Original article

Assessment of overweight, obesity and metabolic variables among students of a private medical college in Dhaka city

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Abstract:

Background: Overweight and obesity are recognized as recent threat which affecting both developing and developed countries. Obesity and its associated morbidities are leading cause of most non-communicable diseases. Few recent studies have indicated the presence of increase in overweight and obesity among children and adolescent but there is no study among adult groups. ***Method and material***: This cross sectional study was done to assess the prevalence of overweight, obesity and metabolic variables with their relation among medical students. ***Result***: Our result reveals that 8.6% & 1.9% male and 15% & 3.2% female are suffering from overweight and obesity (based on BMI) respectively. More females (31.3% and 65.2%) are centrally obese than males (3.5% and 34.8%) (According to Waist Hip ratio and Waist Height ratio respectively). But according to Waist circumference more males (30.7%) are obese than females (24%). There is also significant difference of male and female BP. DBP and SBP of male (79.22mmHg & 118.9 mmHg) have high normal level than female (72.71mmHg and 108.67mmHg) ($P<0.001$). There is no significant difference of glycaemic status ($p<.286$) and lipid profile ($p<.347$) with central obesity. ***Conclusion***: Although male students have high upper level of blood pressure, female students are more obese than males (both according to BMI and central obesity). High blood pressure and obesity both acts as risk factors for the development of non communicable disease. Student's awareness therefore should be increased to reduce central obesity and BP within normal range.

Key words: BMI-body mass index; WC-waist circumference; WHR-waist hip ratio; WHtR-waist height ratio; BP-blood pressure; DBP-diastolic blood pressure; SBP-systolic blood pressure; central obesity; lipid profile; glycemic status

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Introduction

Overweight and obesity are considered major epidemic health problems in both developed and underdeveloped countries as many studies showed a remarkable rise[1]. Several recent studies in the united states, showed that overweight and obesity prevalence is increasing dramatically and suggesting that 86.3% of adults will be overweight or obese as well as 51.1% will be obese by 2030[2].

Overweight and obesity are recognized as an 'escalating epidemic' affecting both developed and developing countries. Obesity and its associated morbidities are leading causes of cardiovascular disease (CVD), type-2 diabetes and several other health problems [3].

Physical activities promote controlling blood lipid abnormalities, diabetes, and obesity. On the other hand, sedentary lifestyle is associated with high risk

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of coronary, cerebral, and peripheral vascular diseases and all- cause morbidity and mortality among both genders at all ages[4].

It is estimated that more than 2 two million deaths annually in the world are attributed to physical inactivity[5].Cardiovascular diseases are the leading cause of mortality and morbidity in the world even in the developing countries [6].

Evidence indicates that the pathophysiological process of cardiovascular disease begins at early age, though the manifestations of the disease do not appear until middle age adulthood. Risk factors for cardiovascular disease, particularly lipoprotein profiles, are affected by physiological abnormalities, and lifestyle related issues [7].

The childhood roots of adult obesity and also dyslipidaemia, glycaemic status are widely recognized and associated which calls for health promotion targeted at youth. Recent studies have indicated the presence of increasing trends in overweight and obesity among children and adolescents in Greece [3], but there is no study among adult groups. Moreover, although there are many studies on the health status of medical students, a target group of particular interest as they are future physicians, these have mostly tracked the use of alcohol and tobacco[8].

Although obesity has important genetic and familial components, environmental factors are probably the predominant factors in the current epidemic. In addition to the approach provided by Guo et al at 2004 the status of the parents can be used. Children from families in which one or both parents are overweight have a substantially higher risk of becoming obese than do children whose parents are not overweight [5].

Obesity relates to other risk factor in children as well as adults, but there is little information on the effects of persistent obesity in early Iife. Because obesity begins in childhood, it is important to determine the level at which obesity begins to influence cardiovascular risk. Consequently, individuals who have been obese since childhood are of particular interest for studying the early natural history of obesity and its relationship to the development of dyslipidaemia and glycaemic status. Childhood obesity is associated with high level blood pressure, LDL Cholesterol, insulin resistance and lower level of HDL-C, increased heart rate and increased cardiac output[4].

Anthropometric indices include body mass index (BMI), waist circumference and waist to hip ratio (WHR) and waist height ratio (WHtR). These data are not always easy to interpret but they are important to obtain because, overweight adults are at increased risk for adverse health outcomes, including mortality in later life. Prospective and retrospective studies have shown that obesity, Lipid Profiles, unhealthy diets and sedentary life style have their roots in childhood and tend to track into adulthood [5].

