

Determinants of Overweight and Obesity Among Adolescent Students in Public Secondary Schools in Kwara State, Nigeria

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ABSTRACT

Adolescents and childhood overweight and obesity have been observed as one of the serious public health challenges of the 21st century by World Health Organization. This study identified the determinants of overweight and obesity among adolescents in public schools in Kwara state, Nigeria. Multistage and stratified sampling techniques were used to randomly select 515 participants which comprised of 343 girls and 172 boys aged (10-19) years in 8 public secondary schools from 32 schools in 2 zonal inspectorate divisions. Data was collected using modified Food Frequency Questionnaire (FFQ) and Physical Activity Questionnaire for Adolescents (PAQ-A). Digital bathroom scale and stadiometer were used to measure weight and height of the participants. (SPSS, Version 20) and WHO Anthroplus were used to analyze the data. Overall prevalence of overweight is (4.7%) and obesity (0.2%), while prevalence for male and female overweight (0.6%, 6.7%) and obesity (0%, 0.3%) respectively. Calculated mean BMI for age of the participants was (19.72± 2.62) kg/m². Overweight and obesity were positive but weakly correlated to food consumption (FC) of participants ($r=0.012$), however the relationship was significant ($p<0.001$). Furthermore, overweight and obesity were negatively correlated with no significance to the physical activity level of participants ($r=-0.105$). Participants need to consume more of low calorie foods such as fruits and vegetables and should also engage in more physical activity practices such as aerobics to lower overweight and obesity prevalence.

Keywords: Determinants, Adolescents, Overweight and Obesity, Food consumption, physical activity level.

INTRODUCTION

Overweight and obesity have been established as one of the public health concern of the 21st century by World Health Organization.¹ In the last few decades, the cause of death especially in the developing country like Nigeria has gradually been shifting from the infectious diseases to Non Communicable Diseases (NCDs) that were strongly attributed to overweight and obesity.^{3,4,5,6} Globally, the prevalence of overweight and obesity

among children and adolescents has significantly increased over the last three decades particularly in Africa, Eastern Mediterranean Region (EMR) and Asia.^{7,8,9,10,11,12,13} It has been established through several studies that overweight and obesity caused high morbidity and mortality among different age groups¹³. Adolescents who are overweight could experience conditions like depression, anxiety, low-self esteem and peer rejection². Overweight and obesity are nutritional disorders emanating from calorie imbalances. These disorders develop when

calorie consumption surpasses calorie expenditure, and the excess calorie gradually accumulates which later results into abnormal weight gain. Furthermore, the underlying causes of overweight and obesity were unhealthy food consumption and physical inactivity. These causes were formerly attributed to affluence but of recent, the disorders could be experienced by all the socio- strata.^{14, 15, 16, 17,18,19,20.} Although the predictive factors of overweight and obesity development are becoming more contextual due to how the condition is determined and what parameter was used to establish its occurrence in an individual. However, the behavioral factors are still paramount in the determination of overweight and obesity among adolescents.^{21, 22, 23, 24.} Human behavior is dynamic within certain situations. For instance, economic developments in Africa had changed the lifestyle of people in relation to consumption of certain foods and drinks, their means of transportation, relaxation, the percentage of income spent on social activities and domestic appliances available in their homes. According to Dr. David, an associate professor in the department of human health and nutritional sciences, university of Guelph, Canada, "Obesity is a complex disease that is highly influenced by an individual's lifestyle habits (diet & physical activity). Importantly, each of these lifestyle habits can influence the activity of our genes, and ultimately an individual's susceptibility to developing disease"

Adolescents are exposed to this changed lifestyle early in life that it is seen as the best form of life to live. The dietary transition recently going on in Africa is contributing greatly to high mortality and morbidity attributed to overweight and obesity.^{26, 27, 9, 28, 29.} The frequency of consumption of energy dense snacks and sugary beverages has increased considerably particularly among the adolescents students in urban areas and in private schools. Also physical inactivity which has been observed to increase among the adolescents due the use of varieties of electronic devices that keep them awake almost always throughout the night.^{30,31,32,33.} School sporting and physical activities practice have been judged to equally be on the decline as a result of inadequate governments support for sports in public schools.^{33,34,35.}

In Nigeria, overweight and obesity disparities exist between adolescents in private and public schools. Overweight and obesity prevalence have been reported to be on the increase among students in private secondary schools but very few research studies were carried out in public schools.^{36,37,38,39,40.} The need to appraise determinants of overweight and obesity of the public secondary schools students in Kwara state was a worthwhile task, hence this study was carried out in order to enable the policymakers and caregivers as well as administrators of public schools make decisions that will help improve the nutritional status of public students for healthy living.

