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Body mass index and normal blood pressure among Sudanese adults in Khartoum state

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Body Mass Index and normal Blood Pressure among Sudanese adults in Khartoum state

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Abstract:

Background

Life style changes & industrilization lead to increase in obesity and obesity related diseases as diabetes, hypertension and ischemic heart disease.

Hypertension is a major determinant risk factor of ischemic heart disease and stroke, the leading cause of death in developed countries.

Since then many studies had been done to understand the relation between the increase in body mass index (BMI) and increase in blood pressure (hypertension).

Methods:

An extensive internet search has been done concerning relation between body mass index & blood pressure in non-hypertensive persons covering the period from 1994 to 2014.

Key words for searching were blood pressure & body mass index.

Results

Seven papers were reviewed showed liner relation between elevation in blood pressure and increase in body mass index. Women have higher body mass index while men have higher blood pressure.

Conclusion:

Elevation in body mass index correlated with increase in blood pressure

Background:

Currently Sudanese physicians use international guidelines to treat hypertension in Sudanese population despite differences in ethnicity, life style and nutritional status due to lack of national reference values.

Objectives;

The objective of this study to study the relation of the normal value of blood pressure to body mass index among healthy Sudanese adult's females & males and to establish the normal value of blood pressure in Sudanese's.

Methods:

An intensive internet searching was conducted concerning the researches about the relation of body mass index to the blood pressure.

Key words used for researching were blood pressure, body mass index

The web site used was the National Center of Biotechnology Information using Google Scholar.

The search covered the period from 1994 to 2014.

Results:

Author	Type of study/country	year	Sample size	Results & conclusion
Suman Dua ⁽¹⁾	Cross sectional study /India	2014	240 117 males 123 females	Weight, Height, upper arm circumference, pulse rate, Bp (SBP, DBP) were found to be ↑ in males than females except the skin fold thickness. BMI & fat percentage found to be higher in females than males. +ve correlation between age and BP & between BP & BMI.
F tesfaye ⁽²⁾	Ethiopia , Indonesia, Vietnam	2006	8014 4050 Ethiopia 1944Indonesia 2020 Vietnam	BMI of was higher in Ethiopian men and Indonesian women by 10% and 25% respectively. Blood pressure of Indonesian women 124.13 for systole & diastole higher in Indonesian women & men
Jones ⁽³⁾	Korea	1994	22354	Females have higher BMI of $23.4 \pm 3.2 \text{ kg/m}^2$ Relation between BMI & blood pressure (SBP, DBP) was almost linear, in BMI between $16\text{-}25 \text{ kg/m}^2$ every unit associated with differences of 0.89mmHg in diastolic.

				Over range of BMI unit associated with difference of 1.0mmHg in diastolic blood pressure.
Payam Peymani ⁽⁴⁾	Iran/ cross sectional study	2012	3916 1976 males 1940 females	Positive correlation between increase in BMI & increase in blood pressure in both gender with mean systolic 123.9 ±20.0 in men &121.2±17.7 in women. Obesity in women was significantly higher than men (P<0.001)
Igbos ⁽⁵⁾	Nigeria	2011	579 325 male 245 female	Women showed higher predisposition to both general and central obesity in urban and rural sample. Urban men have higher mean blood pressure (p<0.05). The study showed that education have significant impact on obesity & blood pressure.
J Mufunda ⁽⁶⁾	Eretria	2004	2352	15.9% of general population are found to be hypertensive >140/90 17%of them are males &15% females. +ve correlation between BMI & SBP,DBP&

				<p>MAP effect of BMI is higher in males than females progression coefficient 0.64 & 0.38 respectively, ≤ 0.05</p> <p>BMI did not have significant effect in blood pressure in lean people (BMI < 19) & with high BMI.</p>
W B Droyvold (7)	Norway	1984–86 1995-97	15.971 women 13.846 men	<p>Increase & decrease in BMI were significantly associated with increase and decrease in SBP & DBP in both gender in all age group although the strongest effect was found in among who were 50 years and older.</p> <p>Odds ratio for having hypertension was 1.8 among women and 1.6 for men.</p> <p>An independent effect of change in BMI on change in SBP & DBP in both women and men, and that people who increase in their BMI are at increased risk for hypertension.</p>

Discussion:

All previous studies showed positive correlation between increase in BMI & increase in blood pressure (SBP, DBP).

Education have significant impact on BMI & blood pressure.

