Original Article

Determinants of wasting among schoolchildren in a Southwestern state of Nigeria: Implications to strengthen the nutritional component of primary health-care model

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Abstract

Background: Wasting is linked to about one-third of mortality among school-age children. More studies have centered on stunting among under-five children, with few documented studies exploring comparability and determinants of wasting among school pupils in southwestern Nigeria. This study aimed to investigate the comparability and determinants of wasting among schoolchildren in rural and urban communities of Obafemi-Owode local government area, Ogun State, Nigeria. **Methods:** A cross-sectional study utilizing a quantitative approach was carried out among children both in rural and urban primary schools. Data were collected through interviewer-administered questionnaires. EPI-INFO version 6.03 was used, children were classified as wasted if weight-for-height Z-scores were <2 standard deviations below the National Center for Health Statistics/World Health Organization median. Associations were tested using t-tests and Chi-square test, while predictors were examined with logistic regression at 95% level of significance. **Results:** Male gender was predominant (54.6%). Significantly more pupils from rural areas lived with grandparents and other guardians (60.3%) compared to their urban counterparts (39.7% P = 0.005). Pupils from rural schools were four times more likely to be wasted compared to those located in urban regions (odds ratio [OR]: 4.2; 95 confidence interval [CI] = 2.24–7.69). Male pupils were twice likely to be wasted compared to the female pupils (OR: 2.08; 95 CI = 1.22–3.55). **Conclusion:** Conclusively, the study revealed that the prevalence of wasting was higher among children from rural schools than in urban schools. There is an urgent need to implement viable interventions and policies that address nutritional deficiencies in primary school pupils, particularly in rural areas.

Keywords: Malnutrition, nutrition, primary health care, schoolchildren, wasting

Introduction

Nutrition, which affects childhood development process, has been associated with healthy growth, organ development, strong immune system, neurological and cognitive formation, and function in children.[1,2] Nutritional status as referred to nutritional state of an individual or a specific population influences children's survival predominantly as a result of shared correlation between malnutrition and diseases.[1,3,4] Malnutrition continues to remain a key global health concern and a nutritionally correlated condition mostly in developing regions[5] which is considerably the fundamental cause of the persistently increased child mortality, adding to over and above a third of all mortality in a group of children under the age of five.[1] One of the two major anthropometric indicators used to describe malnutrition is wasting, representing low weight for height, generally related to illness including food deprivation.[1,6] Wasting is also regarded as acute malnutrition

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resulting from rapid weight loss and consequent inability to gain weight.[7]

Food and nutrition, an essential component of the primary health-care model,[8] has not enjoyed much progress in a number of countries. Worldwide, 51 million school-age children were wasted and 17 million were severely wasted in 2013. The prevalence of wasting in 2013 was projected at nearly 8%, whereas severe wasting was estimated at 3%.[9] In Asia with a population of about 33.9 million, it is estimated that 11.9 million were severely wasted, while in Africa, 4.3 million out of 14.1 million were severely wasted. In Latin America and Caribbean, about 0.7 million of the children were moderately wasted, of which 0.2 million were severely wasted.[7] However, South Asia has the highest prevalence of wasting with an estimation of 16%. Moderate and severe wasting was highest with over 25 million wasted children in India.[10,11] In sub-Saharan Africa, the combined prevalence of wasting was about 7.1% for all 32 countries of this subregion,[12] while in Nigeria, an estimation of 7% are severely wasted.[13]

Several works have explored and made available wider national estimates of wasting through concerted evidence-based interventions and policy actions. These were established, so Nigeria can attain the World Health Assembly's (WHA) global nutrition target of decreasing and maintaining infantile wasting to <5% and attain a 30% decrease in low birthweight by 2025.[14] Considering this, there is a need for comparable detail of action across susceptible population in order to formulate viable policies to cushion the effects of wasting in Nigeria and sub-Saharan Africa. Thus, the study set out to examine the following objectives; first to establish the prevalence of wasting among selected urban and rural primary schoolchildren in Obafemi-Owode county of Ogun state in southwestern Nigeria. The study also aimed at documenting the factors that predispose to wasting among the same rural and urban pupils. Finally, the study examined the determinants of wasting in the selected primary schools of southwestern Nigeria.

