Okorie I., Ekeh A.C., Ugo C.H. 2024. "A cross-sectional study on minimum dietary diversity and anthropometric status of women of reproductive age (15–49 years) in Ikwuano Local Government Area, Abia State Nigeria." *World Nutrition*, *15*(4), December, 78–83. https://doi.org/10.26596/wn.202415478-99

Research

A cross-sectional study on minimum dietary diversity and anthropometric status of women of reproductive age (15–49 years) in Ikwuano Local Government Area, Abia State Nigeria

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Keywords: women of reproductive age, minimum dietary diversity, body mass index; waist-hip ratio; non-consecutive 7-day 24-hr dietary recall

https://doi.org/10.26596/wn.202415478-99

World Nutrition 2024;15(4):78-83

Background

To prevent nutrient deficiencies and chronic diseases, women of reproductive age (WRA) (15–49 years), need to eat a diversified and adequate diet for the provision of micronutrients and phytochemicals.

Objective

The purpose of the study was to conduct a seven-day assessment of the minimum dietary diversity (MDD) and anthropometric status of WRA in Ikwuano Local Government Area.

Methods

A community-based cross-sectional study design was used among 208 consenting WRA from 8 communities in 2 clans of the LGA. A semi-structured 7-day recall questionnaire that measured MDD for women (MDD-W) was used. A score of 5 (out of 10) food groups was considered to be an adequate MDD. The WRA's body mass index (BMI) and waist-hip ratio (WHR) were evaluated, and BMI was calculated and compared with standards. The data were analyzed using descriptive statistics (frequency and percentage), the paired sample t-test, and Spearman Correlation, while the level of significance was set at $p < 0.05$.

Results

About 51.0% of sample women achieved MDD, 29.8% were underweight, 14.4% were overweight and 7.2% were obese. There was a significant difference ($p < 0.05$) in the mean value between day 1 (4.45) and day 7 (4.75) in the MDD of these women. BMI was higher among those who were unemployed, and MDD scores were significantly higher when the WHR was higher.

Conclusions

Most of the respondents achieved MDD, which also contributed to higher WHR. Unemployment was strongly linked to higher BMI status among these respondents.

INTRODUCTION

Maternal health is a crucial aspect of public health, and eating healthy while of reproductive age is indispensable for improved health outcomes for women and for any children they may have. A lack of dietary diversity can lead to inadequate intakes of nutrients as well as phytochemicals and other healthy substances found in whole foods, further contributing to maternal malnutrition such as underweight, micronutrient deficiency, etc., which are major risks for morbidity and mortality in women. Women of reproductive age (WRA) (15–49 years old) are especially vulnerable to micronutrient deficiencies due to their high micronutrient requirements (Allen, 2005; Mirmiran et al. 2006; Issa et al. 2024). Micronutrient deficiencies may jeopardize the health of both the mother and the child by adversely affecting fertility, pregnancy outcomes, and congenital anomalies (Lassi et al., 2020).

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Despite numerous calls to channel attention to women's diet quality, with a particular focus on micronutrient adequacy, there haven't been many programmes to address the problems. This has been due, in part, to a lack of reliable indicators to evaluate these problems in low-income countries, as well as a lack of data on women's dietary practices and micronutrient deficiencies.

Dietary diversity refers to diet variety in appropriate quantity, which are the two main components of diet quality. Women are also more likely to be overweight or obese. Obese WRA have an increased risk of gestational diabetes, preeclampsia, operative delivery, foetal macrosomia, and neonatal morbidity. Obesity is now a global epidemic that has a greater impact on the health of WRA in low and middle-income countries than in high-income countries. A nutritional situation analysis of WRA in Nigeria revealed that 28% were overweight or obese, greater in urban (36.0%) than rural areas (21.0%) (Nigeria Demographic Health Survey (NDHS), 2018).

According to NDHS (2018) about 56% of WRA in Nigeria consumed food from five or more of the ten total food groups. However, there is a lack of data on minimum dietary diversity (MDD) for WRA and on their anthropometric status in the Ikwuano Local Government Area of Abia State. The present study aimed to measure the minimum dietary diversity, and anthropometric status of WRA in the Ikwuano Local Government Area.

