



WESTERN NIGERIA JOURNAL OF MEDICAL SCIENCES (WNIJMS)

**PREVALENCE OF MALNUTRITION AMONG UNDER-FIVE-YEAR-OLD PUPILS OF
PUBLIC PRIMARY SCHOOLS: A CASE STUDY OF OSUN WEST SENATORIAL
DISTRICT**

PREVALENCE OF MALNUTRITION AMONG UNDER-FIVE-YEAR-OLD PUPILS OF PUBLIC PRIMARY SCHOOLS: A CASE STUDY OF OSUN WEST SENATORIAL DISTRICT

Adeogun AS¹, Adeoti CO², Amanyunose AA¹, Akinjide FO¹, Lawal AA¹

1. Department of Food Science and Technology, Osun State Polytechnic, Iree, Nigeria
2. Department of Ophthalmology, Osun State University, Osogbo, Nigeria.

Correspondence to: Adeogun AS. Department of Food Science and Technology, Osun State Polytechnic, Iree, Nigeria. **E-mail:** adeogundayo@yahoo.com

ABSTRACT

Introduction: Malnutrition is a serious threat to the development of young children and the nation and if not tackled on time can lead to the untimely death of the affected children. Adequate data are needed to enable policymakers develop sustainable strategies to stem this problem that has become a global public health issue. The objective of this study is to determine the prevalence of malnutrition among under-five year pupils in public primary schools in the Osun West Senatorial District.

Methods: This is a descriptive school-based cross-sectional study. A semi-structured questionnaire was used to obtain data from respondents. A portable stadiometer was used to measure height, while a bathroom weighing scale was used to measure the weight of the respondents. Stunting, wasting, and BMI were calculated using WHO Anthroplus software and were exported to SPSS 20.0 version for descriptive and inferential analyses. Chi-square was used to analyse categorical data. Statistical Significance was set at $p \leq 0.05$.

Results: Of 300 participants included in the study, 260(86.7%) were underweight (malnourished) while 40(13.3%) of them were obese. About 296(98.7%) were moderately stunted while very few {4(1.3%)} of them were severely stunted, 232(77.3%) were moderately wasted and 68(22.7%) were severely wasted. Risk

factors of malnutrition indices were age, father's occupation, family type, ethnicity, and dietary intake.

Conclusion: There is a very high rate of malnutrition in Osun West Senatorial District. There is a need to put in place program that will improve the nutrition of students before it affects their academic performance.

Keywords: Body mass Index; malnutrition; under-five-year-old pupils; stunting; wasting.

INTRODUCTION

Malnutrition is an important public health problem that is caused by a deficient or excessive intake of nutrients relative to requirements.¹ Under-nutrition (nutrient deficiency) is the prevalent type of malnutrition in tropical developing countries. At most risks are the poor and disadvantaged, particularly women of reproductive age and young children.¹

Malnutrition is directly responsible for 300,000 deaths per year in children younger than 5 years in developing countries and contributes indirectly to more than half of all deaths in children worldwide.² Each year about 1 million Nigerian children die before their 5th birthday. Malnutrition contributes to nearly half of these deaths.³ Stunting,

Date Submitted: 15 October, 2022

Date Accepted: 26 March, 2023

wasting, overweight and underweight are key indicators used to measure nutritional imbalance termed malnutrition in young children.⁴

Stunted growth refers to low height-for-age when a child is short for his/her age but not necessarily thin. Also known as chronic malnutrition, this carries long-term developmental risks.⁵ Stunting prevents children from reaching their physical and cognitive potential.⁴

Wasting refers to low weight-for-height, where a child is thin for his/her height but not necessarily short. It is also known as acute malnutrition and carries an immediate increased risk of morbidity and mortality. Wasted children have a 5-20 times higher risk of dying from common diseases like diarrhoea or pneumonia than normally nourished children.

