# ORIGINAL RESEARCH

# Prevalence and knowledge of risk factors of childhood obesity among school-going children in Osogbo, south-western Nigeria

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## Abstract

**Background**
The global prevalence of overweight and obesity in children is increasing. It is important to examine and monitor obesity critically among the young population who are vulnerable to be influenced by some risk factors in their environment. The objective of this study was to determine prevalence and knowledge of risk factors of childhood obesity among school-going children in Osogbo, south-western Nigeria.

**Methods**
This was a descriptive cross-sectional study among school children (n=480) selected using multistage sampling method. Research instruments used were self-administered semi-structured questionnaires. The taken anthropometric measurements followed standard methods. Data were analyzed using the Statistical Package for Social Sciences (SPSS) software version 17.0

**Results**
The 24-hour dietary recall showed that food was essentially of high carbohydrate content in 337(70.2%) of respondents, with regular consumption of sweets and soft drinks. Only 3.8% of the children were either overweight (2.1%) or obese (1.7%). About 76.1% had good knowledge score of risk factors for obesity. Predictors of good risk knowledge score were being older and being a female. However, predictors of being obese included being older, not regularly walking down to school and not regularly taking part in sporting activities

**Conclusion**
School children studied were at risk of being obese, stressing the need for a sustained promotion of both primary and primordial prevention strategies targeted at this vulnerable age group.

**Keywords:** school children, obesity, risk factors, Nigeria

## Introduction

There are growing fears that the escalating epidemic of obesity which is well known among the adult population in many parts of the world may spread to the present younger generations. This might be especially important in the African continent where the population pyramid is broad based. The global prevalence of overweight and obesity in children is increasing, and there are about 155 million overweight or obese children around the world.[1] In Africa, the prevalence of childhood overweight and obesity in 2010 was 8.5%, and it is expected to increase to 12.7% by 2020, representing a relative increase of 49%.[2] Childhood obesity, which etiologically is the outcome of a complex interaction of biological, psychosocial and behavioral factors, is an important early predictor of adulthood obesity.[3] Obesity occurs when energy intake exceeds energy expenditure.[3,4] Researchers have raised concerns with respect to obesity in children and the adolescence age group since children with high body mass index (BMI) often become obese adults, who are at increased risk of developing obesity-related diseases, such as **type 2 diabetes,** hypertension, and dyslipidemia.[5] Nigeria has made significant progress in improving childhood nutrition. This is important because of the obvious transition from traditional diet with high intake of cereals and vegetables and low intake of animal food, to the Western pattern of high intake of animal foods and other high-energy-dense foods.[6,7] Because of their public health importance, the trends in childhood obesity should be closely monitored[8]. Therefore, it is important to examine obesity critically especially among children, who are more prone to be influenced by some events in their environments. A study into the knowledge, attitude and pattern of childhood obesity could provide evidence for scaling up primordial prevention programmes among school children and primary prevention toward adulthood. The objective of this study was to determine prevalence and knowledge of risk factors of childhood obesity among school-going children in south-western Nigeria.

## Methods
### Study area
The study was conducted in Osogbo, the capital city of Osun State in south-western Nigeria. School children constitute a significant proportion of the population, as they start school early at an average of about 6 years. The City is highly

urbanized, with access to products that could be categorized as related to western lifestyles. The prevalence of obesity in the general population and among children is not known. There are several primary, one secondary and one tertiary healthcare facilities within the city. Some of the secondary schools are compound schools, headed by a supervising principal. Such compound schools consist of two or three secondary schools within the same school compound, each school headed by a school principal.

## Study design

This was a descriptive cross sectional study.

## Study population

The reference population was comprised of all registered school children aged 10 to 19 years in Osogbo.

## Sampling size estimation

Using the Leslie Fisher's formula for the calculation of sample size for population greater than 10,000, a sample size of 384 was calculated using an assumed (unknown) prevalence of childhood obesity of 0.5. The calculated sample size was rounded up to 480 to account for incompletely filled questionnaires and non-response.

## Sampling method

A multi-staged sampling method was adopted in sample selection. In the first stage, only one compound school was selected out of three by simple random sampling employing simple balloting. In the selected compound school, there are three schools of comparable sizes and questionnaires were equally shared among these three schools (making up a compound school). In the second stage, two out of three levels within a school were randomly selected using simple balloting, and questions were proportionally allocated. In stage 3, one out of three elementary classes at a level was randomly selected using simple balloting. Questionnaires were also equally allocated to each class. In stage 3 in a class, a systematic sampling of one-in three pupils according to the day's sitting arrangement as they sat to receive a lecture was used in selecting subjects into the study. In situations where questionnaires allocated to a class got finished, another class was selected and the systematic sampling method repeated again until allocated questionnaires were exhausted.

