

## Prevalence and correlates of obesity among primary school pupils in Sokoto metropolis, Nigeria

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### ABSTRACT

**Background:** Childhood overweight/obesity is becoming a threat to public health worldwide affecting both developed and developing countries. Information on the burden of childhood obesity and the factors associated with it is important in designing appropriate strategies for its prevention and control. **Aim:** This study was conducted to determine the prevalence and correlates of obesity among primary school pupils in Sokoto metropolis, Nigeria. **Materials and Methods:** A cross-sectional study was conducted among 240 primary school pupils selected by multistage sampling technique. Information on the participants' socio-demographic characteristics, and their physical activity and dietary patterns were obtained with a set of structured interviewer-administered questionnaire; anthropometric assessment was also done for them. Data were analyzed using IBM SPSS version 23 statistical computer software package. **Results:** Forty-one (17.0%) of the 240 participants were obese, close to half of them (45.4%) had normal weight, about a third (31.3%) had thinness, while a few of them (6.3%) were overweight. Physical inactivity and unhealthy dietary behavior were also very prevalent among the participants. Obesity was significantly associated ( $p < 0.05$ ) with the participants' age, sex, socioeconomic status, physical inactivity and unhealthy dietary behavior. **Conclusion:** This study showed high prevalence of obesity, physical inactivity and unhealthy dietary behavior among primary school pupils in Sokoto metropolis, Nigeria. Government, policymakers and school administrators should design appropriate strategies for promoting healthy dietary behavior and physical activity among primary school pupils to halt the current trend.

**Keywords:** Prevalence, correlates, obesity, primary school pupils

### INTRODUCTION

Overweight and obesity represent a rapidly growing risk to the health of the people in an increasing number of countries, and for many developing countries, obesity and its consequence have become a challenge similar to hunger and under nutrition.<sup>1,2</sup> Childhood overweight/obesity is becoming a threat to public health worldwide affecting both developed and developing countries.<sup>3</sup>

Of recent, there has been a tremendous rise in the prevalence of childhood obesity mainly attributed to rapidly changing dietary practices and increasing sedentary lifestyle in the developing countries.<sup>4</sup> The prevalence of childhood overweight/obesity worldwide has increased from 4.2% in 1990 to 6.7% in 2010, and it is anticipated to reach 9.1% in 2010 if the current trend continues.<sup>5</sup> The estimated prevalence of childhood

overweight/obesity in Africa in 2010 was 8.5% and it is expected to reach 12.7% in 2020.<sup>5</sup> Another study reported an average overweight and obesity prevalence of 10.6 and 2.5% respectively among school-aged children and youth in sub-Saharan Africa, and the prevalence of obesity/overweight was higher in children living in urban and those of higher socioeconomic status as compared to those of lower socioeconomic status and living in rural areas.<sup>6</sup>

Although, overweight/obesity is believed to be caused by a wide range of interrelating factors operating at multiple levels, the sharp rise in its prevalence in recent years among both children and adults globally has been attributed to unhealthy dietary behavior (with an increased intake of energy-dense foods that are high in fat), and an increase in physical inactivity due to the

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Received: 13-01-2019

Revised: 25-02-2019

Published: 28-02-2019

increasingly sedentary nature of many forms of work, changing modes of transportation and increasing urbanization.<sup>7</sup> Unhealthy dietary behavior includes consumption of fast food or drinks, frequent consumption of fast food, eating away from home, and regular drinking of sugar-rich beverages.<sup>8</sup> All of these have been found to be predictors of overweight and obesity among school children.<sup>9,10</sup>

Physical activity not only has benefits that are associated with reducing the risk of overweight/obesity but it also reduces the risk for cardiovascular diseases and diabetes, reduces blood pressure, depression and osteoporosis, improves the level of high density lipoprotein cholesterol and control of blood glucose in overweight people. It also reduces systemic inflammation and blood coagulation, reduces the risk for colon cancer and breast cancer among women, promotes autonomic tone and improves cardiac and endothelial function.<sup>11,12</sup> In essence, regular physical activity prevents primary and secondary chronic diseases, and premature death.

