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The relationship of Blood Pressure and Obesity among adult Bengalee Male of North 24 Parganas, West Bengal

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ABSTRACT:

The study intends to find out the relationship of blood pressure and obesity among adult male of North 24 Parganas, West Bengal. A cross sectional study has been carried out among 232 male (aged 18 to 60 years) in four villages of block Habra I and II of North 24 Parganas, West Bengal. Two anthropometric measurements viz. height and weight were taken; BMI was calculated. Systolic and diastolic blood pressures were taken and MAP was calculated. There is a significant positive correlation (r= 0.404) between Body Mass Index and Mean Arterial Pressure. With the increasing of BMI status there is a significant increase in both systolic blood pressure and diastolic blood pressure (r= 0.389 and 0.362 respectively). There is a significant difference between Mean Arterial Pressure of obese and non-obese persons (t=3.4005). The study suggests that, the effect of obesity is present on blood pressure, in adult male of the studied area.

Key words*: Body mass index, Obesity, Mean arterial pressure, Systolic Blood Pressure, Diastolic Blood Pressure, North 24 Parganas.*

INTRODUCTION:

Obese people suffer an extent of excess weight; they are vulnerable to diabetes, hypertension and coronary heart disease (Clegg and McKean, 1999; Humayun *et al.* 2009). High blood pressure is an antecedent of heart disease and stroke, both leading causes of morbidity and mortality (Bell *et al.* 2002; Tesfaye *et al.* 2007). A healthy artery has a pale, smooth, glistening lining and in an unhealthy artery there are yellow fatty streaks under the endothelium (Clegg and McKean, 1999). Very low density lipoproteins (VLDL) are formed in the liver and have function of transporting triacylglycerol to the tissues. Low density lipoproteins (LDL) are rich in protein and in cholesterol formed from VLDL in tissues (Clegg and McKean, 1999; Di Giovanna AG, 1994). LDLs are used for steroid hormone production (Clegg and McKean, 1999). Obesity is an excessive accumulation of fat in the body (Mandal *et al.* 2011; Naik *et al*. 2012). Excess LDL in the blood leads to the deposition of cholesterol in the wall of arteries called atheroma, including coronary artery disease, causing a narrowing of the artery lumen or atherosclerosis, it is a condition of progressive degeneration of artery walls (Clegg and McKean, 1999; Di Giovanna AG, 1994). Reduction of the LDL cholesterol in the blood can be achieved by a reduction of fat in the diet, particularly by reducing the intake of dairy products reach in saturated fats (Bambrick, 2005; Khatib Oussaman and El-Guindy MS, 2005). U.S. Department of Health and Human Services (2006) stated that the high blood pressure is now recognized to be a disease of lifestyle, in consequence of dietary indiscretions (excess calories and salt), obesity and lack of exercise. One of the most important risk factor for cardiovascular mortality and morbidity is high blood pressure; because, it attributes 35% risk for the development of atherosclerotic cardiovascular events, 69% for stroke, 49% for congestive heart failure and 24% for premature death (Mo *et al.* 2012). In India, hypertension affects nearly one in 10 (ten percent) people, it is the most common reason for a Indian visit to a physician for checkup his or her blood pressure as well as the number of hypertensive individuals is predicated to nearly double from 118 million in 2000 to 213 million by 2025 (Mohan *et al.* 2013). Different studies show that there is a relationship between BMI and BP; such as eating too much fat leads to weight gain. Some fats, particularly animal fats contain cholesterol which can lead to plaque buildup inside blood vessels which can lead to high blood pressure and other serious conditions (Bambrick, 2005; Khatib Oussaman and El-Guindy, 2005). Several studies in India have shown that change in dietary

patterns, physical activity levels and lifestyle are related to obesity, hypertension and other disease such as coronary heart disease (Naik *et al*. 2012; Gupta and Guptha, 2010). In addition Masuo *et al.* (2000) and Madanmohan *et al.* (2005) have reported that the increasing obesity is often associated with elevated blood pressure and obesity is an independent direct risk factor for cardiovascular disease. Steyn and Brashaw (2001) have argued that a comprehensive surveillances system is important for the management of non-communicable disease like hypertension.

From the review of literature it is very much clear that there is a close relationship between blood pressure with Body Mass Index. However, such type of study in the reference area (North 24 Parganas) is limited. Therefore, the study intends to find out the relationship of blood pressure and body mass index among adult male of North 24 Parganas, West Bengal.