Under-weight refers to low weight-for-age when a child can be either thin or short for his/her age. This reflects a combination of chronic and acute malnutrition.⁵

Child overweight refers to a child who is too heavy for his or her height. This form of malnutrition results from expending too few calories for the amount of food consumed and increases the risk of non-communicable diseases later in life. Child overweight is one of the World Health Assembly's nutrition target indicators.⁶

According to the World Health Organization (WHO) 2020 report, about 144 million children under 5 years have stunted growth, 47 million children are wasted and 14.3 million are severely wasted, whilst 38.3 million are overweight or obese. According to the 2016 South Africa Demographic and Health Survey (SADHS), the prevalence rate of wasting was found to be 2.5% and underweight was 6%, whilst the stunting rate remained high at 27.0% amongst children under 5 years.⁷ Around 45% of deaths reported among children under the age of 5 years are linked to under-nutrition.⁷

Also, according to Nigeria's health demographic and health 2018 report, about 37% of Nigerian children aged 6-59 months

are stunted (short for their age), 7% are wasted (thin for their height), 22% are underweight (thin for their age), and 2% are overweight (heavy for their height).⁸ All these values are on the high side except for the prevalence of overweight.

Children are more vulnerable to different forms of malnutrition caused by the high demand for food during their years of growth.⁷ Malnutrition amongst children under the age of 5 years is a result of a complex interaction of availability, accessibility, and utilization of food and healthcare services.⁷ Nutrition-specific factors include inadequate food intake, poor caregiving and parenting, improper food practices and infectious comorbidities. Nutrition-sensitive factors include food insecurity, and inadequate economic resources at the individual, household, and community levels. Limited or poor access to education, healthcare services, infrastructure and a poor hygienic environment are other nutritional sensitive factors that adversely affect the nutritional status of children under the age of 5 years.⁷

All evidences showed that a high prevalence of malnutrition has serious consequences on the economic development of a nation. For instance, Govender *et al* reported that acute malnutrition can lead to morbidity, mortality and disability, as well as impaired cognitive and physical development with an increased risk of concurrent infections.⁷ Malnutrition weakens every part of the immune system and thus increases susceptibility to infection. Also, as malnutrition worsens, those affected have less energy and experience impairment in brain functions. This can make it difficult (or impossible) for them to perform the tasks needed to acquire food, earn an income, or gain an education.⁹ All these reduce the productivity of the individual which in turn affects the development of a nation.

Malnutrition among children remains a public health problem, which has a short-time, medium and long-time effects. However, there is no accurate data on the prevalence of malnutrition among those under five years and the associated factors in

each of the three Senatorial districts in Osun State. Hence this study is aimed at investigating the prevalence of malnutrition among under-five-years-old Pupils in the Osun West Senatorial District of Nigeria.

METHODS

Description of Study Area

This study was carried out in the Osun West Senatorial District of Osun State. Osun State is an inland state in South-western Nigeria. Its capital is Osogbo. It was created in 1991 from the old Oyo State. Osun State consists of three Senatorial districts, namely; Osun West, Osun East and Osun Central. Osun West Senatorial District is made up of ten local government areas.¹⁰

Study design

The study was a school-based descriptive cross-sectional design using an interviewer-administered, semi-structured questionnaire to carry out an anthropometric assessment of the nutritional status of those under-five-years pupils.

Study Population

Pupils in crèche/nursery and primary 1&2 (Though they were not duly registered and were not to be taught and promoted until they mature enough) in the selected primary schools in each of Osun West Senatorial District constituted the study population.

Inclusion Criteria

Pupils under-five years that are in crèche/nursery and primary 1&2 in selected primary schools whose parents consented to be included in the study were included.

Exclusion Criteria

Pupils who are older than five years, unwilling to participate and those who were sick were excluded from this study.

Sample Size Determination

The sample size for the study was calculated by using Cochran's formula

$$n = \frac{z^2 pq}{e^2}$$
 Where: $z = 1.96\%$; $p =$ the estimated proportion of the population with the attribute in question (which is 20.5% being

the prevalence of malnutrition (Stunting) for Osun State published by NDHS, 2013.¹¹; $e =$ Absolute precision of error; $q = 1 - p$; $n = \frac{1.96^2 \times 0.205 \times (1 - 0.205)}{0.05^2}$; $n = 250$.

Adjusting for a non-response rate of 10%, $n = 275$. Therefore, a total of 300 respondents were recruited for the survey.

Sampling Technique

A multistage sampling technique was used to select respondents for the study.

Stage one: Five local government areas in Osun West Senatorial district were selected by simple random sampling.

