Research

Double burden of malnutrition among mothers and their under five children in rural areas of Oyo State, Nigeria

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Background/Objective

The double burden of malnutrition, characterized by undernutrition among poor children and overnutrition among disadvantaged adults coexisting in the same population group or household, is a serious global problem. The objective of this study was to assess this double burden among mothers and their under-five children in rural communities of Ibadan, Nigeria.

Methods

This cross-sectional and descriptive study adopted two-stage probabilitysampling to recruit 217 mother-child pairs from 18 rural communities in Ido and Akinyele Local Government Areas of Ibadan. A semi-structured, interviewer-administered questionnaire was used to obtain information on socio-demographic characteristics and personal characteristics of mothers and their under-five children respectively.Anthropometric characteristics of mothers weremeasuredand their Body Mass Index (BMI) was determined using WHO classifications. Children's anthropometry was measured and expressed as stunting (height-for-age), wasting (weight-for-height) and underweight (weight-for-age) using WHO Anthro.

Results

Underweight, overweight and obesity among mothers were 9.2%, 15.2% and 3.2%, respectively. Among children, underweight, stunting and wasting were 30.4%, 40.6% and 7.8%, respectively. The proportion of overweight/obese mothers with underweight, stunted, and wasted under-five children was slightly lower, at 15.0%, 35.0%, and 7.5% respectively. Mothers who were overweight or obese were 2.86 times more likely to have an underweight child (weight for age <-2Z), based on an adjusted odds ratio (p=0.026, 95%CI: 1.14-7.20).

Conclusion

This study confirms coexistence of double burden of malnutrition at household level in the rural areas of Ibadan, Nigeria. That is, the concurrence of child undernutrition and maternal overweight in the same household, characterized by a high prevalence of undernutrition, particularly stunting early in life. Therefore, there is an urgent need to strengthen existing policies on child malnutrition and to implement a comprehensive nutritional programme that addresses double burden of malnutrition especially among rural women and their under-five children.

INTRODUCTION

Malnutrition is a pathological condition caused by the inadequacy of one or more of the essential nutrients necessary for survival, growth, reproduction as well as productivity or overweight and obesity. If not addressed, malnutrition in any of its forms could lead to an increased risk of infectious and non-communicable diseases (Varma and Prasad 2017;

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World Health Organization 2020). Each form of undernutrition arises from a complex of nutritional, social and biological deprivation and is manifested in various forms such as stunting (short stature), underweight, growth retardation, muscle wasting, diminished subcutaneous fat and ill health with high mortality rate (Onimawo, Amangbangwu, and Eluwa 2006). Malnutrition affects all countries, rich and poor and more one third of the world's population is affected (Shrimpton and Rokx 2012; Mayer, Pfeiffer, and Beyer 2008; Ijarotimi 2013). Almost 1 billion people continue to be undernourished, with an insufficient intake of calories, protein, and micronutrients (FAO, IFAD, and WFP 2014), and about 2 billion people are overweight or obese. Nearly half of all countries face multiple serious burdens of malnutrition, such as poor child growth, micronutrient deficiency, and adult overweight and obesity (Winichagoon and Margetts 2017).

The so-called double burden of malnutrition (DBM) is the coexistence of undernutrition (including macronutrient and micronutrient deficiencies) and overweight in the same population across the life course (Shrimpton and Rokx 2012; World Health Organization 2017). Undernutrition, as the word "under" implies, is an outcome of insufficient intake, poor absorption, high losses and/or poor biological use of the nutrients. Overnutrition on the other hand is the result of surplus or imbalanced energy intake, expressed as overweight and/or obesity, which can result in impaired body functions as well as, particularly non-communicable diseases (NCDs). In most regions, DBM exists in the same country, in the same community, in the same household, and, to some extent, can even exist in the same individual. In 2014, more than 1.9 billion adults worldwide were either overweight or obese while approximately 462 million were underweight (WHO, 2019). In 2016, more than 42 million children under the age of five were overweight or obese, but 155 million were chronically undernourished, being stunted (low height-for-age), while 50 million children were affected by wasting (low weight-for-height) (WHO, 2017). Nutrition-related factors contribute to approximately 45% of deaths in children aged under-5 years, primarily due to undernutrition (WHO, 2020).