Urbanization & modernization increase risk of obesity and increase in blood pressure.

Conclusion:

Increase in body mass index was accompanied by increase in blood pressure (SBP, DBP).

Women have higher body mass index while men have higher blood pressure.

References;

1. Suman Dua, Monika Bhuker, Pankhuri Sharma, Meenal Dhall and Satwanti Kapoor , Body Mass Index Related To Blood Pressure Among Adults ,journal of medical science ,2014 N; 6(2): 89–95.
2. F Tesfaye, NG Nawi, H Van Minh, P Byass, Y Berhane¹, R Bonita⁵, S Wall, Association between body mass index and blood pressure across three populations in Africa and Asia, Journal of Human Hypertension (2007) 21, 28–37.
3. Jones, Daniel W; Kim, Joung S; Andrew Michael E; Kim, sung J; Hong, Young P, Body Mass Index & Blood Pressure in Korean men and women: the Korean National Blood Pressure survey, Journal of Hypertension, 1994.
4. Payam Peymani, Seyed Taghi Heydrai, Seyed Mehdi Ahmedi, Yaser Sarikhani, Hassan Joulaei, Mohsen Moghadami , Hossein Faramazi , Kamran B.Lankarani, Prevalence of increased blood pressure and It's relation with anthropometric indicators; a population based in fars provinces, Iran, International Cardiovascular Research Journal, 2012; 6(2):40-5.
5. E Jervase, D Barnabas, A Emeka, N Osondu, Ibo Nigeria 2011, Impact of urbanization on obesity, anthropometric profile and blood pressure in the Igbos of Nigeria. Journal of medical science 2011,;3(5):242-6
6. J Mufunda, G Merbrahtu, A Usman, P Nyarango, A Kosia, Y Gehebrat, A Ogbamariam, The prevalence of hypertension and its relation with obesity : results from a national blood pressure survey in Eritrea, Journal of human hypertension (2006)20,59- 65
7. W B Droyvold, K Mdthjell, T I L Nilsen and J Holmen, change in body mass index and its impact on blood pressure: a prospective population study, International Journal of Obesity(2005)29,655- 655.

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Abstract:

Introduction: 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.

Objectives: This study was designed to establish the relation of normal blood pressure & body mass index among healthy Sudanese adults females and males in Khartoum state.

Methods: A cross sectional study was conducted 2016 in AL Khartoum state on healthy Sudanese adults males and females.

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/ht² (weigh / height)**.

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).

Results: There is significant correlation between body mass index and 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 1

9.4% of male were.

Males have higher systolic and diastolic blood pressure than females.

Conclusions: 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 120/80mmHg 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 -89mmHg, 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)⁽⁸⁾.

Different studies have found positive correlation of BMI and blood pressure⁽¹⁻⁵⁾, Jones in Korea found that the blood pressure increased by 0.89mmHg 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⁾⁽²⁾

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⁽¹⁻⁵⁾ and in Iranian study women's obesity was twice to men due to physical activity, physiological differences and adipose tissue distribution⁽⁴⁾.

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:

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 1.1 classification of study population according to BMI

	BMI				Total
	Under weight (n)	Normal	Over weight	Obesity	
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%)

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 & 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

Figure1: The relation between body mass index and systolic blood pressure.

