The National Ribat University

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Body mass index and blood pressure levels among adult Sudanese population in Khartoum state in 2016

A Thesis Submitted in the partial Fulfilment

Required for the M.Sc in Physiology

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Dedication:

I dedicate my work to my loving parents ,whose words of encouragement and push for tenacity ring in my ears.

Acknowledgements:

I cannot express enough thanks to my mentor prof.omer .
I offer my sincere appreciation for the learning opportunities provided by him.
My completion of this research could not have been accomplished without the support of my friends, ola ,najat and anfal.
they provided me with the support that I was desperately needed .
Finally , to my loving parents , my deepest gratitude ,your encouragement when times get rough are much appreciated.

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Body mass index and blood pressure levels among adult Sudanese population in Khartoum state in 2016

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Abstract:

Background:

prevalence of obesity and its comorbid hypertension become the intention of researchers in the previous years. Several studies were made to define the relation between body mass index and the blood pressure , and base on the result a prevention methods can be made.

Methods:

An extensive internet search has been made concerning the relation between the body mass index and the blood pressure, using key words (blood pressure, body mass index).

Results.

Most of the studies have shown that the prevalence of high blood pressure (BP) has increased in relation to increased body weight.

Conclusions:

BMI had a great impact on blood pressure, but there is no consideration of BMI in defining the normal blood pressure.

Body mass index and blood pressure levels among adult Sudanese population in Khartoum state in 2016

Introduction:

relationship between blood pressure and body mass index among Sudanese people is ill define ,until now there is no study has been made concerning this topic.add to that the only reference they use for diagnosis of hypertension is that relates to the western world which they have different climate, life style, ethnic groups, nutritional habits and body mass indices, compared to us. The aim of this study is to set a new values for blood pressure and to investigate the relationship between blood pressure and body mass index.

Methods :

An extensive internet search was conducted concerning the researches related to body mass index in relation to blood pressure.

Web site used: National Center for Biotechnology Information using the Google Scholar

Key words used for the research: Body mass index, blood pressure levels.

Results:

most of the reviewed papers showed a clear correlation between blood pressure and body mass index.

Author	Type of the study/country	year	Sample size	Result and conclusion
Leah E. (Robinson[1]	cross-sectional study/Albama	2013	134 child boys and girls, age between(5-9) .years	134 participants (78% non-Hispanic Black), 10 (7.5%) were overweight and 25 (18.7%) were obese. Pre-hypertension and hypertension were detected in 9 (6.7%) and 20 (14.9%) children, respectively. Results indicate that mean systolic and diastolic blood pressure significantly increased with BMI, $P < 0.001$ and $P = 0.028$. Conclusion: Hypertension was strongly associated with an unhealthy BMI in these young children from a rural and low-socio-.economic community
f. tesfaye[2]	Cross sectional/ Ethiopia, Vietnam and Indonesia	2007	8014adults males and females, age (25-64)	BMI was significantly and positively correlated with both SBP and DBP in all the three populations, BMI in men varied between 19.41 (2.28) in Ethiopia to 21.17 (2.86) in Indonesia in(mean(st.d). Ahigh prevalence of overweight/obesity was noted among Indonesian Women (25%) and men (10%), whereas low BMI was widely prevalent in Ethiopia and Vietnam, ranging from33 to 43%. Mean systolic BP (SBP)among men varied between 117.15 (15.35) in Ethiopia to 127.33(17.80) in Indonesia. The prevalence of hypertension was highest among women (25%) and men (24%) in .Indonesia