Obesity frequently runs in families, and obese parents frequently have obese children. Parenting style and family socio-demographic characteristics are believed to have tremendous effects on the children's healthy dietary behavior, and poor family functioning has been linked with increased risk of overweight/obesity in children and adolescents.<sup>13,14</sup> Also, previous studies have established different types of relationships between the cultural and socioeconomic characteristics of parents and childhood overweight/obesity.<sup>6,15-17</sup>

Whereas, studies conducted in Italy<sup>15</sup> and Spain<sup>16</sup> found that children of parents with higher educational level (university degrees and higher diploma) and with more highly qualified occupations had a lower likelihood of being overweight/obese than children of parents with lower education and less qualified occupations, studies conducted in India<sup>17</sup> and across sub-Saharan Africa<sup>6</sup> found higher prevalence of overweight/obesity in children of parents with higher socioeconomic status as compared to those of lower socioeconomic status.

Overweight/obesity is a major risk factor for non-communicable diseases such as diabetes, certain cancers and cardiovascular diseases; it also affects the physical, emotional, social and school functioning of children and adolescents (thus causing substantially reduction in their health related quality of life).<sup>7,18</sup> It is inconceivable that although effective interventions for the prevention and control of overweight/obesity are available, compliance with these interventions remains low in many developing

countries, and the burden of the disease continues to rise, not only in the adult population, but also among children and adolescents in these countries. Information on the burden of childhood obesity and the factors associated with it is important in designing appropriate strategies for its prevention and control. Little is known about the epidemiology of childhood obesity in Sokoto, Nigeria. This study was conducted to determine the prevalence and correlates of obesity among primary school pupils in Sokoto, Nigeria.

## **MATERIALS AND METHODS**

### **Study Design, Population and Area**

A cross-sectional study was conducted among primary school pupils attending both public and private schools in Sokoto metropolis, Nigeria, in July and August 2016. All pupils whose parents gave consent for them to participate were considered eligible for enrolment into the study.

### **Sample Size Estimation and Sampling Technique**

The sample size was estimated at 234 using the statistical formula for calculating the sample size for descriptive studies,<sup>19</sup> a 17.4% prevalence of obesity among pupils in public and private schools in a previous study,<sup>20</sup> a precision level of 5%, and an anticipated 95% response rate. A total of 240 pupils were enrolled into the study.

The eligible participants were selected by a multistage sampling technique. At the first stage, 2 of 5 Local Government Areas (LGAs) in Sokoto metropolis were selected by simple random sampling using the ballot option. At the second stage, line listing of all the public and private schools in the selected LGAs was done, and 40% of the schools were selected by simple random sampling using the table of random numbers (122 public schools and 78 private schools were selected). At the third stage, one class was selected (from primary 2 to 6) in each of the selected schools by simple random sampling, using the balloting technique. At the fourth stage, selection of pupils was done in each of the selected classes by systematic sampling technique using the students' list in each class to constitute the sampling frame.

### **Data Collection**

A set of structured, standardized questionnaire (administered by trained research assistants) was used to obtain information on the study participants' socio-demographic characteristics, and physical activity and dietary patterns. The questions on physical activity and dietary patterns were adapted from the WHO STEPS Instrument for chronic diseases risk factors

surveillance.<sup>21</sup> The socioeconomic status of the pupils was computed using the levels of education and occupation of both parents as described in a study on socioeconomic and socio-cultural background of hospitalized children in Ilesha by Oyedeji.<sup>22</sup> The questionnaire was pretested on 30 pupils in one of the LGAs that were not selected for the study; the questions were well understood but some of the questions were re-arranged to ease the administration of the questionnaire.

Anthropometric assessment was also done for the participants. Weight was measured with shoes off to the nearest 0.5kg using a seca optimal scale; it was validated with a standard weight and corrected for zero error. Height was measured without shoes to the nearest 0.5cm using a stadiometer. Body mass index (BMI) was calculated as weight (kg) divided by height<sup>2</sup> (m<sup>2</sup>) and used as marker for thinness, overweight and obesity based on the WHO 2007 Growth reference BMI for ages 5-19 (and sex). Thinness was defined as BMI <-2SD, overweight was defined as BMI >+1SD (equivalent to BMI 25kg/m<sup>2</sup> at 19 years), while obesity was defined as BMI >+2SD (equivalent to BMI 30kg/m<sup>2</sup> at 19 years).<sup>23</sup>

**Data Analysis**

The questionnaires were manually checked for accuracy and completeness. Data were cleaned, entered into, and analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 23.0. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies and percentages. The chi-square test was used to compare differences between proportions. All levels of significance were set at p < 0.05.