## Ethical approval

To conduct this study, ethical approval was obtained from Ladoke Akintola University of Technology Teaching Hospital Ethical Review Committee. Permission was also sought from the local inspector of education, the headmaster of selected schools and the class teachers. Written informed consent was obtained from their class teacher after due explanation of the objectives of the research to them and the students.

## Research instrument

A self-administered semi structured questionnaire, written in simple English, was used. Data collection was done and supervised by class teachers and trained research assistants who could speak the local language to students who sought

for translation or clarification on any of the questions asked. For this purpose, a local (Yoruba) language version of the questionnaire was drafted by a language expert, and back-translated into English before use. Study variables were in 4 sections namely: personal data of respondents, knowledge about obesity, dietary pattern and other risk factors for obesity and their basic anthropometric measurements. Under dietary pattern, a 24-hour dietary recall was made by asking the students to give the exact names of all the food that they ate in the past 24 hours. Anthropometry: Height was measured to the nearest 0.1 cm using free-standing stadiometer mounted on a rigid tripod. Body weight was measured to the nearest 0.1 kg using a Salter brand balance-beam type weighing scale. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (BMI=weight (kg)/(height (m))$^2$). Waist circumference (WC) was measured midway between the lowest rib and the superior border of the iliac crest with an inelastic measuring tape at the end of normal expiration to the nearest 0.1 cm. Based on WHO classification, individuals were classified into four BMI groups namely: underweight (BMI less than 18.5), normal (BMI 18.5–24.9), overweight (BMI 25.0–29.9), and obese (BMI>30.0). Major outcome variables: The two major outcome variables were "childhood obesity" and "knowledge of risk factors", and these were defined. Childhood obesity was defined as a body-mass index at or above the 85th percentile for age and sex. The common risk factors to obesity include smoking, alcohol, sedentary lifestyle, and western diet which is high in calorie and fat contents. The knowledge of these risk factors were assessed and scored.

## Data management

Data collected were entered in and analysed using the SPSS software version 17.0. Validity of data entered was ensured through random and manual checks as well as looking for outlier values. Adolescents were defined as those pupils within the age group of 10 and 19 years. Mean knowledge score was computed by aggregating relevant knowledge questions together, and assigning +1 to a correct answer and zero to a wrong answer. After finding the mean, values above and below the mean were classified as good and poor knowledge scores respectively. Frequency tables and charts were generated. Both prevalence and risk knowledge scores were analysed using descriptive statistics. Bi-variate analysis using chi square test and multivariate analysis using the binary logistic regression model were used to demonstrate association between major outcome and other selected variables. Odds ratios (ORs) were generated and interpreted as predictors of outcome variables after adjustment for confounding factors such as the parents' socio-economic status. $P$ value was set as significant at figures less than or equal to 0.05.

## Results

Table 1 shows the socio-demographic characteristics of the children. Their mean age was 14.6 ± 1.7 years, 228(47.5%) were males of which 169 (35.2%) were in the lower intermediate class, and the parents of only 32 (6.7%) were in the socio-economic class I.

**Table 1: Socio-demographic characteristics of the study participants (n=480)**

| Variable | N | % |
|---|---|---|
| Age in years (mean14.6 ± 1.7 years) | | |
| 10-13(early adolescence) | 99 | 20.6 |
| 14-16(mid- adolescence) | 352 | 73.3 |
| 17-19(late adolescence) | 29 | 6.0 |
| Sex | | |
| Male | 228 | 47.5 |
| Female | 252 | 52.5 |
| Class | | |
| Lower intermediate | 169 | 35.2 |
| Upper intermediate | 311 | 64.8 |
| Religion | | |
| Islamic | 393 | 81.9 |
| Christianity | 83 | 17.3 |
| Traditional/others | 4 | 0.8 |
| Occupation of father | | |
| Professionals e.g Doctors, Engineers | 32 | 6.7 |
| Civil servant | 78 | 16.3 |
| Traders | 122 | 25.4 |
| Artisan | 177 | 36.9 |
| Others | 71 | 14.8 |
| No. of other siblings | | |
| <4 | 100 | 20.8 |
| 4-7 | 370 | 77.1 |
| >7 | 10 | 2.1 |
| Position in the family | | |
| 1 | 128 | 26.7 |
| 2 | 126 | 26.3 |
| 3 | 157 | 32.7 |
| Others | 69 | 14.4 |

