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Prevalence of hypertension and its relationship with obesity among the adult Bengalee Muslim male of North 24 Parganas, India

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ABSTRACT

The study intends to find out the relation between estimated obesity indicators and blood pressure among adult Muslim male of North 24 Parganas, West Bengal, India. A cross sectional study has been conducted among 240 Muslim male (aged 18 – 60 years) from four villages of block Habra II, North 24 Parganas. Area was selected by the deliberate sampling method whereas participants were selected through random sampling. Some anthropometric measurements and blood pressure were measured through standard techniques. From the anthropometric measurements two anthropometric indicators were calculated i.e. Body Mass Index (BMI) and Waist Hip Ratio (WHR) which indicates obesity. Mean Arterial Pressure (MAP) were calculated from the blood pressure measurements. A significant and positive correlation was present between mean arterial pressure with BMI and WHR ($r = 0.487$ & 0.356 respectively, $p<0.01$). Systolic blood pressure and diastolic blood pressure were also significantly and positively correlated with BMI and WHR. Multiple regression analysis predicts that BMI was the better indicator for increasing of all types of blood pressure (SBP, DBP & MAP) than WHR. As well as multiple regression analysis of anthropometric measurements as independent variables predicts that waist circumference (WC) was the better indicator for increasing of all types of blood pressure (SBP, DBP & MAP) than other measurements. This study suggests among the Muslim communities of West Bengal, central obesity or central regional adiposity is the leading factor of hypertension rather than body obesity.

KEY WORDS: Hypertension, Obesity, Lifestyle pattern, Bengalee,Muslims

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INTRODUCTION

World Health Organization (WHO) reported that blood pressure cause one in every eight death, making hypertension the third killer in the world.[1]In India, nearly one in 10% people were affected by hypertension and it is common reason for Indian visit to a physician to check up their blood pressure level as well as the number of hypertensive individuals is predicted to nearly double from 118 million in 2000 and 213 million by 2025.[2]

Biologically, excess low density lipoprotein (LDL) leads to deposition of cholesterol in the wall of artery which obstructs blood flow and increased blood pressure.[3] This LDL is associated with obesity and which is very rapidly increases among the adult age group of both sexes, because this age group is very unstable for their various social, mental and physiological pressures. Obesity is associated with sympathetic activation and is the leading risk factor for development of hypertension.[4]

Many studies revealed that there is certain relationship is present between obesity and blood pressure. Specially, eating too much fat leads to weight gain, particularly animal fats contain cholesterol which can start to plaque buildup inside blood vessels and can cause high blood pressure and other serious problems.[5] There are so many types of anthropometric indicators are presents which indicate the obesity of an individual. Many researchers tries to include some of the indicators in their studies, like body mass index, waist hip ratio, waist height ratio, percent of body fat, fat mass and so on.

A study stated that higher BMI associates with a higher prevalence of hypertension. This study also revealed that socio-economic or cultural factors, stress and other unmeasured risk factors are also responsible for variation in hypertension prevalence.[6] The prevalence of chronic non-communicable diseases is increasing at an alarming rate in all over world. About 18 million people die every year from cardiovascular disease, for which diabetes and hypertension are major predisposing factors.[7] A progressive increasing of elevated blood pressure prevalence with increasing adipose tissue have found in many epidemiological studies.[8] A close relationship is present between increased abdominal obesity assessed by waist circumference and metabolic risk factors in adults.[9]

Different studies in India also showed more or less similar outcome, obesity affects on blood pressure level can cause hypertension and other coronary heart diseases. Patil and his co-workers studied among adult male in 2015, the result of their study shows that a correlation is present between Waist Hip Ratio (WHR), BMI with hypertension and also shows that a significant association of WHR with hypertension which is an important indicator of central adipose tissue in study population.[10]

A study was conducted by Kundu and Biswas (2016) on relationship of blood pressure and body compositions among adult Bengalee male and this study reveal that a significant positive correlation is present between BP and endomorphic rate, which indicates the relative fatness of an individual.[11] Shekharappa and his confreres in 2011 studied on obese male, and found that there was a statistically significant positive relation is present in case of heart rate, systolic blood pressure and diastolic blood pressure with obesity.[12]

Another study said that fat content of the human body may influence morbidity and mortality and the measurements of total body fat provides useful information and has physiological and medical importance.[13] Hypertension, cardiovascular disease and type II diabetes mellitus and other chronic diseases can cause morbidity and mortality, is positively and independently associated with BMI.[14]

However, existing evidences indicates obesity is a multifactorial condition influenced by many factors like, biological factors which includes genetic abnormalities as well as cultural factors which includes food habit, economic condition, and daily activities and so on.[15] For this matter this type of study becomes more fruitful, when the participant belongs in to an endogamous group which contains a common gene pool.

