ANTHROPOMETRIC INDICES OF ADOLESCENTS IN PRIVATE AND GOVERNMENT SCHOOLS IN JOS NORTH LGA, PLATEAU STATE

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ABSTRACT

Background: Adolescence is a period of transition between childhood and adulthood. Nutritional status assessment using anthropometry is a simple and extremely useful initial approach to assess adolescents' nutrition. This study aims to compare the anthropometry of adolescents in private and government schools, using Body Mass Index (BMI).

Methods: Seven hundred and seventeen (717) adolescents between the ages of 10 and 19 years were studied. Anthropometric data were collected to determine their nutritional status using BMI and comparisons made between private and government-owned secondary schools. BMI was categorized as either normal or abnormal (obesity, overweight, thinness and severe thinness).

Results: Overall, 16% of the respondents had abnormal BMI; obesity-1%, overweight-7.8%, thinness-5.7%, and severe thinness-1.5%, and a statistically significant difference was found between the proportions of abnormal BMI in Private (19.5%) and Government (12.4%) schools (p-value: 0.025). Seventy-seven percent (77%) of the respondents had unhealthy eating habits and no statistically significant difference was found between the eating habits of adolescents in private and government schools (p-value: 0.82). Also, 87.2% of all the respondents reported engaging in physical exercise and a significantly higher proportion was reported in government schools than in private schools (91% vs. 83%, p-value: 0.002). BMI category was found to be significantly associated with school type; those in private schools had a lesser proportion of individuals with a normal BMI (p-value: 0.025).

Conclusions: A large proportion of adolescents in public and government schools in Jos North LGA had normal BMI and engaged in physical activity. Private schools had a higher proportion of adolescents with a poor nutritional status and there is a dual burden of malnutrition in both school types albeit a low proportion. However, the majority of in-school adolescents have an unhealthy eating habit and therefore, nutrition education should be up-scaled in secondary schools to promote healthier eating habits among adolescents.

Keywords: Anthropometric indices, Body Mass Index, Adolescents, Secondary schools.

INTRODUCTION

Adolescence is a period of transition between childhood and adulthood. Adolescence provides a valuable window of opportunity to prepare children for healthy lives in adulthood. The United Nations defined adolescents as individuals between the ages of 10-19 years.[1] In 2016, the United Nations estimated that there were approximately 1.2 billion adolescents in the world, which constitutes 16% of the world's population. In Sub-Saharan Africa, adolescents constitute 23% of the region's population.[1]

Adolescence is considered a nutritionally critical period of life second to infancy because of the rapid increase in physical growth and development. This period is also characterized by changes in lifestyle and eating habits which could negatively impact their health in the future.[2] Adolescents are a vulnerable group whose needs are often unaddressed. There is usually a dearth of services responding to their distinctive needs. Nutritional interventions often focus on children of younger ages and also these adolescents are unreached by health programmes targeted at adults.[3]

The use of anthropometric measurements has been identified as a standard tool in the assessment of the nutritional status of adolescents. These indices are equally predictors of the development of Non-Communicable Diseases (NCDs) in adulthood.[4]

Dual burden of malnutrition (under and over-nutrition) has been observed in adolescents. In North India, 41.3% of a cross-section of adolescents were malnourished (33% underweight, 7.3% overweight and 1.3% obese).[5] Meanwhile in Nigeria, 29% and 7.6% of in-school adolescents were found to be underweight and overweight/obese respectively.[6] Similarly, another study in Abuja found a double burden of malnutrition; undernutrition (wasting and stunting) and over-nutrition (overweight and obesity), among adolescents at a prevalence of 13% and 15.8% for undernutrition and overnutrition respectively.[7]

In 2015, the population of adolescents worldwide was estimated to be 1.8 billion and this gives them importance with regards to the future economic development of nations.[8] This is based on the assumption that they eventually become healthy adults who will be economically productive. The school environment provides an effective and efficient opportunity for reaching large populations of adolescents.

