

Research Article

Dietary Quality and Its Impact on Maternal Nutritional Status in Ondo State, Nigeria

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Abstract

Background: Malnutrition is one of the major problems that have bewildered human health in developing countries **Objective:** The study aimed to assess maternal diet quality and nutritional status of in Ondo state. **Methods:** This was a community based descriptive and cross-sectional study that consisted of 420 respondents (mothers). Respondents were drawn using multistage sampling procedure. Pre-test, semi-structured Interviewer administered questionnaire was used to elicit information from the respondents while anthropometric indices such as height, weight, waist circumference, hip circumference were measurement and Waist hip ratio, mid upper arm circumference were computed according to standard. Body Mass Index (BMI) was calculated from weight and height measurements and classified into underweight (<18.5), normal weight (18.5-24.9), overweight (25.0-29.9) and obesity (≥ 30.0). Data were analysed using descriptive and inferential statistics while level of significant was set $P < 0.05$. **Results:** The nutritional status of the women shows that there was a double burden of malnutrition indicating 10.7% under nutrition, 29.0% overweight and 4.8% obese. BMI was significantly associated with mothers' age ($p = 0.000$), place of residence ($p = 0.009$), marital status ($p = 0.017$), mothers' occupation ($p = 0.026$), occupation of spouse ($p = 0.009$), and monthly income ($p = 0.008$). **Conclusion:** There were existence of a double burden of malnutrition and high prevalence of overweight and obesity in the study area. Household food insecurity contributed greatly to the malnutrition observed in many mothers in the study. Nutrition and health promotion education intervention is recommended in the study area.

Keywords

Malnutrition, Maternal, Diet Quality, Nutritional Status, Overweight, Obesity

1. Introduction

Diverse or quality diets are essential for nutrition and health of all household members but especially important for women of child-bearing age and children as they represent the most vulnerable groups to malnutrition [1]. A quality diet encompasses two major components: adequate coverage of basic macro and micronutrient needs and diet variety.

Many low income and food insecure households lack diet variety and as such consume monotonous diets such as starch staple without animal products, vegetable and fruits [2].

Dietary diversity is an indicator of diet quality or adequacy. It is equally valuable for measuring food security status of a

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particular population [3]. Dietary diversity refers to the total number of food groups consumed over a reference period. For women of reproductive age (15-49 years), the minimum dietary diversity for women (MDD-W) is used to validate their diet quality or adequacy. It is a dichotomous indicator based on ten (10) food groups. Consumption of at least 5 of the 10 possible food groups over a 24 hour recall period is acceptable and said to be adequate. Many women fail to meet this criterion due to poor nutrition knowledge, social circumstances, cultural beliefs and practices [4]. A diverse diet is sufficient with regards to value, amount and nutrition [5, 6]. A diverse diet strengthens the immune system, reduces the risk of deficiency and non-communicable diseases, it enhances productivity thereby reducing the vicious circle of poverty and hunger [7, 8, 1]. It is also associated with a number of improved outcomes such as birth weight, child anthropometric status and improved haemoglobin concentrations. A diverse diet is crucial to the attainment of the most prominent SDG 2 (end hunger), SDG3 (ensure health and promote wellbeing for all at all ages) and SDG12 (ensure sustainable consumption and production patterns) [9]. A non-diversified diet could result to a reduction in physical capabilities and continued cycle of malnutrition. An underweight mother is more likely to have a stunted child and the child could grow into a malnourished adult and then into a nutritional deficient pregnant woman [10, 11]. Therefore, it is essential to encourage actions such as high-quality diet in order to improve nutrition and health outcomes [12].