**Table 2: Dietary pattern in relation to obesity (n=480)**

| Variable | F | % |
|---|---|---|
| **Have you heard about obesity** | | |
| Yes | 274 | 57.0 |
| No | 206 | 43.0 |
| **Sources of information(n=274)** | | |
| TV/Radio | 162 | 33.8 |
| Newspapers | 58 | 12.1 |
| Health care workers | 101 | 21.0 |
| Internet | 75 | 15.6 |
| Others | 11 | 2.3 |
| **24 hour dietary recall** | | |
| Essentially high carbohydrate content e.g. Rice, yam, cassava flour paste | 337 | 83.6 |
| Essentially light carbohydrate content e.g spaghetti, bread | 93 | 23.1 |
| Protein based | 40 | 9.9 |
| Others | 10 | 2.5 |
| **Food in between meals(=403 children)** | | |
| Biscuit and chips etc | 291 | 72.2 |
| Light food | 112 | 27.8 |
| ***Description of normal meal** | | |
| Heavy | 114 | 23.8 |
| Average | 207 | 43.1 |
| Little or light | 159 | 33.1 |
| ***Other nutritional related factors** | | |
| Often skip breakfast | 255 | 53.1 |
| Often takes snacks | 416 | 86.7 |
| Often take sweets | 363 | 75.6 |
| Often takes soft drinks | 422 | 87.9 |
| Often takes ice cream | 359 | 74.8 |
| Often take fruits | 441 | 91.9 |
| Often take meat | 402 | 83.8 |
| Sleeps late at night on most days | 296 | 61.7 |
| Often walks down to school everyday | 295 | 61.5 |
| **Takes alcohol** | | |
| Yes | 10 | 2.1 |
| No | 470 | 97.9 |
| **Smokes cigarette** | | |
| Yes | 4 | 0.8 |
| No | 476 | 99.2 |

Table 2 shows awareness of obesity and the dietary pattern of respondents in relation to childhood obesity. Of the respondents, 274 (57.0%) had heard about obesity, with the TV/Radio being the source of information among 162 (33.8%) of the respondents. The 24-hour dietary recall showed that their food was essentially that of high carbohydrate content (e.g. rice, yam, cassava flour past) in 337 (70.2%) of respondents. Their food in between meals was essentially that of biscuit and chips among 291(60.6%); whereas a normal meal was described as heavy to average in about 66.7% of the children; 363 (75.6%) often took sweets, 422 (87.9%) often took soft drinks. About 296 (61.7%) often slept late at night on most days, 295(61.5%) often walked down to school every day, only 10 (2.1%) took alcohol, and 4 (0.8%) ever took cigarettes.

Mean weight of the children was 40.3±7.2kg, mean height was 148.3±14.6cm, mean waist circumference was 27.7±3.0cm, mean hip circumference was 31.1±2.7cm, and the mean BMI was 18.9±10.9 kg/m². Figure 1 shows the

knowledge scores of risk factors for obesity, with 76.1% having poor knowledge and 23.9% having good knowledge. Figure 2 shows the BMI categories and status of respondents, and about 3.8% of the children were either overweight (2.1%) or obese (1.7%).

Table 3 shows a statistically significant association between BMI status and age, regularly taking part in sporting activities and regularly walking down to school (*P*<0.05) while none was shown between BMI status and sex (P>0.05).There was no statistically significant association between knowledge of risk factors for obesity and age, and between sex and regularly taking part in school activities (*P*>0.05). Older (17-19 years) adolescents were 2.4times more likely to be obese compared to middle-aged (14-16 years) and younger ones (10-13 years), and there was statistical significance (OR=2.35, 95% CI: 0.55-10.0, P=0.23).

Males were 1.1 times likely to be obese when compared to females and this observation was found to be statistically significant (OR=1.11, 95% CI: 0.27- 4.47, P=0.02). Pupils who regularly took part in sporting activities were 2.5 times (1/0.4) less likely to be obese when compared to pupils who did not regularly take part in school or sporting activities, and this observation was found to be statistically significant(OR=0.04, 95% CI: 0.04-0.29, P=001).

