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OVERWEIGHT STATUS AND DIETARY HABIT OF CHILDREN ATTENDING PRIVATE SCHOOLS IN ADO-ODO OTA, SOUTH WESTERN NIGERIA

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ABSTRACT

Globally, childhood overweight/obesity has persistently increased over decades and associated with non-communicable diseases such as type 2 diabetes mellitus, hypertension and other cardiovascular diseases. However, data on the trend of overweight/obesity among Nigerian children is limited because surveys have focused more on under-nutrition problems. This study aimed at determining the prevalence of overweight/obesity and dietary habits of children attending privately owned schools. A multi-stage random sampling was employed to select 478 pupils (8-11 years). Information on socio-demographic characteristics, dietary habit and physical activities were collected via interviewer administered questionnaire. Weight and height measurements were taken to determine overweight and obesity status using BMI-for-age (5-19 years) growth chart. Dietary recall was used to determine daily energy/nutrient intake. The five selected schools were categorized into types 1-4 based on school fees. On analysis, prevalence rates of 14.7% (overweight), 4.7% (obesity) and 4.3% (thinness) were observed. The mean weight of pupils from school type 1(29.4 ± 5.4kg) was statistically different from the mean weights of schools, type 3 (34.0 ± 8.6) and type 4(36.2 ± 8.6kg) at $p<0.001$. Significant difference existed in the overweight status of the school children across school types ($p=0.002$) with school type 4 having the highest prevalence (29.4%). Children who attend the high fee-paying schools were 1.8 times more likely to become overweight/obesity than children who attend the moderate fee schools (OR 1.83; 95% CI (1.08-3.08), $p=0.015$). The average daily intake of energy of pupils of school type 4 (2074±310 kcal) and type 1(1807.96±373kcal) differed significantly ($p=0.01$). Dietary assessment revealed high consumption of fatty foods and inadequate intake of vegetable, fruits and milk. More children (40%) watched television/film followed by 27% who engaged in computer games during their leisure period. Among school children who attend private schools, greater proportions are overweight and obese. Higher prevalence of overweight and unhealthy eating habits were found among school children of type 4 (highest fee) compared to other types. Appropriate nutritional strategies targeting children from wealthy homes should be developed.

Key words: Overweight, dietary assessment, nutritional status, children, anthropometric assessment, private school

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INTRODUCTION

The assessment of the nutritional status of the child serves as a guide to early nutritional intervention in low, middle and high socio-economic settings. Studies have shown that the prevalence rate of overweight and obesity has reached alarming levels in developing countries alongside widespread under-nutrition [1-4]. In these countries, stunting and micronutrient deficiencies (iron, vitamin A, zinc) in children co-exist with obesity and related chronic diseases, creating the double burden of nutritional diseases [5].

In Portugal, a study among children aged six to ten years showed prevalence rates of overweight from 14.7% to 30.5% and obesity from 5.3% to 13.2% in boys, while about 16.5% to 29.1% and 6.4% to 12.6% girls were overweight and obese, respectively [6]. Surveys carried out among school-aged children in Mexico and Brazil reported overweight prevalence rates of 22% and 26%, respectively while in Africa, Asia and Eastern Mediterranean, the combined prevalence of overweight and obesity was below 15% [7]. A systematic review of studies on overweight and obesity in sub-Saharan Africa revealed weighted averages of 10.6% and 2.5% of overweight/obesity and obesity, respectively [8]. The evidence showed a clear transition of increasing proportions of overweight and obesity in this region. According to the 2019 report of FAO on food security and nutrition, the prevalence of overweight is increasing in all age groups, particularly among adults and school-age children [9]. Studies in Nigeria among school-aged children reported 11.1% of obesity in Uyo,13.7% and 0.5% overweight and obesity, respectively in Ekiti State and 11.7% of overweight/obesity in Ile-Ife [10-12]. No private school pupil was either underweight or stunted.

Excessive adipose tissue in children and adolescents is a major public health problem throughout the world [13, 14]. Obesity is a major factor underlying the increase in the prevalence of these chronic diseases: non-insulin diabetes mellitus, hyperlipidaemia and hypertension in both children and adults [15, 16]. In a study in Europe, estimates of obesity related diseases were that over 20 000 and 400 000 obese children suffered type 2 diabetes and impaired glucose tolerance, respectively while above a million were likely to show indicators for hypertension and hypercholesterolaemia [17]. A number of eating patterns have been implicated in overweight. Among them, sweetened fruit drinks have received considerable attention as potential sources of high-energy beverages that could be related to the prevalence of obesity among young people [18]. Other studies have highlighted that many children's diets consist of foods that are high in fat and carbohydrate [1, 19, 20]. Several studies have indicated higher prevalence of over nutrition among those from high socio-economic class in Nigeria whereas overweight/obesity rates were recorded more among the low income people in developed countries [21]. These low-income earners in the developed countries consumed more of junk foods because they could not afford healthy diet. There is need to assess Nigerian children from wealthy homes to identify dietary factors influencing weight. Reviewing a child's dietary habits and anthropometric indices may suggest risk factors for obesity and chronic diseases [22].