A healthy lifestyle and the prevention of disease depend largely on proper nutrition [13]. Malnutrition exists in different forms, as micronutrient deficiencies, undernutrition, overweight, obesity, and non-communicable diseases. The reasons for not eating a healthy, diverse diet are intricate and multifactorial. However, they include a lack of access to foods, uncertainty on diverse diet composition, cultural norms, traditions, poverty, and food and nutrition governance [14]. In 2019, almost three billion people worldwide were unable to afford nutritious diets [15]. The term 'triple burden of malnutrition' refers to a situation where overnutrition, undernutrition, and micronutrient deficiency exist. In low-income nations like Nigeria, it is a significant public health issue [16, 17].

Maternal undernutrition continues to be an excruciating public health challenge yet most interventional programs are focused solely on infant and child nutrition outcomes. The burden is evident in the high global maternal and infant morbidity/mortality [18]. In south-central Asia and sub-Saharan Africa, more than 3.5 million mothers lose their lives annually and undernutrition accounts for 10 to 40% [19]. In Nigeria, 6.9 percent of women (15-49 years) are acutely malnourished and 3.8 percent are severely malnourished [20]. Due to their increased physiological demands, women who consume diets low in nutrients are more susceptible to poor health and unfavourable reproductive consequences. A deficiency in sufficiently varied diets and dependence on plant-based food sources are major causes of women's undernutrition in many resource-constrained

environments [21, 22, 23]. Currently, there is paucity of information on links between diet quality and nutritional status of mothers and this call for immediate action. Understanding the influence of dietary quality on nutritional status will provide useful information to enhance interventions to curb the situation. Therefore, this study was prompted and is aimed to fill the notable gap of maternal diet quality and nutritional status in Owo local government of Ondo state.

2. Methods

2.1. Study Area and Population

The study was carried out in Owo Local Government Area in Ondo State. Owo Local Government Area is situated in south-western Nigeria, at the southern edge of the Yoruba Hills and at the intersection of roads from Akure, Kabba, Benin City, and Siluko. Owo Local Government has eleven (11) political wards and is considered a semi-urban area with a population of 222,262 [24]. Majority of the inhabitants are government workers. The study consisted of women of reproductive age (15-49 years) having children (0-5 years).

2.2. Study Design and Sampling

The study adopted a descriptive community-based cross-sectional design. A sample size of 420 respondents was achieved using fisher's formula with a confidence level of 95%, 5%; 8% margin of error, 45.8% estimated prevalence of food insecurity in Ondo state and 10% non-response rate. Multi-stage sampling was employed to select the sample size (420); the first stage involved the selection of 4 wards from the 11 (eleven) wards in Owo Local Government using simple random sampling. The second stage was selecting two communities from the four wards. The third stage involved the selection of mothers in each of the selected communities using systematic sampling.

2.3. Inclusion and Exclusion Criteria

Women who had children (0-59 months) and were not pregnant were included in the study while women who were sick were excluded from the study.

2.4. Recruitment and Training of Research Assistants

Four (4) research assistants were recruited based on reliability and fluency in the local Owo dialect. The research assistants were trained on the application of data collection technique, use of study instruments, interview methods. The research assistants were tested before they were involved in the study.

2.5. Ethical Consideration

Ethical clearance was obtained from the department of Nutrition and Dietetics, Afe Babalola University Ado-Ekiti, Ekiti State. Letter of approval was obtained from the Chairman, Owo Local Government and informed consent was obtained from each study participant (mother of under-five child). All the interviews were conducted with sufficient privacy after getting informed consent from the respondents.

2.6. Data Collection

Data for this study was collected between January and April, 2022. Mothers with under-five children completed a validated and pretested interviewer administered questionnaire. The instrument was pretested on 102 mothers from five (5) district areas in Owo Local Government.

2.7. Food Security

Household food insecurity access scale (HFIAS) measurement tool which consists of 9 items developed by the Food and Nutrition Technical Assistance [25] project was used [26, 27] Household food insecurity access scale is a standard tool for measuring the degree of food insecurity. There are nine questions on the scale that evaluate the situation of food insecurity in the last month. The maximum score that can be obtained from the scale is 27 and the minimum score is 0. The HFIAS score is a measure of household food insecurity over the past 30 days. Higher scores indicate higher severity of household food insecurity. Individuals' food insecurity status was categorized into 4 groups according to the total score: food security, mild food insecurity, moderate food insecurity, and severe food insecurity. Food insecurity was categorized as described in the scale [28].

