Assessment of Factors Associated With Obesity Among Secondary School Children in Owerri Municipal, Imo State, Nigeria.

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Abstract
Obesity poses one of the serious global health challenges for man. In recent time, the prevalence of obesity has been noticeably increasing among adolescents and school-age children. This study aims at assessing some of the factors associated with obesity among secondary school students in Owerri Municipal, Imo state, Nigeria using a cross-sectional study survey involving n=300 randomly selected secondary school students within Owerri municipal. A structured questionnaire, standard weighing balance and stadiometer were used to collect the required data. SPSS software was used to perform descriptive statistical analysis and chi-square test of association. Body Mass Index for female and male students was 20.4 ± 3.79 and 18.93 ± 2.23 kg/m^2 respectively Obesity was higher (6.7%) among female students than male but less prevalent (2.9%) among boarding students. Obesity was also more prevalent among students who do not undertake conscious physical activity and those who spent more hours per day watching television. Gender, solid starchy food intake, snack consumption, and the number of meals per day were observed to be significantly ($p<0.05$) associated with obesity. Need for increased awareness of obesity is recommended. Health education programmes should be conducted for obese children too. These health education programmes must include diet, exercise and family-based behavior

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Introduction
Obesity is a public health problem worldwide and a significant contributor to ill health (Wan and Lobstein, 2006). It is a condition in which there is an abnormal (accumulation or excessive) body fat that impairs or presents a risk to health (WHO, 2010). The physical and psychological health of individuals regardless of age is highly affected by overweight and obesity. Whereas its mechanism is not well understood, it is believed to be a disorder of multiple causes. Worldwide prevalence of obesity nearly tripled between 1975 and 2020 and, one billion people globally is estimated to be living with obesity by the year 2030 (World Obesity Atlas, 2022). International Obesity Task Force (IOTF) and the International Association for the Study of Obesity (IASO) reported that 200 million school children worldwide are either overweight or obese (WHO, 2018). The rate of increase in obesity in children is higher than that in adults in many countries with about 10% of school children aged 5 – 17years being obese or overweight globally (The GBD, 2017). Values reported in Nigeria's adolescents are in the range of 1.4%-4.2% (Ahmed *et al*., 2013).
Several factors contribute to obesity such as genes, environment, socio-economic status, urbanization,

ethnicity, physical activity, and dietary intake (Cole *et al*., 2000). Obesity in adolescence is of importance because adolescence is known to carry the obesity into adulthood and develop non-communicable disease in their early years of adulthood (WHO, 2010).
As a result of technology, labor-saving devices and equipment are widely used in homes. Children and adolescents are now using video and computer games that require sitting or lying down to participate. These limit expenditure of energy in adolescents which results in excessive weight gain leading to Obesity. Westernization has led to new eating patterns, which affect dietary habits and even patterns of consumption. Adolescents are exposed to foods that are high in fats, high in salts, high in sugar, and poor in micronutrients (Bibiloni *et al*., 2013). Adolescents who are obese, however, face a greater risk of health problem including type 2 diabetes mellitus, high blood pressure, and asthma orthopedic problems which reduces life expectancy than their normal-weight peers (Cole *et al.*, 2000).
Several studies have documented results from studies involving obesity in Nigeria, for instance, Agofure (2018) studied the prevalence of obesity among adults in Issele-Uku, Delta State, Nigeria. Adegoke *et al.*, (2021) studied the prevalence of obesity in correlation

with anthropometric indices and blood pressures in urban Lagos, Nigeria. Akarolo-Anthony *et al*. (2014) examined the correlates of the fast-growing obesity epidemic among Nigerians. Adeniyi *et al.* (2019) studied overweight and obesity among school-aged children and maternal preventive practices as it relates to child obesity in some selected local government areas of Lagos. Adeloye *et al.* (2021) conducted a review and meta-analysis of the prevalence of overweight and obesity in Nigeria in 2020. Irelosen *et al*. (2021) studied the prevalence of obesity amongst apparently healthy adolescents aged 10 – 18 years in secondary schools in Uyo and determine associated predisposing factors of obesity. Adebimpe (2019) Studied the prevalence and knowledge of risk factors of childhood obesity among school-going children in Osogbo, south-western Nigeria. Fagunwa (2021) also reported knowledge of obesity among children and adolescents in Nigeria. Globally, Abduelkareem *et al*., (2020), Vohra *et al*. (2011), Sashindran and Dudeja (2020), Nicolucci and Maffeis (2022), Kansra *et al*. (2020), Sahoo *et al*. (2015), Raj and Kumar (2010), Bibiloni et al., (2013) and Frank (2015) has documented reviews and results of studies of obesity among school-aged children.