METHODS

A community-based cross-sectional design was used for the present study which used a non-consecutive 7-day minimum dietary recall questionnaire to measure dietary diversity and also measured the anthropometric status of WRA in the Ikwuano Local Government Area. A consent letter was obtained from the Chairman of the Local Government, traditional rulers of the communities to allow the researchers carry out the study in their communities, and consent was also obtained from the study participants themselves. Ethical approval to conduct the study was obtained from the Health and Research Ethics Committee (HREC), Federal Medical Centre (FMC) Umuahia, Abia State, Nigeria.

STUDY POPULATION

The study population was 208 WRA living in communities in Ikwuano Local Government of Abia State. Pregnant women, lactating mothers and other WRA who were sick at the time of the study were excluded.

The sample size for the study was estimated using Cochran's formula described by Araoye (2008).

$$n = \frac{Z^2 P\ (100-P)}{e^2}$$

margin of tolerable sampling error applied was 5%

P = prevalence of overweight or obesity among WRA in rural Nigeria, 21% according to NDHS (2018).

$$N = \frac{1.96^2\ X\ 21(100-21)}{5^2} = \frac{3.8416\ X\ 21(100-21)}{25} = \frac{3.8416x1659}{25} = 254.93$$

= 255.

SAMPLING PROCEDURE

The population of the Ikwuano Local Government Area is made up four clans. For convenience, two clans were sampled by balloting without replacement. Four communities were randomly selected from each of the two selected clans (Oboro and Ariam), making a total of eight communities for the study. A quota sampling technique was used to select the study respondents in each of the communities. In each community, a town crier was used to gather respondents who were within the age range (15–49 years) in the community square. Ballot paper with 'Yes' or 'No', was used to select those that would participate in the study, those that picked 'Yes' were part of the study. Approximately 26 respondents from each of the communities took part in the study. The respondents were identified individually, with a name and house tag for ease of further data collection on the 7 non-consecutive days they were visited.

DATA COLLECTION

The sample size was originally 255 but 18% of them dropped out. The achieved number of responses was thus 208. The respondents were interviewed using a semi-structured questionnaire to obtain background information. Another questionnaire we used had been developed by FAO to measure MDD for women (MDD-W) of reproductive age (FAO, 2014). This tool provides results with significant associations with nutrient adequacy for all WRA, regardless of physiological status (Nguyen et al., 2018; Tayakoli et al., 2016). It collected data on various food groups consumed in a day, for non-consecutive 7-days, adapted for local dietary practices and conducted in local languages. Ten food groups used included grains, white roots/tubers or plantain (rice, bread, pap, potatoes, gari, fufu, or plantain), pulses (beans, *moi-moi*, African yam beans), nuts and seeds (groundnut, melon seed, walnut, breadfruit seed, *ogbono* seed or cashew nut), dairy (milk and milk product) (milk powder, liquid milk, ice cream or yoghurt), flesh foods (organ meat/meat/poultry/fish or seafood) (cow meat, fish, goat meat, chicken, turkey, pork meat, prawn, crab or shrimp), eggs, dark green leafy vegetables (pumpkin leaves, waterleaf, bitter leaf, *uziza, utazi, okazi* or garden egg leaves), other vitamin A-rich vegetables and fruits (carrots, sweet potatoes, red *tatase*, pumpkin, mango, pawpaw or *ogbono* fruit), other vegetables (okra, tomatoes, sweet potatoes leaves, cowpea leaves, green pepper or green beans) and other fruits (avocado pear, orange, tangerine, banana, grapefruit or guava).

A dietary diversity score was calculated by summing the number of food groups consumed by the individual respondent over the 24-hour recalls. The population level indicator was calculated based on the following formula

$$\frac{\text{Women (15 – 49years) } who\ consumed\ food\ from\ 5\ groups\ during\ the\ previous\ day}{\text{Total number of women 15 – 49years old}}$$

Only those who consumed five or more food groups were said to have met minimum dietary diversity.