2.8. Dietary Diversity Score

FAO [29] minimum dietary diversity for women questionnaire was adapted and used to obtain data on dietary diversity. Minimum dietary diversity for women (MDD-W) was calculated as the sum of the number of different food groups consumed by the mothers in the 24 hours prior to the assessment. Foods were categorized into 10 groups; (1) Grains, white roots and tubers and plantain, (2) Pulses (beans, peas and lentils), (3) Nuts and seeds (4) Dairy (5) Meat, Poultry and fish (6) Eggs (7) Dark green leafy vegetables (8) Other vitamin A-rich fruits and vegetables (9) Other vegetables (10) Other fruits.

The response categories were "Yes" if at least two food items in a group were consumed and was scored one point. However, half point was awarded for food items less than two. In case where a food item was not consumed in a group, zero (0) point was given representing "No". Dietary diversity was obtained by summing the number of food and food items consumed in each group separately. The total score was calculated and this ranged from 0-12. Terciles of DDS was used to classify into low (≤ 4), medium (5-8) and high (9-12).

2.9. Anthropometric Measurements of the Women

The weight of the subjects was measured to the nearest 0.1kg using a portable bathroom scale (HANSON model) while standing upright and barefooted on the scale [30]. Height was measured using a Stadiometer with the subject standing erect, barefoot while backing the height meter and looking straight in a Frankfurt position. The height was recorded to the nearest 0.1cm [30]. Body mass index (BMI) of the study subjects was calculated by dividing the weight in kilogram to the height in meter squared (Kg/m^2) and BMI categories were defined: below 18.50 kg/m^2 were classified as underweight, between 18.50 and 24.99 kg/m^2 as normal, between 25.0 and 29.99 kg/m^2 as overweight, and over 30.0 kg/m^2 as obese. [31-33]

2.10. Statistical Analysis

Statistical analysis was performed using the statistical package for social science (SPSS) version 21. Descriptive statistics such as frequencies, percentages, mean and standard deviation was used to analyze socio-demographic characteristics and all anthropometric data. To find the association between the variables a cross-tabulation was made and Chi-square statistics was used for the statistical significance of associations between variables. A p-value below 0.05 was considered as statistically significant.

3. Result

3.1. Nutritional Status of Mothers

Table 1 shows the nutritional status of the mothers. Using BMI, 10.7% were underweight, 55.5% were normal, 29.0% were overweight and 4.8% were obese. Using MUAC, the results showed that 9.0% were malnourished, 79.3% were normal and 11.7% were obese.

Table 1. Nutritional status of mothers.

Nutritional status Indicator	Rural Freq (%)	Urban Freq (%)	Total Freq (%)	X ²	P-value
BMI				11.643	0.009
Underweight	33(15.7)	12(5.7)	45(10.7)		
Normal	107(51.4)	126(59.4)	233(55.5)		
Overweight	59(28.4)	63(29.7)	122(29.0)		
Obese	9(4.3)	11(5.2)	20(4.8)		
WHR				0.202	0.653
Normal	135(64.9)	142(67.0)	277(66.0)		
At risk	73(35.1)	70(33.0)	143(34.0)		
Waist circumference				1.280	0.170
Normal	188(90.4)	198(93.4)	386(91.9)		
At risk	20(9.6)	14(6.6)	43(8.1)		
MUAC					
Severely malnutrition	22(10.6)	7(3.3)	29(6.9)	9.340a	0.025
Mild malnutrition	5(2.4)	4(1.9)	9(2.1)		
Normal	160(76.9)	173(81.6)	333(79.3)		
Obese	21(10.1)	28(13.2)	49(11.7)		