There is an urgent need to investigate the magnitude of this problem and implement prevention strategies in early adulthood and adolescence by involving families, schools, and the whole community.

Materials and Methods
Research Design, Sampling Technique, and Sample
The study was conducted in Owerri municipal local government area of Imo state. According to the 2006 census, the region covered is approximately 100 square kilometers (40sqm) in area. The population for this study entails the 29 secondary schools in Owerri municipal local government area of Imo state. Nigeria. Out of the 29 (11 public and 18 private) registered schools in Owerri municipal council, 10 (5 public and 5 private) schools were randomly selected. Using Cochran (1963) with a 95% confidence level and a 5% allowable error margin, the minimum sample size was computed as 288. In other to gain more precision using increasing samples, 300 students were considered as a sample to be used in the study. As an inclusion criterion, any student aged 10 - 19 years attending any of the selected secondary schools is considered appropriate to be included in the study. The study participants were selected using a multistage sampling technique.

Data Collection Instrument, Method of Data Collection and Analysis.
A structured questionnaire, standard weighing scales, and stadiometers were the instruments used for data collection. Biodata, socio-demographic and anthropometric information of each participating student was collected using the designed questionnaire. Each participating student was made to stand against a calibrated stadiometer without shoes, heels together, leg straight, arms at their side, and shoulder relaxed while the height reading was taken. Without shoes and light cloth on, the weight of each participating student was also taken using a standard weighing scale. Using the obtained height and weight, The Body Mass Index (BMI) of each participating student was calculated and compared with the standard value of BMI for teens to determine those who are Obese, Overweight, Normal, and Underweight using the BMI chart for teens aged 2 – 20years. Frequency, percentages, and Chi-square test for association were used to determine the association between BMI and several factors elucidated in the study. All test was carried out at a 5% level of significance while data analysis was implemented in Statistical Package for Social Science (SPSS). All ethical issues related to the study were adequately addressed.
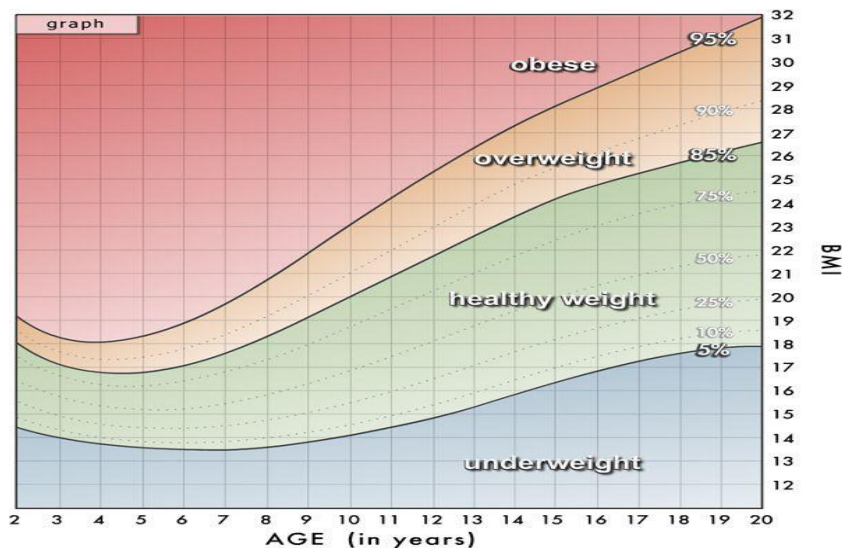
Figure 1: BMI Percentile Chart for Teens aged 2 – 20 years.
Source: Center for Disease Control and Prevention, UK

Result and Discussion

The mean age for all participating students was 14.6 ± 2.40 years with the male having a mean age of 14.60 ± 2.40 years and 14.50 ± 2.40 years for females. Overall average BMI was 19.7 ± 3.3 kg/m². The BMI for female and male students was 20.4 ± 3.79 and 18.93 ± 2.23 kg/m² respectively.