MATERIAL AND METHODS

Cross-sectional analytical design was used in the study because it was ideal for rapid data collection in which large sample size is involved. The study was conducted in the southern senatorial districts comprised of seven local government areas in the state. A multistage random sampling technique was used to select 515 participants (343 girls and 172 boys) from 8 public secondary schools among 32 public secondary schools within two zonal inspectorate divisions. Research assistants for the study were trained for two days in order to sensitize them for the purpose of the study and to standardize the instruments of data collection so as to minimize errors. Also pilot study was carried out in a separate school from the participating schools so as to identify challenges that participants may face and also to make appropriate adjustment before the main study was conducted. Data was collected using a modified Food Frequency Questionnaire (FFQ), physical activity questionnaire for adolescents, digital bathroom scale and stadiometer. The food frequency questionnaire (FFQ) was self-administered with 4 optional responses, (1) never/once per week, (2) 2-3 times per week, (3) 4-5 times per week, (4) more than 5times per week. Participants reported their food consumption by choosing appropriate option. Similarly, physical activity questionnaire for the participants contained 4 options to indicate the frequency of their involvement in physical activity per week. Metabolic equivalent (METs) of participants were calculated using (metabolic equivalent for each physical activity*minutes*days). Total METs for individual participant was determined

and categorized according to standard practice. Participants responded to the questionnaire when they were seated in a well ventilated and spacious classroom. Participants' weights and heights were measured using digital weighing scale and stadiometer respectively. Data was analyzed using statistical package for social science (SPSS version 20) and Anthro-plus package was also used to determine overweight and obesity status of the participants.

RESULTS

In table 3.1 above, many of the participants were female (66.6%), also the higher proportion of them were between 15years and 6months to 18 years and 5months and 75% of the participants came from mixed schools. This result may influence the food consumption as well as physical activity practice of the participants and equally contribute to overweight and obesity prevalence among them.

Table 3.2 indicated that majority of participants walked to school (61.7%) and about a half of them lived with parents. Walking to school daily will improve physical activity of participants; also, living with parents could influence the participants' food consumption as well as activity

practice at home. The result could be a contributing factor in overweight and obesity of participants.

Table 3.3 showed that majority of participants' parents and guardians completed primary education (62.1%) and chose farming as their main occupation (68.1%). The result could influence participants overweight and obesity prevalence.

Breakfast consumption of participants showed that majority of them consumed breakfast (77%) daily (Fig. 3.1). Irregular or skipping breakfast may influence the amount and frequency of food consumption. This result may contribute to the participants overweight and obesity prevalence.

Table 3.4 showed participants' mean frequency of consumption of some selected foods which may influence their overweight and obesity status. Snacks (2.71 ± 0.87) had highest mean frequency of consumption, while boiled potatoes (1.78 ± 0.81) had the lowest mean frequency of consumption per week. Certain food items were known to have high calories and the calories could also increase further with the number of times such food items may be consumed per week.

Table 3.5 showed the metabolic equivalent scores (METS) of participants per week, the result

Table 3.1: Demographic characteristics of participants

Participants characteristics	No. of participants	% of participants
Gender		
Male	172	33.4
Female	343	66.6
TOTAL	515	100%
Age Distribution		
9.6-12.5	26	5.0
12.6-15.5	162	31.5
15.6-18.5	278	54.0
18.6-19.5	49	9.5
TOTAL	515	100%
Type of school		
Boys	1	12.5
Girls	1	12.5
Mixed	6	75.0
TOTAL	8	100%

Table 3.2: Demographic characteristics of participants

Participants characteristic	No. of participants	% of participants
Participants means of transportation to school		
Motorcycles	119	23.1
Public transport	26	5.1
walked	318	61.7
Parents/guardians or cars	52	10.1
TOTAL	515	100%
Participants by whom they lived with.		
Parents	259	50.3
Guardians	123	23.9
Alone	133	25.8
TOTAL	515	100%

indicated that majority (48.7%) of the participants' physical activity intensity per week were categorized as medium while a lower proportion (11.8%) of participants physical activity intensity was categorized as being low according to World Health Organization classification. METs estimation gave