The WHO (2004) classification for body mass index (BMI) was used: underweight (< 18.50 kg/m^2), normal (18.50–24.99 kg/m^2), overweight (25.0–29.99 kg/m^2) and obese (⩾ 30 kg/m^2). For the waist-hip ratio (WHR), the following WHO (2008) classification was used: normal (< 0.80 cm) and obese

(> 0.80 cm). However, WHO Anthro-Plus software was used for adolescents aged 15–19 years to calculate their anthropometric status and compared with the WHO growth reference standard of, -2 to -1 SD z-score (normal), +1 SD z-score (overweight), +2 SD z-score (obesity) and -3 SD z-score and below (underweight), was used.

ANTHROPOMETRIC MEASUREMENT

Weight and height measurement were measured using techniques described by WHO (2008). Participants were weighed three times with minimal clothing and the average was recorded to the nearest 0.1 kg. The height was measured to the nearest 0.1 cm with participants' heels and buttocks against a wall. Their BMI was calculated using (weight in kilograms/height in meter square).

Waist and hip circumference were measured as described by WHO (2008) using a non-stretchable tape. Participants were asked to remove all heavy and tight clothing; belts were loosened and pockets emptied. Subjects stood with their feet 12–15 cm apart, with their weight equally distributed to each leg. They were asked to breathe normally and the reading of the measurement was taken at the distance around the smallest area below the rib cage and above the navel at the end of gentle exhaling. The measuring tape was held firmly, ensuring its horizontal position. The tape was loose enough to allow the observer to place one finger between the tape and the subjects' body and the measurement was recorded to the nearest cm. This procedure was conducted twice and the average of the two measures was recorded. The hip was measured while standing tall and relaxed with the feet together. The measuring tape was kept horizontal around hip and buttocks. The measuring tape was held tight but not to compress or pinch the skin, was taken at the largest area, checked and recorded to the nearest 0.1 cm.

STATISTICAL ANALYSIS

Descriptive statistics, namely frequency and percentage, as well as mean and standard deviation were used for the background information/socioeconomic characteristics. A paired sample t-test was used to test the difference in MDD-W between day 1 and day 7, and Spearman Correlation was carried out to examine the relationship between socioeconomic status, anthropometric status and MDD of the WRA. A significant difference was declared at $p < 0.05$. The IBM-SPSS software version 26 was used for the analysis.

ETHICS

The study was reviewed and approved by the Ethical Committee Federal Medical Centre Umuahia, Abia State Nigeria with reference number – FMC/QEH/G.596/Vol.10/712. The participants provided written/oral informed consent to participate in the study.

Table 1: Background information of the respondents (women of reproductive age)

Parameters	Frequency (n = 208)	Percentage (100)
Age		
15 – 19yrs (late adolescent)	84	40.4
20 – 24yrs (young people)	54	26.0
25 – 49yrs (adult)	70	33.7
Marital status		
Single	168	80.8
Married	39	18.8
Widowed	1	0.5
Educational level attended		
No primary education	4	1.9
Primary education	11	5.3
Secondary education	111	53.4
Tertiary education	82	39.4
Occupation		
Unemployed	116	55.8
Self-employed	68	32.7
Salary earner	1	0.5
Students	23	11.1
Income		
< ₦20,000	58	27.9
₦20,000 – ₦50,000	29	13.9
₦51,000 – ₦80,000	6	2.9
> ₦81,000	2	1.0
No income earning	113	54.3

$ 1 USD = ₦ 1,745

Table 2 shows the mean percentage of the non-consecutive 7-day dietary diversity of the sample women, ranked by percent who had consumed them.

Table 2. Food groups consumed at least once in seven 24-hr recalls in a sample of women of reproductive age in Nigeria

Food groups	Yes	
	Frequency (n = 208)	Percentage
Grains, white roots/tubers or plantain	208	100.0
Nuts & seeds	171	82.2
Pulses (beans, peas & lentils)	159	76.4
Milk & milk product	148	71.2
Dark green leafy vegetables	148	71.2
Vitamin A-rich fruits & vegetables	142	68.3
Organ meat, meat, poultry, fish or seafood	138	66.3
Eggs	115	55.3
Other vegetables	101	48.6
Other fruits	79	38.0

Figure 1 shows the proportions who achieved minimum dietary diversity over a 7-day period among the respondents.