Table 1: Frequency (and percentage) distribution of BMI status across background characteristics.

Characteristics	Categories	Overall	Obese	Overweight	Normal	Underweight
	Categories	300	13 (4.3)	18 (6.0)	268 (89.3)	1 (0.4)
Sex	Male	137 (45.7)	2 (1.6)	3 (2.2)	132 (96.3)	0 (0.0)
	Female	163 (54.3)	11 (6.7)	15 (9.2)	136 (83.4)	1 (0.6)
Age Range	10 – 12	68 (22.7)	2 (2.9)	2 (2.9)	64 (94.2)	0 (0.0)
	13 – 15	116 (38.7)	6 (5.2)	7 (6.0)	102 (87.9)	1 (0.9)
	16 – 18	105 (35)	4 (3.8)	7 (6.7)	94 (89.5)	0 (0.0)
	19 +	11 (3.6)	1 (9.1)	2 (18.2)	8 (72.7)	0 (0.0)
School Type	Public	140 (46.7)	5 (3.6)	9 (6.4)	125 (89.3)	1 (0.6)
	Private	160 (53.3)	8 (5.0)	9 (5.6)	143 (89.4)	0 (0.0)
Level	JSS	157 (52.3)	4 (2.5)	8 (5.1)	144 (91.7)	1 (0.7)
	SSS	143 (47.7)	9 (6.3)	10 (6.9)	124 (86.7)	0 (0.0)
Socio-Economic Status	Class I	78 (26)	6 (7.8)	7 (8.9)	65 (83.3)	0 (0.0)
	Class II	125 (41.7)	4 (3.2)	9 (7.2)	111 (88.8)	1 (0.8)
	Class III	97 (32.3)	3 (3.1)	2 (2.1)	92 (94.8)	0 (0.0)
Residency	Day	230 (76.7)	11 (4.8)	15 (6.5)	203 (88.3)	1 (0.4)
	Boarding	70 (23.3)	2 (2.9)	3 (4.3)	65 (92.9)	0 (0.0)

In Table 1 above, the background characteristics of the participating students to the observed BMIs were summarized using frequencies (and percentages). The percentage values are interpreted conditional on the characteristics. That is, for example, 1.6%, 2.2%, 96.3%, and 0% of males were obese, overweight, normal, and underweight respectively. It could also be observed that about 4 in every 100 students in Owerri municipal secondary schools is obese. Normal weight is observed very high among the students in the study area. Owerri is an activity-filled city with lots of bustling and hustling. Active involvement of these students in the daily hustling could be the cause of less overweight and obesity observed in this study. Malnutrition, famine, and other factors associated to underweight are almost absent in the municipal which is reflected in only one student being observed as underweight. Since an unequal number of students

were used in each category, we could infer based on relativity (and not percentage) that boarding students, JSS students, class II students, and private school students had normal weights than their counterpart categories in the same background characteristics. Obesity was more among females, students aged 13 –

15 years, and those who are attending private schools. Obesity was also more prevalent among those in senior secondary, those on the daily residence, and those in class I socio-economic status.