Nutritional status in adolescence is better assessed using anthropometry.[4] Nutritional status assessment using anthropometry is a simple and extremely useful initial approach to assess adolescent nutrition. Assessment of nutritional related problems and risks in adolescents is valuable for screening, surveillance, programme planning and evaluation purposes. BMI is the anthropometric tool used to assess nutritional status in health care settings.[4]

This study could provide baseline data which may stimulate a prospective study that would seek to validate the reliability of anthropometric indices of adolescents in predicting concurrent and future adverse health outcomes (especially non-communicable diseases) in our environment. Also, it would add to the existing body of knowledge on the nutritional status of adolescents in this area. Findings from the study could also be used to engage school administrators in initiating (where it is lacking) and consolidating nutrition education, screening and surveillance in the school health context.

This study aims to determine the anthropometric indices of adolescents in private and government schools in Jos North Local Government Area (LGA) Plateau State. Specifically, the study will look to assess the eating habits, levels of physical activity

and anthropometric indices of in-school adolescents in Jos North LGA.

METHODOLOGY

Plateau state is located in the North Central Zone of Nigeria. It has 17 Local Government Areas (LGAs) which are further divided into North, Central and Southern Senatorial zones. The study was conducted in state-owned government secondary schools and private secondary schools in Jos North LGA of Plateau State. There are a total of 154 registered secondary schools in Jos North LGA. Jos North LGA is an urban city with an area of 291 km^2 (112.4sqm) and an estimated population of 429,300 people.[9]

The study was carried out among students aged 10-19 years attending private and government-owned secondary schools in Jos North LGA of Plateau State. However, eligible students with a physical disability which may affect anthropometric measurements were excluded. It was a cross-sectional comparative study design.

The minimum sample size was determined using the formula for a comparative study:

$$N = \frac{Z\alpha^2 . 2 . p(1-p)}{(p_1 - p_2)^2}$$

N= minimum sample size for each study group (government or private school)

Zα= z value for alpha level desired (confidence level: 95%): 1.96

P: average proportion of malnutrition = $\frac{P_1 + P_2}{2}$

$$= \frac{0.3122+0.307}{2} = 0.4631$$

P_1= proportion of malnutrition (under and over nutrition) among adolescents in government secondary schools from a previous study = 31.22%

P_2= proportion of malnutrition (under and over nutrition) among adolescents in private secondary schools from a previous study = 30.70%

A non-response rate of 10% was considered and added to the total sample size calculated.

The minimum sample size was 632 (316 each for the Private and Government-owned schools).

A multistage sampling technique was used to select schools and respondents:

Stage One: Co-educational day schools were purposively chosen because students in day schools are more exposed to trending lifestyles and food habits and can make food choices with little restriction than students in boarding schools.

Stage Two: From the list of government-owned and private day co-educational schools, 6 schools were selected randomly from each group using a table of random numbers. This made a total of 12 schools.

Stage Three: To select study participants, equal allocation of the minimum sample size for each type (316) was done across the 6 schools in each group; 54 per school. In each school, the allocated sample size was spread equally across the 6 sets (JSS1-SS3). In each set, participants were then selected by using systematic sampling technique, where the total number of students in each set served as the sampling frame, while the sampling interval (K) was determined by dividing the sampling frame by the allocated sample size. From the list of all students in a set, the first participant was selected within the sampling interval by balloting. Subsequent participants were recruited by using the interval until the allocated size was reached.

The data collection tool was an adapted semi-structured, self-administered questionnaire. Information collected from respondents included their socio-demographic characteristics, eating habits and physical activity. Anthropometric measurements

(height and weight) were also obtained using a calibrated weighing scale and standard stadiometer. Both measurements were taken using standard procedures. Two readings of weight and height were taken for each study participant and the average reading calculated to eliminate intra-observer bias.

Ethical clearance was sought from the Jos University Teaching Hospital Health Research Ethical Committee. Permission was also sought from the respective school authorities. Informed consent (verbal and written) was obtained from the study participants who were 18 years and above and parents/ guardians of those who could not give consent (below 18years).