Stage two: All Primary schools in the selected local government areas were given numbers and two schools were selected from each local government area by random sampling.

Stage three: Thirty Pupils that met the inclusion criteria were randomly selected on each visit day for five days.

Research Instruments

The primary means of gathering data for analysis in this work was the use of structured questionnaires, which was designed by the research team after an extensive review of the literature. The questionnaire was completed by the research team on behalf of the students.

A portable stadiometer was used to measure the height of the respondents, while analogue weighing was used to measure the weight.

The research instruments were tested at two different Primary Schools in the Iree community which is outside the selected senatorial district and also subjected to review by experts in the field of Public Health, Nutrition and Dietetics. Necessary corrections were made to the research instruments before data collection.

Independent variables included the following - Age, gender, class, religion, fathers' educational status, and mothers' educational

status as provided by the pupil's teacher who stood for their parents.

Dependent variables were- Stunting, wasting and body mass index (BMI).

Data Management

Data were analyzed using IBM SPSS (20). Descriptive and inferential statistical analyses were used to describe items included in the survey. All results from the field were coded, compiled and properly recorded in a password-protected excel spreadsheet, made only accessible to the research team. Mean and standard deviations were used to describe the continuous variables, while frequency and percentages were used to describe the categorical data. Dietary scores of the respondents according to socio-demographic characteristics were compared using an independent-samples *t*-test for continuous variables and a Chi-square test or one-way analysis of variance (ANOVA), as appropriate for categorical variables. A statistical significance level of *p* less than 0.05 was used for all statistical analyses. BMI, stunting and wasting were computed using the WHO ANTHRO PLUS software and the results were later exported to SPSS.

RESULTS

A total of 300 respondents were recruited and interviewed in this study. The socio-demographic distribution of the respondents is shown in Table 1. Of the 300 pupils interviewed, 176(58.7%) were males and 124(41.3%) were females. Age distribution showed that 134(44.7%) of the pupils were five years old, while 76(25.3%), 80(26.7%) and 10(3.3%) were four years, three years and two years old respectively. The majority, 248(82.7%), were in primary one, crèche and nursery, while 52(17.3%) of them were in primary two. The occupation of their fathers were as follows: 140(46.6%) of them were drivers, 62(20.7%) were artisans, 50(16.7%) were businessmen (traders), 30(10%) of them were farmers and 12(4.0%) of them were civil servants. The majority, 296(98.6%), of the pupils interviewed were

Yorubas and a few 2(0.7%) were Hausas and Igbos.

Table 1: Socio-demographic characteristics of respondents

Variable	n	Percentage %
Age in years		
2	10	3.3
3	80	26.7
4	76	25.3
5	134	44.7
Sex		
Male	174	58.7
Female	124	41.3
Class		
Creche, nursery & 1	248	82.7
2	52	17.3
Father's occupation		
Civil servant	12	4.0
Farmer	30	10.0
Business	50	16.7
Driver	140	46.6
Artisan	62	20.7
Clergy	6	2.0
Mother's occupation		
Farmer	12	4.0
Businesswoman	170	56.6
Artisan	114	38.0
Clergy	2	0.7
Housewife	2	0.7
Family type		
Monogamy	150	50.0
Polygamy	150	50.0
Ethnicity		
Hausa	2	0.7
Yoruba	296	98.6
Igbo	2	0.7

Table 2 shows the prevalence of underweight, over-weight, stunting and wasting among the respondents.

The majority, 260(86.7%), of the children were underweight (malnourished) while 40(13.3%) of them were obese; 296(98.7%) of them were moderately stunted while very few 4(1.3%) of them were severely stunted.

Table 2: Prevalence of underweight, overweight, stunting and wasting among the respondents

Nutritional Status	n=300	Percentage (%)
Underweight	260	86.7
Obese	40	13.3
Moderately stunted	296	98.7
Severely stunted	4	1.3
Moderately wasted	232	77.3
Severely wasted	68	22.7

Similarly, the distribution of weight for age revealed that most, 232(77.3%), of them were moderately wasted while 68(22.7%) of them were severely wasted.

