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ROLE OF BODY MASS INDEX (BMI) IN THE DEVELOPMENT OF HYPERTENSION IN ADULT POPULATION OF DISTRICT SWAT

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Obesity (body mass index, height and weight) can contribute to the development of hypertension in the adult population. This study compares the body mass index, weight, height, systolic and diastolic blood pressure in normotensive persons with obese normotensive and obese hypertensive indivisuals. The hypertensive and obese normotensive subjects were taken from medical Out Patient Department (OPD) of Saidu Group of Teaching Hospitals, whereas the normotensive subjects were selected from the friends and staff members of Saidu Medical College (SMC), Swat. The study comprised of 100 subjects, 34 normotensive (controls), 33 obese normotensive and 33 obese hypertensive between 40-70 years of age. Body mass index, weight, height, systolic and diastolic blood pressure were compared amongst the three groups. Body mass index, weight, systolic and diastolic blood pressure were significantly elevated in hypertensive than normotensive subjects whereas the body mass index and weight were significantly elevated in obese normotensives than normotensive subjects (control). The onset of cardiovascular complication like hypertension was seen earlier in obese subjects.

Health professionals define "overweight" as an excess of body weight that includes muscles, bones, fats, and water. "Obesity" specifically refers to an excess amount of body fats. Most health care providers agree that men with more than 25 percent body fats and women with more than 30 percent body fats are obese,[1]. A recent review of studies that examined the associations of obesity to blood pressure found in the vast majority a significant relationships among them[2].

The association between overweight and hypertension has been known for several years. However, this association depends on the variability of the prevalence of overweight in a given population[3], and age, sex, and ethnicity are potential cofounders[4]. Body Mass Index (BMI) is recognized as one of the most useful indices for obesity in adults. BMI is determined by dividing weight (wt) in kilograms by height (ht) in meters square. It is highly correlated with weight (0.8-0.9)[5]. Adult obesity is defined as an average body mass index >27.8 in men and >27.3 in women[6].

Obesity is also defined as a BMI greater than or equals to the 95th percentile for age and gender, overweight as a BMI greater than or equal to the 85th percentile but less than the 95th percentile, and normal weight as BMI less than the 85th percentile[7]. Obesity is a significant health problem with medical and psychological consequences[8]. Obesity is associated with increased incidence of cardiovascular disease, diabetes mellitus, certain types of cancer and hypertension[9]. The prevalence of hypertension and diabetes mellitus is more than twice common in obese than it is in normaly built indivisuals. Cardiovascular complications like hypertension and cardiovascular disease mortality rate is more than between two and four time higher in obese than normal built indivisuals[10].

Blood pressure is a product of peripheral vascular resistance and cardiac output. When hypertension is the result of another disease process, it is referred to as secondary hypertension. When no identifiable cause can be found, it is referred to as primary or essential hypertension. Many factors, including heredity, diet, stress, and obesity, may play a role in the development of essential hypertension[11].

MATERIALS AND METHODS

The proposed study was conducted in Physiology Department of SMC, Swat and Department of Medicine, Saidu Group of Teaching Hospitals. A total of 100 subjects were selected. Out of these 34 were normotensive, 33 were obese normotensive and 33 were obese hypertensive. The normotensive subjects were selected from friends and college staff members whereas the obese normotensive subjects and obese hypertensive subjects

were collected from the Medical Out Patients Department of Saidu Group of Teaching Hospitals, Swat.

Both males and females between 40-70 years of age were included in this study. The subjects excluded from the study participation had a medical history of disease other than overweight /ypertension or were taking any medication known to affect metabolism.

Health Scale (model ZT-120) was used to measure weight and height. Weight was assessed at 2 different points during interview, and the 2 were averaged for these analyses. It was measured to the nearest 0.5 kg. Height was also assessed at 2 different points during interview, and the two readings were averaged for these analyses. It was measured to the nearest 0.1 cm[12]. Body mass index (BMI) was determined by dividing weight (wt) in kilograms by height (ht) in meters square (BMI = kg/m^2)[5].