Methods

This study was cross-sectional in design with quantitative approach, carried out in a selection of public primary schools in Obafemi-Owode local government area (LGA) in Ogun Central Senatorial District. Ogun State is one of the 36 states of Nigeria, to be found in the southwestern region of the country. The state was created in February 1976 from the former Western State with an estimated population of 3,751,140 in the 2006 National Population Census.[15] Obafemi-Owode LGA, also created in 1976, is one of the six LGAs in Ogun Central Senatorial District. The LGA is largely rural with infrastructures such as 161 public primary schools, 63 private primary schools, and 41 health facilities owned by the LGA which are made up of three comprehensive health centers, 22 health centers, 8 health clinics, and 8 health posts.[16]

The study population comprised children from public primary schools in Obafemi-Owode LGA. A minimum of 400 pupils per group was estimated by group using a sample size to compare two independent groups.[17] In all, 606 and 554 pupils were recruited, respectively, across 62 rural and urban schools, making a total of 1160 pupils recruited from the study area. One thousand and four hundred forms were distributed, while only 1160 forms were eligible for further processing (Response Rate (RR) = 82.9%). Those excluded were pupils who were chronically ill or who had over 10% of questionnaires improperly filled or incomplete. The sampling technique utilized to recruit the participants has been described in detail elsewhere.[18] Across all LGAs, Grade 4 pupils were considered as a cluster and as such all candidates in Grade 4 that were eligible were invited to participate in the study. Lower grades were excluded due to age restrictions, while grades higher than Class 4 were exempted as majority of them were preparing for national examinations during the data collection period which spanned between May and July 2008. This class was also chosen because most of the pupils were old enough to answer the questions correctly and considering the fact that the rate of school dropout, especially in the rural areas, tended to increase after this class (the highest enrollment figures in most schools being recorded in this class).

The questionnaire was constructed from a review of related records and literature. The research assistants were trained on the method of administering questionnaire to young children so as to be able to get the relevant information. The questionnaire was then pretested in an urban and a rural public primary school in Odeda LGA, a LGA also in Ogun Central Senatorial District. Ambiguous questions identified during the pretest were modified. For the purpose of validation, the Cronbach's alpha reliability analysis was carried out and the estimated coefficient was 0.7, which showed that the instrument possessed a high internal consistency. All the items produced positive corrected item with total correlation ranging between 0 and 0.73. This showed that all items positively correlated with the construct under investigation (nutritional status).

Using semi-structured interviewer-administered questionnaires, sociodemographic data were obtained, while general physical examination and anthropometric measurements (weight and height) were measured to compute nutritional status. This was done with the help of trained community health workers. Prior to the measurements of weight and height, the standard balance beam scale was calibrated back to zero to ensure documentations of accurate measurements for all students according to the World Health Organization (WHO) standards.[19] For the purpose of data analysis, independent variables are the anthropometrics and sociodemographic characteristics of both respondents and parents, while the dependent variable is the nutritional status (wasting).

Each measurement was taken twice to ensure accuracy. Wasting was assessed by measuring weight-for-height (wasting) *Z*-scores calculated using the Centers for Disease Control and Prevention (National Centre for Health Statistics)/WHO reference values (22) with EPI-INFO software package Version 6.03 (CDC; Georgia US). Children were classified as

wasted if the Z-scores were less than −2 standard deviations of the WHO child growth standards median international reference.[20,21] Data were analyzed using the Statistical Package for the Social Sciences (SPSS)software v. 18 (Chicago IL, USA). Data were presented as frequencies and proportions. Bivariate comparisons were tested using Chi-square test with the statistical significance level set at 5%. Predictors of wasting were factored using multivariate logistic regression analysis to identify independent and significant risk factors for wasting within the study population and presented as odd ratios and corresponding confidence intervals (CIs).

