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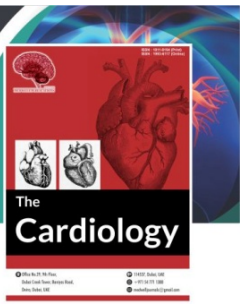

Evaluation of Body Mass Index and Blood Pressure Levels Among Healthy Sudanese Adults in Khartoum State

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Abstract: Many previous studies have shown that the blood pressure increased with the increase in body mass index if the normal blood pressure is dependent on body mass index then normal values of blood pressure should be related to BMI and consequently, hypertension classification be revised. In Sudan the reference values of blood pressure is ill defined, so, still international reference values are used despite the differences in ethnicity, life style and nutritional status. This study was designed to establish the relation of normal blood pressure and body mass index among healthy Sudanese adult's females and males in Khartoum state. A cross sectional study was conducted 2016 in AL Khartoum state on healthy Sudanese adult's males and females. About 200 participants aged between 20-60 years were assessed by a questionnaires covering their age, gender, smoking history, food habit and amount of salt and physical activity, then the blood pressure was measured by manual sphygmomanometer in a sitting position, height was measured by tape and weight by weight scale, body mass index then calculated by the formula BMI = wt/ht^2. Correlation between blood pressure and body mass index was assessed and was taken positive if p value was ≤ 0.05(was consider to be significant). There is significant correlation between body mass index a nd systolic blood pressure $p = 0.01$ while for diastolic blood pressure $p = 0.05$. Females have higher BMI than males, 40% of the females were obese while only 19.4% of male were. Males have higher systolic and diastolic blood pressure than females. The study showed positive correlation between blood pressure and body mass index where there is increased in blood pressure with increased body mass index. Further, studies are recommended to identify the normal blood pressure for every body mass index.

INTRODUCTION

Blood pressure is the force of blood against the arterial walls as the blood circulating throughout the body. The normal blood pressure in adults is taken as 120/80 mm Hg or less, many factors are involved in affecting this level, biological factors, behavioral, family history and socio-economic status[1] but the regulatory mechanisms bring it back to the normal level. If the high level of the BP is sustained then it is classified as prehypertension 120-140/80-89 mm Hg, hypertension> 140/90 which can be either systolic or diastolic. Of these factors is obesity with increased Body Mass Index (BMI), according to the BMI adults are classified as underweight (<18.5), normal (18.5-24.9), overweight (25-29.9), obesity (30-40), morbid obesity (>40)[2].

Different studies have found positive correlation of BMI and blood pressure[1, 3-6], Jones in Korea found that the blood pressure increased by 0.89 mm Hg with increased BMI by 1unit. This raised the question whether the normal blood pressure of obese persons can be higher than the acceptable normal due to their high weight and BMI and make the definition of hypertension dependent on body mass index.

This study has been designed to investigate the effect BMI on blood pressure with the objective to derive an equation for normal blood pressure depending on body mass index.

Elevation in blood pressure increase the risk of cardiovascular disease and stroke, these are the leading causes of death in developed countries, it causes 7.1 million deaths across the world, 13% of all deaths[1, 3] body fat is difficult to assess accurately but can be assessed by skin fold, waist to hip ratio, weight to height ratio and Body Mass Index (BMI). Generally, women have higher body mass index than men[1, 3-6] and in Iranian study women's obesity was twice to men due to physical activity, physiological differences and adipose tissue distribution[5].

MATERIALS AND METHODS

A cross sectional community based study was conducted in Khartoum state on 200 healthy adults (females and males) their age between 20 and 60 years. A consent was taken from the institutes and candidates before filling the questionnaire, blood pressure was measured in the standard method by the manual sphygmomanometer, height was measured using a tape, weight of the candidate was measured by sensitive scale and then body mass index was calculated (kg/m^2), any subject with acute or chronic illness or hypertension was excluded.

RESULTS

About 200 adults were included, 113 males and 87 females, 78 there age between 20-49 years. Obesity is higher among females, 40% of them were obese (17.5% of total) while males tend to have normal weight and only 19.4% of them were obese (11% of total) according to the body mass index (Table 1)

Table 1: Classification of study population according to BMI

	BMI				
Variables	Underweight (n)	Normal	Overweight	Obesity	Total
Males	4 (3.5%)	44 (38.9%)	43 (38%)	22 (19.4%)	113 (56.5%)
Females	4 (4.5%)	25 (28.7%)	23 (26.4%)	35 (40.2%)	87 (43.5%)

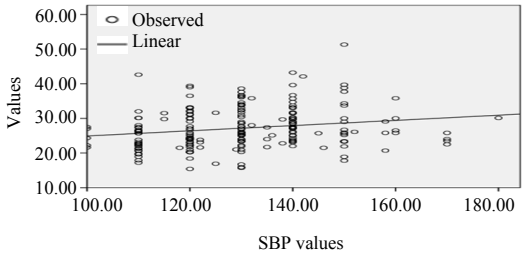

Fig. 1: The relation between body mass index and systolic blood pressure

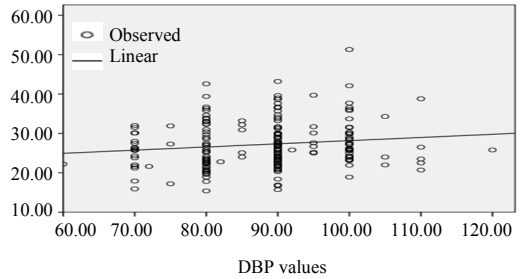

Fig. 2: The relation between body mass index and diastolic blood

Blood pressure was higher in males than females, 47.8% of males were found to be systolic pre hypertensive (27% of total) and 66% have diastolic hypertension according to gender, the increase in blood pressure according to BMI systolic blood pressure was higher in normal weight while diastolic was that higher among over weight. Figure1 and 2 correlation between body mass index and systolic blood pressure was significant ($p = 0.01$) and between body mass index and diastolic blood pressure was also significant ($p<0.05$). R value was significant for systolic blood pressure = 0.001, while r value not significant for diastolic blood pressure = 0.342

DISCUSSION

The correlation of the blood pressure with BMI has previously been documented[1, 3-8]. In this study the blood

pressure increased significantly with the increased BMI for systolic BP ($p = 0.01$) and the diastolic blood pressure increase with increase in BMI but has not reached statistically significant ($p = 0.05$). The systolic blood pressure is dependent mainly on cardiac output, depending the contractility of the heart. This usually increase if there is more need for blood to be pumped to the tissue like in exercise. The increase in body mass index indicate a larger weight and mass which logically needs a higher circulation which is provided by the cardiac output and consequently higher SBP on the other hand this blood need to return back and this also need a higher blood pressure, this leads to an increase in peripheral resistant and consequently increases the diastolic blood pressure.

If the normal blood pressure for BMI 30 is 145/95 mm Hg then the definition is prehypertension and hypertension should be changed accordingly, this needs to be investigated.

CONCLUSION

High blood pressure is seen in individuals with higher body mass index and a large scale study is needed to work out an equation for the formula of normal blood pressure depending on BMI.

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