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**Table 3: Associations between selected demographic characteristics and BMI status, or knowledge of obesity risk hectors**

| Variables | Bi-variate analysis | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | BMI status | | | | Knowledge score | | | |
| | Obese | Non obese | $X^2$value | P value | Good | Poor | $X^2$ value | P value |
| Age | | | | | | | | |
| Early | 3 | 96 | 21.533 | 0.001 | 81 | 18 | 3.029 | 0.220 |
| Mid | 5 | 347 | | | 265 | 87 | | |
| Late | 0 | 29 | | | 17 | 12 | | |
| Sex | | | | | | | | |
| Male | 4 | 224 | 3.659 | 0.301 | 165 | 63 | 2.499 | 0.114 |
| Female | 4 | 248 | | | 198 | 54 | | |
| Regularly take part in school activities | 8 | 382 | 11.069 | 0.011 | 290 73 | 92 25 | 0.086 | 0.769 |
| Regularly walks down to school | 0 | 295 | 56.408 | 0.001 | 222 141 | 222 44 | 8.673 | 0.034 |
| | | | | | | | | |
| Binary Logistic regression with Obesity status | | | | | | | | |
| Variable | | OR | 95%CI | | P value | | | |
| | | | Lower | Upper | | | | |
| Age (ref cat=lower class) | | 2.35 | 0.55 | 10.0 | 0.23 | | | |
| Sex (Ref cat=female) | | 1.11 | 0.27 | 4.47 | 0.02 | | | |
| Regularly take part in school and sporting activities (ref cat=No) | | 0.4 | 0.04 | 0.29 | 0.01 | | | |
| Regularly walks down to school  (ref cat=No) | | 0.23 | 0.03 | 1.82 | 0.16 | | | |
| | | | | | | | | |
| Binary Logistic regression with knowledge score | | | | | | | | |
| Variable | | OR | 95%CI | | P value | | | |
| | | | Lower | Upper | | | | |
| Age (ref cat=lower class) | | 1.58 | 0.88 | 2.72 | 0.143 | | | |
| Sex (Ref cat=female) | | 0.72 | 0.47 | 1.08 | 0.11 | | | |
| Regularly take part in school activities (ref cat=No) | | 1.01 | 0.89 | 1.16 | 0.77 | | | |
| Regularly walks down to school  (ref cat=No) | | 0.94 | 0.89 | 1. 09 | 0.41 | | | |
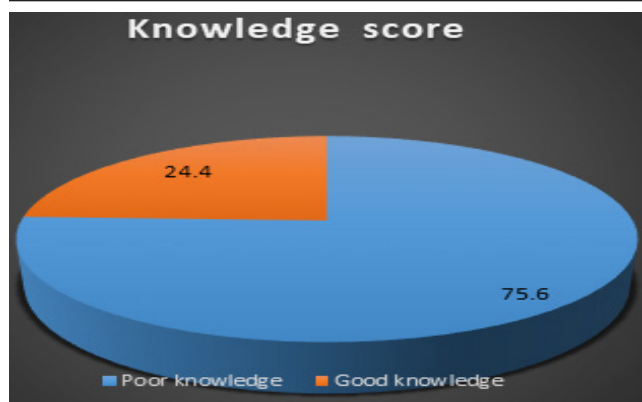
**Figure 1: Knowledge score of risk factors to obesity**
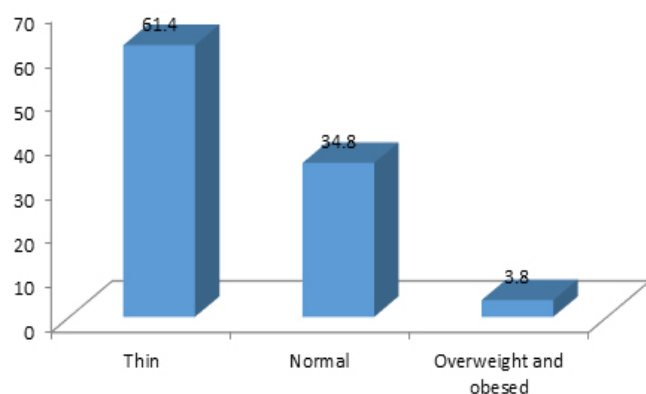