The literature is replete with information on nutritional status of school-aged children in Nigeria. However, majority of these studies were undertaken in public (non-fee paying) schools. Data on overweight status and dietary habits of children attending private or fee-paying schools who, are believed to be from wealthy homes is limited. Therefore,

this study was carried out to determine the overweight status and dietary habits of school-aged children who attend private (fee paying) schools in Ado-odo Ota LGA of Ogun State, South-west, Nigeria. Data on nutrition indicators among this group of children would aid in prioritizing and developing nutritional intervention programmes to meet the need of the target population.

METHODOLOGY

Study setting

Ogun State is a state in Southwestern Nigeria. It borders Lagos State to the South, Oyo and Osun State to the North, Ondo State to the East and the Republic of Benin to the West. Ado-Odo, Igbesa and Ota make up Ado-Odo/Ota LGA of Ogun State. The town harbours both the indigenes who are mainly the Yorubas and non-indigenes who have either migrated from Lagos or employed locally. The proximity of Ota to Lagos and Idiroko has not only led to increased population but to increased market capacities and industrialization. Ota has the highest number of industries in Ogun State. The organisations and industries located in Ota are Obasanjo's Farm, De-United Foods Industries, Unique as well as May & Baker Pharmaceuticals, Honda Manufacturing Industries, Convenant University and Bells University of Technology, among others. The proximity of Ota to Lagos and space constraints in Lagos also contributed to the proliferation of privately owned schools. Majority of these schools have replicates in most of the major cities of Nigeria and, therefore, share similar characteristics in terms of infrastructure and mode of operation including fee payment.

Study design and sampling

The survey was a descriptive cross-sectional study designed to examine the distribution of nutritional status among private school pupils in relation to sex, diet and other specified characteristics. The target population was children who attend privately owned or fee-paying schools. It was assumed that at least 95% of these children were from wealthy homes. The aim was to determine the prevalence and associated factors of overweight and obesity among financially privileged children.

Sample Size Determination

Minimum sample size (n) of 402 pupils was derived using the formular for population greater than 10,000 ($n = \frac{z^2\ pq}{d^2}$) [23]. Standard normal deviate z was set at 1.96 (95% confidence interval). The proportion of primary school children in a school in Ogun State who were malnourished (61.2%) [24]. was used to derive p (0.612) and q (1.0-p=0.388). The level of precision (d) desired was set at 0.05. The calculation was as follows:

$$n = \frac{(1.96)^2 \times .612 \times .388}{(0.05)^2}$$

n = 365 respondents

n = 402 (10% non-response rate)

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Sampling method

A multi-stage random sampling was employed. Ota was selected through simple balloting out of the three areas, namely Ado-Odo, Igbesa and Ota that make up Ado-Odo/Ota Local Government Area (LGA) of Ogun State. Thereafter, the list of 176 privately owned primary schools in Ota was obtained from the Zonal Education Office, Ota. Sixty-nine private primary schools were left after excluding new schools (without pupils in grades 4-6) and unapproved schools. Out of these 69 schools, 20 schools were randomly selected through the use of Table of random numbers. However, based on the available resources in terms of finance, logistics and time, only five schools were selected. The twenty schools were divided into five groups of four schools each on the basis of fees paid. One school was then randomly selected from each group.

Selected schools

The selected schools are privately owned, fee-paying schools. The selected private schools charge varying fees and have terms of engagement which do not favour children from low income families. The terms of engagement include full tuition fees payment before resumption, compulsory payment of text books and after school lesson fees with tuition fees. One other condition is payment of these fees for a session in addition to examination fees for final year pupils. Scholarships at primary level are rare because public schools are non-fee paying at this level.

Selection of participants

The primary school system has six levels (1-6) commonly referred to as grades or basic classes. A child usually begins grade one at age five after the preparatory or kindergarten stage. Two classrooms per grade were randomly selected from each of the schools (6 classrooms per school). Where there was low enrollment (< 15 pupils per classroom), all pupils within the age range of 8-11 years in the three grades were included in the study. This was the case for three schools, but for the other two schools with about 60% of the study population, a list of pupils in grades 4 to 6 and within the age range was obtained. The list was stratified into males and females, and systematic sampling method was used to select the participants (K=2). The number of pupils selected from each school and class varied according to number of pupils enrolled. Pupils living with chronic diseases or physical challenges and those on a religious fast were excluded from the study. Four hundred and seventy-eight (478) pupils were selected for the study. There was a low response rate for the parent questionnaire (< 30% questionnaires returned). Consequently, the criterion of school fees charged per term by each school was used to categorize these private schools into types 1, 2, 3, and 4 (Table 1).