BMI=Body mass index, WHR=Waist hip ratio, MUAC= mid upper arm circumference

3.2. Association Between Socio-Demographic Characteristics and Nutritional Status

Table 2 shows the association between socio-demographic characteristics and nutritional status. Most of the demographic factors had a significant relationship with nutritional status; BMI and age (p= 0.000), BMI and place of residence (p=

0.009), BMI and marital status (p= 0.017). MUAC and age (p= 0.041), MUAC and place of residence (p= 0.025). Also, BMI and occupation (p= 0.026), BMI and occupation of spouse (p= 0.009), BMI and monthly income (P = 0.008), MUAC and occupation (p= 0.000), MUAC and education (p = 0.029), MUAC and occupation of spouse (p= 0.000), MUAC and monthly income (p= 0.038) were all significant.

Table 2. Association between socio-demographic characteristics and nutritional status.

Socio-demographic factors	BMI		WHR		MUAC	
	X ²	P-value	X ²	P-value	X ²	P-value
Age of mother	39.422	0.000*	1.057	0.788	17.512	0.041*
Place of residence	11.643	0.009*	0.202	0.653	9.340	0.025*
Marital status	20.215	0.017*	7.742	0.052	9.419	0.400
Religion	5.008	0.543	3.271	0.195	12.746	0.047*
Education of mothers	10.448	0.315	1.518	0.678	18.578	0.029*
Education of fathers	10.103	0.342	0.825	0.843	13.961	0.124
Occupation of mothers	27.375	0.026*	6.276	0.280	54.134	0.000*

Socio-demographic factors	BMI		WHR		MUAC	
	X ²	P-value	X ²	P-value	X ²	P-value
Occupation of fathers	30.875	0.009*	6.018	0.305	45.597	0.000*
Monthly income	22.257	0.008*	3.540	0.316	17.729	0.038*

*significant at p<0.05

3.3. Association Between Food Security and Nutritional Status Mothers

Table 3 shows the association between food security and nutritional status of the mothers. Chi square test showed that food security had a significant relationship with nutritional status BMI (P= 0.000) and MUAC (P= 0.003).

Table 3. Association between food security and nutritional status.

Variables	Nutritional status indicator Freq (%)				Total	X ²	P-value
Food security	BMI					88.170	0.000*
	Underweight	Normal	Overweight	Obese			
	Food Secured	9(20.0)	134(57.5)	65(53.3)	12(60.0)	220(52.4)	
	Food insecure without mild hunger	6(13.3)	64(27.5)	36(29.5)	5(25.0)	111(26.4)	
	Food insecure with Moderate hunger	16(35.6)	28(12.0)	19(15.6)	3(15.0)	66(15.7)	
Food Insecure with severe hunger	WHR					1.243	0.743
	Normal	Tendency to obese					
	Food Secured	145(52.3)	75(52.4)			220(52.4)	
	Food insecure without mild hunger	76(27.4)	35(24.5)			111(26.4)	
	Food insecure with Moderate hunger	43(15.5)	23(16.1)			66(15.7)	
Food Insecure with severe hunger	Waist circumference					3.584	0.310
	Normal	Obese					
	Food Secured	202(52.3)	18(52.9)			220(52.4)	
	Food insecure without mild hunger	103(26.7)	8(23.5)			111(26.4)	
	Food insecure with Moderate hunger	58(15.0)	8(23.5)			66(15.7)	
Food Insecure with severe hunger	MUAC					19.739	0.003*
	Severe malnutrition	Mild malnutrition	Normal	Obese			
	Food Secured	11(37.9)	4(44.4)	179(53.8)	26(53.1)	220(52.4)	
	Food insecure without mild hunger	10(34.5)	4(44.4)	87(26.1)	10(20.4)	111(26.4)	
	Food insecure with Moderate hunger	8(27.6)	19(11.1)	46(13.8)	11(22.4)	66(15.7)	
Food Insecure with severe hunger							
	Food Insecure with severe hunger	0(0.0)	0(0.0)	21(6.3)	2(4.1)	23(5.5)	

*significance (<0.05)

3.4. Association Between Dietary Diversity and Nutritional Status Mothers

Table 4 shows the relationship between dietary diversity and nutritional status of mothers. There was no significant relationship between dietary diversity and nutritional status (BMI = P-0.294, WHR= P-0.276, Waist circumference=p-0.308, MUAC=p-0.094)

Table 4. Association between dietary diversity and nutritional status of mothers.