Methods and Materials

This Cross sectional study was carried out in Ibrahim medical college from June 2012-June 2013. Study populations were the Medical student of Ibrahim Medical College from 1st year to 5th year. 313 students were selected on the basis of their availability for examine in due time. Students were selected purposively.Data was taken on a questionnaire and check list Participants after obtaining informed consent will be examined on the following parameter:

Anthropometric measurements such as, BMI, WC, WHR and WHtR (to define normal overweight and obesity)

Blood pressure.

Lipid profile

Glycemic status

Methods for Anthropometry and Blood Pressure:

Anthropometric measurements was done by a digital scale to measure body weight (BW). Body height (BH) was measured by using a commercial stadiometer. Body Mass Index (BMI) was calculated as BW in kg divided by the square of the BH in meters (m^2). Waist circumference (WC) was measured in the highest point of iliac crest at the level of umbilicus and hip circumference (HC) at the fullest point around the buttocks. Hip and waist ratio and waist to height ratio will be measured also[9].

Based on the INTERNATIONAL OBESITY TASK FORCE, convened by the world Health Organization, a subject with BMI of 25-29.9 kg/m^2 was defined as overweight; BMI$\geq$30 kg/m^2 was defined as obese. The waist circumference (WC), waist to hip ratio (WHR) and waist height ratio (WHtR) measurements was used to determine the extent of central adiposity. For waist circumference, cut off points of$\geq$90 cm in men and$\geq$80 cm in women was used [11]. A waist to hip ratio$\geq$0.9 in men and$\geq$0.8 in women was considered to represent central obesity [12] and waist to height ratio values of$\geq$

50 in either sex was adopted as cut offs [10]. The individual blood pressure was measured by sphygmomanometer at sitting position. Optimal systolic blood pressure(SBP) is <120mm of Hg, normal SBP is <130 mm of Hg and high normal SBP is 130-139mm of Hg [16]. Optimal diastolic blood pressure(DBP) is <80mm of Hg, normal DBP is 85 mm of Hg and high normal DBP is 85-89 mm of Hg[16].

Collection of blood samples:

Early morning, venous blood samples were drawn for biochemical screening tests, following a 12- hour overnight fasting. Blood samples were collected from the study subjects with all aseptic precautions in clean and dry test tube. Under all aseptic precautions 5cc of blood was collected from the study subjects by using disposable syringe from the medial cubital vein. The needle was detached from the nozzle and blood was transferred immediately into a dry clean plastic test tube with a gentle push to avoid haemolysis. Collected blood was allowed to clot and centrifuged. Separated serum then collected into plastic micro centrifuged tubes and appropriately labeled and stored at -20^{0}C.

Laboratory method:

Serum glucose was measured by glucose - oxidase-peroxidase method fasting blood sugar(FBS) 3.5-5.6mmol/l and 2ABF(2hours after breakfast) is 7.8-11.1mmol/l [13]. Lipid profile (serum Total Cholesterol, serum tri-glyceride, LDL-C and HDL-C) was measured. Serum total cholesterol was measured by cholesterol oxidase-peroxidase method [14]. Serum tri-glyceride(TG) and serum HDL-C was measured by kit method. Serum LDL-C was calculated by a using formula[6]. LDL-chol = Total Cholesterol- (HDL-chol + TG/5) [6].

Dyslipidaemia is defined as total cholesterol≥5.2 mmol/L (200 mg/dl), TG≥1.5 mmol/L (150 mg/dl), LDL-C≥3.4 mmol/L (130 mg/dl) and HDL–C≥0.9 mmol/L (40 mg/dl). These cut offs correspond to the adult panel treatment-III criteria for borderline high total cholesterol, TG, LDL-C and low HDL-C levels[6]. A total cholesterol : HDL-C ?4 was also considered as adverse serum lipid profile [5].

Statistical analysis: All collected data were corrected and entered into the computer based SPSS program for analysis. Qualitative data was analyzed by Chi-Square test and quantitative data by students T-test.

Result

A description of the general characteristics of the participants is provided in table 1. The total sample size for the study was 313, of which an average age 20.12 years with standard deviation (SD) ±1.472. Mean diastolic blood pressure 75mm of Hg (SD ±8.5), Mean systolic blood pressure 112.5(SD ±11.5), fasting lipid profiles where as mean total cholesterol 156.16mg/dl (SD ±30.74), mean triglyceride 158.92 mg/dl (SD ±45.98), mean high-density lipoprotein 40.1 gm/dl (SD ±11.182), low-density lipoprotein 85.73 (SD ±29.7). On glycemic status mean fasting plasma sugar 4.24 mmol/L (SD ±0.858), mean plasma sugar 2 hours after glucose 5.41 mmol/L (SD ±1.08). Whereas anthropometric measurement mean BMI 23.24 kg/m2 (SD ±4.00), mean waist circumference 78.7 cm (SD ±12.43), mean waist hip ratio 0.83 (SD ±0.0929) and waist height ratio 0.49(SD±.08).