DBM remains a priority public health challenge with serious consequences especially in low-and middle-income countries, with children and women of childbearing age being particularly vulnerable (Prioreschi et al. 2017; Talukdar and Seenivasan 2022). In fact, more than 3.5 million mothers and children under-five die annually with undernutrition as the underlying cause, and millions more are permanently disabled physically and mentally due to poor dietary intake in the earliest months of life (Black et al. 2013). Undernutrition and overweight, obesity or NCDs now coexist in many countries. In fact, all NCDs together accounted for 74% of deaths globally in 2019 (WHO, 2020). It was reported in 2011 that more than 18 million women die every year from these silent killers (Ekpenyong et al. 2012). This underlines the need to focus on women's nutritional and health needs, since there is a higher prevalence of some of the predisposing factors in women than men (Chopra et al. 2013; Yaya, Ekholuenetale, and Bishwajit 2018; Ahmed

et al. 2019). Inadequate maternal and childcare has been found to often be the underlying cause of undernutrition, low-productivity, poverty, and even deaths (Nabinta et al. 2007; Black et al. 2013). While all countries have serious malnutrition problems, some countries are hit really hard, especially the developing countries, where 90% of the world's undernourished children live (Alamu et al. 2020).

Today, many countries are facing a double or triple burden of malnutrition – with concurrent problems of stunting, wasting, micronutrient deficiencies, and overweight. Although, the pervasiveness of DBM among populations has been well described, data describing the situation among mothers and their under five children in the rural areas of Nigeria are few. Therefore, this study was carried out to determine DBM among mothers and their under five children living in rural communities of Ibadan, Nigeria. The information from this work can help to illuminate policy and program strategies to deal with the coexisting underweight and overweight problems especially in the rural areas of developing countries like Nigeria. Additionally, better understanding of DBM problems in rural areas among primary food producers is important for planning rural food and nutrition policies.

METHODOLOGY

The study populations for this analytical and cross-sectional study consisted of mothers and their under-five children who were visited in their household. A household was defined as a group of people who occupied a particular housing unit as their usual residence, and ate from the same pot, living under the same roof at the time of the survey. The sample was made up of 217 mother-child pairs in 18 rural communities of Ido and Akinyele Local Government Areas of Ibadan, Oyo State, Nigeria.

The prevalence of underweight children below 5 years of age in farming households, in Oyo Statewas 14.9% (Lawal and Samuel 2010), which was used to determine the minimum sample size of the mother–child pair respondents recruited in the study, using the formula:

$$N = \frac{Z^2 pq}{d^2} \qquad \text{(Leslie Kish)}$$

$$\text{So, } N = \frac{1.96^2 \times 0.149 \times 0.851}{0.05^2} = 194.8 \approx 195$$

To cater for a potential~10% attrition, 220 mother-child pairs were included in the study.

A multi- stage sampling technique was adopted in the selection of the respondents. First, the two local governments (Ido and Akinyele) were randomly selected by balloting, the agrarian communities in the two local governments where the study was carried out were similarly selected by balloting and the households were systematically selected using a sampling interval which was generated by dividing the total number of households with eligible participants in the communities by the number required (110 households from each Local Government Area). A pre-tested, interviewer-administered, semi-structured questionnaire developed in English and translated to the local language (Yoruba) was used to collect data on household and socio-

demographic characteristics of mothers; this includes information on age, education, household size and number of children the mother ever give birth to. Personal characteristics of under-five children of the women were also obtained.

PHYSICAL EXAMINATION OF MOTHERS

An electronic and well calibrated weighing scale and stadiometer were used to collect information on weight and height respectively. The heights of mothers were taken with the backs of their head, their buttocks and heels in contact with the tall block of the stadiometer and both hands hanging loosely on both sides with their eyes looking straight ahead while shoes, hats, and other headwear had been removed. Their weight was similarly taken in light clothes. Body mass index (BMI=weight(kg)/height(m)^2) of mothers was determined and classified according to WHO classifications as underweight (BMI < 18.5), normal weight (BMI = 18.5 – 24.9), overweight (BMI = 25.0 – 29.9) and obese (BMI ⩾ 30).

