed by summing all food groups included in the dietary diversity score. All scores summed up to values between 0-9. The WDDS was further classified into three groups based on the number of food groups consumed by the respondents. Consumption of ≤ 3 food groups = low WDDS, 4 and 5 food groups = moderate WDDS, and ≥ 6 food groups = high WDDS.

*Statistical analysis*

The data was downloaded from the Kobotoolbox® server as a spreadsheet file, cleaned and coded, then analysed using IBM SPSS version 26. Findings were presented as frequencies and proportions for categorical variables, and then means and standard deviations were used as summary measures for continuous variables where the data were normally distributed, medians and interquartile range were used where the data were skewed. Possible associations between the independent variables and WDDS which is the dependent variable were assessed using Spearman's correlation (age, income, household size, parity and Household Food Insecurity Access Score (HFIAS)) and Man Whitney-U test (marital status, literacy, educational status, pregnancy status, geophagia, nutrition sensitisation, farmland ownership, ownership of livestock and keeping a backyard garden). The level of statistical significance was set at $p \leq 0.05$. A multiple linear regression using the enter method was used to identify the independent predictors of the outcome

(WDDS) among the study population. All variables that were theoretically linked to the outcome and variables with a p-value < 0.2 at bivariate analysis were included in the model (age, marital status, literacy, education, income, household size, parity, HFIAS, nutrition sensitization, ownership of farmland, livestock ownership, and keeping a backyard garden). Results were then presented in tables prepared using Microsoft Office 365 software.

*Strengths and limitations of the study*

To the best of the researcher's knowledge, this study is likely the first of its kind to accentuate such an important aspect of nutrition among women of reproductive age in this community. Primary data was obtained by research assistants with a similar background as study participants using a standardized questionnaire of universal applicability adapted to the local context. This study may also have provided information on the household food access, as there is some evidence that women's dietary diversity also reflects household economic access to food. The study used the FAO's reference period of the previous 24 hours to ascertain dietary recall, which is less subject to recall error and less cumbersome for the respondent. However, our study was carried out in only one season (rainy season) when food supplies were still adequate (about 4-5months after the main harvest), and the timing of our study may not reflect the seasonality of dietary diversity.

## Results

This study enrolled 371 women of reproductive age with a mean age of 26.9±7.4 years, with the majority, 288 (77.6%), aged 15-34 years. The women were predominantly married, 360 (97%). More than half of them, 197(53.1%), had no formal education, and among them, 259(69.8%) were able to read and write in at least one language. Table 1: Their average monthly income was NGN 2,368±3814.6 (<USD2), with a minimum of 0 NGN, Maximum 30000 NGN, with their average household size being six people per household. (6.2±3.5)

Table 1: Sociodemographic Characteristics of Respondents at Jaja, Kudan LGA of Kaduna, June 2023

| Sociodemographic Characteristics | Frequency (%) |
|---|---|
| **Age in years** | |
| 15 – 24 | 144 (38.8) |
| 25 – 34 | 144 (38.8) |
| 35 – 44 | 72 (19.4) |
| 45 – 49 | 11 (3.0) |
| **Ethnicity** | |
| Hausa | 361 (97.3) |
| Fulani | 10 (2.7) |
| **Religion** | |
| Christianity | 2 (0.5) |
| Islam | 369 (99.5) |
| **Marital status** | |
| Never married | 1 (0.3) |
| Married | 360 (97.0) |
| Separated | 4 (1.1) |
| Divorced | 2 (0.5) |
| Widowed | 4 (1.1) |
| **Ability to read and write in any language** | |
| Illiterate | 112 (30.2) |

| | |
|---|---|
| Literate | 259 (69.8) |
| **Educational level** | |
| None | 83 (22.4) |
| Quranic | 114 (30.7) |
| Partly primary | 42 (11.3) |
| Completed primary | 36 (9.7) |
| Partly secondary | 55 (14.8) |
| Completed secondary | 39 (10.5) |
| Tertiary | 2 (0.5) |

## Dietary pattern and related factors

Overall, 186(50.1%) had a low WDDS, with an average WDD-Score of 3.54 ± 1.78 (mean ± SD). Table 2: Their diet consisted mainly of starchy staples, as reported by 366(98.7%), while very few had Organ Meat 32(8.6%) and Fish/Seafood 36(9.7%) included. Figure 1: Most 282(76.0%) of the respondents consumed Vitamin A-rich foods, but consumption of iron-rich foods was low, as only 69(18.6%) of the study participants consumed such foods. Figure 2. Very few 5(1.3%) had geophagia, most of the respondents 292(78.7%) had received any form of nutrition education. The average HFIAS score was 3.7±4.8 (mean ± SD).