Prior to the commencement of data collection, ethical approval was obtained from both the Health Research Committee of Federal Medical Centre, Abeokuta, and the Ogun State Universal Basic Education Board. A letter was also issued from the board to the secretary of the local government education authority authorizing the notification of head teachers of the selected public primary schools after which a meeting was held with the association of head teachers in Obafemi-Owode LGA, and the objectives, procedure, and scope of the study were fully explained to them. To ensure that the information reached all the head teachers in the LGA, a meeting was also held with the parent/teacher association (PTA) of the selected urban and one rural school in all selected zones. Thereafter, the head teachers of the other selected schools met with the members of their respective PTAs for full briefing on the objectives of the study. Informed consent was obtained from parents of recruited pupils in addition to the assent that was obtained from all pupils below the age of 18. Only children who signed the assent forms with informed consent from parents/guardians were enrolled into the study. No names (nor identifiers) were requested during the exercise and all information was treated with utmost confidentiality. The ethical standards of the study were in accordance with the guidelines provided by the and the World Association Declaration of Helsinki on ethical principles for medical research involving humans for studies involving experimental animals and human beings, respectively.

Results

Sociodemographic characteristics of respondents

According to Table 1, among ages below 10 and above 13 years, majority (52.8% and 56.3%, respectively) were from the rural areas. Males were predominant (54.7%) from the rural areas. Significantly less pupils (49.8%) from rural zones were among the first four children in the family ($P = 0.020$). Likewise, significantly more pupils from rural areas lived with grandparents and other guardians (60.3%) compared to their urban counterparts (39.7%, $P = 0.005$). Wasting was predominant among the rural regions (80.9%) compared to the urban (19.1%) and this was a significant finding ($P < 0.001$).

Higher percentage of mothers from rural areas (53.4%) and fathers (54.2%) of respondents were largely traders, artisans, or farmers. Other significant factors included clinical characteristics ($P < 0.001$), mothers' educational status ($P < 0.001$) and mothers' occupation ($P < 0.001$), and fathers' educational status ($P = 0.006$) and fathers' occupation ($P < 0.001$) [Table 1].

Table 2 showed that the overall prevalence of wasting among all pupils was 6.23%. Pupils from rural schools were four times more likely to be wasted (80.9%) compared to those located in urban regions (19.1%) (odds ratio [OR]: 4.2; 95 CI = 2.24–7.69). As regards age group, wasting was about eight times more likely to be found among pupils aged <10 years (83.8%) compared to those aged above 10 years (16.2%) (OR: 7.89; 95 CI = 4.09–15.20). Male gender (70.6%) was also twice likely to be associated with wasting compared to the female gender (OR: 2.08; 95 CI = 1.22–3.55). Unlike the fathers' educational status which was not significant, mothers' educational status was a significant predictor of wasting. Mothers with lower educational status (i.e., those with no formal education and those with primary education) were almost three times likely (88.2%) to have children susceptible to wasting compared to those with higher educational status (those who attained secondary and tertiary educations) (OR: 2.80; 95 CI = 1.33–5.92). As observed, mothers' type of marriage ($P = 0.410$), number of children by mother ($P = 0.890$), and number of children by father ($P = 0.946$) all did not show significant association with wasting [Table 2]. All the examined parameters regarding the characteristics of fathers also did not show any significant associations with wasting [Table 2].

According to results from Table 3, significant predictors of wasting in rural respondents include male gender (OR = 1.95; 95 CI = 1.06–3.59) and mothers' educational status (OR = 1.91; 95 CI = 1.06–3.47). Among the urban respondents, number of children being raised by mother was also a predictor though not significant (OR = 2.82; 95 CI = 0.86–9.28). Age was also not a significant predictor at this stage of analysis (OR = 1.76; 95 CI = 0.99–3.14) [Table 3].