Nadia Danon-Hersch[3]	Cross sectional/ India	2007	In 1989 (n = (1081 In 2004 (n = 1255) Males and females Age (25-64)	There is linear relationship between BMI and BP but markedly weaker in 2004 than in1989. Among untreated persons, BMI increment of 1 kg/m2 was associated with an elevation of 2.0/1.5 mm Hg of systolic/diastolic BP in 1989 but only 1.3/1.0 mm .Hg in 2004
Carolin Adler1[4]	Cross sectional study/Germany	1998 and 2008 – 2011	\1998(=6.931) 2008–2011 (n=6,861)	From 1998 to 2008–2011 mean SBP decreased from 129.0 to 124.1 mmHg in all participants and from 126.0 to 122.3 mmHg. BMI was positively associated with SBP both in 1998 and 2008–11The strength of the BMI-SBP-association decreased over time in all and untreated men. In women, the association weakened in the overall sample, but remained similarly strong in untreated womenConclusions: The cross-sectional association of BMI and SBP decreased between 1998 and 2008–11 in Germany.
Nguyen T Tuan[5]	East and Southeast Asia	2009	Chinese(7562), Indonesian(18,502), and (77,758) Vietnamese participants aged 18–65 y	Despite a low mean BMI, the prevalence of hypertension in Chinese, Indonesian, and Vietnamese men were 22.9%, 24.8%, and 14.4%, respectively, and in women were 16.6%, 26.9%, and 11.7%, respectively. prevalence of hypertension was higher in Indonesian adults than in Chinese and Vietnamese adults ($P < 0.05$ .at almost all BMI levels Conclusions: The study showed an ethnic difference in the BMI-hypertension association and in optimal BMI cutoffs between Chinese, Indonesian, and Vietnamese adults. Country-

				specific or even country-, sex-, and age-specific BMI cutoffs might be needed to identify persons at high risk of cardiovascular diseases
Isabel Cristina BrittoGuimarães[6]	Cross /sectional Bahia	2008	536 Adolescents Age (11-18) years	The percentage of high SBP and DBP followed the ,(increase in BMI (p=0.000 reaching 46.4% among boys and 39.3% among obese girls for SBP and 42.0% and 44.6% for DBP, respectively. High SBP and DBP were 3.9 and 3.4 times more frequent among boys and 2.2 to 2.0 times more frequent among girls with WC > 75th p, respectively each increment in BMI would increase SBP .by 1.198 mmHg

Discussion:

While reviewing these papers , most of their results shown a significant relationship between BMI and blood pressure [(1) (2)].

A nother study done by nadia showed that relationship between BMI and BP become weaker over time[(3)].

Conclusion:

Relationship between body mass index and blood pressure is still unknown , a further extensive study is needed to identify this relation, and a accordingly anew blood pressure values can be set based on BMI scale.

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Body mass index and normal blood pressure levels among adult Sudanese in Khartoum State

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Abstract:

Introduction:The normal blood pressure values have considered the age, sex, physical activity and emotional states as the main factors in measuring the BP. Obese subjects are usually diagnosed as hypertensive without considering the BMI which could be an important factor.

Objectives:To study the reference value for blood pressure in relation to body mass index for healthy Sudanese adults living in Khartoum.

Methods:A cross sectional study was performed during 2016 in Khartoum state ,including 200 healthy Sudanese adults aged between 20-60.These 200 participants were evaluated by a questionnaire which covered their age, physical activity , daily salt intake and smoking history. Weight and Height were measured by standard scales, while blood pressure was measured by using a manual mercury sphygmomanometer.BMI was calculated by the formula , weight(kg)/height $(m)^2$.

Results:135 males and 65 females aged between 20-60 were included, 5% of the participants were underweight, 39% were normal weight, 34.5%were overweight, and 21.5% were obese.The BP increased with increased BMI but was statistically not significant, for systolic (p =0.053) for diastolic(p=0.248)

Conclusion: There is possible positive correlation between the BMI and systolic blood pressure with no correlation with diastolic blood pressure. A large scale study is needed to establish a normal blood pressure in Sudanese people and to assess its dependence on BMI.

Introduction:

Hypertension is estimated to cause 7.1 million deaths.[1]In this world Two third of hypertension burden occurs in the developing world.[1]

Blood pressure is generated when the heart contracts against the resistance of blood vessels.[2] Overweight and obesity increase the risk of elevated blood pressure . This is explained by the increased fatty tissues which tend to increase the vascular resistance and subsequently increase the work load on the heart to pump blood.The blood pressure is also affected by other factors including, age, exercise and emotions. [3]The relation between body mass index and blood pressure has long been the subject of the epidemiological research . [2]This relationship has been established more than 70 years ago,[4] but despite the extensive researches which has been made the relationship remains poorly understood.[5]

Many studies have documented the positive correlation of BMI and BP,[6] but others didn't.[7]In a study by Nadia etal the blood pressure was found to increase by 2/1.5 mmHg(systolic/diastolic) for each increase of BMI by 1 kg/m^{2}[1].

