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Risk of Developing Cardiovascular and Coronary Heart Diseases: An Anthropometric Analysis of Rural Women of Punjab

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ABSTRACT

Hypertension and obesity are the leading causes of deaths in the twenty first century. Life style and rapid urbanization has greatly impacted the working of cardiovascular system. Present cross-sectional study has been conducted on 300 rural females residing in different areas of Punjab (Amritsar, Ferozepur, Faridkot, Moga, Mukatsar, Bathinda, Patiala, Ludhiana) ranging in age from 50 to 80 years and were examined anthropometrically for gross body measurements (height and weight), waist circumference and hip circumference. Systolic and diastolic blood pressure was measured using sphygmomanometer. The mean values for Height (cm), Body Weight (Kg), Waist Circumference, Hip circumference, BMI and WHR for the subjects were 154.28 ± 6.28 cm, 60.72 ± 12.45 kg, 88.87±11.4 cm, 89.05 ± 11.08 cm, 25.46 ± 4.7kg/m^2, 0.99 ± 0.03, whereas Systolic and Diastolic Blood Pressure (mmHg), were 132.49 ± 16.67mmHg , 86.39 ± 10.48 mm Hg, respectively. It has been found that 28.66% women fall under normal range of BMI, 3.33% women were in lower than normal range and 50.33% were under the grade-1-overweight, 17% under the grade-2-overweight and 0.66% under the grade-3-overweight, categories. In all, 52.99% women have WHR values < 1 and 47% women have WHR values ≥ to 1, elucidating that they are at higher risk for adverse health consequences such as hypertension, CVD etc. Women showing normal range of SBP and DBP are 41.33% and 43%, respectively. Approximately 53% women have systolic blood pressure and 45% have diastolic blood pressure values under various grades of hypertension.

***Key words**: Body Mass Index (BMI), Waist- Hip Ratio (WHR), Blood Pressure, Obesity, Cardiovascular Diseases, Hypertension*

INTRODUCTION : Obesity and its related health risks are well known. Severe obesity is associated with abnormalities of cardiac structure and function. It is a major public health problem in most of countries and is well recognized as a major risk factor for coronary heart diseases, various metabolic abnormalities, elevated blood pressure and hypertension **(Willet et**

al.,1995; Curb and Marcus, 1991; Folsom,1990). Developing countries are increasingly faced with a double burden of hypertension and other cardiovascular diseases along with infections and malnutrition **(Murray and Lopez, 1996; WHO, 2003)**. Epidemics of such health hazards , taking place in developing countries is related to rapidly ageing population, changing life styles and nutrition transition **(Omran, 1971; Murray and Lopez, 1997; Reddy, 1998).**

High blood pressure (HBP) is a serious condition that can lead to coronary heart disease (also called coronary artery disease), heart failure, stroke, kidney failure, and other health problems."Blood pressure" is the force of blood pushing against the walls of the arteries as the heart pumps blood. If this pressure rises and stays high over time, it can damage the body in many ways. Its measurements is recorded by two numbers. First , Systolic Blood Pressure is measured after the heart contracts and is highest. The second Diastolic Blood Pressure is measured before heart contracts and is lowest. Normal limits of SBP/DBP are 120/80. Systolic and diastolic blood pressure is measured using sphygmomanometer. Hypertension is defined by blood pressure equal or higher than 140/90 mm Hg **(Fuchs et al. 2005).** Numerous factors such as genes, age, alcohol, overweight, obesity, sedentary life styles are responsible for hypertension.

Obesity and hypertension have been shown to increase in parallel across populations along with their degree of development **(Kaufman et al. 1996; Cooper et al.1997)**. It has been recently observed that blood pressure levels and prevalence of hypertension are related to adiposity. Adiposity or excess weight often measured as increased body mass index or increased waist circumference or waist hip ratio are important predictors of blood pressure and hypertension. Deposition of excessive adipose tissue mass in the trunk region of body is linked with an increased risk of hypertension **(Harris et al. 2000; Pausova et al. 2002)**. The waist hip ratio is one of the most commonly used anthropometric measure to indicate central obesity pattern and increased risk of cardiovascular disease in normal weight women **(Perry et al. 1998).** All these adiposity parameters have been shown significantly correlated with SBP, DBP hyper tension at an individual level over a broad spectrum of socio-economic conditions **(Seidell et al. 1992; Reddy et al. 1997).**