The present study intends to find out the relation between blood pressure and different anthropometric variables, which usually indicates obesity among the adult Bengalee Muslim males of North 24 Parganas, West Bengal, India. An additional objective is identification of the most effective components from anthropometric variables, which have significant effect on blood pressure of the studied population.

MATERIALS AND METHODS

Sampling

A cross sectional study was conducted in the first half of the year 2016 on adult Bengalee Muslim male. In this study Muslim population was selected for their endogamous form of marriage, for this they belong to a common gene pool. Age group was considered as 18 to 60 years and total 240 research populations were selected from four villages of block Habra II, district North 24 Parganas, West Bengal. Area was selected by the deliberate sampling method whereas populations were selected through random sampling technique by using proper statistical method, confidence level was 95% and confidence interval was 6.3 where sample size needed 241, one sample excluded as out layer so total sample size 240. Research participants were characterized by mother tongue Bengali, religion is Islam, but not converted in Islam from other religion in recent past, as well as they belongs to same subsistence pattern for at least two generations.

Data collection

All the data were collected from the research participants through the household schedule and it contains age, sex, religion, mother tongue, anthropometric measurements and blood pressure. Data were collected after obtaining the verbal informed consent and all the regulation of standard protocols were maintain for collecting anthropometric measurements and blood pressures.[16,17]

Anthropometric measurements

Anthropometric measurements were obtained from the research participants on the basis of ISAK guidelines.[16] In this present study total four anthropometric measurements were collected from research participants; these are body stature (in cm) measured by error free anthropometer (on nearest ±0.1 cm), body mass or weight (in kg) were measured by a reliable weighing machine (on nearest ±0.1 kg), waist and hip circumferences (in cm) were measured by inelastic tape (on nearest ±0.1 cm).

On the basis of anthropometric measurement different anthropometric indicators were calculated, which indicates the obesity of the research participants. All the anthropometric indicators analyzed by the use of standard formula.[18] Body mass index (BMI) was calculated as weight in kilogram divided by height (stature) in meter square (kg/m^2). Regional fat distribution was estimated on the basis of calculating the Waist Hip ratio (WHR), calculated as waist circumference (in cm) divided by hip circumference.[18]

Blood pressure measurement

Blood pressure (in mmHg) were measured by using an error free mercury sphygmomanometer and a stethoscope. The blood pressure was measured at morning, specifically minimum 30 minute after breakfast. To record the blood pressure, participants were seated in a chair with back supported, feet on the floor and legs uncrossed. The lower edge of the blood pressure cuff was tightened 1 inch above the bend elbow. The measurements (on nearest ±1.0 mmHg) were taken three times at a 10 minute time interval for the accuracy and then the mean value was obtained, which considered as actual blood pressure value.[19,17]

Mean Arterial Pressure (MAP) was calculated by using the following equation MAP = DBP + {1/3(PP)}, where PP (Pulse pressure) = (SBP - DBP), SBP = Systolic blood pressure, DBP = Diastolic blood pressure.[20]

Statistical analysis

Collected data were analyzed by using Statistical Package for the Social Science (SPSS, version 18.0). Mean and Standard deviation (±SD) were calculated for the analysis of descriptive statistics as well as correlation coefficient and stepwise multiple regressions were used for the inferential analysis. All these statistical analysis tries to understand the relation between obesity indicators and blood pressure, significant level always conceded as $p< 0.01$.

RESULT AND DISCUSSION.

Descriptive statistics of the present study among the research participants showing the following overviews. Mean and standard deviation (SD) obtained for blood pressure as, SBP 121.00 (12.84), DBP 80.49 (9.46) and MAP 93.99 (9.92). Mean age of the studied population is 35.00 (11.97).