As the increase in BMI indicates an increased amount of tissue ,which needs to be perfused, then it islogical to have this increase. This raised a question about the normal blood pressure in relation to BMI. The question for high blood pressure classification indicates that normal BP(90-119/60-79) ,prehypertension (120-139/80-89)and hypertension>140/90 ,and this recently been reviewed . If the normal BP is dependent on BMI then this should be changed and this is the objective of this study.

Methods:

This is a cross sectional study conducted among adult Sudanese at Khartoum state capital of Sudan during 2016.

Sample size was 200 participants, aged between 20-60 years old who were not knownto be hypertensive , not suffering from endocrine or renal illness or other chronic diseases.

The aim of the study was explained to the all participants, and before thata consent was taken.

Data was obtained by using a questionnaire which was designed to collect information on age, gender, living area, dietary salt intake, smoking history and chronic diseases.

Blood pressure was measured using a manual mercury sphygmomanometer, and BMI was calculated using the formula weight (kg)/height(m)^2.

BMI of each Subject was categorized using World Health Organization's categorization (Underweight BMI: <18.5 kg/m^2; Normal weight BMI: 18.5-24.9 kg/m^2; Overweight BMI: 25.0-29.9 kg/m^2; and Obese BMI=30.0 kg/m^2).

Data collected was analyzed using software package(SPSS version 20), Pearson correlation was applied and P value less than 0.05 was considered statistically significant.

Ethical clearance for the study was obtained from the National Ribat University, Khartoum, Sudan.

Results:

A total of 200 participants were included, 135 (67..5%)males and 65(32.5%) females. Mean systolic blood pressure was 133.2± 19.9 mmHg. Mean diastolic blood pressure was 86.3±9.8 mmHg. Mean BMI was 26% ±5.26 Kg/m2.

Of the participants, 5% were underweight39% were normalweight,34.5% were overweight and 21.5% were obese.

Regarding the systolic blood pressure 54.5% were prehypertensive and most of them were normal weight (53.8%) , while 52.2% have diastolic blood hypertension , most of them were also normal in weight 53.8%.

Hypertension was higher among males group: 35.5% systolic and 55.3% diastolic compared to females group: 24.6% systolic , 41.5% diastolic.(tables1&2)

There is a positive correlation between BMI and SBP (P value= 0.053) , with no correlation with DBP (P value=0.248) (Fig 1&2)

Table(1):

BMI in relation to diastolic blood pressure and gender differences.

