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Body Mass Index and Blood Pressure Pattern of Students in a Nigerian University

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Abstract

Purpose: Reports in Nigeria and other developing countries have indicated a rise in the prevalence of obesity among adults. In identifying at what age in our environment obesity starts becoming a problem, we measured the burden of overweight and obesity among young adults.

Methods: Four hundred and sixty four undergraduate students, who were undergoing medical examination as part of admission process, were recruited. Their weight, height and blood pressure (BP) were measured and their body mass index (BMI) was calculated. The prevalence of obesity, overweight and under-nutrition among these students were determined according to international guidelines.

Results: The prevalence of obesity (3.4%) and under-nutrition (3.1%) among the students, were similar. Female students had higher prevalence of obesity (4.02%) and under-nutrition (3.1%) than the males. Overweight was found to be commoner in male subjects (26.78%) than in females (20.98%). The prevalence of hypertension was 3.4% in the study population and was commoner in males (5.9%) than in females (0.89%). Mean systolic blood pressure and diastolic blood pressure were significantly higher in males than females ($p < 0.05$).

Conclusion: Obesity and under-nutrition are prevalent among the fresh undergraduate students. As part of the orientation programme for fresh undergraduate students in Nigerian Universities, nutrition education should be carried out. The need to always conduct blood pressure monitoring for all University students is also recommended.

Keywords: Body mass index; Blood pressure; Obesity; University students; Nigeria.

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Introduction

According to estimates by the Global Burden of Disease (GBD) study, deaths due to non-communicable diseases (NCD) in developing countries will be four times that due to communicable diseases by 2020 [1]. Such communicable diseases includes hypertension, diabetes mellitus, coronary heart disease, stroke and metabolic syndrome. Commonly, these diseases have obesity as a common denominator.

Obesity is now seen as an emerging public health disaster throughout the world [2,3] (including sub-Saharan Africa) [1]. The relationship between obesity and the potentially attendant increase in NCDs in adult African population may have its origin early in life [4,5]. A possible point in early life when this problem begins varies from infancy to early childhood, adolescence and early adulthood [6]. The recent inclusion of developing societies in the world map of rising overweight/obesity is worrisome. This is because the countries being affected cannot afford financial cost presently borne by the developed worlds in the fight against obesity epidemic. Added to this, developing countries like the sub-Saharan African countries do not have the kind of health care system that can effectively handle the disease burden occasioned by overweight/obesity.

The essence of this work is to identify the burden of overweight/obesity in early adolescents with a view to arresting the rising prevalence of obesity in middle aged populations. A population that is likely just behind middle aged and readily accessible, is university student population. It is hoped that if the point at which a rise in obesity rate occurs is identified, a public health approach which is cheaper and less technically demanding can be applied for maximal benefit.

Methods

This study was carried out in University Clinic of Delta State University, Abraka, Nigeria. The subjects comprised newly admitted students of the university who came to the clinic for their routine medical examination. We briefed the students on the essence of this work and sought their consent before they were recruited for the study. Thereafter, consecutive, consenting students were recruited.

After collecting data on their age and sex, we measured their blood pressure (BP, using a mercury sphygmomanometer with the appropriate cuffs size) as well as their weight and height (using a beam balance scale), from which their body mass index (BMI) were calculated. In measuring BP, each student was made to rest for at least five min, in a sitting position with uncrossed legs, before the BP reading was taken. A student was considered to be hypertensive if the BP was equal to or greater than 140/90 mmHg, according to the WHO/ISH guidelines [7]. The students who had BP values consistent with hypertension on first reading were re-evaluated as appropriate. If the BP was still the same, such a student was recorded as hypertensive.