Human Subjects Considerations

Permission to undertake the study was sought from the Education Board Unit in Ota and management arms of the privately owned schools. The objectives and method of the study were explained to the heads of the schools who formally informed parents/guardians of eligible children. The school authorities and parents were made to understand that study participation involves minimal risk to the children. The study did not include any invasive method or collection of biological specimens. The anthropometric and dietary assessment sessions were planned and undertaken in multiple visits, such that discomfort and/or disruption of school and family relationships

were minimal. The summary of anthropometric data was explained to each participant and written on cards for their parents. The school managers were also briefed on the outcome of the anthropometric and dietary assessments. Participants with poor outcome were given the option of referral. The children who agreed to participate and whose parents gave consent were included in the study. The research objectives and procedure were also explained briefly to each child before the sessions. Children who did not want to continue with the study at any stage were allowed to leave. The procedures were carried out individually in a well-ventilated enclosed office. Coded letters and numbers were used for the schools and participants. The identities of the final codes for schools were withheld and known only to the investigators. Information obtained was not given to any other researcher.

Data collection

Quantitative and qualitative methods of data collection were employed in the study. Six research assistants (two food technicians and four teaching trainees) were trained for five days on standard procedures for anthropometric measurements. To minimize intra and inter observer errors, each research assistant handled same measurement throughout the study. The food technicians were further trained for three days on dietary recall techniques. Information on socio-demographic characteristics and lifestyle habits (dietary intake and physical activity) was obtained via pre-tested structured questionnaires. Some unstructured questions were asked using interview method and summary of responses collated. These were open ended questions designed to obtain more information on specific dietary behaviours. The questions were:

"Which food(s) do you experience discomfort when consumed?
"Mention foods you don't like eating"
"Why don't you like eating the foods?"
"Which foods do you eat with vegetables as side dish?"

Anthropometric measurements

Body weight was measured to the nearest 0.1kg using a Laica digital scale (EP 1440, Laica, Italy), which also measures % body fat and total body water. Height was measured to the nearest centimeter with a metal tape measure affixed to a wooden board. Pupils stood straight, bare-footed with heels, buttocks and back touching the wooden board. Waist circumference was measured to the nearest 0.1cm. Each measurement was taken at the smallest diameter between the costal margin and the iliac crest (the hip), at the end of a normal expiration by using a non-stretchable tape. Mid upper arm circumference (MUAC) was measured half way between the acromion process of the scapular and the tip of the elbow, using a non-stretchable standard tape measure on the left arm of each pupil. Head circumference was measured by placing the flexible non-stretch tape round the frontal bone just superior to the supra orbital ridges and passing it through the head of the same level on each side and laying it over the maximum occipital prominence at the back. Chest circumference was measured by paling the tape round the body at the nipple line of the chest. All the measurements were taken according to the guidelines of World Health Organization [25]. Weight and height measurements were taken to determine overweight status using BMI-for-age (5-19 years) growth chart (overweight: z-score of BMI >1SD;obesity: z-score of BMI >2SD

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and thinness: z-score of BMI < -2SD. The proportion of children who were short for stature was determined using height for age growth chart [26].

Dietary assessment

Participants provided three 24 hour recalls within a two- to three-week period, including two week days and one-weekend day [27]. Subjects were asked to recall everything consumed (including foods, beverages and snacks), 48 hours before the first visit day and a Saturday or Sunday preceding the second visit day. For most of the subjects, Saturday was used because many skipped breakfast on Sunday. Each school was visited twice or more depending on the number of participants, within a two-week period to obtain the dietary recalls. Samples of cooked foods were purchased each day of the study from the food vendors and weighed. These served as visual aids to estimate quantity of foods consumed by the children as outsourcing of food service was found to be common. Interviewers estimated foods consumed by the children in multiples of the food samples. Nutrient data were averaged across three days to obtain an estimate of energy and nutrient intakes. Mixed dishes were disaggregated into corresponding single dishes in gram weights, and then summed into single whole food weights. The nutrient contents of the food items were then determined using Nigerian Food composition Table. When nutrition information was not available in the food composition table, manufacturers' nutrition labels and information were utilized for packaged foods.

RESULTS AND DISCUSSION

Socio-demographic and anthropometric characteristics

Four hundred and twenty-three pupils out of 478 participated fully (some pupils could not complete dietary recall sessions). One hundred and eighty two (43%) pupils were males, while 241 (57%) pupils were females. The mean age, weight, height and BMI were 9.6 ±0.9 years, 32.9 ± 8.4kg, and 138.2± 8.3cm and 17.2±3.6kg/m^2, respectively. The results indicate that the children whose families belong to the middle and high socio-economic class in the location are of normal weight and height. Their mean BMI for age was higher than that of the reference population until about 11 years of age when it dropped (Figure 1). The finding could be attributed to the slower rate of weight increase (34.7 -35.4 kg) to that of height increase (1.41-1.45m) from age 10 compared to that of the reference population. Other studies among elite children in Ibadan [28] and Abuja [29] also recorded higher mean weights. However, the report of zero under-nutrition among the elite children in some studies [12, 28] is not supported by the present work. In addition, this work compares favorably with the findings recorded by Onimawo [1] and Akhatar's [30] among urban and higher socio-economic class children of their study populations.