Table 3.3: Demographic characteristics of participants' parents or guardians

Participants characteristic	No. of participants	% of participants
Educational background of participant's parents/guardians		
None	6	1.2
Primary	320	62.1
Secondary	105	20.4
University	59	11.5
Others	25	4.9
TOTAL	515	100%
Occupation of participant's parents/guardians		
Civil servants	17	3.3
Artisan	36	7.0
Farmers	351	68.1
Business activities	111	21.6
TOTAL	515	100%

Table 3.4: Mean frequency of consumption of foods by participants in a week (n=515)

Selected food items	Mean frequency of consumption per week
Boiled yam/Cassava	2.15±0.89
Boiled potatoes	1.78±0.81
Potatoes chips	2.14±0.84
Doughnut & Biscuits	2.36±0.99
Spaghetti & Noodles	2.14±0.85
Peanut butter	2.34±1.15
Roasted peanut	2.04±1.06
Snacks	2.71±0.87
Whole milk	2.08±0.71
Ice-cream & yogurt	2.10±0.72
Fried eggs/boiled eggs	2.15±0.69
Soda drink	2.14±1.05
Fruits	2.37±0.07

an indication of the energy expenditure in various physical activity engaged-in by participants and this may influence their overall weight status.

Table 3.6 showed the participants weight status by gender. This result indicated that prevalence of overweight and obesity among male (0.6%, 0.0%) participants was lower compared to female (0.0%, 0.3%). The sample size may cause the disparities between prevalence of the participants, however girls are usually tend to be overweight than obese because they are always cognizant of their appearance as compared to boys and also girls tend to eat more frequently than boys.

Table 3.7 showed the relationships between food consumption pattern and the body mass index for age of participants. This result indicated that a weak but positive relationship existed between participants' food consumption and their body mass index, although the relationship was not significant. However, the relationship between physical activity level and body mass index for age of participants was negative and weak but significant. The low food consumption pattern of participants could contribute to the weak and significance of the relationship. In addition, negative relationship that existed between physical activity level and body mass index indicated that as the physical activity increases the weight reduces or vice versa. Table 3.8 showed the analysis of variance between body mass index for age categories of participants and mean composite scores for food consumption and physical activity (METs). This result indicated that mean composite scores for each weight status varies, the overweight participants had higher mean composite score

Table 3.5: Metabolic equivalent scores (METS) per week of the participants

N=515			
IPAQ METs Categories per week	Number of participants	% of participants	Physical activities intensity
<600	61	11.8	low
600-3000	251	48.7	medium
>3000	203	39.4	high

than the normal weight participants and so on. The mean composite scores of participant showed level of acceptable significance, this indicates that overweight participants ate more than normal weight participants as so on. Similarly METs score also varies with weight status, however, the METs scores did not show level of acceptable significance. This indicates that participants METs scores did not vary much to the participants' weight status. The physical activity of those who were overweight did not vary much from those participants who are of normal weight and so on.

DISCUSSION

Finding of this study indicated that 54% of participants were between 15 years and 6months to 18 years and 5months, this finding is similar to finding reported by ^{40,43.} among public and private school participants in which about 60.8% of them were between (15-19) years. This clearly illustrates that participants in this study might have established certain food habits in their food consumption and physical activity practice that may influence their weight status. Furthermore, about 61.7% of participants walked to school, this is in line with findings of ^{43.} where majority of participants walked to school. Walking to school may influence physical

activity level of participants and since this study was conducted in rural and semi-urban areas. It indicates that the environment encouraged free movement of participants unlike in many urban cities where neighborhood environment does not encourage human movement. Socially disadvantage environments like rural areas reduce the prevalence of overweight and obesity^{44.} The findings showed that 50.3% of participants lived with parent, this is similar to finding of ^{43.} . Majority of participants' parents/guardians occupation was farming, this means that many of them were likely to be unskilled workers and may likely have low income, and this condition places them at the bottom of socioeconomic strata. Participants' parents/guardians' socioeconomic status may influence their children food consumption and physical activity practices because many of the participants are still dependants, as it was observed by ^{27.} in which lower socioeconomic status determined food consumptions of adolescents.