Discussion

Prevalence of wasting

The findings from the analysis reported that a significant number of respondents were aged <10 years. The prevalence of wasting from the results is considerably low compared to other countries such as South Asia where a prevalence of 16% was documented.[10,11] On the other hand, some results recorded <16% in another study.[12] Even though the prevalence of wasting was found to be low in this study, the deleterious effects of poorly managed cases have been documented in literature and should not be underestimated. Wasting as an indicator of malnutrition is responsible for almost one-third of mortality among school-age children. It can predispose children to greater risks of severe illness from common childhood infections that include pneumonia, diarrhea, malaria, human immunodeficiency virus, or AIDS, and measles.[10,11] It also predisposes to physical and mental deterioration, such as delay in physical growth, poor intellectual quotient, lower cognitive

Table 1: Association between sociodemographic characteristics by location only

	Variable	Rural (*n*=606) (%)	Urban (*n*=554) (%)	Total (*n*=1160) (%)	χ^2	*P*
1	Sex					
	Male	346 (54.7)	287 (45.3)	633 (100)	3.268	0.071
	Female	260 (50.0)	267 (50.0)	527 (100)		
2	Age (years)					
	≤10	259 (52.8)	231 (41.2)	490 (100)	2.449	0.294
	1-12	236 (49.9)	237 (50.1)	473 (100)		
	≥13	111 (56.3)	86 (43.7)	197 (100)		
3	Wasting					
	Yes	55 (80.9)	13 (19.1)	68 (100)	23.749	<0.001*
	No	551 (50.5)	541 (49.5)	1092 (100)		
4	Caregiver					
	Both parents	460 (50.1)	458 (49.9)	918 (100)	8.020	0.005*
	Grandparents and others	146 (60.3)	96 (39.7)	242 (100)		
5	Birth order					
	1-4	383 (49.8)	386 (50.2)	769 (100)	5.428	0.020*
	≥5	223 (57.0)	168 (43.0)	391 (100)		
6	Clinical characteristics					
	Weight (kg), mean±SD	25.9±4.9	28.1±5.2	27.0±5.2	*t*=−7.287	<0.001*
	Height (cm), mean±SD	131.8±7.5	133.5±8.1	132.6±7.9	*t*=−3.539	<0.001*
	Respondents' family characteristics by location					
	Family characteristics					
7	Mothers' type of marriage					
	Monogamous	293 (50.1)	292 (49.9)	585 (100)	2.199	0.138
	Polygamous	313 (54.4)	262 (45.6)	575 (100)		
8	Children by mother					
	1-4	238 (48.9)	249 (51.1)	487 (100)	3.823	0.051
	≥5	368 (54.7)	305 (45.3)	673 (100)		
9	Children by father					
	1-4	137 (46.6)	157 (53.4)	294 (100)	5.026	0.025
	≥5	469 (54.2)	397 (45.8)	866 (100)		
	Mothers' sociodemographic characteristics					
10	Educational status					
	‡Lower	491 (51.2)	467 (48.8)	958 (100)	17.012	0.000*
	‡Higher	115 (37.7)	190 (62.3)	305 (100)		
11	Marital status					
	Currently married	486 (51.0)	467 (49.0)	953 (100)	3.315	0.069
	Not currently married	120 (58.0)	87 (42.0)	207 (100)		
12	Occupation					
	Civil servant	10 (22.7)	34 (77.3)	44 (100)	15.968	<0.001*
	Traders/artisans/farmers	596 (53.4)	520 (46.6)	1116 (100)		
	Fathers' sociodemographic characteristics by location					
13	Religion					
	Christianity	329 (50.8)	319 (49.2)	648 (100)	1.271	0.260
	Islam	277 (54.1)	235 (45.9)	512 (100)		
14	Educational status					
	‡Lower	459 (46.9)	520 (53.1)	979 (100)	7.652	0.006*
	‡Higher	147 (38.6)	234 (61.4)	381 (100)		
15	Occupation					
	Civil servant	33 (32.4)	69 (67.6)	102 (100)	17.730	<0.001*
	Traders/artisans/farmers	573 (54.2)	485 (45.8)	1058 (100)		
16	Number of wives					
	1-4	593 (52.2)	543 (47.8)	1136 (100)	0.036	0.849
	≥5	13 (54.2)	11 (45.8)	24 (100)		