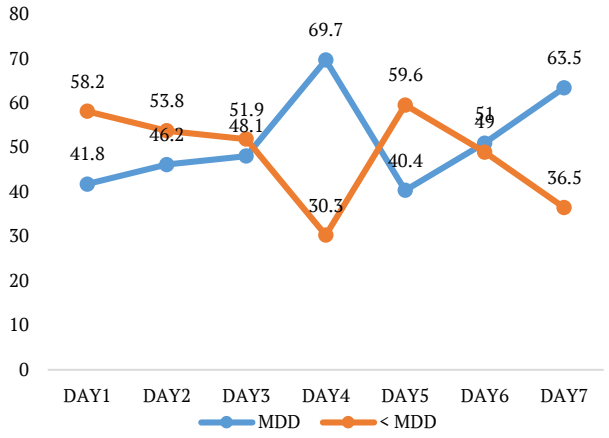

Figure 1: Proportions who achieved minimum dietary diversity over a 7-day period among the respondents (women of reproductive age).

MDD = minimum dietary diversity; <MDD = less than minimum dietary diversity.

Table 3 shows the mean average of a 7-day MDD status of the respondents. 51.0% met this (which in effect meant they consumed at least one vegetable, fruit, pulse/nut/seed, animal source food and starchy stable).

Table 3. Mean average minimum dietary diversity status of women of reproductive age

Parameters	Frequency	Percentage
Less than MDD	102	49.0
MDD	106	51.0
Total	208	100.0

MDD = minimum dietary diversity

Figure 2 shows the proportion of the respondents in various anthropometric categories, illustrating the differences between estimates that are based on BMI or WHR.

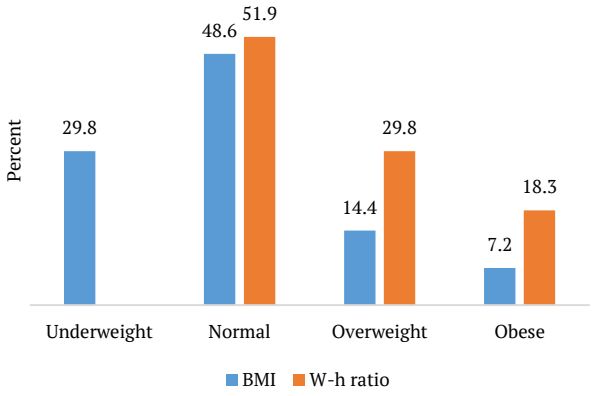

Figure 2: Anthropometric status of the respondents (women of reproductive age)

BMI = body mass index; W-h ratio = waist-hip ratio; zero cases of underweight were identified using W=h ratio

Table 4 shows that MDD was lower on day 1 than on day 7.

Table 4: Comparison between day 1 and day 7 on minimum dietary diversity of the women of reproductive age

Parameter n = 208	Day 1	Day 7	MD	Std error	p-value	%D
MDD-W	4.45 ± 0.71	4.75 ± 0.76	0.30 ± 0.93	0.064	0.0001	6.74

MD = mean difference; std error = standard error; %D = percentage difference

Table 5 shows the relationship between socioeconomic status, MDD and anthropometric status (BMI and WHR) of the respondents. Unemployed women had significantly ($p < 0.05$) lower BMI status and MDD. There was a positive relationship ($p < 0.05$) between WHR and MDD.

Table 5: Relationship between socioeconomic status, minimum dietary diversity and anthropometric status of women of reproductive age (n = 208)

	BMI	WHR	Education	Occupation (unemployed)	MDD
BMI					
r	1	-0.018	0.021	-0.279*	-0.018
p-value		0.797	0.868	0.0001	0.797
WHR					
r	-0.018	1	0.007	-0.045	0.156*
p-value	0.797		0.921	0.521	0.024
Unemployed					
r	-0.279*	-0.045	0.126	1	-0.152*
p-value	0.0001	0.521	0.069		0.028

*BMI = body mass index: WHR = waist-hip ratio: MDD = minimum dietary diversity; r = correlation: * = denotes significant value.*

DISCUSSION

Consuming a diverse and balanced diet during among WRA is vital for ensuring their micronutrient status, among other things. This study examined that among WRA in an area of Nigeria.