Variables	Nutritional indicator Freq (%)				Total (%)	X ²	P-value
Dietary diversity	BMI					7.303	0.294
		Underweight	Normal	Overweight	Obese		
	Good	36(80.0)	179(76.8)	105(86.1)	14(70.0)	334(79.5)	
	Medium	8(17.8)	51(21.9)	17(13.9)	6(30.0)	82(19.5)	
	Poor	1(2.2)	3(1.3)	0(0.0)	0(0.0)	4(1.0)	
	WHR					2.575	0.276
		Normal	Tendency to obese				
	Good	214(77.3)	120(83.9)		334(79.5)		
	Medium ;	60(21.7)	22(15.4)		82(19.5)		
	Poor	3(1.1)	1(0.7)		4(1.0)		
	Waist circumference					2.358	0.308
		Normal	Obese				
	Good	305(79.0)	29(85.3)		334(79.5)		
	Medium	56(14.5)	5(14.7)		61(14.5)		
	Poor	25(6.5)	0(0.0)		25(6.0)		
	MUAC					10.838	0.094
		Severe	Mild	Normal	Obese		
	Good	23(79.3)	4(44.4)	265(79.6)	42(85.7)	334(79.5)	
	Medium	5(17.2)	5(55.6)	65(19.5)	7(14.3)	82(19.5)	
	Poor	1(3.4)	0(0.0)	3(0.9)	0(0.0)	4(1.0)	

*Significance p<0.005

4. Discussion

The study aimed to assess maternal dietary quality and nutritional status. Nutritional status is an indicator of the general wellbeing of a population. Adequate nutritional status is crucial for maintaining women's health and increasing their ability to work, as well as the health of their children [34, 35]. Poor nutrition is associated with increased health risks for the mother and her offspring [36]. Because of the potential health risks, it is imperative that their nutritional status and food intake be continuously monitored, particularly in a resource-poor nation like Nigeria. Anthropometric index deviations from the reference

value are considered proof of malnutrition. Double burden malnutrition (undernutrition and overnutrition) often resulting in underweight and obesity are burdens currently faced by many countries due to improper dietary practices [37, 38]. It has become so common that it is found to co-exist in different people living side by side in a country, community or household. High prevalence of undernutrition and obesity was recorded amongst mothers in this study. Obesity and overweight has been attributed to occur due to changing lifestyle and poor dietary practices and choices. Highly processed foods, starchy staples rich in carbohydrates constitute the diet of many households thereby aggravating the situation. Furthermore, the overall prevalence of maternal overweight/obesity in the study area was slightly higher than the prevalence of overweight in

Nigeria (28%) according to the Nigerian demographic Health survey [39, 40]. However, this was lower than the findings of Enwerem et al., [41] in Osun state where he recorded over 40% overweight/obesity prevalence amongst women and slightly lower than 35.4% reported by Asosega et al., [42] among reproductive women in Ghana. This can be attributed to a sedentary lifestyle, imbalanced energy intake and energy expenditure, which can raise susceptibility to overweight and obesity in individuals.

The prevalence of underweight amongst mothers in the study area was slightly lower than the estimate reported at the national level [39] and was in the range of estimates (between 10 to 40%) in sub-Saharan countries [43]. Malnutrition in women leads to low productivity, and might leads to cycle of malnutrition resulting to mothers giving birth to malnourished children. This condition is associated with higher prevalence of low birth weight children thus increasing infant mortality rate. Although, the prevalence of women undernutrition has been on a decline in the recent times, nonetheless, high prevalence is still noticeable in sub-Saharan Africa [43].