**Ethical Consideration**

Institutional ethical clearance was obtained from the Ethical Committee of Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study was obtained from the Honorable Commissioner, Sokoto State Ministry of Basic and Secondary Education, Sokoto, Nigeria. Informed consent was also obtained from the parents of the pupils before the commencement of the study.

**RESULTS**

**Socio-demographic characteristics of participants**

All the 240 questionnaires administered were adequately completed and found suitable for analysis, giving a response rate of 100%. The ages of the participants ranged from 6 to 15 years (mean = 9.9 ± 2.2 years), and majority of them (58.3%) were aged 6-10 years. Majority

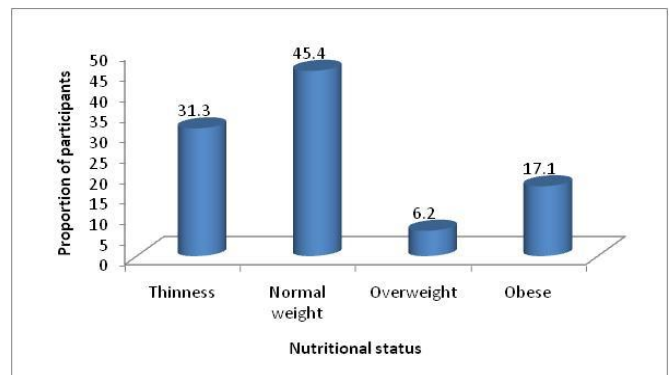
of participants were females (52.1%), attend public schools (60.0%), and their parents were in the medium and low socioeconomic classes (69.5%) as shown in Table 1.

**Table 1: Socio-demographic characteristics of participants**

Variables	Frequency (%) n =240
Age group (years)	
6-10	140 (58.3)
11-15	100 (41.7)
Sex	
Male	115 (47.9)
Female	125 (52.1)
Socioeconomic class	
High	71 (29.6)
Medium	77 (31.2)
Low	92 (38.3)
Type of school	
Private	96 (40.0)
Public	144 (60.0)

**Nutritional status of participants**

Forty-one (17.1%) of the 240 participants were obese, close to half of them (45.4%) had normal weight, about a third (31.3%) had thinness, while a few of them (6.3%) were overweight (Figure 1).



**Figure 1: Nutritional status of participants**

**Pattern of physical activity among participants**

A larger proportion of participants (39.6%) go to school in a private car, and only about a third of them (31.7%) trek to school. Most of the participants (89.2%) participate in sporting activities at school, with the most commonly performed sporting activities being running (45.8%) and playing football (25.8%). Majority of participants spend 30 minutes or more playing sport (77.1%), and participated in sporting activities 3 times or more in a week (62.9%). Majority of participants (54.2%) have never participated in any domestic chores, and most of them (84.6%) have never been involved in any form of agricultural activities at home (Table 2).

**Table 2: Pattern of physical activity among participants**

Variables	Frequency (%) n = 240
Means of transportation to school	
Private car	95 (39.6)
Walk to school	76 (31.7)
Public transport	33 (13.8)
Motor cycle	23 (9.6)
School bus	13 (5.4)
Participate in sporting activities	
Yes	214 (89.2)
No	26 (10.8)
Type of sporting activity performed	
Football	62 (28.5)
Cycling	19 (7.9)
Running	110 (45.8)
Watching television	20 (8.3)
Computer games	29 (12.1)
Duration of sporting activity	
<30 minutes	54 (22.5)
30 minutes	148 (61.7)
>30 minutes	37 (16.4)
Number of times performed physical activity in a week	
<3 times	89 (37.1)
3 times	89 (37.1)
>3 times	62 (25.8)
Type of domestic chores performed at home	
House cleaning	85 (35.4)
Laundry and ironing	19 (7.9)
Cooking food	6 (2.5)
None	130 (54.2)
Type of agricultural activities performed at home	
Farm work	18 (7.5)
Gardening	19 (7.9)
None	203 (84.6)

### Participants' dietary pattern

All the participants (100%) reported consumption of fried food at home, and most of them (75.0%) eat food at home before going to school; of these, most (92.6%) do so more than thrice a week. Majority of participants (55.8%) take food from home to school; of these, majority (92.5%) do so more than thrice a week. Only a few (11.7%) were served lunch at school. All the participants (100%) reported consumption of fruits, but most of them (78.3%) do so less than thrice a week. Almost all the participants (97.1%) reported consumption of vegetables but most of them (84.6%) do so less than thrice a week (Table 3).