PHYSICAL EXAMINATION OF UNDER-FIVE CHILDREN

Length/Height (cm), weight (kg) and age (months) were taken and anthropometric indices such as weight-for-height, height-for-age and weight-for-age, were derived for under-five children using WHO Anthro software.

DATA PROCESSING AND ANALYSIS

Data were cleaned, cross-checked, and verified for accuracy. Statistical analysis was done using SPSS software version 20.0. Data were summarized using descriptive statistics such as mean, frequency tables and percentages. Inferential statistics such as Chi-Square test, Fisher's Exact Test, and logistic regression were used to determine statistical differences and associations between variables. Level of statistical significance was set at p< 0.05.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from University of Ibadan/ University College Hospital Institutional Review Board (IRB) and from the local governments where the research was carried out. Informed consent was obtained from community leaders, each family head and the mothers.

RESULTS

As presented in Table 1, the mothers' ages ranged from 20 to 52 years with a mean age of 32.3±6.20 years. The majority (95.9%) were married. More than half of the women (62.2%) had no formal education. Most of the households (68.7%) had 6-10 members. Most of the children aged 0 – 59 months (59.4%) were male and 40.6% female with mean age of 35.3±14.1 months. Only 6 (2.8%) were infants, and more than half of the mothers (53.9%) delivered the index child at home.

Table 1. Socio-demographic characteristics of rural Nigerian mothers and their children

Variable	Frequency	Percentage
Age (years) Mean =32.3±6.20		
20-30	96	44.2
31-40	102	47.0
41-55	19	8.8
Marital status		
Married	208	95.9
Widowed	9	4.1
Mothers' level of education		
No formal education	135	62.2
Primary education	65	30.0
Post primary education	11	5.1
Complete secondary education	6	2.8
Household size (Mean= 6.28 ± 1.70)		
1-5	64	29.5
6-10	149	68.7
11-15	4	1.8
Sex of Children		
Male	129	59.4
Female	88	40.6
Children's age (Months)		
0–11	6	2.8
12-23	58	26.7
24-35	55	25.3
36-47	52	24.0
48-59	46	21.2
Place of delivery of the index child		
At home	117	53.9
Clinic/Maternity	95	43.8
Mission House	4	1.8
TBA Centre	1	0.5
Total	**217**	**100**

The BMI of these rural mothers, as shown in Table 2, was 22.5 ± 3.46; 9.2% were underweight, 72.4% had normal weight, 15.2% were overweight, and 3.2% were obese.

Table 3 shows that 30.4% of the children were underweight with 5.5% being severely underweight, 40.5%, stunted with 19.8% severely stunted, while 7.8% were wasted and 3.7% severely wasted.

Table 4 shows the Fisher's Exact Test for associations between mothers' BMI and their children's nutritional status. Among the overweight and obese mothers, 15.0% had underweight children, while 35.0% of the overweight and obese mothers had stunted children and 7.5% of the overweight and obese mothers had children who were wasted.

Table 2. Nutritional status of sample mothers

Variables	Frequency	Percentage
<18.5 (Underweight)	20	9.2
18.5-24.99 (Normal weight)	157	72.4
25.0-29.99 (Overweight)	33	15.2
30.0 and above (Obese)	7	3.2
Total	**217**	**100**

Mean BMI= 22.5, SD= 3.46

Table 3. Nutritional Status of under-five children of sample mothers

Variables	Frequency	Percentage
Child weight for age (WAZ)		
Moderate underweight ((< — 2Z-Score)	54	24.9
Severe underweight (< — 3Z-Score)	12	5.5
Not underweight	151	69.6
Mean score= -1.247±1.23		
Child height for age (HAZ)		
Moderate stunting ((< — 2Z-Score)	45	20.7
Severely stunting (< — 3Z-Score)	43	19.8
Not stunted	129	59.5
Mean score= -1.744±1.50		
Child weight for height (WHZ)		
Moderate wasting ((< — 2Z-Score)	9	4.1
Severe wasting (< — 3Z-Score)	8	3.7
Not wasted	200	92.2
Mean score= -0.233±1.32		
Total	**217**	**100**