Blood pressure data was obtained, after at least 5 minutes of rest, with subjects in seated position. A mercury sphygmomanometer (model SM-300), with an appropriate sized cuff covering two third of the upper arm, was used. The onset of the first tapping sound was taken to indicate the systolic blood pressure, whereas the point of complete disappearance of the sound (Korotkoff V) was taken to indicate diastolic blood pressure. The mean of three readings was recorded[13]. Blood pressure level that exceeds 145-150 / 90-95 mmHg at two occasions was taken as hypertension in adults[14].

RESULTS

The results in table 1 show comparison of weight, height, body mass index, systolic and diastolic blood pressure of normotensive subjects with obese normotensive subjects. No statistically significant differences were found in the parameters like height, systolic and diastolic blood pressure amongst the two groups while parameters like weight and body mass index were significantly higher in obese normo-tensive subjects than normotensive subjects.

Table 1: *Comparison of various parameters in two groups.*

S. No.	Parameters	Normotensive subjects	Obese Normotensive subjects
1.	Body weight (Kgs)	65	82**
2.	Height (M)	1.75	1.72
3.	Body mass index (BMI=kg/m^2).	21	28**
4.	Systolic B.P (mmHg) (mmHg)	120	125
5.	Diastolic B.P (mmHg)	80	82

Values are given as mean ± SEM *$p \leq 0.05$ (significant) **$p \leq 0.001$ (highly significant) when normotensive were compared with obese normotensive subjects.

Table 2: *Comparison of para-meters in two groups.*

S. No.	Parameters	Normotensive subjects	Obese hypertensive subjects
1.	Body weight (Kgs)	65	85**
2.	Height (M)	1.75	1.70
3.	Body mass index (BMI=kg/m^2).	21	31**
4.	Systolic BP(mmHg)	120	180**
5.	Diastolic B.P (mmHg)	80	100**

Values are given as mean ± SEM * $p \leq 0.05$ (significant), ** $p \leq 0.001$(highly significant) when normotensive were compared with obese obese hypertensive subjects.

Table 3: *Comparison of parameters in the two groups.*

S. No.	Parameters	Obese Normotensive subjects	Obese Hypertensive subjects
1.	Body weight (Kgs)	82	85*
2.	Height (M)	1.72	1.70
3.	Body mass index (BMI=kg/m^2).	28	31*
4.	Systolic B.P (mmHg)	125	180**
5.	Diastolic B.P (mmHg)	82	100**

Values are given as mean ± SEM * $p \leq 0.05$ (significant), ** $p \leq 0.001$ (highly significant), when obese normotensive were compared with obese hypertensive subjects.

The results in table 2 show comparison of weight, height, body mass index, systolic and diastolic blood pressure of normotensive subjects with obese hypertensive subjects. No significant difference was found in parameter like height between the two groups. The parameters like weight, body mass index, systolic and diastolic blood pressure were significantly higher in obese hypertensive subjects than normotensive subjects.

The table 3 shows the comparison of weight, height, body mass index, systolic and diastolic blood pressure of obese normotensive subjects with obese hypertensive subjects. No significant differences were found in parameters like height, body mass index between the two groups. The parameters like systolic and diastolic blood pressures were highly significantly greater in obese hypertensive than obese normotensive subjects while parameter like weight was significantly greater in obese hypertensive subjects than obese normotensive subjects.

DISCUSSION

The present study recorded the association of body weight, body mass index with systolic and diastolic blood pressures. The main findings of this study were that the systolic and diastolic blood pressures were significantly higher in obese subjects than normally built individuals. These observations are consistent with the similar reports in a research on prevalence of obesity with increased blood pressure[15]. This means that hypertensive individuals develop characteristic increase in weight and body mass index. This early increase in weight and body mass index in hypertensive individuals has been reported by multiple researchers.[16,17] A recent study in a white Canadian population presented data on the effect of overweight and age on systolic and diastolic blood pressure, a strong association of body mass index and age with hypertension was found.[18] As an additional comment, the prevalence of increased weight and body mass index may be related to the increased blood pressure in Mexico in the last generation[19], and it is within this context that the results of the present study have to be evaluated.

In **conclusion**, systolic and diastolic blood pressures are elevated in obese indivisuals than normal built indivisuals, suggesting that the onset of cardiovascular complication like hypertension is different in the two groups, earlier in the obese indivisuals than normal built indivisuals.

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