Research Article

Correlation of Obesity with Hypertension in Medical Students

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Abstract | The relationship between obesity and hypertension has long been recognized. Overweight and obesity are disorders of balance of energy affecting people of various ethnic groups, age and socio–economic statuses. It has been found that obesity is closely associated and correlated with hypertension. Preventive strategies for obesity may offer a cost-effective approach towards lowering blood pressure.

Objectives: To determine the frequency of obesity according to body mass index and waist hip ratio and its relationship with hypertension among medical students.

Methodology: It was a descriptive cross sectional study where a total of 213 students of 1st year MBBS and BDS were involved. Their waist circumference, hip circumference, height and weight were recorded. Moreover, on these subjects bosy mass index (BMI), waist circumference (WC), waist hip ratio (WHR) were calculated and blood pressure was recorded.

Results: Amongst 213 students, a total of 97(45.5%) were male and 116 (54.5%) were females. Among studied subjects, 2 (2.1%) males and 8 (6.9%) females were underweight, whereas 55(56.7%) male and52(44.8%) were of normal weight. The prevalence of overweight in male and females was 17(17.5%) and 22(19.0%), prevalence in obese I in male and female was 20(20.6%) and 23(19.8%), and obese II was 3(3.1%) and 11(9.5%) respectively**.** Frequency of obesity was found to be more in females than in males according to BMI and WHR. Hypertension was present in 12(30.8%) normal weight students, 6(15.4%) overweight, 14(35.9%) obese I and 7(17.9%) obese II subjects. Correlation between BMI, WC, and WHR was positively significant with SBP and DBP.

Conclusion: High prevalence of overweight and obesity was observed in students. Strong positive correlation of BMI, WC and WHR with systolic and diastolic blood pressures was shown in our study. Results of this study indicate that increase in BMI leads to increase in hypertension.

Introduction

Overweight and obesity is a medical condition in which abnormal or excessive fat accumulates in the body [1]. It is the most accustomed form of malnutrition in not only developed but developing countries as well. More than 1.5 billion people in the world are overweight or obese [2]. Obesity is considered to be known public health problem internationally with rapidly rising prevalence in several developed countries because nearly two third adult population are overweight [3]. Prevalence of obesity in urban Pakistani population is 22-37% [4]. Increased prevalence of diabetes mellitus (DM), hypertension, and cardiovascular diseases (CVS) has been reported among overweight and obese persons as a result of unhealthy

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lifestyle [5]. Obesity is found to be major risk factor for the development of hypertension [6]. It is more likely that obese patients will develop arterial hypertension and may require antihypertensive medication [7]. Early detection of obesity and its intervention with treatment could prevent the long-term consequences like the development of cardiovascular diseases.

Estimated prevalence for HTN in the world is almost one billion and it is increasing in developing countries. Hypertension has almost two times higher prevalence in the obese than in non-obesesubjects [8]. Abdominal or centralobesity is an emergent clinical and public health problem. It is closely associated with increased risk of coronary heart diseases (CHD) [9]. Anthropometric measurements of central obesity such as waist circumference (WC), waist hip ratio (WHR) are found to be more strongly associated with cardiovascularrisk factors as compared to BMI [10]. Obesity associated hypertension is linked with many serious conditions e.g. congestive cardiac failure, atherosclerosis, cerebrovascular and coronary artery disease, atrial fibrillation and renal insufficiency. Along with medical treatment, dietary and life style modificationsare necessary for the management of obesity related HTN. Weight loss plays an important role to reverse several mechanisms that are responsible for hypertension in obese [11].

In last few decades, there is growing trend of taking junk food in the form of fast food, lack of taking fresh fruits, fibre containing foods and vegetables. Junk food like snacks, soft drinks are preferred. Younger generation spend more time on television, mobile phones and computers thereby increasing screen time. Lack of physical activityand sedentary behaviour are responsible for rising prevalence of non-communicable diseases like diabetes mellitus (DM), hyper-tension (HTN), ischemic heart disease (IHD) and obesity. These conditions are leading cause of mortality and disability all parts of the world [11].

Overweight and obesity in college students is almost 40% that is very alarming. Most of them are unaware of the increased health risks linked with being overweight [12]. A small percentage of about 8.5% of college students eat the proposed amount of fruits and vegetables. It was noticed that many college students are lacking variety in their diets.Obesity is the important challenge for Pakistani population because we are genetically prone to it [13].

In present study, we found out the prevalence of obesity by three indexes (BMI, WHR and WC) and their association with hypertension prevalence in medical students, age group of 18-21. This young age group is importantmentally, emotionally and physically as this age group is the transition period when the individuals are entering adulthood, so this age group is very important. Students joining Medical Colleges represent this group. Due to less physical activity as they have to give maximum time to their studies, they are easilypredisposed to obesity and its related complications. Thus it is very important to assess their weight,-this is specifically crucial in case of medical students who are future health guard of population because they have to undergo hard medical training to excel in their profession and they get a very little time for physical activities and outdoor games.