MATERIALS & METHODS:

A cross-sectional study had been carried out among 232 Bengalee adult male, aged from 18 to 60 years residing of block Habra I and II of district North 24 Parganas, West Bengal, India. Data were collected from four villages of block Habra I and II of North 24 Parganas, namely Anarbaria, Atle Das Para, Kaiputra Para and Buzrg Bamonia. The field investigation was conducted during February to May, 2013. Data was collected by one of the authors (RNK). The studied subjects belong to the same subsistent pattern for last two generations. Participants were selected through random sampling.

Two anthropometric measurements Height and Weight as well as Blood Pressure were taken from the participants. Height (in cm.) was measured by anthropometer (on nearest ±0.2 cm.) and weight (in kg.) was measured by the weighing machine (on nearest ±0.1 kg.) and maintain rules and regulation of standard protocol for collecting anthropometric measurements (Mukherji *et al.* 2009; Lohman *et al.* 1988). The blood pressure (mmHg) was optimally taken in morning after breakfast with a reliable error free mercury sphygmomanometer and stethoscope (Khatib Oussaman and El-Guindy, 2005; National Health and Nutritional Examination Survey III, 1993). In order to record the blood pressure, subjects were seated for at least 5 minutes in a chair with their backs supported and their arms bared and supported at heart level (Humayun *et al.*2009; National Health and Nutritional Examination Survey III, 1993). Measurements (on nearest ±1.0

mmHg) were taken three times, at 5 minutes time interval and mean values were selected for analysis. Adult healthy individuals were considered as normal if Systolic Pressure is 120mmHg and Diastolic Pressure 80mmHg (Khatib Oussaman and El-Guindy MS, 2005). Two parameters were calculated accordingly the first one is Body Mass Index (BMI) and calculated as $[\frac{Weight\ \ (kg.)}{Height\ \ (m^2)}]$ and second one is Mean Arterial Pressure (MAP) and calculated as $(\frac{[Systolic\ +\ 2\ \ (Diastolic)]}{3})$ (Mukherji *et al.* 2009; Shapiro and Loiacono, 2010; Human Physiology with Vernier, 2005). BMI was categorized according to the WHO recommended cut-offs where BMI considered to be ≥25 Kg/ m^2 was considered as 'Obese' (Mukherji *et al.* 2009). Hypertension was determined by the calculating MAP value labeled as ≥76.67 (≥140/85mmHg), more elaborate classification of blood pressure provide for adults by European Society of Hypertension and the European Society of Cardiology (ESH/ESC) was taken (Khatib Oussaman and El-Guindy MS, 2005). For statistical analysis SPSS (version 16.0) and PAST (version 2.04) are used as statistical software.

RESULTS AND DISCUSSION:

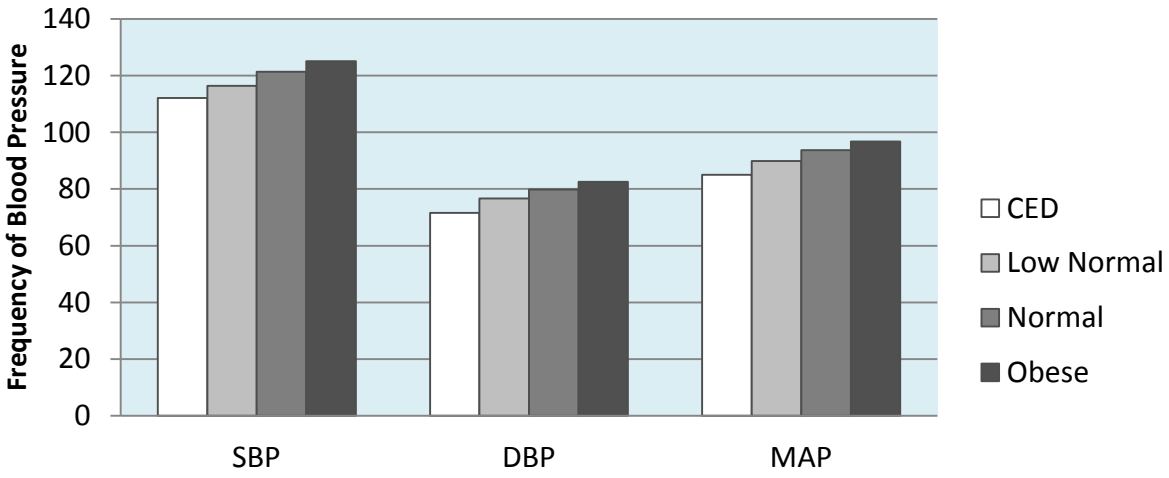
The data on adult male from the study, obtain the following general overview; all data are expressed as means ± SD. Their mean height and weight are 163.07 (SD ± 5.60) cm. and 57.26 (SD ± 9.14) kg respectively; as well as mean SBP 119.58 (SD ± 13.04) mm Hg and DBP 78.33 (SD ± 10.25) mm Hg. And mean BMI and MAP are 21.52 (SD ± 3.17) Kg/ m^2 and 92.08 (SD ± 10.31) mm Hg respectively. The present study has shown that both obese and non-obese individuals co-exist in the adult population of the studied area.