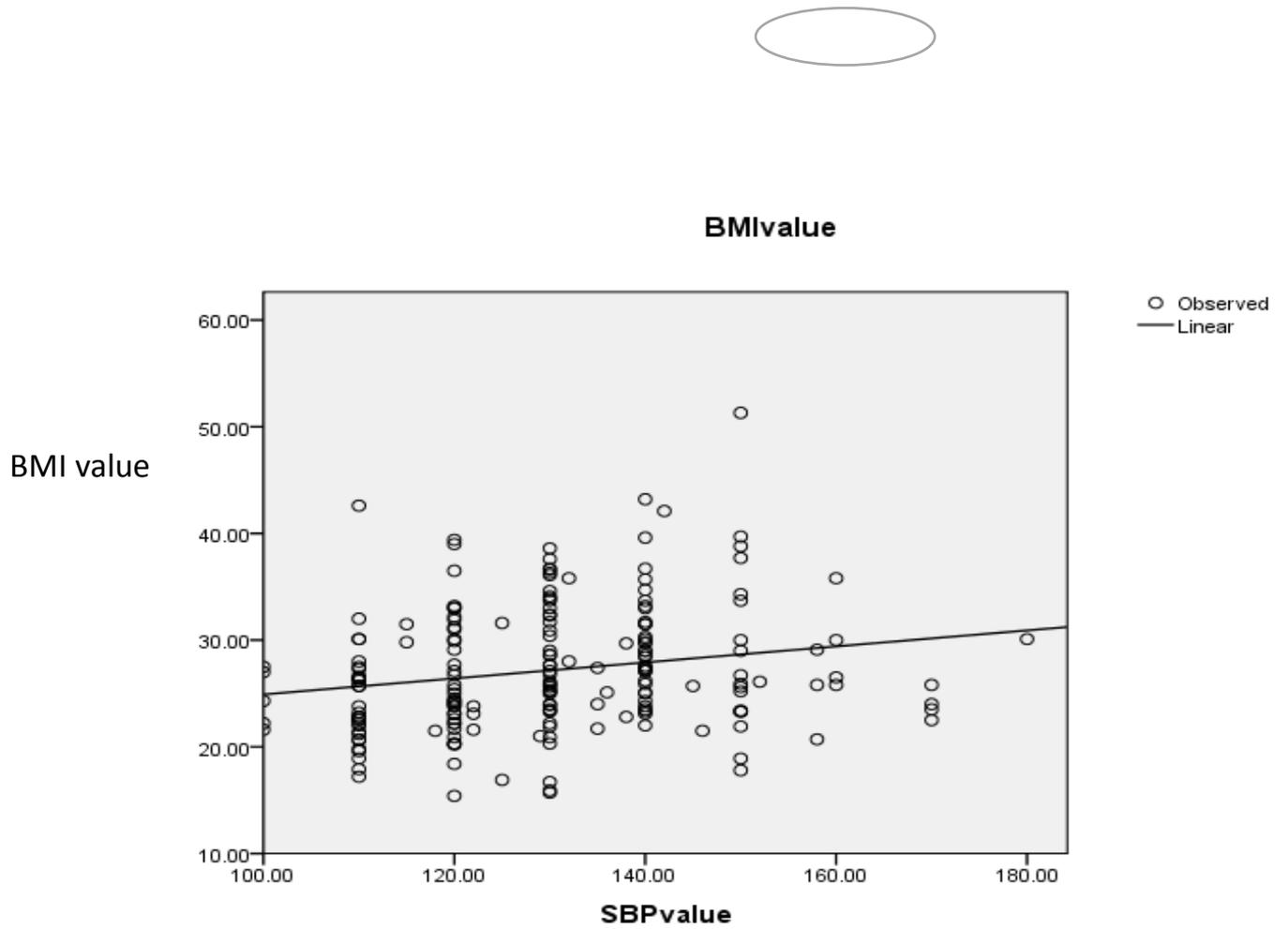
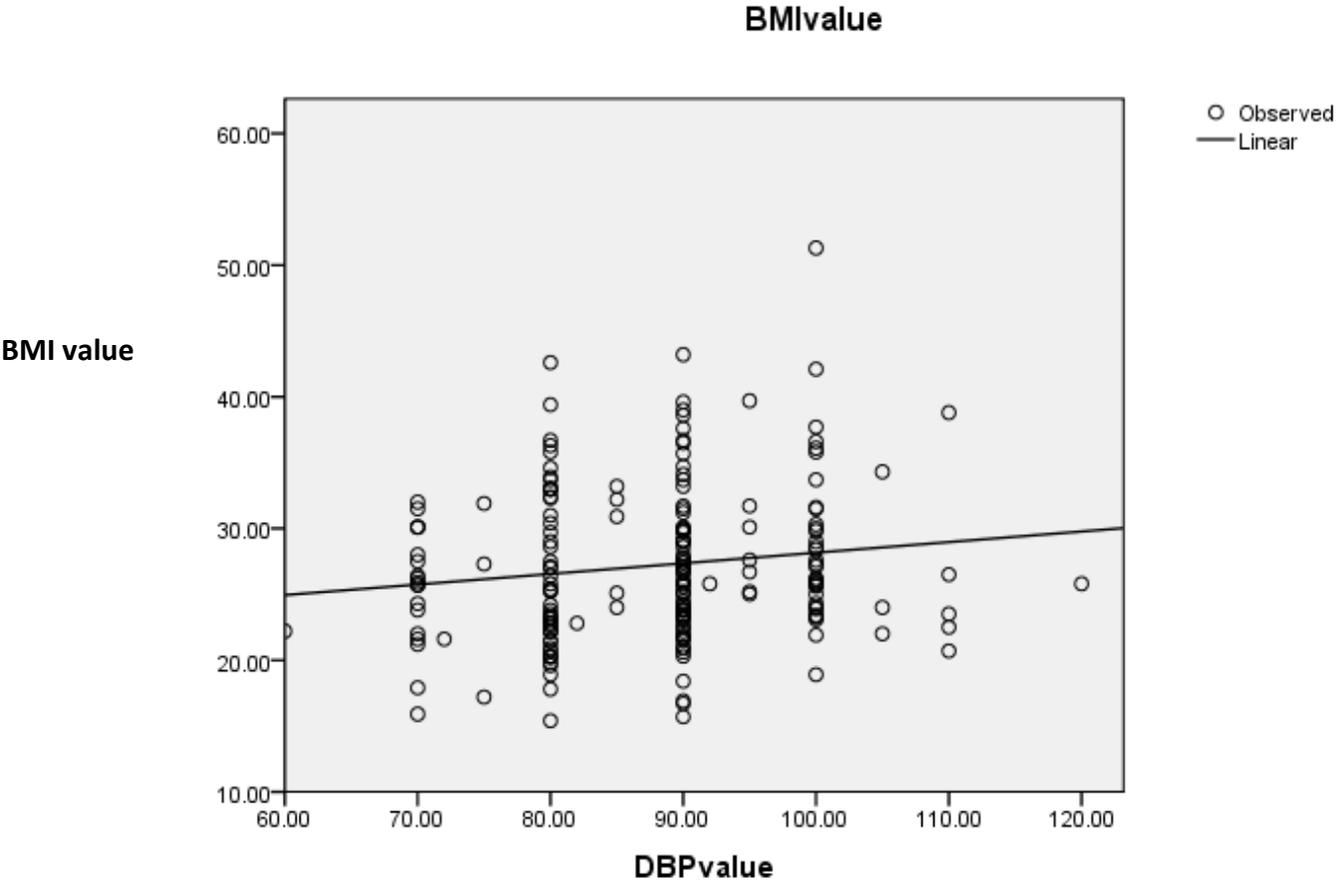