### Correlates of obesity among participants

Obesity was associated with the participants' age, sex, socioeconomic status and type of school attended. The prevalence of obesity was significantly higher ( $p < 0.05$ ) among participants that were aged 6-10 years, females, those whose parents belong to high socioeconomic class, and those that attend private schools, as compared to the participants in the other groups (Table 4).

Obesity was also associated with the participants' physical activity pattern; the prevalence of obesity was significantly higher ( $p < 0.05$ ) among participants who perform less than 30 minutes of sporting activity daily, those who participate in sporting activity less than thrice a week, those who do not participate in domestic chores and those who do not engage in agricultural activities at home, as compared to the participants in the other groups (Table 5).

**Table 3: Participants' dietary pattern**

Variables	Frequency (%) n = 240
Fried food consumption at home	
Yes	240 (100)
No	0 (0)
Eat food at home before going to school	
Yes	180 (75.0)
No	60 (25.0)
Number of times ate food at home before going to school per week (n = 161)	
<3 times	1 (0.6)
3 times	11 (6.8)
>3 times	149 (92.6)
Food taken from home to school	
Yes	134 (55.8)
No	106 (44.2)
Number of times took food to school per week (n = 134)	
<3 times	1 (0.7)
3 times	9 (6.7)
>3 times	124 (92.7)
Type of food taken from home to school (n = 134)	
Fried yam and egg	18 (13.4)
Chips and egg	44 (32.8)
Indomie and egg	38 (28.4)
Spaghetti	33 (24.6)
Others	1 (0.7)
Lunch given at school	
Yes	28 (11.7)
No	212 (88.3)
Consumption of fruits	
Yes	240 (100)
No	0 (0)
Number of times ate fruits per week	
<3 times	188 (78.3)
3 times	50 (20.8)
>3 times	2 (0.8)
Eat vegetables	
Yes	233 (97.1)
No	7 (2.9)
Number of times ate vegetables per week	
<3 times	203 (84.6)
3 times	36 (15.0)
>3 times	1 (0.4)

Similarly, obesity was associated with the participants' dietary behavior; the prevalence of obesity was significantly higher ( $p < 0.05$ ) among participants who eat food at home before going to school, those who take

food from home to school, and those who take fried other groups (Table 6).  
 food from home to school, as compared to those in the

**Table 4: Distribution of obesity by the participants' socio-demographic characteristics**

Variables	Obesity status		Test of significance
	Obese Frequency (%)	Not obese Frequency (%)	
Age group (years)			
6-10	34 (24.3)*	106 (75.7)	$\chi^2 = 12.359$ , p = 0.002
11-15	7 (7.0)	93 (93.0)	
Sex			
Male	11 (9.6)	104 (90.4)	$\chi^2 = 8.811$ , p = 0.003
Female	30 (24.0)*	66 (68.8)	
Socioeconomic status			
High	25 (35.2)*	46 (64.8)	$\chi^2 = 25.710$ , p < 0.001
Medium	11 (14.3)	66 (85.7)	
Low	5 (5.4)	87 (94.6)	
Type of school			
Private	30 (31.2)*	66 (68.8)	$\chi^2 = 22.669$ , p < 0.001
Public	11 (7.6)	133 (92.4)	