The table-1 shows the mean and standard deviation of Blood Pressure of different BMI level, that a continuous increasing of Systolic and Diastolic Blood Pressure, which found together in Mean Arterial Pressure. The mean blood pressure (SBP, DBP and MAP) of entire sample are higher among the obese individuals compared to other categories of the BMI. Figure- 1 represents the graphical representation of the table- 1, which very clearly showing that the SBP, DBP and MAP contentiously increased in respect of different BMI categories, lowest mean value of blood pressure are found among the CED individuals and height mean value of blood pressure are found among the Obese individuals. It is clearly showing in the table-2.

Table – 1: BMI group wise Blood Pressure distribution (n=232)

BMI category	Number of individuals	Mean SBP (in mmHg, ±SD)	Mean DBP (in mmHg, ±SD)	Mean MAP (in mmHg,±SD)
CED	38	112.08 (±8.62)	71.55 (±7.93)	85.06 (±7.23)
Low Normal	47	116.43 (±12.46)	76.68 (±9.14)	89.93 (±9.30)
Normal	103	121.42 (±12.76)	79.79 (±10.96)	93.66 (±10.61)
Obese	44	125.11 (±14.04)	82.55 (±8.35)	96.73 (±9.48)

Figure- 1: BMI group wise Blood Pressure distribution



SBP = Systolic Blood Pressure CED = Chronic Energy Deficiency
DBP = Diastolic Blood Pressure MAP = Mean Arterial Pressure

Table-2 depicts the significant test between the obesity and blood pressure. In Systolic, Diastolic and Mean Arterial Pressure are consists that, the mean values are higher among the obese subjects and lower in non-obese subjects. The Student's t-test revealed that the mean blood pressure of the obese individuals are significantly ($p<0.05$) different from the non-obese individuals.

Table – 2: Obesity-Blood Pressure significant test (n=232)

BMI category	Mean SBP (±SD)	Mean DBP (±SD)	Mean MAP (±SD)
Obese	125.11 (±14.04)	82.55 (±8.35)	96.73 (±9.48)
Non Obese	118.28 (±12.48)	77.35 (±10.43)	90.99 (±10.22)
t-test of Blood Pressure between Obese & Non Obese individuals			
t-value	3.1889*	3.0836*	3.3983*

*significant, $p<0.05$

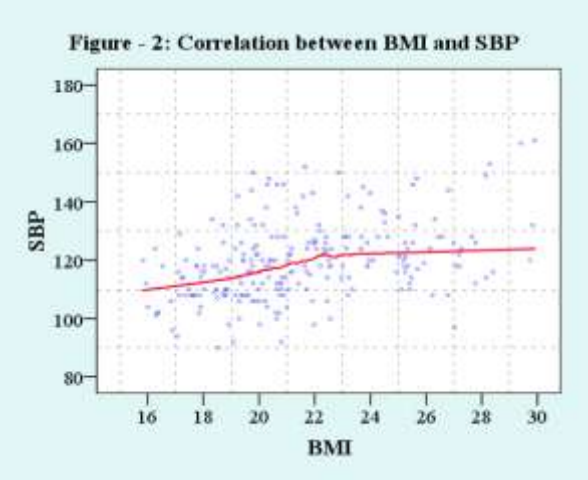
Table-3 represents a simple correlation matrix showing the bivariate Pearson correlation analysis of Body Mass Index, Weight and Weight with the Blood Pressure. Among the participants the Body Mass Index and Weight are positively correlated with the Systolic Diastolic and Mean Arterial Pressure, *r-value* is significant ($p<0.01$). But in case of Height there is no significant correlation with the Blood Pressure, *r-value* is not significant. So, in BMI mainly weight is responsible for the Blood Pressure other than height.