Table 2: Women Dietary Diversity Among Respondents at Jaja Community, Kudan LGA, Kaduna State

| Variable | Frequency | Percent |
|---|---|---|
| **WDD-Score** | | |
| 0 | 1 | 0.3 |
| 1 | 53 | 14.3 |
| 2 | 55 | 14.8 |
| 3 | 77 | 20.8 |
| 4 | 92 | 24.8 |
| 5 | 43 | 11.6 |
| 6 | 26 | 7.0 |
| 7 | 14 | 3.8 |
| 8 | 7 | 1.9 |
| 9 | 3 | 0.8 |
| Total | 371 | 100 |
| | | |
| **WDDS Category** | | |
| Low dietary diversity (≤ 3) | 186 | 50.1 |
| Moderate dietary diversity (4-5) | 135 | 36.4 |
| High dietary diversity (≥ 6) | 50 | 13.5 |
| Total | 371 | 100 |

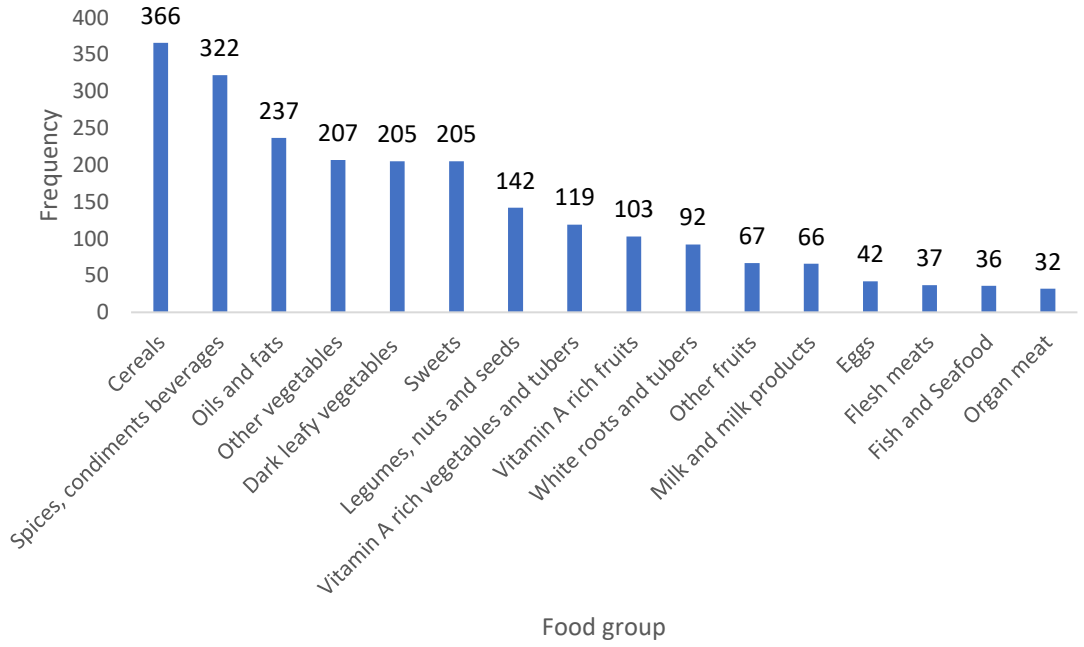


Figure 1: Food Groups Consumed by Respondents at Jaja, Kudan LGA, Kaduna State, June 2023