Table 3 shows the relationship between the prevalence of under-weight, over-weight and socio-demographic status of the respondents, which showed that pupils of age five {112(83.6%)} were more malnourished (underweight) than their counterparts of age two {8(80%)}, three {70(87.5%)}, and four {70(92.1%)} respectively. This showed that rate of underweight increases with age. Also, male pupils {156(88.6%)} were more malnourished (underweight) than females {104(83.9%)}. In addition, pupils from polygamous families {138(92.0%)} were more malnourished than those from monogamous families {122(81.3%)}. Test of significant association revealed a significant association between the family type of the pupil, their ethnicity and nutritional status (BMI), (p-value <0.05).

Table 4 revealed the association between socio-demographic status and nutritional status. One hundred and forty-two (82.7%) male pupils were wasted compared to 90(79.2%) of them that were females. This shows that male pupils were more malnourished than their female counterparts. Pupils of age five 100(74.6%) were more wasted than those of age four 50(65.8%), three 72(90.0%) and age two 10(100.0%) respectively. It can be seen from this result that malnutrition increases with the age of the children. There was a significant association between the age of the pupils,

Table 3: Relationship between nutritional status (BMI) and socio-demographic status of the respondents

Variable	Underweight	Obese	Statistics
Age			
2	8(80.0%)	2(20.0%)	$\chi^2=3.481$ p=0.323
3	70(87.5%)	10(12.5%)	$\chi^2=3.481$ p=0.323
4	70(92.1%)	6(7.9%)	$\chi^2=3.481$ p=0.323
5	112(83.6%)	22(16.4%)	$\chi^2=3.481$ p=0.323
Class			
1	210(84.7%)	38(15.3%)	$\chi^2=4.913$ p=0.086
2	50(96.2%)	2(3.8%)	$\chi^2=4.913$ p=0.086
Sex			
Male	156(88.6%)	20(11.4%)	$\chi^2=1.430$ p=0.232
Female	104(83.9%)	20(16.1%)	$\chi^2=1.430$ p=0.232
Religion			
Christian	96(85.7%)	16(14.3%)	$\chi^2=0.717$ p=0.699
Muslim	160(87.0%)	24(13.0%)	$\chi^2=0.717$ p=0.699
Father's occupation			
Civil servant	12(100.0%)	0	$\chi^2=9.171$ p=0.102
Farmer	26(86.7)	4(13.3)	$\chi^2=9.171$ p=0.102
Business man	46(96%)	2(4.0%)	$\chi^2=9.171$ P=0.102
Driver	50(84.3%)	22(15.7%)	$\chi^2=9.171$ p=0.102
Artisan	50(80.6%)	12(19.4%)	$\chi^2=9.171$ p=0.102
Clergy	6(100.0%)	0	$\chi^2=9.171$ p=0.102
Mother's occupation			
Famer	12(100.0%)	0	$\chi^2=0.402$ p=0.982
Trader	168(98.8)	2(1.2%)	$\chi^2=0.402$ p=0.982
Artisan	112(98.2)	2(1.8%)	$\chi^2=0.402$ p=0.982
Clergy	2(100.0%)		$\chi^2=0.402$ p=0.982
House	0	2(100%)	$\chi^2=0.402$ p=0.982
Family type			
Monogamous	122(81.3%)	28(18.7%)	$\chi^2=7.365$ p=0.007
Polygamous	138(92.0%)	12(8.0%)	$\chi^2=7.365$ p=0.007
Ethnicity			
Hausa	0	2(100)	$\chi^2=13.371$ p=0.001
Yoruba	258(87.2%)	38(12.8%)	$\chi^2=13.371$ p=0.001
Others	2(100.0%)	0	$\chi^2=13.371$ p=0.001

their ethnicity and nutritional status (weight for age), (p-values < 0.05)

Table 5 shows the result of the association between the prevalence of stunting and socio-demographic status. The result shows that pupils of age five 132(98.5%) were more stunted than pupils of four 74(97.4%), age three 80(78.9%), and age two 10(100.0%). Also, it can be deduced from the result that the rate of stunting increases with the age of the respondents. Male pupils 174(98.9%), were more malnourished than female pupils 122 (98.4%). The results also revealed no association between age, sex, religion, mothers' occupation, family type, and ethnicity, but shows that an association existed between the fathers' education and nutritional status.