*Statistically significant; ‡Lower: No formal education and primary education; ‡Higher: Secondary education and up to tertiary education. SD: Standard deviation

ability, declined economic productivity, reduced reproductive performance, poor school achievement or performance, heightened behavioral complications, deficient social skills, and vulnerability to contracting diseases.[11]

Table 2: Association between sociodemographic characteristics and wasting

Variables	Wasting (*n*=1160)		χ^2	*P-value*	OR	95% CI
	Wasted (*n*=68) (%)	Not wasted (*n*=1092) (%)				
School location						
Rural	55 (80.9)	551 (50.5)	23.75	<0.001*	4.14	2.24-7.69*
Urban	13 (19.1)	541 (49.5)				
Age (years)						
≤10	57 (83.8)	433 (39.7)	51.19	<0.001*	7.89	4.09-15.20*
≥10	11 (16.2)	659 (60.3)				
Sex						
Male	48 (70.6)	585 (53.6)	7.48	0.006*	2.08	1.22-3.55*
Female	20 (29.4)	507 (46.4)				
Birth order						
1-4	48 (70.6)	721 (66.0)	0.59	0.440	1.23	0.72-2.11
≥5	20 (29.4)	371 (34.0)				
Caregiver						
Parents	60 (88.2)	858 (78.6)	3.62	0.057	2.05	0.97-4.33
Grandparents and others	8 (11.8)	234 (21.4)				
Respondents' family characteristics						
Mothers' type of marriage						
Monogamous	31 (45.6)	554 (50.7)	0.68	0.410	0.81	0.50-1.33
Polygamous	37 (54.4)	538 (49.3)				
Children by mother						
1-4 children	28 (41.2)	459 (42.0)	0.02	0.890	0.97	0.59-1.59
≥5	40 (58.8)	633 (58.0)				
Children by father						
1-4	17 (25.0)	277 (25.4)	0.01	0.946	0.98	0.56-1.73
≥5	51 (75.0)	815 (74.6)				
Respondents' mothers' characteristics						
Educational status						
‡Lower	60 (88.2)	795 (72.8)	7.87	0.005*	2.80	1.33-5.92*
‡Higher	8 (11.8)	297 (27.2)				
Marital status						
Currently married	52 (76.5)	901 (82.5)	1.59	0.207	0.69	0.39-1.23
Not currently married	16 (23.5)	191 (17.5)				
Occupation						
Civil servant	0	44 (4.0)	§2.85	0.106	0.17	0.01-2.74
Traders, artisans, and farmers	68 (100.0)	1048 (96.0)				
Respondents' fathers' characteristics						
Religion						
Christianity	45 (66.2)	603 (55.2)	3.12	0.077	1.59	0.95-2.66
Islam	23 (33.8)	489 (44.8)				
Educational status						
‡Lower	47 (69.1)	732 (67.0)	0.13	0.722	1.10	0.65-1.87
‡Higher	21 (30.9)	360 (32.9)				
Occupation						
Civil servant	2 (2.9)	100 (9.2)	3.08	0.079	0.30	0.07-1.24
Traders, artisans, and farmers	66 (97.1)	992 (90.8)				

§Fisher's exact test; *Statistically significant; ‡Lower: No formal education and primary education; ‡Higher: Secondary education and up to tertiary education. OR: Odds ratio; CI: Confidence interval

Factors and determinants of wasting

This study revealed some observable determinants associated with wasting among schoolchildren which include clinical characteristics, mothers' educational status and occupation, and fathers' educational status and occupation location. Pupils ≤10 years of age were more wasted compared to other age groups, males are found to be more likely wasted than females. Families with children within birth order 1–4 were more likely to have wasted children compared with families with more than ≥5. These findings only serve to corroborate literature that factors such as paternal educational status, income, preterm children, absence of antenatal follow-up, acute respiratory infection, and diarrhea predispose children to wasting.[11] Other factors reported to be associated with wasting include maternal illiteracy, increased number of children in the household, preterm deliveries, age of