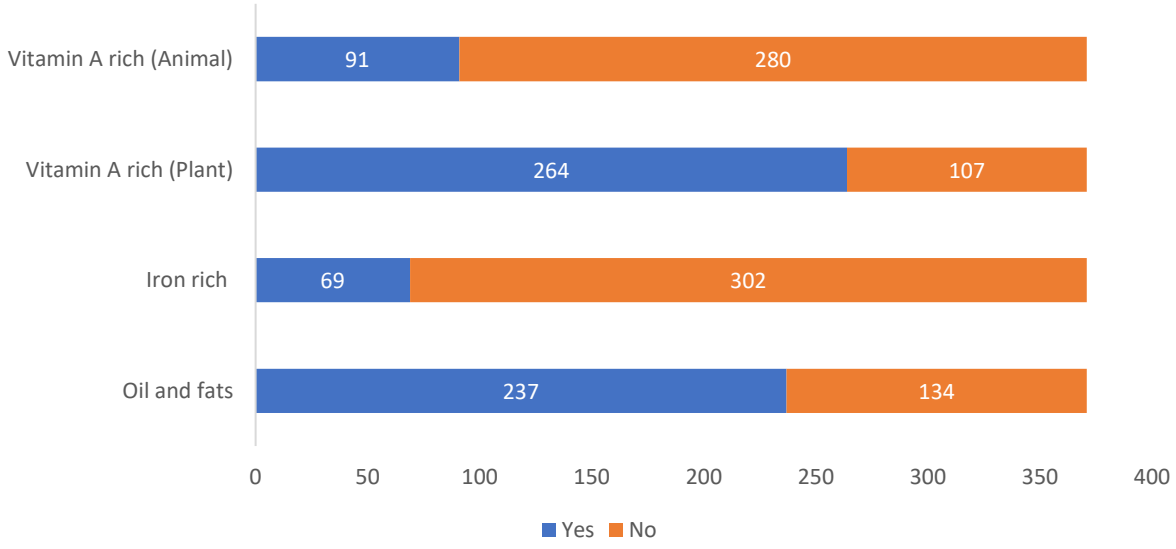


Figure 2: Micronutrient Specific Food Groups Consumed by respondents at Jaja Community, Kudan LGA, Kaduna State, June 2023

## Factors associated with WDDS

On bivariate analysis, WDDS was found to have a statistically significant relationship with some factors such as the woman's level of education (p-value 0.04), parity (p-value 0.009), geophagia (p-value 0.018), HFAIS (p-value 0.006), having had nutrition sensitization (p-value 0.018), and farmland ownership (p-value 0.022). Table 3

Table 3: Bivariate Analysis of the Factors Associated with Women Dietary Diversity at Jaja Community, Kudan LGA, Kaduna State, June 2023

| Variables | f (%) | Median (IQR) | Test Statistic | p-value |
|---|---|---|---|---|
| **Age in years** | 371(100) | | r=-0.071 | 0.170 |
| **Average monthly income** | 371(100) | | r=-0.049 | 0.349 |
| **Household size** | 371(100) | | r=-0.048 | 0.359 |
| **Parity** | 371(100) | | r=0.135 | **0.009*** |
| **HFIAS** | 371(100) | | r=-0.142 | **0.006*** |
| **Marital status** | | | | |
| Not married | 11(2.9) | 3.0(5.00) | U=2323.5 | 0.319 |
| Married | 360(88.1) | 4.0(2.75) | | |
| **Ability to read and write in any language** | | | | |
| No | 112(30.2) | 3.0(2.75) | U=15407.0 | 0.333 |
| Yes | 259(69.8) | 4.0(3.00) | | |
| **Educational status** | | | | |
| No formal | 197(53.1) | 3.0(2.00) | U=19207.5 | **0.041*** |
| Formal | 174(46.9) | 4.0(3.00) | | |
| **Pregnancy status** | | | | |
| No | 317(85.4) | 3.0(2.50) | U=8859.5 | 0.675 |
| Yes | 54(14.6) | 4.0(3.00) | | |
| **Geophagia** | | | | |
| No | 366(98.7) | 3.0(2.00) | U=1467 | **0.018*** |
| Yes | 5(1.3) | 6.0(3.00) | | |
| **Nutrition sensitization** | | | | |
| No | 79(21.3) | 4.0(4.00) | U=9574.5 | **0.018*** |
| Yes | 292(78.7) | 3.0(2.00) | | |
| **Farmland ownership** | | | | |
| No | 135(36.4) | 4.0(3.00) | U=13683.0 | **0.022*** |
| Yes | 236(63.6) | 3.0(2.00) | | |
| **Ownership of livestock** | | | | |
| No | 137(36.9) | 4.0(3.00) | U=15244.5 | 0.424 |
| Yes | 234(63.1) | 3.0(2.00) | | |

| | | | | |
|---|---|---|---|---|
| **Keeping a backyard garden** | | | | |
| No | 245(66.0) | 3.0(2.00) | U=16667.0 | 0.200 |
| Yes | 126(34.0) | 4.0(2.00) | | |

r= Spearman's rank correlation, U= Mann-Whitney U test

On multivariate analysis, parity, HFIAS score, educational status, nutrition sensitization, geophagia, and ownership of farmlands were significant predictors of WDDS. Each additional unit increase in parity is associated with an average increase of 0.102 points in WDDS, assuming other variables are constant. Women who were literate and had geophagia had an average increase of their WDDS score by 0.399 and 1.694 when compared with those without.