The body weight of each subject was recorded while putting on minimal clothing. We took their height readings from a measuring scale drawn on the walls in the clinic. Before the height was measured, the subjects were asked to remove their shoes or sandals, and made to stand against the marked wall with their calcaneus, gluteus and occiput touching it. All readings were personally taken by the authors of the study. BMI was determined from the weight (kg) and height (metres) of the subjects and the subjects were classified into malnutrition (18.5 kg/m^2), normal ($20.0\text{-}24.9 \text{ kg/m}^2$), overweight ($25.0\text{-}29.9 \text{ kg/m}^2$) or obesity (30 kg/m^2) as appropriate. The mean of these variables were determined in the whole population and in the male and female

Table 1: The distribution of studied parameters in male and female subjects

Parameters	Male [mean (sd)]	Female [mean (sd)]	P value
Age (years)*	22.49 (2.97)	21.57 (2.35)	0.0002
BMI (Kg/m ²)*	25.54 (3.19)	23.38 (3.28)	0.0001
SBP (mmHg)*	116.50 (19.96)	111.39 (12.02)	0.001
DBP (mmHg)*	75.25 (11.29)	72.46 (8.73)	0.003
Prev. Hypert. (%)	5.86	0.89	0.001
Prev. Obesity (%)	3.44	2.93	4.02
Prev. Undernutri. (%)	3.10	1.26	4.91

SD, Standard deviation; SBP, Systolic blood pressure; DBP, Diastolic blood pressure
 Prev. Hypert, Prevalence of hypertension; Prev. Obesity, Prevalence of obesity;
 Prev. Undernutri, Prevalence of under-nutrition; (*) male (n) =238, female (n) =226;
 (*) male (n) =236, female (n) =226

groups. At 95% confidence interval, differences in mean values were compared using the Student T-test or Chi-square test, as appropriate. The prevalence of malnutrition was also determined in the whole population as well as the male and female groups. Correlation among the variables (age, gender, BP and BMI) was carried out using regression analysis. The minimum p values considered significant was 0.05.

Results

Four hundred and sixty four (464) students were recruited for the study, out of which 238 (51.3%) were males and the rest (48.7%) females. The mean age of the study subjects was 22.0±2.72 years. There was a significant difference between the ages of the males as compared to the females ($p < 0.05$) (Table 1).

The mean systolic blood pressure (SBP) in the study was 114.78±13.7 mmHg. Mean SBP in the females was significantly lower than the mean SBP in males ($p < 0.05$). Similarly, the mean DBP was significantly higher in the males than in the females ($p < 0.05$). The prevalence of hypertension in the study was 3.4%. This was higher in the males who had a prevalence of 5.9%, as against the 0.9% noted in the females (Table 1). There was no good correlation between age and BP, age and BMI and BMI versus

BP. Gender was also not well correlated.

A distribution of BMI in the study sample is provided in Table 2. About 62% of the population had BMI values (20.0-24.9 kg/m²) in the normal BMI interval. Those who were overweight constituted 23.9% while 3.4% of them were obese. Notably, about 3.1% of these students were under-nourished with BMI less than 18.5 kg/m². More females were under-nourished as compared to males. About 4% of female students were obese and this was higher than the 2.9% noted in the males (Table 2).

Table 2: Body mass index distribution in the study population

BMI (Kg/m ²)	Study sample (%)	Male %	Female %
<18.5	3.10	1.26	4.91
20.0 – 24.9	62.15	61.09	64.29
25.0 – 29.9	23.87	26.78	20.98
≥30.0	3.44	2.93	4.02

% are based on total number in each category

Discussion

Delta State is composed of varied ethnic groups, which are represented in this study in addition to other ethnic groups in the country. However, comparison based on ethnicity could not be carried out, because of very wide variations in the number of

students in the various groups. This will not allow for reasonable statistical inferences. The mean age of 22 years in the study suggests that the results of this work may apply to young adults in Nigeria. Therefore, they may represent the situation in the immediate period before the middle ages, in terms of some cardiovascular risk factors that we studied. It is hoped that the results will provide information on the stage at which adults' population BMI and BP starts its upward trend in our community.