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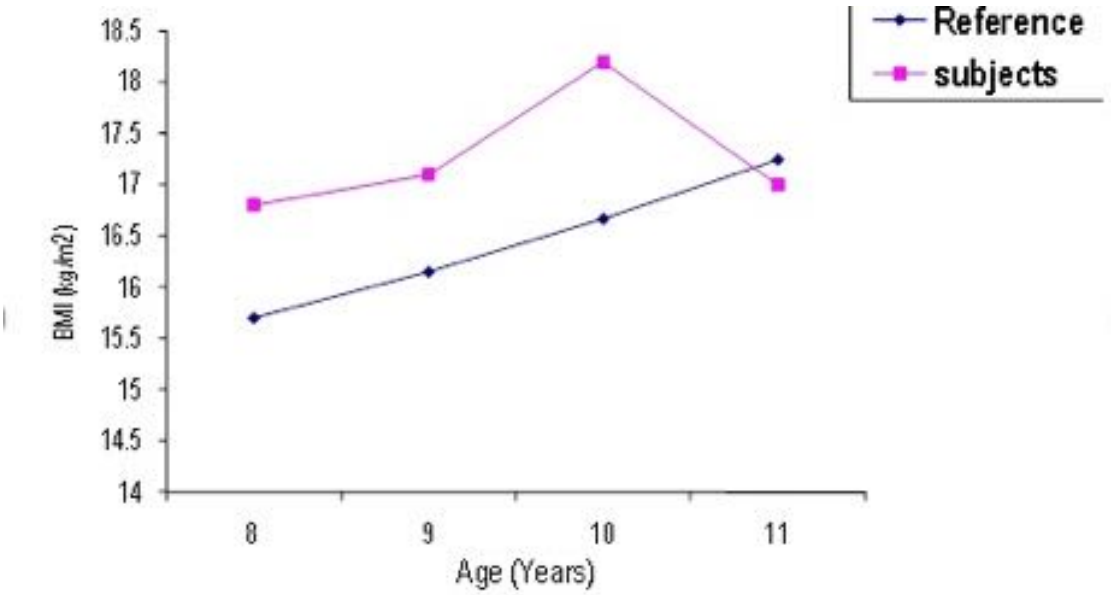

Figure 1: BMI for age (girls) compared with girls of same age (WHO Ref. Population)

The BMI for age of the girls declined from the tenth to the eleventh year, while that of the males increased (Figure 2). Opara *et al*. [10] also reported such fall in mean weights of female children compared to that of the males. The increasing muscle mass of males as they approach adolescent age might have led to the higher BMI.

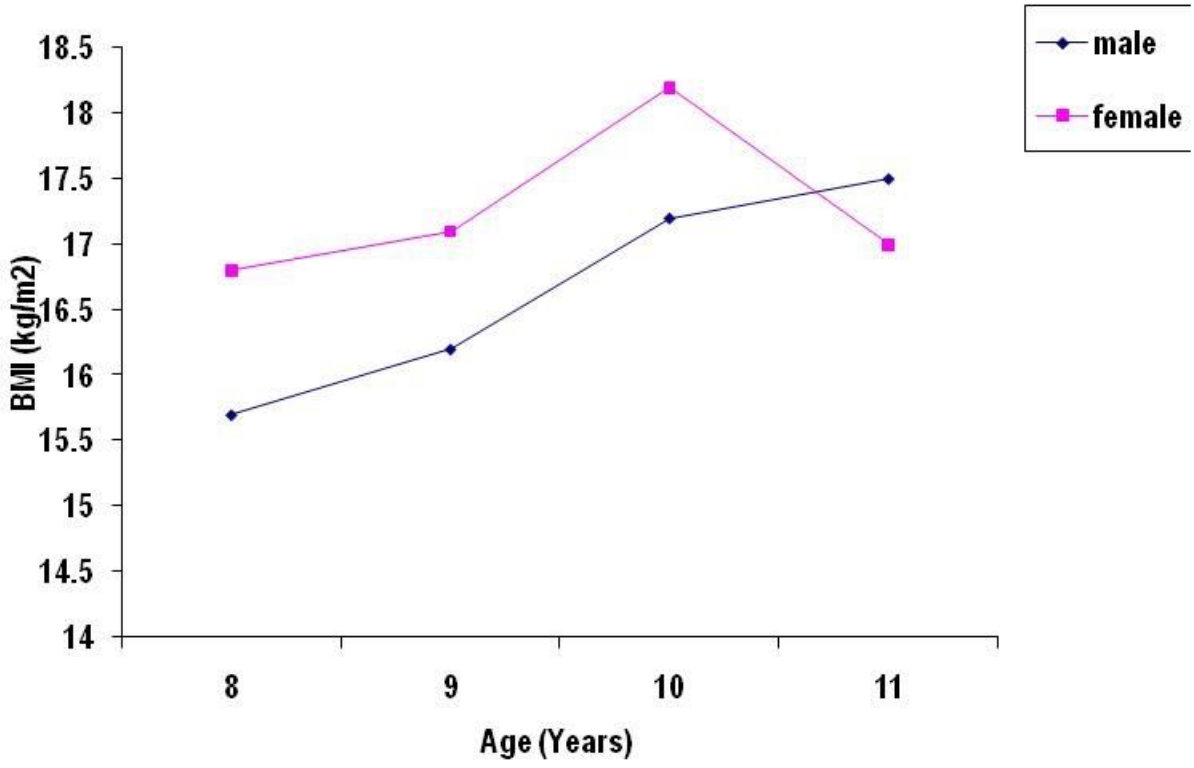

Figure 2: BMI for age (male and female pupils aged 8-11 years)

