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Brief Report

Association of Blood Pressure with Body Mass Index, Waist Circumference and Waist-Hip ratio among the Maghaya Dom of Birbhum District, West Bengal

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ABSTRACT

Background: There is linear relationship between high blood pressure and body mass index, waist circumference and waist-hip ratio. This study deals with correlation of blood pressure with body mass index, waist circumference and waist-hip ratio among the Maghaya Dom population of Birbhum district, West Bengal.

Materials and methods: Altogether 304 adults Maghaya Dom (male: 151; female: 153) were studied. Systolic (SBP) and diastolic blood pressure (DBP) were measured by mercury sphygmomanometer. Blood pressure values were classified according to the report of JNC – 8. Anthropometric measurements were taken using standard anthropometric techniques (Lohman, Roche, and Martorell 1988). Pearson coefficient of correlation analysis was performed.

RESULTS: Both SBP and DBP mean values were higher among the males (SBP: 134.75; DBP: 88.12) than that of the females (SBP: 127.08; DBP: 84.34). A gradual increase of mean SBP and DBP is evident with the advancement of age among the females. But it is not true in case of males.

DISCUSSION: Results of coefficient of correlation values indicate that increase in blood pressure, body mass index, waist circumference and waist-hip ratio show higher mean in different classes in the females, which is not true in the males in studied population. Findings of the present study show that incidences of obesity, waist circumference and hip circumference are considerably higher among the females than their counterpart. These increment shows a linear order in the females, whereas among the females a different trend is perceptible.

KEYWORDS: Blood pressure. Body height and weight. Waist and hip circumference. Correlation.

INTRODUCTION

Relationship between excess weight and diseases has been recognized over time (Visscher and Seidell 2001, Cameron et al 2003). Obesity is recognized as a major independent risk factor for cardiovascular diseases (Després et al. 2001). This is because increased body fat is accompanied by profound changes in the physiological and metabolic functions of the body, which are directly dependent on the degree of excess weight and on its distribution around the body (Sanya et al. 2009). Prevalence of obesity is rising in developed and developing nations, and it is called as an important risk factor for early mortality (WHO 1998). A number of clinical measurements for obesity have been used to determine susceptibility to cardiovascular diseases (Cameron et al. 2003). These include anthropometric indies such as body mass index (BMI), waist-hip ratio (WHR) and waist circumference (WC) (Bray and Gray 1988, Flier and Flier 2005).

The progressive increase in blood pressure (BP) generally occurs with increase in adipose tissue (Yalcin et al. 2005). Adiposity is located centrally in abdomen, which can be measured by waist circumference and waist-hip ratio (Anuurad et al. 2003). Positive correlation of BMI and hypertension is well documented (Dua et al. 2014). According to Seidell et al. (2001). BMI is unable to recognize between fat and fat free masses. Further, it is proposed to revise for Asians due to increase prevalence of chronic diseases in lower range (Anuurad et al. 2003). BMI, WC and WHR thus have proven correlation with hypertension with the query of one being better (Chaudhary et al. 2018). This study is an attempt to examine the correlation of blood pressure (BP) with BMI, WC and WHR among the Maghaya Dom of Birbhum district, West Bengal.

MATERIALS AND METHODS

The Doms are known as one of the unclean castes of West Bengal. The community has four sub groups namely, Chhanchi-Dom, Ankure-Dom, Bajune-Dom and Maghaya-Dom. They claim that they originated from a common ancestor. The Doms live in the plains of West Bengal and are distributed in Burdwan, Hoogly, Howrah and Birbhum districts. This study was carried out among 304 adults Maghaya Dom (male: 151; female: 153) in 2019. A Maghaya Dom-dominated area was purposively selected for the feasibility of the study. For the shake of present study, the Maghaya Dom data were collected from Shantiniketan Municipal area and Middyapara, Sian and Sujapur Muluk of Birbhum district. A cross-sectional survey design was employed, involving multi-stage sampling approach.