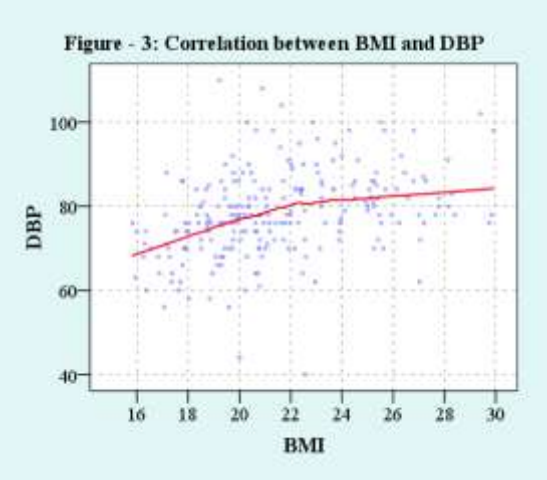
Table – 3: Pearson Correlation between Body Mass Index and Blood Pressure (n=232)

Parameters	SBP	DBP	MAP
BMI	0.389**	0.362**	0.404**
Weight	0.370**	0.367**	0.399**
Height	0.013	0.073	0.053

**significant, $p<0.01$

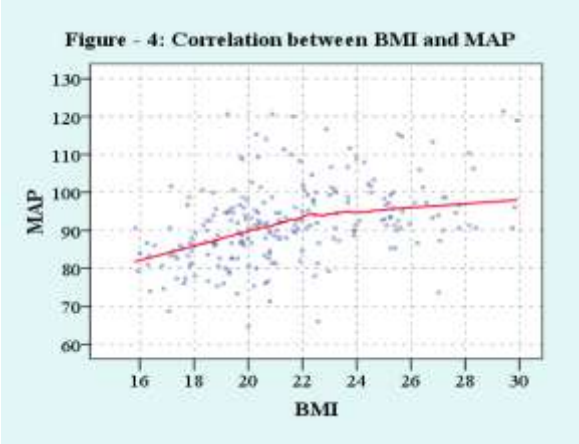
Both, the figure – 2 and figure – 3 showing the correlation between Body Mass Index and Blood Pressure, as well as figures contain graphical representation of Loess-Gaussian curve (Confidence intervals 95%) which showing the direction of incensement of Blood Pressure (SBP and DBP) through the BMI category wise. In figure – 2, Systolic Blood Pressure increased with the increase of BMI level. Diastolic Pressure, in figure – 3 represents increase with BMI





category, same as it is found in Systolic Pressure. Both Systolic and Diastolic Blood Pressure are increasing up to 22 BMI level abruptly and after 22 level of BMI category both type of Blood Pressure increase very slowly.

The figure- 4, correlation between BMI with MAP is the graphical distribution of MAP status in respect of BMI among the villagers, and the Loess-Gaussian curve (Confidence intervals 95%) showing that both BMI and MAP are continuously increased. The curve represents up to the BMI range of 22.00 a continuous increasing of MAP abruptly and then the MAP are very slowly increased until the BMI range of 30.00.



CONCLUSION:

The mean blood pressures of the studied population reveal that, the lowest blood pressure is present among the individuals who belong to the lower BMI category as well as blood pressure increase parallel to the increase of BMI level, which indicate that high body mass or weight is an important factor for high blood pressure. This study again shows that a significant positive correlation is present between blood pressure and BMI. The result indicates that a strong association is present between blood pressure and obesity among the adult Bengalee male population of North 24 Parganas, West Bengal.

The same work or study had been done in different areas and populations all over the world. A same conclusion was obtained by other related works of Naik *et al*. (2012) worked in Tirupati town of Andhra Pradesh, Humayun *et al.* (2009) worked on Peshawar of Pakistan and Bell *et al.* (2002) regarding ethnic differences between BMI and High Blood Pressure among peoples of China, Philippines and United. Therefore, the study instead of its limitation conclude that with the increasing of BMI status there is a significant increase in both systolic blood pressure and diastolic blood pressure among Bengalee male of North 24 Parganas, West Bengal.

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