Socio-economic status has been found be a predictor of underweight in developing countries, poor wealth status contribute to undernutrition in women through poor food intake and increase exposure to infections [44, 45]. This study finds a significant relationship between some of the socio-demographic characteristics and nutritional status of the household women. Education was significantly associated with MUAC but not significant with BMI. These findings are confirmed by Hlavonova et al., and Chung [46, 47] where it was reported that there was a consistent inverse association between education and BMI in developing countries. Women who are educated tend to have greater knowledge and exposition about diets and lifestyle factors, which allows them to make well-informed decisions regarding their own and their children's nutrition [38]. Women are known to play essential role in household health care and nutrition. Higher education among women could serve as a source of employment for income generation [43]. Mothers' participation in the workforce will help curb this situation as it will give her the opportunity to exercise more freedom of choice and decisional autonomy in household nutrition [48]. Women's education has implications that go far beyond the classroom. Women's education leads to improved child health and nutrition through multiple channels, which includes increased autonomy, enhanced literacy and analytical skills, which can facilitates the maternal health and care-giving decision-making, as well as financial decision-making in the household [49]. Income influences the purchasing power of a balanced and varied diet. As seen in this study, most underweight and severely malnourished women were from rural households which are characterized by low income earners lack access to nutritious food. The continued consumption of less nutritious food eventually results to malnutrition and also increases exposure to infections. Income is one of the most basic factors for people to improve their diets. When there is an increase in

income, households have better food purchasing power making them better able to access diversified diets. This is in line with findings of [8] in their study stated that families with high income may have the ability to purchase different types of foods from the various food groups and on the contrary, those with low income may limit dietary diversification as families may choose cheaper sources of food and rely on basic staples for nutrition.

Food security was significantly associated with nutritional status in this study. Majority of obese women were from food secure households while severely malnourished women were mostly from food insecure (moderate hunger) households. Several studies conform to these findings [50]. In Malaysia, food insecurity was associated with obesity while a study in Trinidad and Tobago noted an association between food insecurity and underweight.

With the rise in food prices, recession and inflation, a substantial number of Nigerian households are becoming food insecure [51]. Food insecurity can affect anyone but its effect on women deserves special attention because of their social vulnerability to it. The effects of household food insecurity include protein energy malnutrition, micronutrient deficiencies diet, increased risk pre-term birth, anemia and non-communicable diseases among others [51]. Research indicates that mothers who are the poorest in terms of wealth are more likely to prioritize their children by making sure they are fed well. These mothers are also more likely to adopt risky coping mechanisms, such as cutting back on their food intake and compromising the quality of their diet [3, 11]. This can make mothers become deficient in vital macro and micronutrients Numerous studies have suggested that optimal nutritional status is obtained when diet is diverse (consumption foods from different food groups such as cereals, roots and tubers, oil, fat and butter, legumes and vegetable) and that a lack of dietary diversity could result in protein deficiency and micronutrient deficiency. Dietary diversity score in this study was very high but showed a negative correlation with nutritional status of mothers. This finding is in line with the report of Khamis et al., [52].

5. Conclusion

There were existence of double burden of malnutrition and high prevalence of overweight and obesity in the study area. Household food insecurity contributed greatly to the malnutrition observed in many mothers in the study. Nutrition and health promotion education intervention to improve maternal nutritional status is recommended in the study area.

Abbreviations

BMI	Body Mass Index
WHR	Waist Hip Ratio
MUAC	Mid Upper Arm Circumference

Author Contributions

Adedayo Elizabeth Oyeyemi: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing

Dada Isreal Olanrele: Project administration, Supervision, Validation, Writing – review & editing

Ajayi Kayode: Methodology, Project administration, Supervision, Validation, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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