Table No. 1: Correlations of blood pressures with anthropometric measurements and anthropometric indicators

Anthropometric measurements and indicators	Mean (SD)	SBP	DBP	MAP
Body stature	163.40 (5.38)	0.077	0.008	0.039
Body mass	59.25 (9.65)	0.468**	0.416**	0.467**
BMI	22.18 (3.32)	0.468**	0.449**	0.487**
Waist circumference	80.06 (9.10)	0.440**	0.471**	0.489**
Hip circumference	86.02 (5.70)	0.441**	0.428**	0.462**
WHR	0.929 (0.065)	0.296**	0.359**	0.356**

Significant, ** $p<0.01$

Correlations between blood pressures and different anthropometric measurements as well as anthropometric indicators of the studied participants are showing in the table 1, here the blood pressures include SBP, DBP and MAP. The results from the table revealed that a significant ($p<0.01$) positive correlation is present between blood pressures and anthropometric measurements as body mass, waist circumference and hip circumference. Body mass shows the highest correlation with the SBP and waist circumference shows the highest correlation with the DBP of the studied population. There is no significant correlation is present between body stature and blood pressures. It is also observed from this table that the correlations of SBP and DBP are not same in respect of different anthropometric variables, for this matter MAP taken into consideration. MAP shows highest correlation with waist circumference. All the blood pressures are also positively and significantly ($p<0.01$) correlated with anthropometric indicators such as BMI and WHR. BMI is highly correlated with SBP, DBP and MAP.

Table 2A. Stepwise multiple regression between anthropometric measurements and blood pressure of studied participants

Dependent variables	B	R^2 change	t-value	p-value
SBP	0.356	0.127	7.505	0.0001
DBP	0.403	0.162	8.672	0.0001
MAP	0.410	0.168	8.863	0.0001

Predictor BMI as independent variable

Table 2B. Stepwise multiple regression between anthropometric indicators and blood pressure of studied participants

Dependent variables	B	R^2 change	t-value	p-value
SBP	0.348	0.121	7.316	0.0001
DBP	0.350	0.123	7.370	0.0001
MAP	0.373	0.139	7.931	0.0001

Predictor BMI as independent variable

The results of stepwise multiple regression coefficient are stated in table 2A and 2B, which includes three stepwise multiple regression coefficient compactly. Table 2A includes of anthropometric measurements and table 2B includes anthropometric indicators for stepwise multiple regressions analysis.

All the anthropometric measurements such as body stature, body mass or weight, waist and hip circumferences are selected as independent variables as well as SBP, DBP and MAP are selected consistently as dependent variables in the table 2A. The beta value (β) refers that from all the independent variables only waist circumference is significantly ($p<0.0001$) predicts on SBP, DBP and MAP among the research participants. On the basis of R^2 change, the model predicts that percentage of (R^2) is for SBP, DBP and MAP in respect of waist circumference as independent variables are 12.7%, 16.2%, and 16.8% respectively (table 2A).

In the table 2B, BMI and WHR are selected as independent variables and SBP, DBP and MAP are selected consistently as dependent variables. The Beta value (β) refers that only BMI is significantly ($p<0.0001$) predicts on SBP, DBP and MAP among the research participants. On the basis of R^2 change, the model predicts that percentage of (R^2) is for SBP, DBP and MAP in respect of BMI as independent variables are 12.1%, 12.3%, 13.9% respectively (table 2B).

Table 3: BMI category wise blood pressure difference of obese and non obeseparticipants

BMI category	Mean SBP (SD)	Mean DBP (SD)	Mean MAP (SD)
Obese (>25.00)	128.06 (12.45)	85.25 (8.40)	99.52 (8.68)
Non Obese (<25.00)	119.23 (12.34)	79.30 (9.36)	92.61 (9.75)
t-value	4.424**	4.020**	4.487**

Significant, ** $p<0.01$

The differences of mean SBP, DBP and MAP in respect of BMI category such as obese and non-obese division as well as statistical significant test showing in the table 3. The mean values in case of SBP, DBP and MAP are higher among the obese individuals and lower in the non-obese individuals. The student's t-test revealed that the mean blood pressures values are significantly ($p<0.01$) different among obese individuals and non-obese individuals.