When the mean BMI of the study group is subjected to gender influence, the mean BMI was significantly higher in males (25.54kg/m²) than in the female (23.38 kg/m²). In some studies done in older populations [8,9], there was no such difference. The suggestion from this is that there is an obliteration of this difference by increase in the BMI of females as the population gets older. This tends to suppose that weight gain in older subjects could be more in females. This is unlike the situation in younger ages, as suggested in this study, where males had higher prevalence of overweight (27% vs 20.9%). The higher prevalence of overweight in young men, have also been noted by other workers [10,11].

The obesity rate observed in our study is not much different from the 1.6% reported for males, and 4.9% for females in the data from a World Bank report on Nigeria in 2002 [3]. A likely reason for the higher obesity found in females is that, they are more prone to progressing from overweight to obesity, than males. This higher prevalence of obesity in females is found both in young and old persons [8,10,12,13]. In a study involving young African-Americans, obesity was however commoner in males [11]. Except for a study carried out in a rural area in Maiduguri, Nigeria [12], studies in older Nigerians had a higher prevalence of obesity than seen in this study. The implication of this finding is that efforts at addressing overweight/obesity of adult population should commence at earlier ages. This will in turn

help to address diseases associated with elevated BMI. The university students or even students at lower educational levels might be good targets for such exercises. Some workers have advised that such effort should target, not only those young persons who are overweight/obese, but also those who are moving up the BMI ladder [14].

An admixture of overweight/obesity and under-nutrition signifies a population in nutrition transition. This is typical of developing nations, in which those who belong to the high socio-economic class are overweight/obese and the low socio-economic class individuals are commonly under-nourished. This is unlike the situation in developed countries where overweight/obesity is commoner in those in the low socio-economic stratum [16,17]. Therefore the issue of addressing increase in BMI in Nigeria should be focused on high socioeconomic group individuals, more so on females. Better still, the target population should be addressed in their earlier ages. It is also important that the level of under-nutrition in this environment should receive enough scientific attention.

One reason why medical sciences focus on overweight/obesity, is its potentially attendant increase in cardiovascular risk. The origin of obesity in early life is thought to increase the propensity for the development of cardiovascular risk factors and atherosclerosis [18]. Hypertension is one of the factors that have been clearly identified as a cardiovascular risk factor. In this study, the prevalence of hypertension (3.4%) is much lower than the 17-20% in the whole Nigeria population [19,20]. The higher prevalence of hypertension in males as compared to females in our study has been reported in some other studies [20,21] but contrarily reported in others [8,22]. Possible reasons for the high prevalence of hypertension in males in the study group include the higher mean age and prevalence of overweight in males. In 1998, a study showed that the contribution of obesity to hypertension in Africans was only 10% [23].

We suggest that overweight rather than obesity is more associated with hypertension in this environment. It would also appear that the effect of obesity on BP level was not much, as the mean SBP and DBP were also higher in males. A similar picture was found in another Nigerian study [10]. But in this latter study, the mean values of SBP and DBP were higher than in the present one. This is thought to be due to the higher mean age of the study subjects. This is in keeping with previous observations that increase in BP and prevalence of hypertension, is related to age [20-22] more so SBP [21]. The observation of low prevalence of hypertension noted above in the present study could be associated with the lower mean age compared to adult populations [19,20].

Conclusion

The prevalence of obesity and under-nutrition among the fresh undergraduate students has been documented. The problem of overweight/obesity noted in studies in adult Nigerian population, seem that of older ages with feeder from younger persons.

As part of the orientation programme for fresh undergraduate students in Nigerian Universities, nutrition education should be carried out. The need to always conduct blood pressure monitoring for all University students is also recommended. Particular attention should be paid to obesity in the female population, and high BP in young men. This action is imperative now considering the huge and unsustainable cost of medical care, occasioned by obesity and related diseases, in developed countries [3].

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