Table 2 shows comparative study of all the parameters among both male and female. Total number of

Table: 1 General characteristic of participants. (n=313)

Characteristics	Minimum	Maximum	Mean	(± SD)
Age (year)	17	25	20	(1.47)
Blood Pressure (mm of Hg)				
Diastolic	60	100	75	(8.5)
Systolic	80	140	112.5	(11.5)
Lipid Profile (mg%)				
Total cholesterol	83	297	156	(30.7)
Triglyceride	82	356	159	(46)
High density lipoprotein	15	74	40	(11)
Low density lipoprotein	23.5	238	85.7	(29.7)
Blood Glucose(mmol/L)				
Fasting blood glucose	2.6	10.2	4.3	(0.9)
Blood glucose 2hr after breakfast	2.8	12.2	5.4	(1.0)
Anthropometry				
Height (cm)	126	190	160.75	(9.15)
Weight (kg)	32	100	60.26	(12.62)
BMI (Kg/m^2)	12.7	37.0	23.2	(4.0)
Waist circumference (cm)	33.0	113.0	78.7	(12.4)
Waist Hip Ratio	0.09	1.2	0.83	(0.09)
Waist Height Ratio	0.20	0.72	0.49	(0.08)

Table 2 Anthropometric and metabolic variables of the participants according to gender.

Variable	Total Mean ± SD	Gender Male Mean + SD	Female Mean + SD	*P* value
Age	20.12 (1.47)	20.17 (1.47)	20.09 (1.47)	0.632
Blood pressure(mm of Hg)				
Diastolic	75.14 (8.50)	79.22 (8.60)	72.71 (7.48)	0.000
Systolic	112.50 (11.5)	118.91 (10.20)	108.67 (10.64)	0.000
Lipid Profile				
Total cholesterol	156.16 (30.7)	158.17 (32.32)	154.96 (29.79)	0.373
Triglyceride	158.92 (45.98)	159.89 (45.95)	158.35 (46.10)	0.774
High density lipoprotein	40.10 (11.18)	40.85 (11.61)	39.65 (10.92)	0.358
Low density lipoprotein	85.70 (29.70)	85.54 (31.95)	85.84 (28.36)	0.931
Blood Glucose				
Fasting blood sugar	4.2 (0.85)	4.30 (0.91)	4.21 (0.82)	0.385
2 hour after break fast	5.41 (1.08)	5.58 (1.15)	5.30 (1.03)	0.036
Anthropometry				
BMI	23.24 (4.00)	23.34 (3.77)	23.18 (4.14)	0.731
Waist circumference	78.66 (12.43)	81.18 (12.55)	77.16 (12.15)	0.006
Waist hip ratio	0.82 (0.09)	0.85 (0.10)	0.81 (0.08)	0.000
Waist height ratio	0.48 (0.07)	0.48 (0.07)	0.49 (0.07)	0.091

students were 313. Among them male were 117(37.4%) & female 197(62.6 %). Average age of male & female was 20 years. Mean diastolic blood pressure among male was 79.22(±8.60%) and female was 72.71(±7.48%). Mean systolic blood pressure was 118.91(±10.20%) and 108.67(±10.64%) among male and female respectively.

Mean total cholesterol was 158.17(32.32) and 154.96(29.79); Mean TG level 159.89 (±45.95) and 158.35 (±46.10) ; mean HDL 40.85 (±11.6) and 39.65 (±10.92); mean LDL 85.54 (±31.95) and 85.84 (±28.36) between male and female respectively. P value >0.05. There is no significant difference in metabolic variables between male and female. Fasting blood sugar level in male was 4.30(±0.91) & female was 4.21(±0.81) with p value of 0.385. Blood sugar 2 hrs breakfast level in male was 5.58(±1.15) & female was 5.30(±1.03) with p value of 0.036 (<0.05). Anthropometric measurement between male and female shows mean BMI 23.34(3.77) and 23.18(4.14) with P value 0.731;There is no significant difference in BMI between male and female. Mean waist circumference 81.18(12.55) and 77.16(12.15) with P value 0.006 . It is not significant; waist hip ratio was 0.85 (±0.10)and 0.81 (±0.08) P value 0.000. It is significant; waist height ratio was 0.48 (±0.07)& 0.49 (±0.07) P value 0.091 respectively. It is not significant.

Table 3: Distribution of the according to the anthropometric measurements.