Figure 1: Distribution of relation between Mean Arterial Pressure and Waist circumference

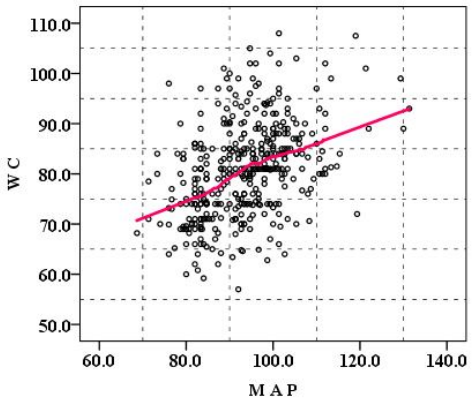
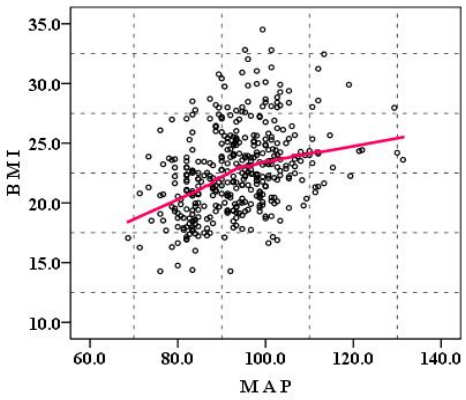


Figure 2: Distribution of relation between Mean Arterial Pressure and Body Mass Index



Results showing BMI point out obesity of the participants, which is an important factor for the increasing blood pressure. Waist circumference showing more clearly that regional obesity or central obesity is the major factor for increment of blood pressure. The relation of blood pressures with waist circumferences and BMI are showing in figure 1 and 2 respectively. Here, MAP used for the assessment of blood pressures, because MAP is a better indicator for analytical interpretation as compare to SBP and DBP separately as it yields different results. Both figures describe the scattered plot along with a Loess-Gaussian curve and its confidence interval is 95%. Figure 1 shows waist circumference affection MAP or blood pressure positively and it is clearly indicated by the curve. More or less same trends found in case of figure 2, where the curve is represented by BMI, where MAP rises positively with the increasing BMI.

CONCLUSION:

Hypertension is one of the major challenging health issues for the developing countries as India, because this global burden of non-communicable disease is increasing dramatically in this region. Hypertension or high blood pressure is basically a multi-factorial trait; numerous factors are responsible for rising of hypertension, under two major umbrellas like biological factors and environmental factors such as lifestyle pattern and food habit.

Result of the study demonstrated that, the lowest mean blood pressures are found among the individuals who belong to the lower BMI category as well as mean blood pressures are higher among the obese BMI category, which indicate that higher body mass or body weight in respect of body area is an important factor for increase of high blood pressure. Present study also reveals that among the Muslim males, body mass and waist circumference both are positively and significantly correlated with mean arterial pressures but correlation value is higher in case of waist circumference. This study also indicates to the regional fat depositions from the table 2A and 2B. Multiple regression coefficients very clearly point out that BMI positively predict to all the blood pressures and this BMI represents obesity of a person. So, the obesity is very important factor for blood pressures. On the other hand, waist circumference is another predictor of blood pressures, showing by the multiple regression coefficients, which indicate that not only obesity but also central obesity is very important factor for high blood pressures. Perhaps, due to the regional fat depositions, in case of this present study waist circumference highly responsible for high blood pressure.

It is difficult to treat any genetic problems of huge population, which are responsible for hypertension rather than any type of environmental problem that should be easily curable. This environmental problem basically includes our lifestyle patterns such as, more calorie related food intake, very less physical activities and so on. Actually these factors directly did not affect blood pressure rather this factors cumulatively creates obesity and this obesity affects blood pressure.

However, it is necessity to make effective steps for the prevention of hypertension level among Muslim male research participants through health education, life style changes, and dietary modifications and also to make aware of the fact that regional fat depositions, especially in the waist region affected blood pressure level, so that they must be aware of this fact.

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