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With reference to Table 2, the mean weight of females was higher than that of males but the difference was not significant (p=0.095). The observation that the mean weight of the females was higher than that of the males is also consistent with many other regional researches [24, 31, 32] and among Portuguese children [33]. However, it contradicts studies from the United States and Qatar, which reported higher BMI and overweight in males [34] and higher mean height of females [35]. According to Table 3, the overall rate of overweight/Obesity was 19.4% using the BMIZ score rating. Majority of this population were of healthy weight. A similar observation was made among the children from elite homes in other studies [28, 29, 31]. The prevalence of overweight and obesity among children of this study is higher than the 5% declared by the World Health Organisation [36]. Other works reported higher prevalence rates of overweight/obesity (29.9%) and obesity (13. 3%) [37, 38]. A higher prevalence of obesity was also reported among the females (6.2%) compared to the males (2.7%) in this study, although not statistically significant (p=0.454). This is in contrast with the report of Musa *et al*. [38], which stated a higher prevalence of obesity among the males.

Dietary characteristics

The mean intakes of energy and energy-yielding nutrients are displayed in Table 4. It shows that the study population was within recommended dietary allowances for these macronutrients. Based on this study, about 60 % of the energy intake came from carbohydrates. This is in contrast with the findings of Onimawo *et al.* [1], who reported about 85%. Also, a higher mean intake of fat (63.1± 20.87) was observed in this study. These different observations in the nutrient intakes of pupils in this study and other works could be that the pupils in this study consumed more fatty foods such as fried dodo, hot dog, pizza and other fast foods. In addition, we measured a higher intake of foods such as noodles, spaghetti and rice. Study participants ate less locally sourced foods. The easy accessibility of short-time cooking, high energy but poor nutrient dense foods predisposes children in the developing countries to the risk of becoming overweight. The 3-day 24-hour recalls revealed inadequate intake of vegetable, fruits, dairy products and high biological value protein rich sources, while food frequency-based questions (FFbQ) recorded moderate to adequate milk intake. A majority of the pupils preferred orange to other fruits but about 39% (158) took a piece of fruit per day while 24.3% (99) ate a piece of fruit two or three times per week. Interestingly, 35% (143) of pupils claimed taking 2-3 fruits per day based on FFbQ in contrast to dietary recall report. Most of the respondents reported eating vegetables but as stewed vegetable or soup ingredients only and not served separately as a distinct part of meals. Food frequency-based questions data indicated that 102 (50.5%) pupils took only one tablespoon of milk daily, while 73 (36.1%) pupils consumed two tablespoons of milk per day. These measurement contrasts highlight the problem of over-reporting associated with FFQ method of dietary assessment. It was also observed that among children of this age group, multiple pass dietary recall seemed the better method of dietary assessment. The low consumption of fruits, vegetables and milk reflected in the dietary recall reports might result in micronutrient insufficiency among this group.

One important observation was the issue of fasting periods among these young children. Quite a number of children skipped breakfast two or more days of the week on constant basis for religious reasons. The implication of breakfast skipping to academic

performance and overweight has been documented [39]. In addition, based on these interviews, a majority of the children reported stomach discomfort after consuming beans, which negatively affected bean meal consumption. Regrettably, bean meal is the major protein rich staple in Nigeria. Frequent intake of fried foods and butter was common. The most frequent food taken was rice (daily), which was also common in the recall.

Melon (*Citrullus lanatus*) soup locally called 'egusi' soup was preferred to other soups, followed by ewedu (*Corchorus olitotrius*) soup. These soups are usually paired with 'amala' (dried yam flour meal), 'garri' (roasted cassava flour), semovita (corn-based meal) or other cassava based flour meals. Melon soups are prepared with ground melon seeds, fish or meat, palm kernel oil and vegetables such as spinach, bitter leaves or pumpkin leaves. Melon seeds are rich in fat (>45%) and contain protein (>22%) comparable with protein in soy bean (40). Melon oil is rich in polyunsaturated fatty acids (PUFA). It has high content of essential fatty acids particularly linoleic, which is documented to lower total and low-density lipoproteins (LDL) blood levels (41). Cholesterol and LDL are risk factors of coronary heart disease. Although melon soup is nutritious, its high fat content (melon seed and palm oil) predisposes to overweight. Ewedu leaves also known as jute leaves are green leafy vegetables prepared into a slimy soup and consumed with added stew (tomato/pepper sauce). The leaves are rich in minerals, vitamins and anti-oxidants such as polyphenols, flavonoids (42, 43). Ewedu soup with stew (fried tomato/pepper sauce) is a common delicacy among the Yorubas. The culture of adding stew to Ewedu increases the fat content of meals and may also negatively affect weight status.