A plurality (40%) of the WRA in our sample were in late adolescence, aged 15–19 years. The late adolescent period is crucial for preconception nutrition particularly related to non-communicable diseases (NCDs) later in life. A majority of the respondents who participated in this study were single, as expected among younger women, at least where the low prevalence of early marriage is low, as in the study area. Despite the respondents' relatively high levels of education, the majority were unemployed or working in low-wage occupations. This is unsurprising given Abia State's high unemployment rate of 31.6% (NBS, 2018).

The respondents' dietary diversity was assessed over a non-consecutive 7-day period of 24-hr recalls to determine their MDD as a measure of diet quality. They did not meet it for the first three sessions and the fifth session of data collection. This implies that there was irregularity, perhaps in terms of accessibility to a minimum diversified diet, or possibly limited knowledge on the importance of diverse diet or how to achieve it. Nevertheless, the majority achieved MDD over the entire period, which means they consumed food from five or more food groups (often at least one vegetable, fruit, pulse/nut/seed, animal source food and

starchy staple) the previous day. This could well have led to dietary adequacy of micronutrients.

51.0% of the WRA in our study achieved MDD, compared to 71.7% of WRA in Mauritania reported by Issa et al. (2024), but only 25.0%, 31.0% and 40.3% of the WRA in South Africa (Chakona, 2017), Burkina Faso (Custodio et al., 2020) and Bangladesh (Islam et al., 2023), respectively.

The majority of these WRA were malnourished (underweight, overweight or obese). This compared with the 28.8% reported by Abdulkarim et al. (2014) on the malnutrition prevalence in the Abuja Municipal Area Council Nigeria. Obesity is one of the most significant public health challenges facing Nigeria, with about 21.0% of WRA overweight or obese, even in the rural areas in Nigeria (National Population Commission (NPC), 2019).

Unemployment was associated with both lower MDD and lower BMI. Lower income likely reduces people's ability to access a wide variety of foods. This in turn could lead to a lower BMI (increasing the risk for underweight). An individual's employment status is linked to their dietary and health status (Adekoya et al., 2022). Dahiya and Viswanathan (2015) and Viswanathan et al. (2015) also found a lower BMI with lower socioeconomic status.

Focusing well evaluated interventions on WRA (especially the younger group), could reduce the long-term consequences of poor maternal nutrition and obesity, even on the child (Abdulkarim et al., 2014; Adekoya et al., 2022). Utilizing a diet quality-based framework to improve their micronutrient intake could reduce the over-dependence on micronutrient supplementation as a strategy.

LIMITATIONS

The present study did not examine the quantity of food consumed by the respondents and thus could not determine if they were meeting their daily nutrient requirements. While the dietary assessment procedure we used is methodologically strong, the cross-sectional nature of the study prevented us from taking seasonal variation of diet into account.

CONCLUSIONS

Although substantial proportions of this relatively young sample of WRA in an area of Nigeria were either underweight or overweight, about half were in the normal range. About half also achieved MDD, defined as consuming a least five or more food groups among 10 possible. 56% of these women were unemployed and this was linked to a lower BMI and a lower MDD. Unlike BMI, the WHR was associated with a higher MDD. Further study on the quantity of food consumed is required to develop a strategic framework/policy and intervention to improve dietary diversity and thus macro- and micronutrient status of women of reproductive age in Nigeria. We believe that the use of the non-consecutive 7-day dietary assessment that we used will be a useful tool for obtaining accurate data in this regard.

AUTHOR CONTRIBUTIONS

IO: design of the study, final content developer, data analysis, and data collection, supervision, funding, methodology. ACE: Literature search, data collection, and processing, funding. CHU: literature search, data collection, and processing, funding. Both authors contributed to the article and approved the submitted version.

CONFLICT OF INTEREST

The authors declare that they have no other potential conflicts of interest.

ACKNOWLEDGEMENTS

None

FUNDING

None

Received: November 8, 2024; **Revised:** December 4, 2024; **Accepted:** December 21, 2024; **Published:** December 31, 2024.

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