Breakfast consumption pattern indicated that 77% of participants do eat breakfast at home before leaving for school, this finding agrees with similar study conducted by ^{4.} among government and private students in secondary schools, his finding showed that 73.8% of students in governments' school ate breakfast as compared to 66.3% students

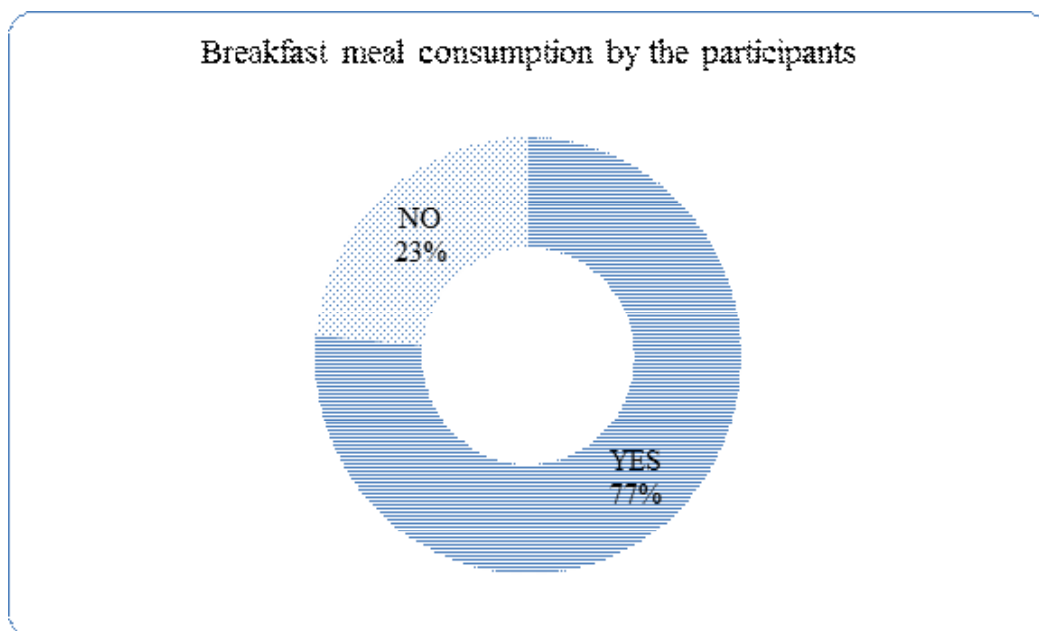


Fig. 3.1: Participants daily breakfast consumption

from private schools. Breakfast consumption by participants may influence their weight status and prevalence of overweight and obesity among them ⁴. reported that daily breakfast consumption was associated with less overweight and obesity, healthier dietary practice and physical activity related behaviors. Furthermore, ⁴⁵. reported that in a similar study that 84% of children who eat breakfast with family ate fruits and vegetables 5 or more times per week, but this is contrary to findings of this study where the mean times of fruits consumption of participants was (2.37±0.07) indicating that the participants fruits consumption was less than 3 times per week. Low fruits consumption may lead to deficiency of water soluble vitamin particularly Vitamin C and other micronutrients.

Finding on food consumption of participants indicated that all the selected food items in this study were consumed in less than 3 times per week. Mean consumption of snacks was higher than the other foods, this finding agrees with finding of similar study conducted by ⁴⁶. in which higher proportion of participants in his study consumed fast foods with soft drinks. This clearly illustrates that participants snacks and soda consumption may influence overweight and obesity among participants. Several studies associated higher prevalence of overweight and obesity to snacking among other obesity risk factors.^{42, 43, 47, 48}. The finding on physical activity level (PAL) of participants in this study indicated that only 11.8% had low physical activity intensity, while majority of participants had between moderate

Table 3.6: Summary of participants' body mass index for age (BMI for age) as classified by (WHO, 2007) ⁴¹

BMI for age	Categories of weight status	Male participants n=172		Female participants n=343		Total participants n=515		Mean (BMI) for age of all the participants (kg/m ²)
<15th percentile	Underweight	82	47.7%	68	19.8%	150	29.1%	
15th-84.5th percentile	Normal weight	89	51.7%	251	73.2%	340	66.0%	
85th -97th percentile	Overweight	1	0.6%	23	6.7%	24	4.7%	
>97th percentile	Obese	0	0%	1	0.3%	1	0.2%	
Total		172	100%	343	100%	515	100%	19.76±2.62