Several studies have shown the increase in prevalence of obesity and its related adverse health outcomes among both men and women and across all racial/ethnic age groups. Blacks have less risk of cardiovascular disease than whites **(Stevens et al. 1992)** and African Americans have more than twice risk of developing hypertension of their white counterparts **(Sixth Report, 1997).** The incidence of coronary artery disease is higher in India than in the Framingham Study **(Wilson et al. 1989).** The prevalence of adverse health outcomes in India has more than doubled in the past two decades. Although there have been steady increases in the prevalence of these parameters among the Indian population **(Gupta 2004; Gupta et al., 2008).**

We investigated the relationship of different anthropometric parameters of obesity and blood pressure and prevalence of cardiovascular diseases and hypertension among rural women of

Punjab. The following anthropometric measurements have been taken to estimate obesity using **Lohmann et al. (1988)** techniques:

1 Height (cm)

2 Weight (kg)

3 Waist Circumference (cm)

4 Hip Circumference (cm)

From these measurements, BMI and WHR have been calculated.

Objectives of the Present Study

The present study has the following objectives:-

1 To estimate the prevalence of hypertension among rural women of Punjab.

2 Observe the relationship between these parameters and blood pressure among rural women of Punjab.

MATERIAL AND METHODS

A total of 300 women ranging in age from 50 to 80 years residing in different areas (Ludhiana, Muktsar, Patiala, Amritsar, Moga, Faridkot, Ferozepur and Bathinda) of Punjab. All of them were house wives and were measured for various anthropometric parameters that is, Height (cm), Weight (Kg), Circumferences (waist and hip) following the standard techniques given by Lohmann et al. (1988). BMI was calculated by dividing body mass (kg) by height squared (m^2) and was categorized into different grades of overweight and thinness using the criteria given by **WHO (2002).**

Classification given by **Willet et al. (1999)** has been used for waist-hip-ratio. Blood pressure was measured twice with a standard mercury manometer with the participant seated, and was used for the second measurement. Prevalence of hypertension was calculated with the help of criteria given by **WHO/ISH (1999).**

RESULTS AND DISCUSSION

Mean and standard deviation of anthropometric measures and blood pressure are presented in Table 1.Mean values for Height (cm), Body Weight (Kg), Waist Circumference, Hip circumference, Systolic and Diastolic Blood Pressure (mmHg), BMI and WHR for the subjects were 154.28 ± 6.28 cm, 60.72 ± 12.45 kg, 88.87±11.4 cm, 89.05 ± 11.08 cm, 132.49 ± 16.67mmHg , 86.39 ± 10.48 mm Hg, 25.46 ± 4.7kg/m^2, 0.99 ± 0.03, respectively.

Table 1: Mean and standard deviation (S.D.) of anthropometric parameters and blood pressure in Punjabi rural women.

Parameters	Women (n=300)	
	Mean	SD
Height (cm)	154.28	6.28
Weight (kg)	60.72	12.45
Waist Circumference (cm)	88.87	11.4
Hip Circumference (cm)	89.05	11.08
Systolic Blood Pressure (mmHg)	132.49	16.67
Diastolic Blood Pressure (mmHg)	86.39	10.48
BMI (kg/m^2)	25.46	4.7
WHR	0.99	0.03

The pattern of body fat distribution is a more important determinant of disease risk. Regional adiposity measures have been proposed as alternatives to the measurement of body mass index for diagnosing the persons at risk of developing future diseases and is further recommended an index of obesity by World Health Organization. Many researches had shown that regional distribution of body fat in abdominal area has significant relation with cardiovascular risk factors independent of total adiposity **(Despres et al. 1990; Terry et al. 1991)** but others have shown the opposite effects **(Folsom et al. 2000; Taylor et al. 2010).**

BMI classifications of the subjects are shown in Table 2. About 28.66 per cent of the total women lie under the normal range of the BMI (18.5-22.99), 3.33 per cent of women having BMI values lower than the normal range (16–18.49) and 50.33 per cent lies under the grade-1-overweight and 17 per cent under the grade-2-overweight but only 0.66 percent lies under grade -3-overweight. According to BMI classification, the women having BMI values more than the normal range is under the risk of developing obesity, diabetes, hyperlipidemia etc. The present study has shown that a high percentage of the individuals in the present study are obese. Based on BMI, it can be concluded that general obesity is quite prevalent. Many studies had shown BMI a well known associate of BP and hypertension. **Dom et al.** (1997) had shown that BMI is strongly related to cardiovascular diseases in his 29 year follow up study on residents of Buffalo, New York in 1960. Similarly many other studies had shown that risk of type 2 diabetes , coronary artery disease and all cause mortality repeatedly increases in proportion to increase in BMI **(Manson et al. 1987; Seidell et al. 1996; Lindsted 1991; Hubert et al. 1983)**

Table 2: BMI classification using WHO (2002) criteria.