The participation of the subjects was voluntary in nature and the present investigation was undertaken in accordance with the ethical guidelines of Anthropological Survey of India. Data were collected while the respective households were visited. The samples were free from any selection bias. The age of the individuals was recorded using valid identity cards and documents. Participants were healthy males and females (age ranges between 20 and 60 and above years). The mean age of the males and females was 37.71 and 37.65 years, respectively. Systolic (SBP) and diastolic blood pressure (DBP) were measured by a mercury sphygmomanometer. Obtained values were classified according to the report of JNC – 8 (Paul et al. 2014). Pearson coefficient of correlation analysis was performed to find out the association of blood pressure with BMI, waist circumference and waist-hip ratio. All anthropometric measurements of lightly-clothed participants were taken by the author, using standard anthropometric techniques (Lohman, Roche, and Martorell 1988).

RESULTS

It is apparent from Table 1 that 20% of the males and 37% of the females have a normal BP. Conversely, near about one fourth (21.85%) of the males fall in the category of stage I hypertension. A good percentage (11.26%) of the males have stage II hypertension. Whereas, near about half (47.02%) of the males have pre-hypertension. Side by side, among the females also, a good percentage (37.25) of them have pre-hypertension. However, females show comparatively lower percentage of stage I (17.65%) and stage II (6.54%) hypertension than their counterpart. This is supported by a chi-square test (χ^2=11.72), which indicates a significant difference between two genders in terms of blood pressure.

Table 1: BP levels (mmHg) in both sexes of the Maghaya Dom

Levels of BP*	Male (n=151)		Female (n=153)	
	No.	%	No.	%
Normal (systolic <120/diastolic <80)	30	19.87	57	37.25
Pre-hypertension (systolic 120-139/diastolic 80-89)	71	47.02	59	38.56
Stage I: hypertension (systolic 140-159/diastolic 90-99)	33	21.85	27	17.65
Stage II: hypertension (systolic ≥ 160/diastolic ≥ 100)	17	11.26	10	6.54

*According to JNC-8 (Paul et al. 2014)
χ^2=11.72 (df=3, p value <0.05)

Means and SD of SBP and DBP according to different age groups are furnished in Table 2 for the Maghaya Dom population. Both SBP and DBP mean values are higher among the males (SBP: 134.75; DBP: 88.12) than that of the females (SBP: 127.08; DBP: 84.34). A gradual increase of mean SBP and DBP is evident with the advancement of age among the females. But in males a dissimilar trend is perceptible in this respect. However, SD values vary more among the males than their counterpart. It is seen the from the results of t-test that there exists significant difference between two genders in terms of SBP in 20-29 years, 30-39 years and 60 and above years age group. Side by side, in case of DBP also significant differences exist in the same age groups like SBP.

Table 2: SBP and DBP in different ages of both sexes of Maghaya Dom

Age groups (in years)	Male					Female				
	No.	SBP (mmHg)		DBP (mmHg)		No.	SBP (mmHg)		DBP (mmHg)	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
20-29	56	134.54	20.32	88.84	12.29	53	117.51	11.85	80.36	8.87
30-39	29	132.93	26.21	87.83	14.90	29	122.90	14.23	82.90	9.02
40-49	25	130.92	16.36	86.28	12.07	33	133.64	17.28	87.73	8.12
50-59	35	138.40	13.41	87.86	9.45	35	138.49	20.56	87.80	11.02
60 & above	6	138.83	9.95	92.0	5.14	3	131.67	4.73	91.0	2.0
Total	151	134.75	19.38	88.12	11.99	153	127.08	17.83	84.34	9.75

SBP: 20-29 years: t=8.92 (df=302, p value <0.05)

SBP: 30-39 years: t=4.14 (df=302, p value <0.05)

SBP: 40-49 years: t=1.39 (df=302, p value <0.05)

SBP: 50-59 years: t=0.45 (df=302, p value <0.05)

SBP: 60 & above years: t=8.04 (df=302, p value <0.05)

DBP: 20-29 years: t=6.89 (df=302, p value <0.05)

DBP: 30-39 years: t=3.50 (df=302, p value <0.05)

DBP: 40-49 years: t=1.23 (df=302, p value <0.05)

DBP: 50-59 years: t=0.05 (df=302, p value <0.05)

DBP: 60 & above years: t=2.17 (df=302, p value <0.05)

Near about half of the males (49.01%) and females (47.71%) fall in the category of normal BMI. Whereas, 33.77% of the males and 26.8% of the females are under weight. A good percent of them is overweight (males: 11.26%; females: 9.8%). Percentage of obese individual is comparatively higher among the females (15.69%), which is not true among the males (5.96%) (Table 3). This is supported by a chi-square test (χ^2=8.02), which indicates a significant difference between two genders in terms of BMI.