Methodology

Our study was a descriptive cross sectional study conducted in Physiology department, CMH Lahore Medical College from December 2016 to March 2017. Total 213 students of 1st year MBBS and 1st year BDS were included in the study after approval from institutional review board & ethical committee. Informed consent was taken. Demographic profile (name, age, address, class roll number, marital status, CNIC # & Cell number) was noted on a especially designed questionnaire.

For general obesity, Student's height in centimetres and weight in kilograms was taken by stadiometer. They were advised to remove shoes for their height measurement and extra clothing before taking their weight. We calculated BMI by weight in kilograms divided by square of height in meters. On the basis of their BMI ,they were divided into five groups: under weight, normal weight, over weight, obese 1 and obese 11[14].

For abdominal obesity, (WC and hip (HC) were taken. Waist circumference was taken at the midpoint betweeniliac crest and lower border of rib cage and average of 3 readings was taken. Hip circumference was measured at the level of greater trochanter and 2cm above and below the trochanter was calculated. Average of 3 readings was taken. We calculated waist hip ratio (WHR) as waist circumference divided by hip circumference. The recommendations of international diabetic federation (IDF) for waist circumference in

South Asians are: Men >90cm; Women >80cm. The cut-off value for WHR for male and female in South Asians ≥ 0.90cm (M); ≥0.85cm (W)[15].

Blood Pressure measurements were taken using stethoscope and mercury sphygmomanometer. Students were asked to sit and relax for 5 minutes and blood pressure was taken in sitting position first in right arm then in left arm. We heard First and fifth Korotkoff sounds forsystolic and diastolic readings respectively. We took two readings separated by two minutes and it was averaged. Subjects were divided into four groups on the basis of blood pressure, normal, pre-hypertension, stage 1 and stage 11 HTN [16].

Analysis was done by SPSS 21. Quantitative variables like height, weight, BMI, WC, WHR, systolic and diastolic blood pressures were presented as mean±S.D. While qualitative variables like gender, hypertension andobesity were presented as frequency and percentages. P- Value ≤ 0.05 was taken as significant. For correlation between Obesity parameters & blood pressure, Pearson correlation test was used.

Results

Among 213 students, 97(45.5%)were male and 116(54.5%) were females. A total of 2(2.1%) males and 8(6.9%) females were underweight (Table 1). So there were 10(4.7%) students who were underweight.

55(56.7%) males and 52(44.8%) females were of normal weight. Prevalence of overweight in male and females were 17(17.5%), 22(19.0%), respectively. In obese category I, males and females were 20(20.6%), 23(19.8%), while in obese category II, there were 3(3.1%) males, 11(9.5%) females. Prevalence of underweight, overweight and obesity was more in females than males according to BMI and WHR (Table 2). Hypertension was present in 12(30.8%) normal weight students, 6(15.4%) overweight, 14(35.9%) obese I and 7(17.9%) obese II subjects (Table 3). Correlation between BMI, WC and WHR was positively significant with SBP and DBP. Mean±SD of height among medical students was 165.5±9.357cm, weight was 64±12.99kg, WC was 118±84cm, HC was 129±97cm, BMI 35±23.31, WHR 0.96±0.8696, SBP 138.54±13.90, DBP 78.83±10.30.

For comparing mean of study variables between male and female medical students independent sample t-test was used. The mean ± standard deviation of body mass Index, Waist Hip Ratio and Waist Circumference in men and women were, respectively, 22.91±3.3 and 23.6±4.37Kg/m2 (P=0.043), 89±.02 and 0.84±0.04 (P=0.0000), 86.24±7.06 and 83.62±9.186 cm (P=0.057). The mean of SBP and DBP in men and women was 125.90±13.540 and 113.88±12.906 (P= .648), 83.45±10.467 and 74.96±8.431 (P=0.000).

Table 1: *Comparison of study variables between male and female students*

	Gender	N	Mean	Std. Deviation	P-value
Height (cm)	Male	97	173.747	5.7803	.357
	Female	116	158.720	5.4591	
Weight (Kg)	Male	97	69.412	12.5098	.470
	Female	116	59.603	11.6722	
Waist circumference (cm)	Male	97	86.24	7.062	.057
	Female	116	83.62	9.186	
Hip circumference (cm)	Male	97	96.43	7.241	.152
	Female	116	98.45	8.963	
Body Mass Index (Kg/m2)	Male	97	22.9199	3.39985	.043*
	Female	116	23.6431	4.37380	
Waist to Hip Ratio	Male	97	.8942	.02664	.000*
	Female	116	.8489	.04277	
Systolic Blood Pressure (mmHg)	Male	97	125.90	13.540	.648
	Female	116	113.88	12.906	
Diastolic Blood Pressure (mmHg)	Male	97	83.45	10.467	.000*
	Female	116	74.96	8.431	