Figure 2: The relation between body mass index and diastolic blood



Discussion:

The correlation of the blood pressure with BMI has previously been documented (1-7).

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 is 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 is also need a higher blood pressure, this leads to an increase in peripheral resistance and consequently increases the diastolic blood pressure.

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

In 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.

References:

- 1) Suman Dua, Monika Bhuker, Pankhuri Sharma, Meenal Dhall and Satwanti Kapoor , Body Mass Index Related To Blood Pressure Among Adults ,journal of medical science ,2014 ; 6(2): 89–95.
- 2) F Tesfaye, NG Nawi, H Van Minh, P Byass, Y Berhane¹, R Bonita⁵, S Wall, Association between body mass index and blood pressure across three populations in Africa and Asia, Journal of Human Hypertension (2007) 21, 28–37.
- 3) Jones, Daniel W; Kim, Joung S; Andrew Michael E; Kim, sung J; Hong, Young P, Body Mass Index & Blood Pressure in Korean men and women: the Korean National Blood Pressure survey, Journal of Hypertension, 1994.
- 4) Payam Peymani, Seyed Taghi Heydrai, Seyed Mehdi Ahmedi, Yaser Sarikhani, Hassan Joulaei, Mohsen Moghadami , Hossein Faramazi , Kamran B. Lankarani, Prevalence of increased blood pressure and It's relation with anthropometric indicators; a population based in fars province ,Iran, International Cardiovascular Research Journal, 2012; 6(2):40-5.
- 5) E Jervase, D Barnabas, A Emeka, N Osondu, Ibo Nigeria 2011, Impact of urbanization on obesity, anthropometric profile and blood pressure in the Igbos of Nigeria. Journal of medical science 2011, May; 3(5):242-6
- 6) J Mufunda, G Merbrahtu, A Usman, P Nyarango, A Kosia, Y Gehebrat, A Ogbamariam, The prevalence of hypertension and its relation with obesity : results from a national blood pressure survey in Eritrea, Journal of human hypertension (2006) 20, 59- 65
- 7) W B Droyvold, K Mdthjell, T I L Nilsen and J Holmen, change in body mass index and its impact on blood pressure: a prospective population study, International Journal of Obesity (2005) 29, 655- 655.
- 8) WHO.