Table 3: Multivariate analysis of sociodemographic and predictors of wasting according to location

Variables	Rural location			Urban location		
	OR	95% CI	*P*	OR	95% CI	*P*
Predictors of wasting by location						
Sex						
Male	1.95	1.06-3.59	0.03#	*	*	*
Female	1.0					
Children by mother						
1-4	*	*	*	1.0		
≥5				2.82	0.86-9.28	0.09
Mothers' educational status						
Lower	1.91	1.06-3.47	0.03#	*	*	*
Higher	1.0					
Age (years)						
≤10	1.76	0.99-3.14	0.06	*	*	*
≥10	1.0					

*Variables not included in logistic regression model for this location as they were not significant on bivariate analysis; #Statistically significant. OR: Odds ratio; CI: Confidence interval

child, length and rate of breastfeeding during the first 6 months of life,[22] low family income, lack of access to health services, and unsafe water supply.[23]

Other notable factors reported by Desalegne *et al.* that were not examined in our study include the duration of pregnancy on likelihood of wasting later on in life. Preterm children from the study were nearly four times more probable to be wasted, while absence of antenatal follow-up was four times more likely to cause wasting.[11]

Findings showed that pupils with school location within the rural settings were more probable to be wasted than those located in urban regions. This also validates documented results from literature,[14] which observed the same results that the prevalence of wasting was higher in the rural settings than the urban settings. The increased likelihood of dilapidated and inadequate infrastructure, reduced access to health-care facilities, and lack of proper awareness on how to use locally accessible nutritious foods further complicate the scourge of wasting among the rural school pupils compared to their urban counterparts.[24] In a comparative view, children living in the northwest geopolitical region were considerably more susceptible to severe wasting when compared to their southwestern and southeastern counterparts.[14]

However, male participants of schools in the rural settings were almost two times more likely to be wasted compared with the female counterparts. Children by mother of 1–4 of schools in the urban settings were almost three times less likely to be wasted than those of ≥5. From the overall predictors of wasting, it was found that rural areas were about three times more significantly associated with high risk of wasting than the urban settings.

Limitations of the study

Despite the strengths of this study, some limitations should be noted. It will be difficult to decipher if wasting preceded or facilitated some factors such as number of children or number of wives married by father. In other words, temporality and causality cannot be ascertained. This is very typical with studies utilizing cross-sectional study design.[25]

The generalizability of this study is limited to southwestern part of Nigeria where the study was conducted. It should be also noted that the major ethnic group in this part of the country where the study was conducted are the Yorubas. As such, the influence and interference of sociocultural beliefs and practices on some of the findings cannot be overlooked. Finally, the likelihood of an underestimation is a possibility considering that Grade 5 and Grade 6 were excluded.

Future directions of the study

A qualitative component is certainly desirable in future studies to understand the underlying issues with family structure or individual-level peculiarities that can predispose to wasting among affected pupils.

Strengths of the study

Nevertheless, the study provides empirical findings that can serve to provide baseline statistics in further studies. Noteworthy strengths of this study include the selection of a fairly large and representative sample and high involvement rate of schoolchildren.

Conclusion

The study revealed that wasting was more common among children from rural schools compared to the urban schools. The control of wasting among schoolchildren is paramount to attain the WHA's global nutrition target of decreasing and maintaining infantile wasting to <5% and attaining a 30% decrease in low birthweight by 2025.[23] In addition, it is expedient that a viable and effective nutritional intervention should be formulated and implemented for primary school pupils, particularly those in rural settings. We advocate for policies that will encourage nutritional interventions and campaign to curtail the occurrence of wasting among schoolchildren; school diets that are balanced and rich in needed nutrients should be implemented across all primary and secondary schools in Nigeria and sub-Saharan Africa. Furthermore, adequate awareness campaign and short-term training courses for parents will help to augment governmental interventions on nutrition in the fight against malnutrition using locally available resources, as well as ensuring food security.

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Conflicts of interest

There are no conflicts of interest.

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