Table 2: *Prevalence of general and central obesity in male and female students*

		Male	Female	Total	
BMI group	Underweight	2	8	10	.113
		2.1%	6.9%	4.7%	
	Normal weight	55	52	107	
		56.7%	44.8%	50.2%	
	Overweight	17	22	39	
		17.5%	19.0%	18.3%	
	Obese I	20	23	43	
		20.6%	19.8%	20.2%	
	Obese II	3	11	14	
		3.1%	9.5%	6.6%	
Grouping on the basis of WHR	Non Obese	66	64	130	.05
		68.0%	55.2%	61.0%	
	Obese	31(32%)	52(44.8%)	83(39%)	

There were 15.4% overweight students who were hypertensive, in obese I 35.9% and obese II 17.9% were hypertensive. Association of obesity on the basis of BMI groups with blood pressure was determined by chi-square test (p value = 0.000)

Table 3: *Prevalence of hypertension on the basis of obesity by BMI*

		Hypertensive/ non hypertensive		Total	P- value
		Present	Absent		
BMI group	Underweight	0	10	10	.000
		.0%	5.7%	4.7%	
	Normal weight	12	95	107	
		30.8%	54.6%	50.2%	
	Overweight	6	33	39	
		15.4%	19.0%	18.3%	
	Obese I	14	29	43	
		35.9%	16.7%	20.2%	
	Obese II	7	7	14	
		17.9%	4.0%	6.6%	
Total		39	174	213	
		100.0%	100.0%	100.0%	

BMI, WHR and WC all were positively correlated with blood pressure (P value= .000). (Table 4)

Discussion

Since last two decades, studies conducted in Pakistan indicate that under and over nutrition both exist in our population. Transition period of childhood to adulthood has an important position in human's life because it is the phase of rapid growth rate. Due to less physical activity and sedentary life stylesprevalence of overweight and obesity is rapidly increasing in young medical students. Thus assessing frequency of underweight,overweight and obesity among adolescents is very important to prevent morbidity and mortality related to them.

Prevalence of obesity and hypertension were determined in medical students of 1st year MBBS and 1st year BDS. BMI, WC and WHR was used for grouping students into obese and non obese on the basis of South-Asians obesity guidelines [17]. BMI, WC and WHR are important indicators for assessing CVD risk factors particularly hypertension.

Table 4: *Correlation of BMI, WC and WHR with systolic diastolic blood pressure*

		Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
BMIgroup	Pearson Correlation	.375**	.351**
	Sig. (2-tailed)	.000	.000
	N	213	213
Waist to Hip Ratio	Pearson Correlation	.250**	.265**
	Sig. (2-tailed)	.000	.000
	N	213	213
Waist circumference (cm)	Pearson Correlation	.372**	.374**
	Sig. (2-tailed)	.000	.000
	N	213	213

In National Health Survey of Pakistan (NHSP), over-

weight prevalence was 13.5% for males and 19.6% for females that is comparable with our study, while underweight population was 25% in NHSP that is higher than our study in which prevalence of under weight was 4.7%. Mean BMI was 20.9kg/m² for males and 21.7kg/m² for females according to NHSP while in our study mean BMI in males was 22.9kg/m² and in females was 23.6kg/m² that is slightly higher than NHSP [18]. In another comprehensive study conducted on Pakistani population, the prevalence of obesity, overweight and underweight was 2.2%, 14% and 11%, respectively. Another study conducted by Shams N et al on female medical students [19], there were 47(15%) underweight, 62(20%) overweight and 78(25.4%) obese female students. Change in lifestyle and eating behavior in youngsters in the past decades are the key factors for difference of obesity values in studies. Study on large sample size at national level is needed.

Our study noted another important finding that a very high prevalence 39% of central obesity in medical students existed. Specifically, there were 31(32%) obese males and 52(44.8%) obese females on the basis of WHR. Study by Bertsias G, showed prevalence of central obesity as 13% [20]. Another study conducted by Afzal M indicated a prevalence of 12.3% that are lower than our study. Strong positive correlation of BMI, WC and WHR with systolic and diastolic blood pressures was shown in our study. It indicates that increase in BMI leads to increase in hypertension in male and female students. The link between these two CVD risk factors has well shown in various studies [21-22]. Importance of prevention as well as control of weight and obesity is constant with our study results. These findings also emphasize that measurement of blood pressure and body weight and timely diagnosis and control are essential for overweight and obese people.

Conclusions

We concluded that high prevalence of overweight and obesity was seen in medical students and it was positively correlated with hypertension. HTN was significantly higher in males as compared to females while obesity was more pronounced in females. It is concluded that medical students should be screened for obesity and hypertension along with dietary advice, implementation of life style modification, and pharmacological intervention if needed. Our study also

suggests that not only being overweight and obesity is a problem of importance among medical students but being under-weight is also a significant problem among students of medical college. Overweight and obese students were advised to do regular exercise, modify their life style and dietary habits to prevent obesity related complications. Underweight students were advised to improve BMI by taking balanced diet.

Author's Contribution

Rana Khurram Aftab: Designed the study, analysed the results and provided references for writing the article.
Farhat Ijaz: Approved the study and helped in writing the article.
and Samia Jawed: Helped in article-writing and proof reading.

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