Table 6 shows the percentage distribution of respondents on types of snacks they like taking: 104(34.7%) liked to take fried flour-based snacks such as puff-puff, while 108(36.0%) liked baked flour-based snacks; a total of 82 liked taking sweet and candy while only a few of them 4(1.3%) preferred proteinous snacks.

Table 7 shows the association between the number of times eaten per day and the prevalence of malnutrition. Out of the total 260 that were underweight, 258(87.2%) do take three square meals per day, while only 2(50.0%) skip a meal or eat two times per day. Also, out of 60 respondents that were obese, only 2(50.0%) eat two times per day while 38(12.8%) do eat three times per day. There was a significant association when BMI was compared with the number of times eaten per day. Also, a total of 296 were moderately stunted, of which 292(98.6%) normally take three square meals per day, while only 4(100.0%) ate two times per day. Only 4(1.4%) of the respondents who took three square meals per day were severely stunted. There was no association between the prevalence of stunting and the number of times eaten per day. Not only that, a total of 232 were moderately wasted out of which 230(77.7%) do take three square meals and only 2(3.1%) eat two times per day. A total

Table 4: Relationship between the socio-demographic characteristics of the respondents and nutritional status

Variable	Nutritional status		Statistics
	Moderately Wasted	Severely wasted	
Age in years			
2	10(100.0%)	0	$\chi^2=16.591$ p= 0.001
3	72(90.0%)	8(10.0%)	$\chi^2=16.591$ p=0.001
4	50(65.8%)	26(34.2%)	$\chi^2=16.591$ p=0.001
5	100(74.6%)	34(25.4%)	$\chi^2=16.591$ p=0.001
Class			
Primary 1	192(77.4)	56(22.6)	$\chi^2=3.448$ p=0.178
Primary 2	40(78.3)	12(21.7)	$\chi^2=3.448$ p=0.178
Sex			
Male	142(80.7%)	34(19.3%)	$\chi^2=2.724$ p=0.099
Female	90(79.2%)	34(27.4%)	$\chi^2=2.724$ p=0.099
Religion			
Christian	84(75.0%)	28(25.0%)	$\chi^2=1.6112$ p=0.447
Muslim	144(78.3%)	40(21.7%)	$\chi^2=1.6112$ p=0.447
Father's occupation			
Civil servant	8(66.7%)	4(33.3%)	$\chi^2=5.972$ p=0.309
Farmer	24(80.0%)	6(20.0%)	
Businessman	44(88.0%)	6(12.0%)	
Driver	108(77.1%)	32(22.9%)	
Artisan	44(71.0%)	18(29.0%)	
Clergy	4(66.7%)	2(33.3%)	
Family type			
Mono gamous	110(73.3%)	40(26.7%)	$\chi^2=2.738$ p=0.098
Poly gamous	122(81.3%)	28(18.7%)	
Ethnicity			
Hausa	2(100.0%)	0	
Yoruba	230(77.7%)	66(22.3%)	
Others	0	2(100.0%)	$\chi^2=7.422$ p=0.024

Table 5: Relationship between the prevalence of stunting and socio-demographic status.

Variable	Prevalence of malnutrition		Statistics
	Moderately Stunted	Severely Stunted	
Age in years			$\chi^2=2.216$ p=0.529
2	10(100.0%)	0	
3	80(78.9%)	0	
4	74(97.4%)	2.6(2.6%)	
5	132(98.5%)	2(1.5%)	
Class			
Primary 1	248(100.0%)	0	$\chi^2=19.79$ p=0.000
Primary 2	48(92.3%)	7(7.7%)	
Sex			
Male	174(98.9%)	2(98.9%)	$\chi^2=1.26$ p=0.723
Female	122(98.4%)	2(1.6%)	
Religion			
Christian	110(98.2%)	2(1.8%)	$\chi^2=0.313$ p=0.86
Muslim	182(98.9%)	2(1.1%)	
Father's occupation			$\chi^2=12.62$ p=0.033
Civil servant	12(100.0%)	0	
Farmer	28(93.3%)	2(6.7%)	
Businessman	46(96.0%)	2(4.0%)	
Driver	140(100%)	0	
Artisan	62(100.0%)	0	
Clergy	6(100.0%)		
Mother's occupation			$\chi^2=0.402$ p=0.982
Farmer	12(100.0%)	0	
Trader	168(98.2%)	2(1.8%)	
Artisan	112(98.2%)	2(1.8%)	
Clergy	2(100.0%)	0	
House	2(100.0%)	0	
Family type			$\chi^2=0.00$ p=1.00
Monogamous	148(98.7%)	2(1.3%)	
Polygamous	148(98.7%)	2(1.3%)	
Ethnicity			$\chi^2=0.55$ p=0.973
Hausa	2(100.0%)	0	
Yoruba	292(98.6%)	4(1.4%)	
Igbo	2(100.0%)	0	