The pupils reported getting home from school between 5 pm and 6 pm. Physical activity assessment revealed that more children (40.8%) watched television/film followed by 28.2% who engaged in computer games (Table 5). This habit was also observed by Ajayi *et al*. [37]. Among children who did not do any house chores before going to school, overweight/obesity was more common than among those who did house chores before leaving for school (23.5 vs 15.6%).

These pupils were kept for about 8-10 hours in school. The major activities undertaken during this period were learning and writing. These activities neither encourage movement of the limbs nor consume appreciable amounts of calories. Due to tiredness from long hours at school, these pupils retired to bed early. This is regrettably a vicious cycle. Moreover, the privately owned schools allocated only about 20-30 minutes to sport-related activities once in a week. Based on observation, only one of the schools (type 4) has sporting facilities. However, these facilities are usually utilized before and during competitions. In addition, very few of the pupils (school type 1) reported walking to and from school. More than 90% of the children either used school buses or cars. This implies that these children are confined to a sitting position, a sedentary lifestyle, most part of their childhood period. The low physical activity level and sedentary lifestyle coupled with high fat meals could have contributed to the recorded overweight/obesity prevalence.

Bivariate associations between overweight/obesity status and demographic/lifestyle characteristics

Associations between overweight/obesity and characteristics of the study population are presented in Table 6. Among the variables, school type and break time were significantly associated with being overweight and obese. Overweight/obesity was more prevalent (35.4%) among pupils of school type 4 (highest fee) compared with pupils of other school types (lower fee-paying schools). The lowest prevalence of overweight/obesity (3.6%) was observed among pupils of school type 1 (lowest fee-paying school). The duration of break period, which is a function of school type, was also observed to have significant relationship with overweight/obesity status of the school children. Pupils who recorded that they had 15 minutes break period each school day had higher prevalence of overweight/obesity (32%) than those who had break period of above 45 minutes (9.6%). Ajayi *et al*. [37] reported that regular physical activity was significantly associated with low prevalence of overweight/obesity.

Although statistical relationships existed between the prevalence of overweight/obesity and other variables including age of pupils, frequency of fried foods and mode of transportation to school, these were not significant. Overweight/obesity was more prevalent among females (21.7%) compared to males (18.3%).

Socio-demographic, anthropometric characteristics across school types

Family income plays a major role in the choices parents make for their school children [10, 31]. Exploring overweight status by school type (used here as a proxy for family income) revealed that about 29% of school children of school type 4 were overweight compared to 3% recorded among children of school type 1. It is generally believed that persons of high financial status are of high socio-economic level and, therefore, should be able to afford healthy diet, but this may not be the case. According to a systematic review done on obesity, a positive association was observed between obesity and socio-economic status among men and women in low income countries [9]. Table 7 displays the socio-demographic, dietary and anthropometric characteristics of these pupils by school types. The mean weight of pupils increased from school type 1 (lowest fee-paying school) to type 4 (highest fee- paying school) (29.4 to 36.2 kg). This agrees with the study done in Nigeria using also the criterion of school fees charged as a proxy for social/financial status [20] and another study among Hispanic girls [13]. According to these studies, pupils in higher fee-paying schools recorded higher mean weights than their counterparts.

Odds of overweight/obesity associated with school fee status (Types)

The relationship between school types and overweight/obesity status was further examined using odds ratios (Table 8). The independent variable 'type 1 to 4' denoting levels of tuition and other fees charged by the different schools where the study was undertaken was collapsed into two levels of ≤ $300 (moderate fee) and > $300 (high fee). On analysis, it was observed that children who attend the high fee-paying schools were 1.8 times more likely to become overweight than children who attend the moderate fee schools (OR 1.83; 95% CI (1.I-3.1), p=0.015). This further highlights the possible influence of financial status of parents on overweight and obesity status of children.

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It is believed that obesity in children is more prevalent among the financially advantaged families of low- and middle-income countries [44]. In low income countries, the affluent or highly educated persons tend to be more likely to be obese [44], while in middle- and high-income countries, overweight and obesity are associated with lower socio-economic status among women [45]. This study did not obtain information on the educational status of the parents, which should be pursued in subsequent research. However, because this study experienced a poor response from the families, it suggests that obtaining detailed information about the socio-economic status from advantaged homes is a challenge. Educational levels might be more successfully measured than family incomes. If better family income and/or education data were available, these analyses could have examined the differences among overweight/obese children from financially only, educationally only and both financially/educationally advantaged homes.