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0. Qualitative variables such as socio-demographics, eating habits categories, and BMI categories were presented as frequencies and proportions. Chi-squared test was used to test for associations between the qualitative variables and difference between proportions in the two school types. All p-values ≤ 0.05 were considered to be statistically significant.

RESULTS

A total of 717 adolescents aged 10-19 years, from 12 co-educational day secondary schools (6 schools each from private and government-owned secondary schools), responded to the questionnaires.

Table 1 shows the socio-demographic characteristics of the respondents in public and private schools. Majority of the respondents in both types of schools were females. The age-groups, ethnic groups, parents' educational attainment, the family of origin sizes and types showed a statistically significant difference between private and government-owned schools.

Table 2 shows the eating habits of in-school adolescents, majority of the participants (77.1%) had unhealthy behaviours (excessive consumption of energy-dense high-calorie foods and inadequate intake of the recommended servings of the different food groups).

Table 3 shows the physical activity levels among the respondents**.** Majority of them (87.2%) engaged in physical exercise at least twice in a week.

Table 4 shows the anthropometric indices of Adolescents in the Selected Secondary Schools**.** The indices were categorized using the WHO reference values for BMI-for-age for individuals aged 5-19 years. Overall, 16% of the study participants had BMIs that fell outside the normal range (Obesity, overweight, thinness and severe thinness).

DISCUSSION

Adolescents' eating habits have come to the limelight because of unconventional meals, fast-food intake, and snacking.[10] Assessment of the eating habits of the participants in this study showed that a significant majority (77%) had unhealthy eating habits and there was no statistically significant difference between the proportions of respondents with unhealthy eating habits in private and government-owned schools. Similarly, a study carried out in Mauritius that assessed eating habits among adolescents showed that 68% of study participants skipped breakfast and a higher percentage (84%) of them consumed high calorie-containing snacks in-between meals.[10] Also, more three-fifths (69%) of adolescents in Sokoto, Nigeria reported skipping meals.[11] Meal skipping is an unhealthy eating habit and skipping of breakfast has been associated with lower nutritional status and the risk of cardiovascular diseases[12]. It has also been reported that less adequate breakfast habits may contribute to the appearance and further development of obesity.[13] Both studies have similar findings with

this study because they show the poor eating habits practiced by adolescents.

Accurate assessment of physical activity in children and adolescents is a challenge. At least six categories of techniques have been used to assess physical activity among children and adolescents; these include self-report, electronic or mechanical monitoring, direct observation, indirect and direct calorimetry. Each method has some strengths and weaknesses.[14] In this study, self-reported participation in physical exercise was used and an overwhelming proportion (87.2%) reported that they engaged in physical activity at least twice a week. A statistically significant difference (p-value: 0.002) was found between the proportions of physical exercise, more adolescents in government schools engaged in physical exercise than those in private schools (91% vs. 83%). Similarly, In Brazil, nearly 84% of the adolescent respondents reported practising physical activity weekly.[15] In contrast, a study in Nepal revealed a lower proportion of physical activity among in-school adolescents (69%), however, physical activity was assessed as adequate or inadequate based on WHO recommendation and not simply as engaging in physical exercise or not.[16]

Using WHO reference for BMI z-scores (BAZ) for individuals aged 5-19 years, abnormal BMI is any value greater than +1 Standard Deviation (SD) or less than -2SD from the reference value.[17] In this study, 16% of the respondents had abnormal BMI (obesity-1%, overweight-7.8%, thinness-5.7% and severe thinness-1.5%) and there was a statistically significant difference in the proportions of individuals with abnormal BMI between the private and government schools (19.5% vs. 12.4%, p-value:0.025). For all the subcategories of abnormal BMI, private schools had higher proportions than the government schools. Conversely, a similar study carried out in Ibadan Nigeria, revealed that around 41% were either underweight, overweight or obese.[18] This proportion of abnormal BMI may perhaps be explained by the relatively higher proportions of unhealthy eating patterns and habits among the respondents.