\*Statistically significant

**Table 5: Distribution of obesity by the participants' physical activity pattern**

Variables	Obesity status		Test of significance
	Obese Frequency (%)	Not obese Frequency (%)	
Means of transportation to school			
Private car	21 (22.1)	74 (77.9)	$\chi^2 = 6.656$ , p = 0.155
Walk to school	8 (10.5)	68 (89.5)	
Public transport	4 (12.1)	29 (87.9)	
Motor cycle	3 (13.00)	20 (87.0)	
School bus	4 (30.8)	9 (69.2)	
Participate in sporting activities			
Yes	34 (15.9)	180 (84.1)	$\chi^2 = 0.863$ , p = 0.353
No	6 (23.1)	20 (76.9)	
Type of sporting activity performed			
Football	4 (6.4)	58 (93.6)	$\chi^2 = 20.708$ , p < 0.001
Cycling	3 (15.8)	16 (84.2)	
Running	15 (13.6)	95 (86.4)	
Watching television	6 (30.0)*	14 (70.0)	
Computer games	12 (41.4)	17 (58.6)	
Duration of sporting activity			
<30 minutes	18 (33.3)*	36 (66.7)	$\chi^2 = 14.950$ , p = 0.001
30 minutes	16 (10.8)	132 (89.2)	
>30 minutes	5 (13.5)	32 (86.5)	
Number of times performed physical activity in a week			
<3 times	19 (21.4)*	70 (78.6)	$\chi^2 = 14.950$ , p = 0.001
3 times	15 (17.0)	73 (83.0)	
>3 times	5 (8.10)	57 (91.9)	
Type of domestic chores performed at home			
House cleaning	7 (8.2)	78 (91.8)	$\chi^2 = 8.713$ , p = 0.033
Laundry and ironing	2 (10.5)	17 (89.5)	
Cooking food	1 (16.7)	5 (83.3)	
None	30 (23.1)*	100 (76.9)	
Type of agricultural activities performed at home			
Farm work	1 (5.6)	17 (94.9)	$\chi^2 = 2.471$ , p = 0.291
Gardening	2 (10.5)	17 (89.5)	
None	37 (22.3)*	166 (77.7)	

\*Statistically significant

**Table 6: Distribution of obesity by the participants' dietary pattern**

Variables	Obesity status		Test of significance
	Obese Frequency (%)	Not obese Frequency (%)	
Eat food at home before going to school			
Yes	35 (19.4)*	145 (80.6)	$\chi^2 = 4.000,$ $p = 0.046$
No	5 (8.3)	55 (91.7)	
Number of times ate food at home before going to school per week (n = 161)			
<3 times	0 (0)	1 (100)	FE $\chi^2 = 3.216,$ $p = 0.200$
3 times	0 (0)	11 (100)	
>3 times	32 (21.5)	117 (78.5)	
Food taken from home to school			
Yes	33 (24.6)*	101 (75.4)	$\chi^2 = 14.384,$ $p < 0.001$
No	7 (6.6)	99 (93.4)	
Number of times took food to school per week (n = 134)			
<3 times	0 (0)	1 (100)	FE $\chi^2 = 3.531,$ $p = 0.171$
3 times	0 (0)	9 (100)	
>3 times	33 (26.6)	91 (73.4)	
Type of food taken from home to school (n = 134)			
Fried yam and egg	6 (33.3)*	12 (66.7)	$\chi^2 = 13.840,$ $p < 0.001$
Chips and egg	14 (31.8)	30 (68.2)	
Indomie and egg	10 (26.3)	28 (73.7)	
Spaghetti	3 (9.1)	30 (90.9)	
Others	0 (0)	1 (100)	
Lunch given at school			
Yes	4 (14.3)	24 (85.7)	$\chi^2 = 0.129,$ $p = 0.719$
No	36 (17.0)	176 (83.0)	
Number of times ate fruits per week			
<3 times	27 (14.4)	161 (85.6)	$\chi^2 = 4.255,$ $p = 0.119$
3 times	12 (24.0)	38 (76.0)	
>3 times	1 (50.0)	1 (50.0)	
Eat vegetables			
Yes	38 (16.3)	195 (83.7)	$\chi^2 = 0.736,$ $p = 0.391$
No	2 (28.6)	5 (71.4)	
Number of times ate vegetables per week			
<3 times	31 (15.3)	172 (84.7)	$\chi^2 = 2.285,$ $p = 0.319$
3 times	9 (25.0)	27 (75.0)	
>3 times	0 (0)	1 (100)	

\*Statistically significant, FE: Fisher's exact

## DISCUSSION

This study determined the prevalence and correlates of obesity among primary school pupils in Sokoto metropolis, Nigeria. The 17.1% prevalence of obesity obtained among the participants in this study is quite high when compared with the findings in studies conducted among pupils in other cities across Nigeria including Gombe, North-East Nigeria (6.5%),<sup>24</sup> Ile-Ife, South-West Nigeria (3.1%),<sup>25</sup> and Port Harcourt, South-South Nigeria (5.9%).<sup>26</sup> The relatively low prevalence of obesity reported in the other studies as compared to this study could be due to differences in the composition of the study population in the studies. Whereas, the study population in this study solely consists of primary school pupils, the study in Ile-Ife was conducted among both primary and secondary school pupils.