CONCLUSION

The outcomes of this study show that among school children who attend private schools, greater proportions were overweight and obese than thin. Sedentary lifestyle, low levels of physical activity in school and after school as well as consumption of high fat meals were found among these children. This strongly identifies children who attend private schools and from wealthy homes as 'high risk group' for overweight. It also suggests that the financial status of parents is a strong determinant of childhood overweight/ obesity among this group. This underpins the importance of considering target group peculiarities in planning, implementing and evaluating nutrition intervention programmes. It is paramount to align overweight intervention programmes with that of under-nutrition to mitigate imminent problems of double burden of malnutrition. Further investigations should be undertaken using qualitative methods to explore underlying factors influencing increased weight among children of the high socio-economic class in Nigeria. There is need for further research on reliable dietary assessment procedure particularly for fruit, dairy and vegetable intake among children. More studies should be undertaken on safer methods of processing and preparation of legumes. Finally, extensive analytical surveys are required to study the effect of long school hours on nutritional status and academic performance.

Limitations of study

The major limitation of this work was the use of tuition fees paid by each school as proxy for financial status of parents. Some privately owned fee-paying schools may have pupils or students on different forms of scholarships. Information on source or kind of fee payment was not collected. It is likely that some of these children might have come from low income families. Dietary information was self-reported thus, issues of recall bias, over or under reporting might not be completely ruled out. The study population comprised of pupils selected from five private schools in Ota. This sample may, to some extent, represent the target population (Nigerian children attending private schools) because of the similarities in the conditions of engagement and mode of operations of private schools in Nigeria. However, the strength of the study was that

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dietary habit/intake was assessed using both dietary recalls obtained across three different days including a weekend day (Saturday) and food frequency questionnaire.

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Declaration of conflicting interests

The Authors declare that there is no conflict of interest.

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Table 1: Characteristics of the selected private schools

Parameters	**Type 1**		**Type 2**		**Type 3 (2 schools)**		**Type 4**	
Pupils	No	Age(years)	No	Age(years)	No	Age(years)	No	Age(years)
	60	9.80	113	9.41	182	9.64	68	9.35
Males	23	9.82	57	9.54	75	9.83	27	9.44
Females	37	9.78	56	9.27	107	9.57	41	9.57
Fees per term	>$200		>$200 – $300		>$300 – $800		>$800	

Table 2: The anthropometric measurements (Mean ±SD) based on sex

Parameter	Female (N= 241)	Males (N=182)	Total
Age (years)	9.5 ±0.9	9.7 ± 0.9	9.5 ±0.9
* Weight (kg)	33.5[a]	32.1[a]	32.9 ± 8.4
Height (cm)	138.2[a]	138.2[a]	138.2 ± 8.3
BMI (kg/m^2)	17.5 ± 3.8	16.9 ± 3.3	17.2 ± 3.6

* No significant difference in mean weights (p=0.095)

Table 3: Classification of nutritional status based on Z-scores (N=423)

Nutritional classification	Z-score	N (%) of pupils
Short for stature	< - 2SD	10 (2.4%)
Overweight (BMIZ)*	> +1SD	60 (14.7%)
Obesity (BMIZ)*	> +2SD	20 (4.7%)
Normal (BMIZ)*	≥ - 2SD≤1	323 (76.4%)
Thinness (BMIZ)*	< - 2SD	18 (4.3%)

*BMIZ score was interpreted using the WHO BMI for age reference (2007)

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Table 4: Mean intake of energy and energy yielding nutrients

Nutrients	Intake	% of energy	Recommendation (4-18yrs)*
Energy (Kcal)	1928.60±352.90		
Carbohydrate (g)	287.97± 63.76	59.7%	45-65%
protein (g)	54.61± 17.80	11.3%	10-30%
fat (g)	63.10± 20.87	29.5%	25-35%

*Acceptable Macronutrient Distribution Ranges. Food and Nutrition board, Institute of Medicine, National Academy Dietary recommended intake (DRI) for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and fatty acids.

Table 5: Frequency distribution of what children do most after school

Activity	Frequency (n (%))
Watch television/film	168 (39.7%)
Playing computer games	116 (27.4%)
Play with siblings	55 (13.0%)
Others	84 (19.9%)
Total	423 (100%)

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Table 6: Socio-demographic and anthropometric characteristics by school type