Table 6: Response of respondents on types of snacks liked

Types of snacks	n=300	Percent%
Fried flour-based snacks	104	34.7
Baked flour-based snacks	108	36.7
Sweet and candy	82	27.3
Proteinous	4	1.3

of 68 respondents were severely wasted, out of which, 2 (50.0%) skip a meal per day and 66(22.3%) had three square meals. There was no significant relationship between the number of times eaten per day and the prevalence of wasting.

Table 8 shows that out of 260 respondents who were underweight, 99(94.3%) of them liked to take FFBS (Fried flour-based snacks), 82(75.9%) liked to take BFBS (Baked flour-based snacks, 77(92.8%) do take sweet and candy, while only 2(50.0%) liked proteinous snacks. Also out of 40 respondents who were obese, 6(5.7%) liked FFBS, 26(24.1%) liked BFBS, 6(7.2%), while 6(7.2%) liked taking sweet and candy and only 2(50.0%) liked proteinous snacks. There was an association between BMI and the type of snacks liked or taken. Also, a total of 296 were moderately stunted, out of which 105(100.0%) liked FFBS, 104(96.3%) liked BFBS, 83(100.0%) liked sweet and candy and only 4(100.0%) liked proteinous snacks. There was no association between the prevalence of stunting and the types of snacks liked. Out of 232 respondents who were moderately wasted, 79(75.2%) of them do take FFBS, 84(77.8%) do take BFBS, 65(78.3%) like to takes sweets and candy, and only 4(100.0%) like taken proteinous snacks. A total of 68 respondents were severely wasted, out of which 26(24.8%) preferred to take FFBS, 24(22.2%) do take BFBS, and 18(21.7%) liked to take sweets and candy, none take proteinous snacks. There was no association between the prevalence of wasting and the type of snacks taken as shown in Table 8.

DISCUSSION

On a general note, there was a very high prevalence of malnutrition among under-five school children in the Osun West Senatorial District when compared to the prevalence threshold established by the WHO-UNICEF Technical Advisory Group on Nutrition Monitoring. According to WHO prevalence of severity of malnutrition indices less than <2.5% is considered very low, between 2.5-

Table 7: Relationship between the prevalence of Malnutrition and Dietary intake of respondents

Nutritional status	No of times eaten per day		Statistics
	2	3	
Underweight	2(50.0%)	258(87.2)	$\chi^2=4.717$ p=0.003
Obese	2(50.0%)	38(12.8%)	$\chi^2=4.717$ p=0.003
Moderately stunted	4(100.0%)	292(98.6%)	$\chi^2=0.05$ p=0.813
Severely stunted	0	4(1.4%)	$\chi^2=0.05$ p=0.813
Moderately wasted	2(50.0%)	230(77.7%)	$\chi^2=1.7209$ p=0.189
Severely wasted	2(50.0%)	66(22.3%)	$\chi^2=1.7209$ p=0.189

Table 8: Relationship between types of snack liked and the nutritional status.

Nutritional status	Types of snacks liked				STATISTICS
	FFBS	BFBS	S&C	PS	
Underweight	99(94.3%)	82(75.9%)	77(92.8%)	2(50.0%)	$\chi^3=23.387$ p=0.000
Obese	6(5.7%)	26(24.1%)	6(7.2%)	2(50.0%)	$\chi^3=23.387$ p=0.000
Moderately stunted	105(100.0%)	104(96.3%)	83(100.0%)	4(100.0%)	$\chi^3=7.207$ p=0.066
Severely stunted	0	4(3.7%)	0	0	$\chi^3=7.207$ p=0.066
Moderately wasted	79(75.2%)	84(77.8)	65(78.3%)	4(100.0%)	$\chi^3=1.493$ p=0.684
Severely wasted	26(24.8%)	24(22.2%)	18(21.7%)	0	$\chi^3=1.493$ p=0.684

Note* FFBS= Fried flour based snacks,** BFBS= Baked flour based snacks, ***SC= Sweet and candy,**** PS= Proteinous snacks.