Additionally, BMI category was found to be significantly associated with school type (p-value=0.025), the private schools had a lower proportion of individuals with a normal BMI (80.5% vs. 87.4%) and a higher proportion of respondents with abnormal BMI. This is likely due to the finding that the proportion of physical exercise was significantly higher in government-owned schools.

CONCLUSION

Majority of the respondents in both school types engaged in physical exercise and have BMIs that fall within the normal range, however, unhealthy eating habits was seen among the majority of the respondents. Private and government secondary schools significantly differ in their magnitude of abnormal BMI and physical activity levels among adolescents.

RECOMMENDATION

Nutrition education should be up-scaled in secondary schools to describe more, emphasize and promote healthier eating habits among adolescents.

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TABLES

Table 1: Socio-demographic characteristics of in-School adolescents in private (n=353) and government (n=364) schools in Jos North LGA, Plateau State.

Variable	Private f(%)	Government f(%)	χ^2	p-value
Gender				
Male	152(43.1)	165(45.3)	0.374	0.541
Female	201(56.9)	199(54.7)		
Age group				
Early adolescence	196(55.5)	153(42.0)	13.056	0.001*
Late adolescence	157(44.5)	211(58.0)		
Religion				
Christian	334(94.6)	355(97.5)	4.403	0.111
Muslim	15(4.2)	8(2.2)		
Others	4(1.1)	1(0.3)		
Ethnic group				
Hausa	7(2.0)	19(5.2)	100.017	0.001*
Igbo	37(10.5)	17(4.7)		
Yoruba	71(20.1)	11(3.0)		
Plateau indigenous	148(41.9)	256(72.8)		
Others	90(25.5)	52(14.3)		
Father's education				
No formal	9(2.5)	15(4.1)	31.313	0.001*
Primary	25(7.1)	48(13.2)		
Secondary	75(21.2)	124(34.1)		
Tertiary	244(69.1)	177(48.6)		
Mother's education				
No formal	15(4.2)	21(5.8)	34.327	0.001*
Primary	21(5.9)	57(15.7)		
Secondary	132(37.4)	164(45.2)		
Tertiary	185(52.4)	121(33.3)		
Family type				
Monogamous	295(83.6)	269(73.9)	9.980	0.002*
Polygamous	58(16.4)	95(26.1)		
Family size				
≤5	106(30.0)	78(21.4)	6.947	0.008*
>5	247(70.0)	286(78.6)		

***Statistically significant.**

Table 2: Eating habits of adolescents in private and government schools (n=717)

Eating habit	Private f(%)	Government f(%)	Total f(%)	χ^2	P - value
Unhealthy	271(76.8)	282(77.5)	553(77.1)	0.05	0.82
Healthy	82(23.2)	82(22.5)	164(22.9)		

Table 3: Engagement in physical exercise by Adolescents in Private and Government Schools (n=717)

Physical exercise	Private f(%)	Government f(%)	Total f(%)	χ^2	P- value
Yes	294(83.3)	331(90.9)	625(87.2)	9.37	0.002*
No	59(16.7)	33(9.1)	92(12.8)		

***Statistically significant**

Table 4: BMI of Adolescents in Private and Government schools in Jos North LGA (n = 717)

BMI category	School type			χ^2	p-value
	Private f(%)	Government f(%)	Total f(%)		
Normal	284 (80.5)	318 (87.4)	602 (84.0)	11.14	0.025*
Overweight	32 (9.1)	24 (6.6)	56 (7.8)		
Obesity	6 (1.7)	1 (0.3)	7 (1.0)		
Thinness	22 (6.2)	19 (5.2)	41 (5.7)		
Severe thinness	9 (2.6)	2 (0.6)	11 (1.5)		
Total	353(100.0)	364(100.0)	717(100.0)		

* Statistically significant