Table 4. Association between mothers' BMI and their children's nutritional status

Mothers' BMI	Children's Nutritional Status N (%)		P-value
	Underweight	*Not underweight*	
Underweight	12 (60.0)	8 (40.0)	
Normal weight	48 (30.6)	109 (69.4)	0.002
Overweight and obese	6 (15.0)	34 (85.0)	
	Stunted	*Not stunted*	
Underweight	11 (55.0)	9 (45.0)	0.339
Normal weight	63 (40.1)	94 (59.9)	
Overweight and obese	14 (35.0)	26 (65.0)	
	Wasted	*Not wasted*	
Underweight	4 (20.0)	16 (80.0)	
Normal weight	10 (6.4)	147 (93.6)	0.555
Overweight and obese	3 (7.5)	37 (92.5)	

The logistic regression of the association between mothers' BMI and children's nutritional status, as shown in Table 5, shows that mothers who were overweight or obese were 2.91 times more likely to have underweight children compared to mothers who were not overweight or obese (p=0.023, 95%CI: 1.16 -7.31) and 2.86 times when adjusted

Table 5. Logistic regression of the association between mothers' BMI and children's nutritional status

Variable	Yes	No	COR*(95%CI)	P value	AOR*(95% CI)	P-value
Mothers' BMI	*Underweight*					
Overweight/Obese	6	34	2.91 (1.16–7.31)	0.023	2..86(1.14–7.20)	0.026
Not Overweight/Obese	60	117				
	Stunted					
Overweight/Obese	14	26	1.13(0.65-2.73)	0.429	1.33(0.65-2.73)	0.409
Not Overweight/Obese	74	103				
	Wasted					
Overweight/Obese	3	37	1.06(0.29-3.88)	0.931	1.02(0.27-3.74)	0.981
Not Overweight/Obese	14	163				

COR* = Crude Odd ratio, AOR* = Adjusted Odd ratio, CI = Confidence Interval

(p=0.026, 95%CI: 1.14-7.20). Stunting in under-five children was not significantly associated with overweight/obese mothers (COR: 1.13, 95%CI: 0.65-2.73, p=0.429 and AOR: 1.33, 95%CI: 0.65-2.73, p=0.409). A similar non-significant result was observed between mothers' BMI and wasting in their children.

DISCUSSION OF FINDINGS

This study thus presents further evidence of the occurrence of double burden of malnutrition after evaluating anthropometric assessments of mothers and their under five children living in rural communities of Ibadan, Nigeria.

9.2% of the mothers in this study were underweight, 18.4% were overweight and obese. This prevalence of underweight was a bit lower compared to 11.3% reported by Ene-Obong, Enugu, and Uwaegbute (2001) in a study undertaken among women in two rural farming communities in Enugu State, Nigeria. This might partly be due to the BMI < 18.6 cut off used in that study. The prevalence of underweight in the present study is fragmentally lower than the 12.0% reported among women in the 2018 National Demographic Health Survey (NPC, 2019) and in Sub-Saharan Africa (Smith et al. 2003), but much lower than the 35.0% and 43.0% reported earlier in Latin America and South Asia respectively (Smith et al. 2003). The prevalence of overweight and obesity among mothers in this study was lower than the 41.3% reported by Senbanjo et al. (2019) in a study undertaken in Lagos. This may be because Lagos is more metropolitan and a lifestyle that promotes weight gain will be predominant there. Even though the maternal undernutrition in this study is less than 10%, undernourishment in women is always a situation of public health concern (Shalom and Opeyemi 2014). The more prevalent form of malnutrition among the rural women in this study was overweight/obese, which can be classified as a problematic situation of public health significance. This prevalence of overweight/obese mothers could have both short- and long-term implication for maternal and child health (Elshibly and Schmalisch 2008; Ugwa 2015).