However, some variables were predictors of a decrease in the WDD-score. A unit increase in HFIAS Score is associated with an average decrease of 0.0172 points in WDDS, assuming other variables are constant. Also, women who had nutrition education and owned farmlands in their households had an average decrease of their WDDS score by 0.556 and 0.620 points when compared with those without. Table 4

Table 4: Predictors of Women Dietary Diversity at Jaja Community, Kudan LGA, Kaduna State, June 2023

| | WDDS | | 95%CI | |
|---|---|---|---|---|
| Variable | Beta | p-value | Lower | Upper |
| Age in years | -0.009 | 0.522 | -0.035 | 0.018 |
| Parity | 0.102 | **0.003** | 0.034 | 0.169 |
| HFIAS Score | -0.072 | **<0.001** | -0.110 | -0.034 |
| Formal Education | 0.399 | **0.040** | 0.019 | 0.778 |
| Nutrition sensitisation | -0.556 | **0.016** | -1.008 | -0.104 |
| Presence of Geophagia | 1.694 | **0.029** | 0.176 | 3.212 |
| Ownership of farmlands | -0.620 | **0.003** | -1.025 | -0.215 |

Model Summary F=7.153, df (7,363), p-value=<0.001 $R^2 = 0.121$

## Discussion

The majority of the study participants were **married Hausa Muslim women**, primarily within the **20–29-year age range**. This mirrors patterns observed in similar populations in Nigeria. Only a small proportion had completed secondary education, which is the **national minimum qualification in Nigeria**. The **average monthly income** was 2,368.34 Naira, which is significantly **below the national minimum wage** of 30,000 Naira. Most households were typically **large**, with an average **household size of 6.16 persons**.

Almost all women consumed starchy staples; this is consistent with national data, which reports 94% prevalence of such foods in Nigerian diets.[21] Specifically, 92% reported tuber consumption, aligning with North Central Nigeria studies showing high reliance on cereals and tubers in Eggon (79%) and Tiv (94%) communities.[24] This result is also in concordance with findings from South-Eastern Nigeria, where the predominant food groups in the diet of the South-east were cereal/grains (92.0%), white tuber (78.7%), dark green vegetables (55.2%),[25] and also in similar to results from a study in West Bengal where starchy staples were commonly consumed foods.[26]

Moderate consumption was noted for nuts, seeds, vitamin A-rich vegetables, and white roots. In contrast, only 38–40% consumed legumes, and intake of animal proteins was very low: 10% flesh meat, 8.6% organ meat, and 9.7% fish/seafood. These findings are consistent with national trends of lower pulses and animal-source food intake among women. The starchy-dominant diet suggests a serious risk of protein inadequacy and malnutrition in this group.[27] High use of spices, condiments, and beverages was observed, similar to findings also reported in a North Central Nigerian study sample (86.8%).[24]

About half of the respondents in the current study exhibited low to moderate Dietary Diversity Scores (DDS). Meanwhile, a study conducted in Panshekara, Kano State, reported a slightly higher value, that 64.2% of households had low DDS,[28] In contrast, a broader survey conducted across three south eastern Nigerian states (n = 1,200) found that 84.6% had average dietary diversity score and only 7.6% of households had low DDS, while 84.6% had average DDS and 7.8% had high DDS, with a mean score of 7.0 ± 1.8 on a scale ranging from 1 to 14.[25] At the National level in Nigeria, similar findings were demonstrated; based on the most recent data from the Global Diet Quality Project, only 48% of women met the minimum dietary diversity (MDD-W) and 61% were recorded to consume at least one whole grain, pulse, or nut,[21] while the DHS 2018 country survey showed that only 51% of women aged 15-49 years met the diversity threshold.[18]