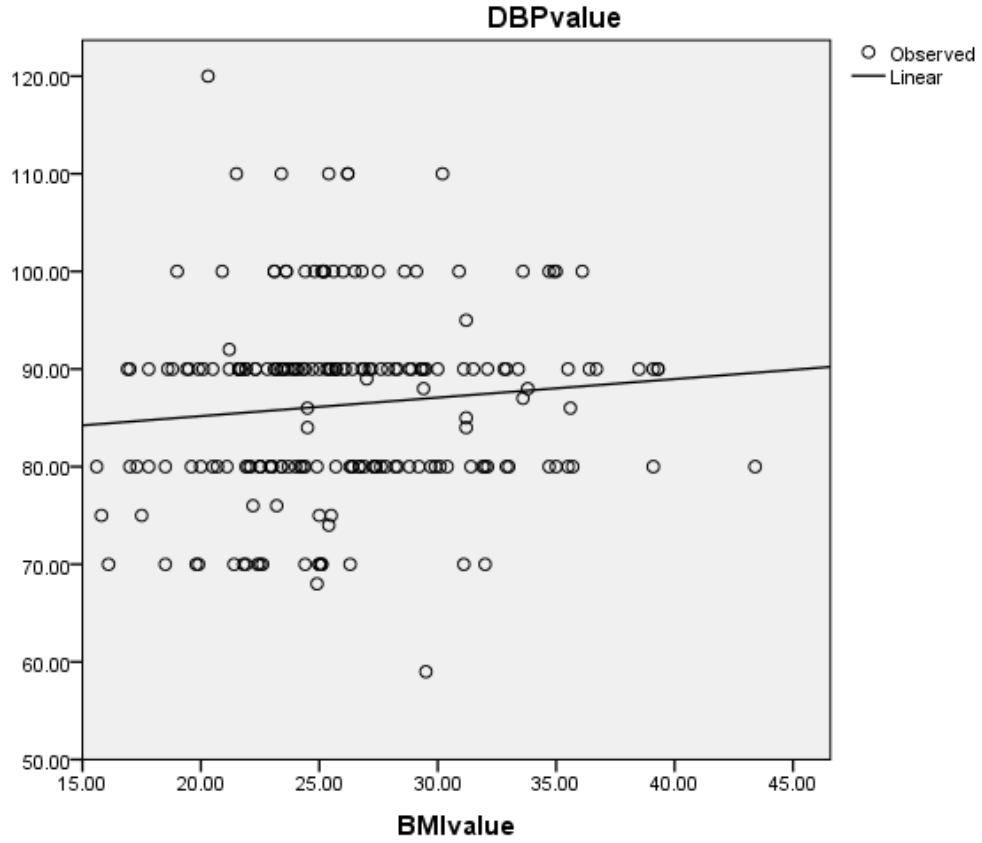
	Hypotension		**Normal**	**Prehypertension**		**Hypertension**		**Total**	
	NO	% OF group		NO	% of groups	NO	% of groups	NO	% of total
Males Under weight	0	0	3	3	37.5%	2	25%	8	5.6%
Normal weight	0	0	7	18	29.5%	36	59%	61	43.2%
Over weight	1	2.1 %	3	13	27.6%	27	57.4%	47	33.3%
Obesity	0	0	0	6	31.5%	13	68.4%	19	13.4%
Total	**1**	**7.4%**	**16**	**40**	**28.3%**	**78**	**55.3%**	**141**	**100%**
Females Under weight	0	0%	0	1	50%	1	50%	2	3%
Normal weight	0	0%	4	7	41.1%	6	35.2%	17	26.1%
Over weight	0	0 %	4	7	31.8%	11	50%	22	33.8%
obesity	0	0%	2	13	54.1%	9	37.5%	24	36.9%
Total	**0**	**0%**	**10**	**28**	**43%**	**27**	**41.5%**	**65**	**100%**
TOTAL Underweight	**0**	**0%**	**3**	**4**	**40%**	**3**	**30%**	**10**	**5%**
Normal weight	**0**	**0%**	**11**	**25**	**32%**	**42**	**53.8%**	**78**	**39.1%**
Overweight	**1**	**1.4%**	**10**	**20**	**28.9%**	**38**	**55%**	**69**	**34.1%**
Obesity	**0**	**0%**	**2**	**19**	**44.1%**	**22**	**51.1%**	**43**	**21.6%**
Total	**1**	**50%**	**26**	**68**	**34%**	**105**	**52.2%**	**200**	**100%**

Table(2) :

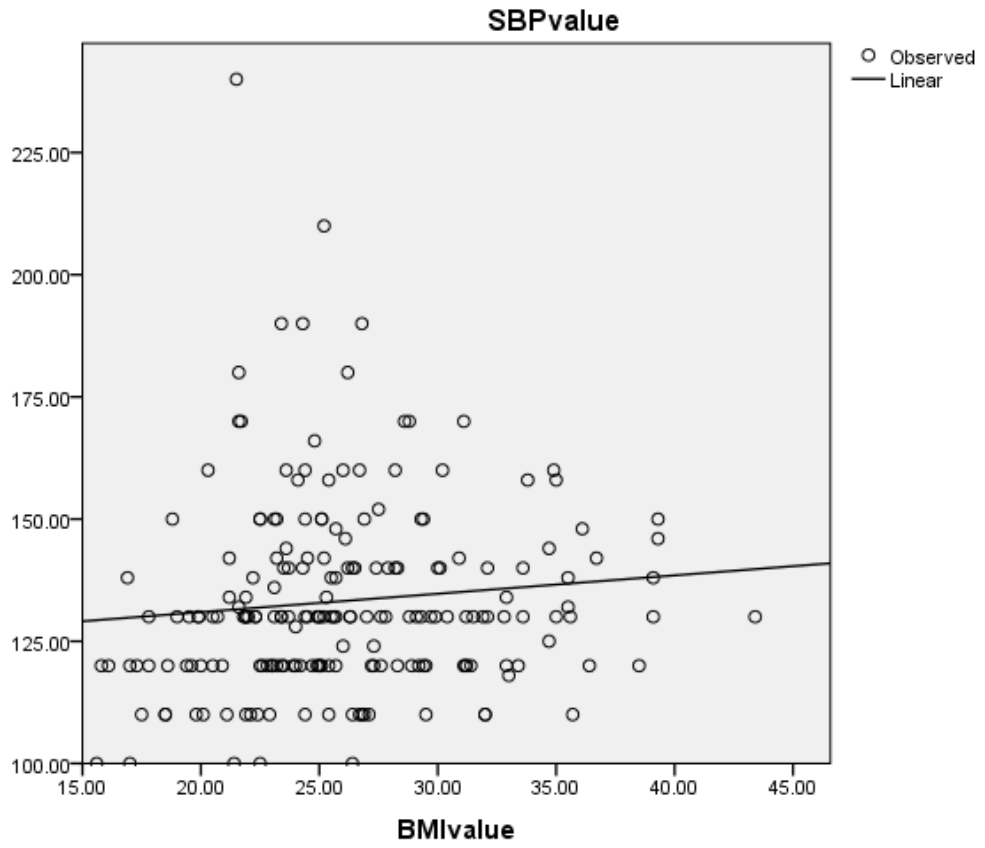
BMI in relation to systolic blood pressure and gender differences.