The mean weight-for-age, height-for-age and weight-for-height Z-scores for the under five children were -1.247,

-1.744 and -0.233 respectively. Thirty percent of the children were underweight (5.5% were severe), 40.5% stunted (19.8% were severe) and 7.8% wasted (3.7% were severe). This prevalence of stunting is slightly higher than the national average of 37% reported in the 2018 report of NDHS, but similar to the 42% recorded during the Nigeria Food Consumption and Nutrition Survey reported by Maziya-Dixon et al. [NO_PRINTED_FORM] and the 43.3% reported by Senbanjo et al. (2019). However, the prevalence of severe stunting in this study (19.8%) is a fragmentally higher than the National Survey (17.0%). The higher level of stunting in this study may be because the sampling of the National Survey included both rural and urban areas, wherein rural children were more likely to be stunted than urban children (46 percent compared with 27 percent) (NPC, 2019). The percentage of underweight children in this study is similar to the national average of 29%, while the percentage of wasted children is slightly lower than the national average of 9.2%. However, children in Nasarawa state (Awogbenja and Ugwuona 2010) reported prevalences of 53.3% underweight, 75.7% stunting and 19.1% wasting.

Prevalence of undernutrition among the under-five children of overweight and/or obese mothers was 15.0% (underweight), 35.0% (stunted) and 7.5% (wasted). This in higher than what was reported by Islam et al. (2018) in a similar study among Mother-Child Pairs in Bangladesh; they reported that the prevalence of overweight or obese mother and underweight children was 3.8%, stunting,4.7% and wasting,1.7% which was lower compare to mothers who were not overweight or obese. However, a study on double burden of malnutrition in urban poor settings in Nairobi, Kenya reported that 43% and 37% of overweight and obese mothers respectively had stunted children while 51.3% and 46.6% of underweight and normal weight mothers respectively had stunted children (Kimani-Murage et al. 2015). Hence, this finding verifies that women's own health and nutritional status is one of the pathways through which women's status influences child nutrition. This high prevalence of undernourished children and overweight/obese mothers indicates the existence of a double burden of malnutrition in the same household

There was a significant (p<0.05) relationship between mothers' BMI and the under-five children's nutritional sta-

tus, as an adjusted logistic regression analysis shows that mothers who were overweight or obese were 2.86 more likely to have underweight children. However, stunting and wasting were not significantly associated with mothers BMI ($p > 0.05$). Sultana, Rahman, and Akter (2019) reported that mothers with a normal BMI were less likely to have stunted children. In Mexico, analysis of secondary data of more than 600 mother/child pairs showed that maternal central obesity and child stunting were present in 6% of pairs. The odds of having a stunted child were twice as great in mothers with a waist-hip ratio (WHR) around 1, compared with mothers with a WHR of 0.65 (Barquera et al. 2007).

CONCLUSIONS AND RECOMMENDATIONS

We found a coexistence of malnutrition among mothers and young children at household level in these rural areas of Ibadan, Nigeria, with overweight mothers actually being more likely than others to have an underweight child.

To reduce the high prevalence of undernutrition, existing policies on child malnutrition should be reviewed and strengthened, efforts must be geared towards averting the problem of double burden of malnutrition by tackling maternal and child malnutrition and related health consequences of malnutrition in the rural setting. There is dare need for composite and evidence-basednutritional interventions that addresses double burden of malnutrition especially among rural women and their under-five children. Even though, this study was limited to 2 vast local government areas of Ibadan, Oyo State, Nigeria, the situation may be similar throughout the broader rural communities in many parts of Nigeria and Sub-Saharan Africa. Further research work with a larger sample frame is needed not only in giving fresh look into the subject but to also identified risk factors of double burden of malnutrition among mother and under-five children in the rural setting.

AUTHORS' CONTRIBUTIONS

Ope Adeyanju and Grace T. Fadupin contributed substantially to the conception, research design of the work, data collection and analysis as well as interpretation of data. Research findings was arranged by AdeyanjuOpe and both authors review the work and approved the final manuscript draft for submission.

CONFLICTS OF INTEREST

The authors declare to have no conflict of interest.

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