<5% is considered low for both wasting and overweight, while 2.5-<10% is considered low for stunting. Also, 5-<10 is considered medium for both wasting and overweight and 10-<20 is considered medium for stunting. Prevalence range between 10-<15% is considered high for wasting and overweight, while 20-<30% is regarded as high for stunting. In addition prevalence ≥ 15 is considered very high for wasting and overweight and ≥ 30 is considered very high for stunting.¹² The high prevalence of malnutrition indices in this study is also similar to previous findings in Ethiopia.¹³ It, however, contradicts the study conducted in Southeast Nigeria by Chukwuemaka *et al* in which there was low prevalence; this variation may be due to differences in dietary intakes on a regional geographic basis.¹⁴

The prevalence of malnutrition (wasting) increases with the age of the children with a significant association, but not with stunting and BMI. This corroborates the findings of the previous study conducted in Ethiopia in which the rate of malnutrition forms

increased with the age of the children.¹³ There was no association between the prevalence of stunting, underweight, and overweight; this also goes in line with another study conducted in the Enugu metropolis and Imo State, Southeast Nigeria which revealed that there was no association between the age of the children and the nutritional status.^{14,15}

The present study revealed that there was no significant relationship between malnutrition and gender. A similar result was reported in Enugu, in which there was no significant association between gender and nutritional status.¹⁴ However, in the study conducted in Ethiopia, nutritional status was dependent on gender.¹³ In addition, Manyike *et al* also reported no significant association between the prevalence of stunting and wasting.¹⁶

At the time of this study, the father's occupation and the mother's occupation do not have a significant effect on the malnutrition indices, except for stunting. This finding contradicts the findings of most

of the researchers who linked the poor nutritional status of young children to the socioeconomic status of parents.^{13,14} However, our findings corroborate the study of Emily *et al*, who stated that the prevalence of being underweight does not have an association with the father's or mother's occupation.¹⁷ The reasons for these differences perhaps may be because most of these pupils were from lower-class socioeconomic parents who ordinarily could not afford to send their wards to private schools and are not likely to be able to feed them well. The association between stunting and father's occupation found in this study goes in line with previous studies.¹⁸ Stunting occurs as a result of prolonged malnutrition which is consequential to the low-income status of both the father and the mother of the children.

Family type and ethnicity were associated with underweight, obesity, and wasting but not with stunting. This was also reported in the studies conducted in Ethiopia and Abeokuta, southwest Nigeria, in which children from polygamous families were more likely to be malnourished than children from monogamous families.^{13,18} Also, variation in the meal preparation and dietary intake from one ethnicity to another can lead to forms of malnutrition, as a study in Ethiopia corroborates the findings from this study that geographical region and ethnicity can influence nutritional status.¹³

Our study revealed a relationship between dietary intake (such as the number of times eaten per day, and types of snacks liked) and the prevalence of underweight and obesity. These findings are consistent with the study of Babatunde *et al* in Ilorin, Kwara state and that of Kalu and Etim.^{18,20}

CONCLUSION

There is a high rate of malnutrition among under-five year pupils in public primary schools in Osun West Senatorial District as shown by this study. Therefore all hands must be on deck to bring about lasting and

sustainable solutions to tackle this menace, as it has dire consequences on the development of the children, the community, the state and the nation at large.

Acknowledgement: Appreciations to Dr Atere and Dr Sunday Olanrewaju both of Osun State University for assisting in obtaining ethical clearance.

Conflicts of interest: The authors declare no conflict of interest.

Ethical clearance/approval: Ethical clearance/approval for this study was obtained from the Health Research Ethical Committee of the College of Health Sciences, Osun State University, Osogbo, Nigeria.

Consent: Verbal inform consent of the respondent to participate was obtained from their teachers/caregivers who stood in for the parents.