**Figure 2: BMI categories and status of respondents**

Pupils who regularly walked to school were 4.3 (1/0.23) times less likely to be obese when compared to pupils who did not regularly walk down to school, though this observation was not found to be statistically significant(OR=0.23, 95% CI: 0.03-1.82, P=0.16). Late adolescents were 1.58 times more likely to have a higher knowledge score compared to middle and early adolescents, and this observation was not found to be statistically significant (OR=1.58, 95% CI: 0.88-2.72, P=0.143). Males were 1.4 (1/0.72) times less likely to have high knowledge scores compared to females and this observation was also found not to be statistically significant (OR=0.72, 95% CI: 0.47-1.08, P=0.11).Going by the odds ratio values on further analysis, predictors of good risk knowledge score were being older and being a female. However, predictors of being obese included being older, not regularly walking down to school and not regularly taking part in school and sporting activities.

## Discussion

In this study, the mean BMI was $18.9 \pm 10.9$ kg/m$^2$, this is comparatively similar to findings from another related study[9] in which the mean body mass index (BMI) was $16.6 \pm 4.0$ kg/m$^2$.Only very few(1.7%)of the children under study were either overweight or obese. This trend supports a Nigerian study[10] in which the prevalence of overweight, obesity, and thinness among children aged 5 to 18 years was reported to be 11.4%, 2.8%, and 13.0% respectively, supporting the conclusion that developing countries, therefore, face the double burden of obesity and undernutrition.[11] Similar

prevalence rates were obtained from other studies.[12-15]. However, other studies[16,17] reported a higher prevalence of obesity than ours. While recognizing the role of nutrition in development of obesity, it is important to note that childhood obesity may result from a complex interaction of genetic, social and environmental factors that may influence eating and physical activity behaviour. Dietary wise, the 24-hour dietary recall showed that food was essentially of high carbohydrate content (e.g. rice, yam, and cassava flour paste) among majority of the children. Majority of them could have eaten those foods based on what their parents or guardians could afford. These types of traditional high calorie but low nutrient dense food can predispose them to childhood obesity.[9,15] Though an association between the Western dietary pattern and obesity might have been observed, the lower BMI pattern observed among respondents in this study could be partly explained by the fact that physical activities could over time lead to significant burning of body fat among the respondents who mostly walked down to and from school every day, as well as took part in school sports. A little over half of the respondents had heard about obesity in this study, with TV/Radio being the highest source of information. In a related study, half of the children interviewed had heard about obesity from teachers at school (20%), radio (19.4%) and books/newspapers (17.3%)[9]. In this study, the knowledge scores of risk factors for obesity showed that about three quarter of our respondents had poor knowledge of risk factors for obesity. In a comparative study, less than half (45.4%) had knowledge about the risk factors of childhood obesity.[9]Awareness and good knowledge about obesity and its risk factors could encourage better attitude towards weight reduction messages. The poor awareness and knowledge is an indication for relevant stakeholders to step up awareness programmes towards weight reduction programmes targeting this yet unexposed population of children, and whose behaviour is still modifiable in primordial and primary prevention efforts. In addition, the radio and television are accessible and affordable to most households in Nigeria, and they have been a veritable means of acquiring information on health matters. Supporting findings from our study, numerous studies have also shown that sedentary behaviours such as not walking down to school or regularly being transported to school in the school bus, watching television and playing computer games late into the night were associated with increased prevalence of obesity.[13,14]

The gender differences in relation to obesity status found in our study shows higher knowledge among the girls. This has been supported by several studies that reported that more girls tend to have higher knowledge of risk factors for obesity than boys.[18-21] The gender differences may not be unconnected with socio-economic and biological factors. However, some other studies corroborate report from our study by finding no significant differences in the level of knowledge about nutrition between obese and non-obese children.[22,23]

## Conclusion

Though the prevalence of obesity among the studied population was low when compared to other studies, their feeding pattern from a 24-hour dietary recall was

essentially those of complex but low nutritious carbohydrate which translated into under-nutrition among a significant proportion of the subjects. The poor knowledge of risk factors among about three quarter of the subjects suggests an urgent need to step up awareness programmes by all stakeholders including the government, integrated agencies involving health and education, the health care systems, and the communities and households. The study group is a young, vulnerable and exposed population; so major steps should be taken to promote both primary and primordial prevention strategies targeted at this vulnerable age group.

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## Conflict of interest

The author declares that there is no any conflict of interest regarding the publication of this paper.

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