Table 3: BMI* categories among both sexes of Maghaya Dom

Categories	Male		Female	
	No.	%	No.	%
Underweight (≤18.5)	51	33.77	41	26.80
Normal (18.5-22.9)	74	49.01	73	47.71
Overweight (23-24.9)	17	11.26	15	9.80
Obese (≥25)	09	5.96	24	15.69

*According to Asia-Pacific Guidelines (WHO 2000)
χ^2=8.02 (df=3, p value <0.05)

Waist circumference, hip circumference and waist-hip ratio are shown according to different groups in Table 4. Among males 4.64% fall in risk group in case of waist circumference, whereas among females 9.8% fall in this category. More than 95% of the males and 88% of the females fall in low category of hip circumference. In case of waist-hip ratio, 82.78% of the males and 66.67% of the females fall in the category of high-risk group. It is found from the results of chi square tests that there exists significant difference in terms of waist circumference and waist-hip ratio between two genders. But this is not true in case of hip circumference.

Table 4: Waist circumference, hip circumference and waist-hip ratio among both sexes of Maghaya Dom

Parameter	Group	Male			Female		
		Range	No.	%	Range	No.	%
Waist	Normal	<90	144	95.36	<80	107	69.93

circumference (cm)	Risk	≥90	07	4.64	≥80	46	30.07
Hip circumference (cm)	Low	<94	144	95.36	<97	135	88.24
	Normal	94-105	07	4.64	97-108	15	9.80
	High	>105	-	-	>108	03	1.96
Waist - hip ratio	Normal	≤0.90	26	17.22	≤0.85	51	33.33
	High	>0.90	125	82.78	>0.85	102	66.67

Waist circumference: χ^2=34.16 (df=1; p value <0.05)
Hip circumference: χ^2=5.82 (df=2; p value <0.05)
Waist-hip ratio: χ^2=10.43 (df=1; p value <0.05)

Results of Pearson coefficient of correlation show that all these values are positively correlated between SBP, DBP with BMI, WC and WHR. Though, there exists a weak relationship. There is statistically significant correlation among SBP and DBP with others among females, whereas, in case of males BMI shows statistically significant correlation with SBP and DBP both. Side by side, in case of waist circumference SBP shows significant correlation in this gender.

Table 5: Pearson coefficient of correlation between SBP, DBP with BMI, WC and WHR

Correlation	Male		Female	
	R^2	P	R^2	P
BMI VS SBP	0.253	0.002*	0.267	0.001*
BMI VS DBP	0.161	0.048*	0.253	0.002*
WC VS SBP	0.235	0.004*	0.286	0.000*
WC VS SBP	0.144	0.078	0.275	0.001*
WHR VS SBP	0.038	0.641	0.258	0.001*
WHR VS SBP	0.027	0.743	0.251	0.002*

*Statistically significant (P value <0.05)

DISCUSSION

Body mass index, waist circumference and waist-hip ratio have linear relation with increase blood pressure (Chaudhary et al. 2018). Increase in SBP and DBP is positively correlated with BMI, WC and WHR among the Maghaya Dom females. All correlations in this section are statistically significant among them. But among the males a different trend is noticed. Relationship of BMI with SBP and DBP is positively correlated and this correlation is statistically significant. Side by side, SBP is positively correlated with WC in males. There exists significant difference between two genders in terms of different classes of BP and BMI. In case of WC and WHR also two genders show significant difference. It can be said that increase in BP, BMI, WC and WHR follow a linear order in the females, which is not true in the males in the studied population. Findings of the present study buttressed that incidences of obesity, waist circumference and hip circumference are considerably higher among the females than their counterpart.

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