	Normal	**Prehypertension**		**Hypertension**		**Total**	
		NO	% of groups	NO	% of groups	NO	% of total
Males Underweight	2	6	75%	0	0%	8	5.9%
Normal weight	6	35	57.3%	20	32.7%	61	45.1%
Overweight	3	26	55.3%	18	38.2%	47	34.8%
Obesity	0	9	47.3%	10	52.6%	19	14%
Total	**11**	**76**	**56.2%**	**48**	**35.5%**	**135**	**100%**
Females Underweight	1	1	50%	0	0%	2	3%
Normal weight	6	7	41.1%	4	23.5%	17	26.1%
Overweight	5	10	45.4%	7	31.8%	22	33.8
Obesity	4	15	62.5%	5	20.8%	24	36.9%
TOTAL	**16**	**33**	**50.7%**	**16**	**24.6%**	**65**	**100%**
TOTAL Underweight	3	7	70%	0	0%	10	5%
Normal weight	12	42	53.8%	24	30.7%	78	39%
Overweight	8	36	52.1%	25	36.2%	69	34.5%
Obesity	4	24	54.8%	15	34.8%	43	21.5%
Total	**27**	**109**	**54.5%**	**64**	**32%**	**200**	**100%**

Fig (1): correlation of diastolic BP(DBP) and body mass index(BMI)



Fig(2): correlation of systolic blood pressure (SBP) and body mass index (BMI)



Discussion:

There is a positive association between measures of obesity and blood pressure in both developed and less develop countries.[8]

.Dollet et al. explained obesity associated hypertension as an inadequate vasodilatation in the presence of increased blood volume and cardiac output ,which are natural consequence of an increase mass.[9]

Investigators have concluded that body mass index is one of the most important predictor of blood pressure[10]

This study examined the relationship between blood pressure and body mass index among Sudanese adults in Khartoum state. There is an increase in blood pressure with increased body mass index which is more clear with systolic blood pressure (fig1&2) .

This is supported by a study done by Martin D. shown that BMI less than 25 relates arise in systolic blood pressure[11]

A study by Helene le long showed that SBP level increase of approximately 1 mmHg for 1Kg/m^2 change in BMI.[12]

Alsoan odd result appears that hypertension percentage are higher among males group rather than females group.

A study by Tesfaye et al also reported higher blood pressure in men than women a phenomenon sometimes referred to as gender dichotomy in blood pressure([13])

Two factors were limiting this study., small size data and short time, further studies in a large scale are required. In conclusion: From the results of this study, there is a possible positive correlation between systolic blood pressure and BMI, with a non-significant increase in DBP with increased BMI.

A large scale study is needed , the guidelines of high blood pressure classification can be changed depending on the BMI.

Conclusion:

From the result of this study, there is appositive correlation between systolic blood pressure and BMI, with a non-significant increase in DBP with increase BMI.

A large scale study is needed , the guidelines of high blood pressure classification can be changed depend on the BMI

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