These numbers reflect a moderate level of dietary variety among women of reproductive age in the country and an indication that about half of the women surveyed are not meeting the minimum recommended dietary diversity, which suggests potential risk of micronutrient deficiencies and overall poor diet quality. The predominance of whole grains and legumes suggests that fibre-rich foods and plant-based protein are somewhat accessible or being consumed, but still leaves a large proportion of women not consuming food groups that are critical for their health and wellbeing. Micronutrient inadequacy is a concern when less than half of the population attains sufficient food group coverage, which could contribute to risks of anaemia, poor immune function, and other nutrition-related health issues. These trends underscore the need for strengthened interventions targeting women's diet diversity through nutrition education, improved food availability, and empowerment strategies.

Across the globe, dietary diversity is a challenge in developing countries, especially in rural communities of resource-limited environments where monotonous low-quality diets are the norm. Comparable distributions of dietary diversity have been documented elsewhere, for instance, in Ethiopia, low, medium, and high DDS were observed in 11.8%,67.2%, and 21.0% of households, respectively.[29] Findings reported in a study from India show the prevalence of low, medium, and high dietary diversity scores was 56.4%, 33.3%, and 10.3%, respectively.[30] These figures align with the moderate diversity observed in our study, which has been identified as one of the severe problems among poor populations that resulted in various forms of nutritional issues.

This study also shows the influence of socio-economic factors such as education, food insecurity (HFIAS), and farmland ownership on women's dietary diversity. Literate women scored, on average, 0.399 points higher in WDDS than their illiterate/unlettered counterparts—an effect that reflects the important role of education. When situated in the context of broader literature, comparable patterns emerge across Africa; for instance, in Cameroon, Kenya, Nigeria, Senegal, and Tanzania, higher education and wealth were consistently associated with better dietary diversity among women of reproductive age.[31] Education enhances nutrition knowledge and improves women's decision-making power, especially as it concerns preference for nutritious food items, as seen among women in Kenya.[32] It is therefore imperative to strengthen the education of girls and to integrate nutrition literacy into adult education programmes in an attempt to improve their diet quality and that of their entire community.

Further, this study found that an increase in HFIAS score corresponded with a decrease in WDDS — highlighting the negative effect of food insecurity on dietary diversity. Similar trends are observed in rural populations of Kenya, Ethiopia, and Ghana, where food-insecure households had lower dietary diversity scores.[33], [34] Interestingly, farmland ownership in this study was tied to a reduction in WDDS. This may be a result of the limited control over land use observed among women, a factor that may lower any potential benefits to their diets.

Each addition to the woman's parity yielded an increase in WDDS—this suggests that women with more children may benefit from greater exposure to health systems or accumulated caregiving experience. In Tanzania, pregnant women with higher nutrition knowledge and those living closer to health centers were more likely to meet minimum dietary diversity (AOR=2.58 and AOR=1.77, respectively).[35] Thus, strategies towards strengthening ANC counseling accessibility and frequency could replicate such gains in this study setting.

Contrary to expectation, having received nutrition education was associated with a decrease in WDDS, possibly because the most vulnerable women—those with poorer diets—are more likely to be targeted for education programmes, without undergoing behavioral change. Geophagia was associated with a +1.694-point increase in WDDS; this may reflect underlying micronutrient cravings or cultural coping strategies during pregnancy. However, geophagia also poses numerous health risks, and cultural contexts must guide interventions. Community and maternal education can successfully challenge harmful dietary myths—such as forbidding protein during pregnancy—resulting in improved maternal and child dietary outcomes.

## Conclusion

The dietary diversity of the women in this study is low, with most having monotonous diets containing mainly starchy staples, in alignment with national and regional findings. The low dietary diversity was noted to be influenced by a complex interplay of socio-economic factors. While some findings—like the positive impact of literacy and parity—align with existing literature, others—such as the negative impact of nutrition sensitization and farmland ownership—challenge assumptions and point to underlying systemic or programmatic issues. Beyond individual and household factors, broader community and environmental conditions contribute to shaping dietary diversity; thus, policies and interventions must be multi-layered: from improving education and food security infrastructures, enhancing nutrition counseling and women's empowerment, and realigning cultural norms through community engagement, to tackling food insecurity through social protection and food system strengthening. Combining social protection with behavior change strategies may help households discontinue cultural practices like food taboos in pregnancy and prioritize nutrient-rich foods even under constrained budgets.

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