Parameter	Total subjects(n=313)			Male(n=117)			Female(n=196)		
	No	%	95% CI	No	%	95% CI	No	%	95%CI
Over weight	74	23.6	23.6±0.096	27	8.6	8.6±0.103	47	15.0	15±0.031
Obese	16	5.1	5.1±0.107	6	1.9	1.9±0.109	10	3.2	3.2±0.109
Waist Height Ratio	112	35.8	35.8±0.088	39	34.8	34.8±0.149	73	65.2	65.2±0.109
Dyslipidimia	195	62.3		72	23		123		
Present								62.3	
Absent	118	37.7		45	14.4		73	23.3	

Table-4 Comparison of metabolic variables among participants based on central obesity.

Parameter	Central obesity Yes (n=174) Mean (± SD)	Central obesity] (n=139) Mean (± SD)	*P* - Value
Blood Glucose			
Fasting	4.20 (0.82)	4.30 (0.90)	0.286
2 hr After break fast	5.36 (1.08)	5.47 (1.09)	0.351
Lipid profile			
TC	154.52 (29.29)	158.21 (32.47)	0.291
TG	157.63 (48.68)	160.54 (42.46)	0.578
HDL	40.63 (11.46)	39.43 (10.81)	
LDL	84.56 (30.19)	87.20 (29.12)	0.347

*P*_value reached from X^2 test

Table 3 shows that according to BMI 27 males and 47 females are overweight (8.6%, CI (confidence interval) - 10.18 - 7.02) and 15%, CI – 17.02 – 12.98). Number of obese males are 6 (1.9%, CI – 2.67 – 1.13) and females are 10 (3.2%, CI – 4.19 - 2.21).Central obesity (on the basis of WC) shows that 96 male students (30.7%, CI - 33.31 – 28.09) and 78 female students (24%, CI - 26.41 - 21.59) are centrally obese. According to Waist Hip ratio 31.3% female and 3.5% male & according to Waist Height ratio 65.2% female and 39% male are centrally obese.

A comparative study of metabolic variables based on central obesity represented in table 4. Total no. of centrally obese individuals are 174 and 139 students do not have any central obesity. Fasting blood sugar level was 4.20 (±0.82) is centrally obese and 4.30(0.90) is non obese individuals (P - 0.286). Blood sugar 2 hours after breakfast was 5.36(1.08) and 5.47(1.09) is two groups respectively with a P value 0.351.

Lipid profile among the two groups shows mean TC level 154.52(29.29) and 158.21(32.47) (P=0.291), TG level 157.63 (48.68) & 160.54 (42.46) (P=0.578), HDL 40.63(±11.40) and 39.43(10.81) (P = 0.347), LDL level 84.56(30.19) and 87.20(29.12) (P value = 0.437) respectively.

Discussion

The aim of the present study was to determine the prevalence of lipid and glycemic status, overweight and obesity in a sample of a private medical college student in Dhaka city.

The findings of our study showed that according to WC central obesity was 55.6%. Among them 30.7% are male and 24.5% are female, showing a significant difference between the two groups (p= 0.006). According to waist hip ratio 3.5% male and 31.3% female have developed central obesity shows a significant difference(p<.000) between the two groups. According to waist height ratio 30.4% of more females are centrally obese than males. Our study shows that according to BMI among 117 male students 27(8.6%) are overweight and 6(1.9%) are obese and among 196 female students 47(15.0%) are overweight and 10 students (3.25%) are obese. There are also significant difference of male and female BP. Diastolic and systolic blood pressure of male (79.22mm of Hg and 118.9mm of Hg), have high normal level than female(72.7mmofHg and 108.6mm of Hg). This findings is consistent with the study of Greek 2002 (high BP in males than female)[4].

Though TG level is slightly high in both male and female (159.89mg/dl & 158.35mg/dl respectively) other lipid levels are normal. Blood glucose both fasting and two hours after breakfast is normal in all study subjects.

Our results showed that in general overweight and obesity proportions were high. Overweight and Obesity according to BMI and central obesity (WHR and WHtR) was more frequently encountered in females than males. Although more males are centrally obese according to waist circumference, in other two parameters females are more obese than males centrally. On the other hand obesity due to WC was significantly higher in males than females. These results are consistent with other studies. Wang 2006 et al[18] showed the vast increase in weight in overweight American adults was faster than in children and in women than in men. There is no significant relationship between metabolic variables and overweight and obesity p value <.347.

Conclusions:

The epidemic of overweight and obesity is having a huge impact on the physical and social well-being of adult in future. Computer use, watching TV, less physical activity and family factors are important risk factors for obesity. Obesity promotes insulin resistance, hypertension as well as dyslipidimia. Reducing obesity through life style changes is an important step for adult to prevent the development of non communicable disease[16] . Overweight and obesity remain a challenging problem in future, and more effective interventions are desperately needed.

Recommendation:

Student's awareness should be increased to reduce central obesity.

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