However, similarly high prevalence of obesity was obtained in studies conducted in some parts of Nigeria and other sub-Saharan African countries including Lagos, Nigeria (17.4%),<sup>20</sup> and Tamale, Ghana (17.4%)<sup>27</sup>; and they point to the fact that the burden of obesity in Nigeria and other sub-Saharan African countries is almost on a par with that of the developed countries. The findings of significantly higher prevalence of obesity among the younger pupils in the 6-10 years age group (24.3%) as compared to the older pupils in the 11-15 years age group (7.0%), among females (24.0%) as compared to males (9.6%), and among those in the high socio economic class (35.2%) as compared to those in the medium (14.3%) and low (5.4%) socioeconomic

classes in this study are in consonance with the findings in studies conducted in Nigeria and other places.<sup>6,17,20,28,29</sup>

In Lagos, Nigeria, Ajayi *et al.*,<sup>20</sup> found decreasing prevalence of obesity with advancement in age, suggesting that children were more obese in the pre-pubertal phase as compared to the post-pubertal phase, and this is believed to be due to the increased self-consciousness about weight gain and physical appearance among post-pubertal children; they are therefore more likely to engage in healthy dietary behavior and increased physical activity to maintain their weight.

Similar to the higher prevalence of obesity obtained among the female participants in this study as compared to the male participants, other studies conducted across Nigeria<sup>28,29</sup> also reported higher prevalence of obesity among females. This is believed to be related to socio-cultural barriers; females have very low levels of physical activities in the developing countries as compared to males, as they mostly engaged in domestic chores, particularly, food preparation, and as such, they are more exposed to food and less involved in physical activity as compared to males.

Also, the higher prevalence of obesity among pupils from high socioeconomic status as compared to those from middle and low socioeconomic classes in this study provides additional evidence in support of the findings of studies conducted among school-aged children and youths in sub-Saharan Africa that majorly reported higher prevalence of overweight/obesity in children of higher socioeconomic status as compared to those of lower socioeconomic status.<sup>6,17</sup> In contrast to the situation in the developed countries in which obesity is more prevalent among children whose parents belong to low and medium income and less qualified occupations,<sup>30</sup> rising income is associated with obesity in low income countries.<sup>24,31</sup> This is believed to be due to the fact that in the developed countries parents with low and medium income are more likely to purchase cheap and unhealthy food (such as refined grains, added sugar and fats etc.), instead of healthy food (such as fish, lean meat, fresh vegetables and fruits), thus placing them and their children at a higher risk of overweight/obesity. On the contrary, in the developing countries, parents with high income often buy these unhealthy food and drinks as they erroneously perceive doing so as a sign of affluence.

The significantly higher prevalence of obesity among pupils with reduced physical activity and unhealthy

dietary behavior as compared to those who were physically active and practiced healthy dietary behavior in this study are consistent with the findings in previous studies.<sup>24,32,33</sup> These findings also corroborate the documented benefits of physical activity regarding maintenance of healthy weight status as a result of its potential major impact on body composition, metabolism and increased energy expenditure.<sup>12</sup>

This study did not find any significant relationship between fruits and vegetable consumption and obesity in school pupils. This finding appears to differ from the finding in other studies which reported an inverse relationship between fruits and vegetables consumption and overweight/obesity among children.<sup>34,35</sup> The findings of this study underscore the need for government, policymakers and school administrators to design appropriate strategies for promoting healthy eating behavior and physical activity among primary school pupils in Sokoto, Nigeria.

## CONCLUSION

This study showed high prevalence of obesity, physical inactivity and unhealthy dietary behavior among primary school pupils in Sokoto metropolis, Nigeria. Government, policymakers and school administrators should design appropriate strategies for promoting healthy dietary behavior and physical activity among primary school pupils to halt the current trend.

## Acknowledgements

The authors appreciate the Honorable Commissioner, Ministry of Basic and Secondary Education, Sokoto State, Nigeria; the Honorable Commissioner, Ministry of Health, Sokoto State, Nigeria; the Headmasters and teachers in the selected schools, and all the pupils that participated in the study for their cooperation.

## Source of support

Nil.

## Conflict of interest

None declared.

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**How to cite this article:** Bello-Ibrahim Z, Raji MO, Oche MO, Yusuf T. Prevalence and correlates of obesity among primary school pupils in Sokoto metropolis, Nigeria. *Int Arch Med Health Res* 2019; 1(1): 8-15.