Body Mass Index (BMI)	**Grade**	**(n=300)**
<16	Grade-3-Thinness	3 (1%)
16-16.99	Grade-2-Thinness	1(0.33%)
17-18.49	Grade-1-Thinness	6(2%)
18.5-22.99	NORMAL	86(28.66%)
23-29.99	Grade-1-Overweight	151(50.33%)
30-39.99	Grade-2-Overweight	51(17%)
≥40	Grade-3-Overweight	2(0.66%)

Waist hip ratio is widely used anthropometric measure for calculating body fat distribution and is used as indicator of abdominal obesity in many population studies. Higher values of WHR are associated with increased visceral fat accumulation which may underlie adverse metabolic profile associated with obesity **(Bjorntorp, 1990).** It has been significantly correlated with CVD and related mortality in Swedish women **(Lapidus and Bengtsson, 1988).** The results of WHR classification are shown in Table 3. As many as 10.33 per cent of the women have the WHR of ≤ 0.95, 42.66 per cent of women have the WHR between 0.96-0.99 and 47 per cent of the population have the WHR more than or equal to 1. It indicates that he present population is at a higher risk for adverse health consequences such as metabolic disturbances including dyslipidaemia, hypertension, diabetes, cardiovascular diseases, hyper-insulinaemia etc. **Rexrode et al. (1998)** had shown that WHR is significantly associated with cardiac heart disease in women. At least one large cohort study showed 60% greater relative risk of death in women with more centralized pattern of fat distribution **(Folsom et al. 1993). Perry et al. (1998)** had shown that women had an increased likelihood of elevated levels of VLDL cholesterol, DBP, CVD risk factors and an increased risk of having low concentrations of HDL at a WHR≥0.90.

Table 3: WHR classification (Willet et al. 1999)

Waist-Hip-Ratio (WHR)	(n=300)	Percentage
0.95	31	10.33%
0.96-0.99	128	42.66%
≥1.00	141	47%

Table 4: WHO/ISH classification of blood pressure levels

Category	Systolic Blood Pressure(SBP)	Diastolic Blood Pressure(DBP)	(n=300)
Optimal	<120	<80	31(10.33%)
Normal	<130	<85	136(45.33%)
High Normal	130-139	85-89	51(17%)
Grade-1-Hypertension	140-159	90-99	48(16%)
Grade-2-Hypertension	160-179	100-109	12(4%)
Grade-3-Hypertension	≥180	≥110	9(3%)
Isolated Systolic Hypertension	≥140	<90	13(4.33%)

It can also be concluded that blood pressure levels are related to adiposity (both general and abdominal). Such inferences have also been drawn up in other similar studies both in India and abroad **(Deshmukh et al. 2006; Ghosh and Bandyopadhyay 2007; Gupta et al. 2007; Kotchen et al. 2008).** Adiposity shows positive correlation with hypertension **(Novotny et al. 1998).** Prevalence of hypertension is depicted in the Table 4. A total of 45.33 per cent women showed normal values of blood pressure, 10.33 per cent women having blood pressure under optimal category. 44.33 per cent of the women are under various grades of hypertension. Out of total sample size, 13 cases of isolated hypertension were observed. The relationship of BP to cardiovascular mortality has been found to be similar among different countries, continuous and linear, even at the lower range of BP, i.e., below the cut-off points (140/90 or 160/95 mmHg) generally used to define hypertension **(Van den Hoogen et al.2000).** Significant associations between BMI and BP have also been documented in various populations **(Hu et al. 2000).** Significant correlation of BMI to SBP and DBP, in men and women, was reported by studies in Tanzania and Nigeria (**Kadiri et al. 1999; Njelekela et al. 2001**). The present study shows relation between BMI, WHR and Blood Pressure. This relation bears great significance, given the fact that all these parameters have a prime role to play in the estimation of cardiovascular risk. These findings are in good agreement with other studies, supporting a stable relationship between body mass and abdominal adiposity with blood pressure **(Kaufman et al. 1996; Reddy et al. 1997).**

In a nutshell, Punjabi rural women have high prevalence of obesity. Body mass index and WHR have correlations with DBP and SBP. Both these anthropometric measures seem to have strong influences on blood pressure and hypertension.

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