Footnote.- * BMI for age in (kg/m²) was calculated to give the mean BMI for age of all the participants

Table 3.7: Relationships between BMI for age, food consumption pattern (FCP) and physical activity level (PAL) for the participants

Variables	P value	Coefficient of correlation(r)
BMI and food consumption pattern(FCP)	P=0.785	0.012
BMI and physical activity level(PAL)	P=0.017	-0.105

and high intensities. The finding further showed that weak but negative relationship existed between body mass index (BMI) and physical activity of participants ($r=-0.105$; $p=0.01$), meaning that as physical activity level decreases, participants BMI increases, invariably overweight and obesity will increase. However, this finding is in contrast with a similar study conducted by ⁵. in which no significant relationship existed between overweight and obesity and physical inactivity of participants. Furthermore, finding in this study revealed that physical activity level failed to determine overweight and obesity of participants because no significant difference

Table 3.8: ANOVA test of food consumption pattern (FCP) and physical activity (METs) based on BMI for age categories of the participants

Body mass index (BMI) For age categories	Number of participants	Mean composite scores for (FCP)	Physical activity (METs)
n=515			
Underweight	150	61.36±11.44a	2235.72±1670.86a
Normal weight	340	65.84±11.64b	2263.81±1534.69a
Overweight	25	70.24±9.58c	2506.56±1376.69a
P-value (ANOVA)	515	p=0.001	p=0.725

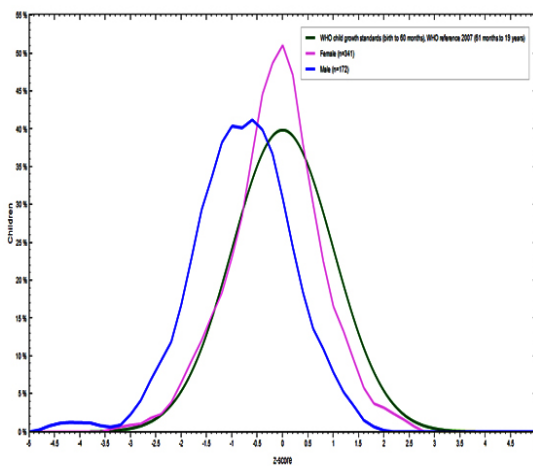


Fig 3.2: Participants Body Mass Index (BMI) by Sex compared to (WHO, 2007)41 Standard

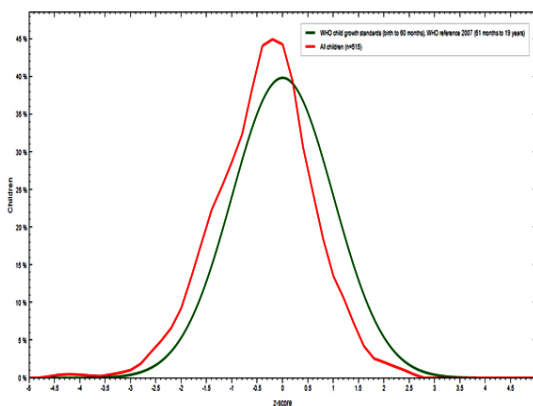


Fig 3.3: All participants Body Mass Index (BMI) compared to (WHO, 2007)41 Standard

between the physical activities in different categories. This finding agrees with,⁴⁹ in which there was no significant association between risk factors i.e. physical activity and weight status of participants. This clearly illustrates that physical activity level of participants were not different among different weight categories.

The finding of this study clearly shows that food consumption of participants determined overweight and obesity because significant association exists between the overweight and obese participants ($p < 0.01$) and those participants who were not. This showed that the participants who were overweight and obese ate more food than those who were not, therefore in order to reduce the prevalence of overweight and obesity among adolescents students in public secondary schools in Kwara state, the students food consumption need some modifications.

CONCLUSION

Determinants of overweight and obesity among participants indicated that only food consumption positively determines participants' weight status, although frequency of food consumption was low as compared to other research studies. In addition to that, physical activity of participants do not determine overweight and obesity among participants, but it shows that physical activity level negatively influenced weight status of participants thereby reducing prevalence of overweight and obesity among them. Therefore, participants need to improve on consumption of fruits and vegetables as well as reduce consumption of soda and other sweet sugary beverages (SSBs) in order to maintain desirable weight. Participants also need to improve

on their physical activity practices as this will in long term control their weight.

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