Table 2: Frequency (and percentage) distribution of Obese students by variables

Variable	Category	Overall 300	Obese 13 (4.3)
Number of meals per day	2 times	19 (6.3)	0 (1.6)
	3 times	240 (80.0)	8 (3.3)
	4 times	41 (13.7)	5 (12.2)
Conscious Physical Activity	Yes	181 (60.3)	5 (2.7)
	No	119 (39.7)	8 (6.7)
Duration of Physical Activity	< 30mins	132 (44.0)	4 (3.0)
	30 – 60mins	61 (20.3)	3 (4.9)
	61 – 120mins	24 (8.0)	0 (0.0)
	>120mins	0 (0.0)	0 (0.0)
	None	83 (27.7)	6 (7.2)
Duration of Watching TV	< 1hr	61 (20.3)	1 (1.6)
	1 – 4hrs	211 (70.3)	10 (4.7)
	>4hrs	28 (9.3)	2 (7.1)
Snacks consumption	Daily	37 (12.3)	3 (8.1)
	1 – 3days/week	137 (45.7)	4 (3.1)
	4 – 6days/week	120 (40.0)	5 (4.2)
	None	6 (2.0)	1 (6.3)
Fruit Consumption	Daily	43 (14.3)	0 (0.0)
	1 – 3days/week	145 (48.3)	5 (3.4)
	4 – 6days/week	102 (34.0)	4 (3.9)
	None	10 (3.0)	2 (2.0)
Vegetable Consumption	Daily	65 (21.7)	0 (0.0)
	1 – 3days/week	134 (44.7)	7 (5.2)
	4 – 6days/week	90 (30.0)	3 (9.1)
	None	11 (3.7)	3 (14.2)
Fast food consumption	Daily	6 (2.0)	2 (33.3)
	1 – 3days/week	100 (33.3)	5 (5.0)
	4 – 6days/week	153 (51.0)	3 (3.3)
	None	18 (6.0)	1 (4.3)
Sweetened beverage consumption	Daily	28 (2.0)	2 (7.1)
	1 – 3days/week	150 (33.3)	4 (2.7)
	4 – 6days/week	103 (51.0)	4 (3.9)
	Others	12 (4.0)	3 (25)
	None	18 (2.3)	0 (0.0)

In Table 2 above, noticeably is the fact that students who do not take vegetables and fruit relatively had higher obesity prevalence. On the other hand, obesity was also relatively nonexisting among those who do

not consume sweetened beverages, snacks, and fast food including those who spend more time in physical activity. More inferences are obvious from Table 2.

Table 3. Results of testing the significance of BMI and associated factors.

Variables	Test Value	P-value
Sex	6.23	0.001*
Age	2.385	0.736
School Type	0.692	0.405
Educational Level	1.923	0.166
Residential	6.831	0.013*
Socio Economic Status	1.077	0.584
No. of meals per day	0.692	0.030*
Breakfast consumption per week	1.923	0.166
Lunch consumption per week	1.077	0.584
Super consumption per week	3.769	0.052
Snack consumption per week	2.692	0.030*
Fruits consumption per week	0.154	0.026*
Vegetable consumption per week	2.462	0.001*
Fast food consumption	9.308	0.002*
Sweetened beverage consumption	0.846	0.082
Duration of physical activity	7.846	0.038
Duration of watching TV	1.270	0.001*
Sweetened beverage consumption (e.g Tea)	1.923	0.766
Grain consumption (e.g Rice)	0.077	0.997
A solid starchy food (e.g akpu/fufu)	4.932	0.001*

In Table 3, the result of testing for the significance of various factors in association with BMI is presented. Variables with asterisked p-values are significant at a 0.05 level of significance. Thus, from Table 3 above, Sex, Residency, the number of meals per day, duration of physical activity, snack consumption per week, fruits consumption per week, vegetable consumption per week, fast food consumption, duration of watching TV, and solid starchy food consumption were observed to be significant to BMI. These results agree with some existing literature. Duration of watching TV, sex, and fast-food consumption agree with Abduelkarem *et al*., (2020), duration of physical activity agrees with Vohra *et al*., (2011), and fruit, vegetable, and starchy food (akpu/fufu) consumption agree with Adeniyi *et al*., (2019) and Agofure (2018).

Conclusion
Assessment of some factors associated with obesity has been made in this study concerning selected schools in Owerri municipal. Results obtained indicate the prevalence of obesity in the studied area across various background characteristics. Results obtained in this study also agree with existing literature whose objective is similar to that of this study and has been conducted in Nigeria. The study advocates educational programmes for obese students to include diet, exercise, and a family-based behaviour approach. This study also provides useful baseline information for future studies on obesity in secondary schools in Owerri Municipal area, Imo state.

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