Variables	Type 1(n=60)	Type2 (n= 113)	Type3 (n=182)	Type 4 (n=68)
Sex				*p=0.305*
Male % (n)	38.3 (23)	50.4 (57)	41.2 (75)	39.7 (27)
Female % (n)	61.7 (37)	49.6 (56)	58.8 (107)	60.3 (41)
Age (years)				*p=0.010*
8 % (n)	1.7 (1)	19.5 (22)	12.6 (23)	16.2 (11)
9 % (n)	40.0 (24)	30.1 (34)	30.2 (55)	42.6 (29)
10 % (n)	35.0 (21)	40.7 (46)	37.9 (69)	30.9 (21)
11 % (n)	23.3 (14)	9.7 (11)	19.2 (35)	10.3 (7)
Ethnicity				*p=0.010*
Yoruba % (n)	88.3 (53)	82.1 (92)	76.0 (136)	80.9 (55)
Igbo % (n)	10.0 (6)	15.2 (17)	11.2 (20)	11.8 (8)
Hausa % (n)	0	0	0.6 (1)	2.9 (2)
Others % (n)	1.7 (1)	2.7 (3)	12.3 (22)	4.4 (3)
Housework before school				*p=0.000*
Yes	76.7 (46)	49.1 (53)	36.7 (66)	32.8 (22)
No	23.3 (14)	50.9 (55)	62.8 (113)	67.2 (45)
Mode of transport to school				*p=0.000*
Walk % (n)	45.0 (27)	14.3 (16)	11.6 (21)	3.0 (2)
Bike % (n)	3.3 (2)	21.4 (24)	13.3 (24)	0
Car % (n)	36.7 (22))	58.9 (66)	64.1 (116)	50.7 (34)
School bus %(n)	15.0 (9)	5. 4 (6)	11.1 (20)	46.3 (31)
Anthropometry				
*Weight (kg)	29.4^{cd}	31.0^{c}	34.0^{ab}	36.2^{a}
Height (cm)	136.0 ± 8.0	135.3 ± 7.9	140.1 ± 8.2	139.7 ± 7.4
BMI (kg/m^2)	15.7 ± 1.9	16.9 ± 3.8	17.5 ± 3.8	18.4 ± 3.2
*Waist (cm)	53.9^{c}	57.3^{b}	60.2^{ab}	61.0^{a}
*Body fat (%)	10.9^{b}	11.5^{b}	12.4^{b}	18.1^{a}
Dietary characteristics				
*Fat (g)	57.1^{c}	58.5^{bc}	63.4^{b}	71.4^{a}
*Energy (kcal)	1807.96^{c}	$1893.29b^{c}$	1969.89^{b}	2074.13^{a}
Frequency of butter use				*p=0.018*
Frequent % (n)	44.0 (22)	58.1 (54)	60.0 (50)	62.5 (35)
Rarely % (n)	6.0 (3)	22.6 (21)	16.7 (25)	16.1 (9)
Occasionally%(n)	50.0 (25)	19.4 (18)	22.0 (33)	21.4 (12)
Frequency of fried foods				*p=0.020*
Everyday % (n)	34.5 (19)	21.1 (19)	18.0 (30)	8.3 (5)
Weekly % (n)	30.9 (17)	34.4 (31)	35.9 (60)	40.0 (24)

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Occasionally%(n)	29.1 (16)	31.1 (28)	34.7 (58)	28.3 (17)
Rarely % (n)	5.5 (3)	13.3 (12)	11.4 (19)	23.3 (14)
Vegetables with meals				*p=0.180*
Yes % (n)	86.2 (50)	72.1 (80)	72.9 (129)	64.6 (42)
No % (n)	13.8 (8)	27.9 (31)	26.6 (47)	35.4 (23)
Nutritional status				*p=0.002*
Thinness % (n)	6.7 (4)	5.3 (6)	2.7 (5)	4.4 (3)
Normal % (n)	90.0 (54)	75.2 (85)	70.0 (142)	61.8 (42)
Overweight % (n)	3.3 (2)	15.0 (17)	12.6 (23)	29.4 (64)
Obesity % (n)	0	4.4 (5)	6.6 (12)	4.4 (3)

*Mean values followed by different superscripts are significantly different ($p<0.05$)

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Table 7: Association of overweight/obesity with selected socio-demographic and lifestyle habits

Variables	Overweight/Obesity %	Total	*p-value*
Sex			
Males	18.3	175	*0.392*
Females	21.7	230	
Age (years)			
8	19.6	56	*0.051*
9	24.1	137	
10	22.3	148	
11	7.8	64	
Polygamy			
Yes	22.5	40	*0.715*
No	20.1	364	
School types			
Type 1(low fee)	3.6	56	*0.000*
Type 2(Moderate fee)	20.6	107	
Type 3(High fee)	19.8	177	
Type 4(Very high fee)	35.4	65	
Mode of transport to school			
Walk	12.7	63	*0.085*
Bike	10.6	47	
Car	23.4	231	
School bus	23	61	
Any house chore before school			
Yes	15.6	179	*0.132*
No	23.5	217	
School break time			
15 (minutes)	32.0	75	*0.005*
30 (minutes)	18.8	276	
≥ 45 (minutes)	9.6	52	
Activity when less busy at home			
Watch TV/Film	23.3	163	*0.800*
Computer game	18.9	111	
Play card	17.6	17	
Play with siblings	17.6	51	
Sleep	15.9	44	
Do you take vegetables with meals			
Yes	19.6	291	*0.503*
No	24.5	102	
Frequency of fried foods			
Occasionally	16.1	112	*0.065*
Everyday	18.3	71	

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Once in a week	29.5	129	
Rarely	19.6	45	
Frequency of butter use			
Most times	23.8	193	*0.385*
Rarely	18.2	55	
Occasionally	14.1	85	

Table 8: Odds of overweight/obesity associated with school fee status (Types)

Determinant	N	Overweight/obesity		
		Frequency (%)	OR (95% CI)	*p-value*
Moderate fee ≤ $300	163	14.7	1.00	0.015
High fee > $300	242	24.0	1.83 (1.08-3.08)	

OR- Odds ratio, CI-confidence interval. Moderate fee (Types 1 and 2), High fee (Types 3 and 4)

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