Data availability: The data set for this research study was stored in the author's google drive under a password and can be reproduced upon request if the needs arise for this publication.

REFERENCES

- 1 Burgess A. Nutritional disorder In: Short Textbook of Public Health medicine for the tropics. Georgina B and Heather S (4eds). London. Arnold; 2003; pp 261-283
- 2 Harohalli R.S. Malnutrition: Practice Essentials, Background, Pathophysiology. <http://emedicine.medscape.com> (Accessed September 5, 2022)
- 3 Malnutrition in Nigeria: silent crisis. Available from <https://www.prb.org/wp-content/uploads/2015/07/nigeria-malnutrition-factsheet-1.pdf>. (Accessed September 5, 2022.)

- 4 Malnutrition. Available from https://www.who.int/health-topics/malnutrition#tab=tab_1. (Accessed September 5, 2022.)
- 5 Anthropometric Definition of Malnutrition. Available from motherchildnutrition.org/malnutrition/about-malnutrition/anthropometric-definitions-of-malnutrition.html. (Accessed September 5, 2022.)
- 6 Child malnutrition: Overweight prevalence among children under 5 years of age. Available from: www.who.int/data/gho/indicator-metadata-registry/imr-details/74. (Accessed September 5, 2022)
- 7 Govender I, Rangiah S, Kaswa R, Nzaumvila D. Malnutrition in children under the age of 5 years in a primary health care setting. *S Afr Fam Pract*. 2021; 63(1): 5337
- 8 National Population Commission (NPC) [Nigeria] and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF, pp 255-296. Available from: <https://www.dhsprogram.com/pubs/pdf/FR359/FR359.pdf>. (Accessed September 5, 2022)
- 9 Malnutrition. Available from: <https://en.wikipedia.org/wiki/Malnutrition#Effects>. (Accessed September 6, 2022.)
- 10 Osun West Senatorial Zone/ District. Available from: <https://www.manpower.com.ng/places/senatorial-zone/128290/osun-west>. (Accessed September 6, 2022.)
- 11 National Population Commission (NPC) [Nigeria] and ICF. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF, pp 177-181. Available from: <https://dhsprogram.com/pubs/pdf/fr293/fr293.pdf>. (Accessed September 6, 2022)
- 12 Malnutrition. Available from: <https://data.unicef.org/topic/nutrition/malnutrition/>. (Accessed 5th September 2022)
- 13 Abay KI, Ashenafi AW, Garoma WB. Prevalence of malnutrition and associated factors among under-five children in Ethiopia: evidence from the 2016 Ethiopia Demography survey. *BMC Res Notes*. 2019; 12:391
- 14 Jude CK, Chukwunedum AU, Egbuna KO. Under-five malnutrition in a South-Eastern Nigeria metropolitan city. *Afr Health Sci*. 2019; 19(4): 3078-3084.
- 15 Duru CB, Oluoha UR, Uwakwe KA, Diwe KC, Merenu IA, Chigozie IO, *et al*. Prevalence and sociodemographic determinants of malnutrition among under-five children in rural communities in Imo State, Nigeria. *Am J Public Health Res*. 2015; 3:199-206
- 16 Manyike PC, Chinawa JM, Ubesie A C, Obu HA, Odetude OI, Chinawa AT. Prevalence of malnutrition among pre-school children in South-east Nigeria. *Ital J Paediatr*. 2014; 40:75
- 17 Bloss E, Wainana F, Bailey RC. Prevalence and predictors of underweight, stunting, and wasting among children aged 5 and under in western Kenya. *J Trop Pediatr*. 2004; 50:260-270
- 18 Senbanjo IO, Oshikoya KA, Odusanya OO, Njokanma OF. Prevalence of and risk factors for stunting among school children and adolescents in Abeokuta, southwest Nigeria. *J Health Popul Nutr*. 2011; 29(4):364-370
- 19 Raphael OB, Funke IO, Segun BF, Foluke SO. Prevalence and Determinants of Malnutrition among Under-five Children of Farming Households in Kwara State, Nigeria. *J Agric Sci*. 2011; 3:173-181
- 20 Kalu RE, Etim KD. Factors associated with malnutrition among under-five children in developing countries: A Review. *Glo J Pure Appl Sci*. 2018; 24:69-74