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Original Research Article

ANTHROPOMETRIC INDICATORS AS PREDICTORS OF HIGH BLOOD PRESSURE IN YOUNG FEMALES OF NORTH INDIA

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ABSTRACT

This study was undertaken to find out correlation of anthropometric measurements with blood pressure and to find out effectiveness of anthropometric indicators as predictor's of high blood pressure. Study group included 1200 young unmarried females in age group of 18-35 years residing in Haryana and Punjab region. Information was obtained about diet and physical activity of the subjects. A positive correlation of weight, BMI, WC, WHR and WHtR with SBP and DBP was observed and it was found to be highly significant. Deranged anthropometric parameters were observed with high fat intake and sedentary life style. BMI came out to be better predictor of blood pressure among females of Punjab and Haryana region.

KEY WORDS: Anthropometric Measurements, Blood Pressure, Obesity.

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INTRODUCTION

The application of simple anthropometry to identify relationships between body composition and health risk in clinical practice is no less valuable than the use of advanced technologies to gain insight into the mechanistic links between body composition and disease in the laboratory. Despite the modern techniques, anthropometric measurements such as height, weight, body mass index (BMI) and waist-hip circumference ratio (WHR) etc. are traditionally important methods to study the genetic structure and prediction of risk factors of many complex diseases in human health [1].

Obesity is prevalent among all age groups and is on the rise among adults especially the women worldwide in both developed and developing countries [2]. As individuals from both developed and developing countries consume more and more quantities of high energy food and have less physical activity, the number of overweight and obese individuals increased to epidemic proportions. Obesity has a potential detrimental effect on blood pressure and increases cardiovascular events [3]. The prevalence of obesity is increasing both in developed and developing countries. The National family health survey (NFHS-2) shows that 9% women in Delhi are obese and another 25% are overweight, which is highest among all the states in country. Punjab comes close to Delhi with 21.1% overweight and 9.1% obese women. Haryana ranks third in north India with 12.3% overweight

and 3.9% obese women. These three north Indian states, all together comprise 18.5% overweight and 7.2% obese women [4].

Body mass index (BMI), as an indicator of obesity, has been found to be consistently associated with increased risk of hypertension [5]. Excess intra-abdominal fat is associated with greater risk of obesity-related morbidity than is overall adiposity [6]. Thus measurement of waist circumference and waist-hip ratio (WHR) have been viewed as alternatives to BMI, with both measures regularly used in the clinical and research settings. Waist circumference has been shown to be the best simple measure of both intra-abdominal fat mass and total fat [7]. A number of cut- off points to differentiate between, obese, overweight and underweight have been proposed but WHO has opined that lower cut- off points than currently recommended should be used in some populations, especially in Asia, this is attributed to body fat distribution. Asian Indians tend to have more visceral adipose tissue despite having lean BMI [8]. Being overweight is associated with two to six-fold increase in the risk of developing hypertension [9] Hypertension is an important risk factor for cardiovascular disease (CVD) and has become a major global burden on public health [10]. Obesity and weight gain have been identified as the most important determinants of hypertension [11.

Hypertension is a major health problem in India, though its prevalence varies from population to population. Factors like high salt intake, heavy consumption of alcohol, obesity, lack of exercise are the important environmental factors that increase risk of developing hypertension [12].

Rapid urbanization, life style modification, demanding and stressful employment, sedentary life style and low rates of physical activity have increased the risk of obesity and hypertension in females. Therefore it has become very important to screen the population at risk at an early age so as to apply preventive strategies. Therefore this study has been taken up among females of Haryana and Punjab to study the correlation of anthropometric measurements with blood pressure and to find out effectiveness of anthropometric indicators as related to different grades of blood pressure.

MATERIALS AND METHODS

The present study was done on 1200 young adult unmarried females of age group 18-40 years belonging to Haryana and Punjab region. Prior informed consent for this study was obtained from subjects, in writing both in English & Vernacular. Females who were wheel chair bound or had difficulty in standing were excluded from the study. The subjects already diagnosed having heart disease, chronic diseases of the major organs and endocrine disorders were excluded from the study.

Anthropometric Measurements: Height (m): measurement of maximum distance from floor to the highest point on head, when the subject is facing directly ahead. Weight (kg) of subject was taken on calibrated weighing scale with minimum body movements. Pulse rate: (PR) was felt on radial artery at wrist for 1 min. 4. Blood pressure (mmHg): measured with a sphygmomanometer and stethoscope. The individual was made comfortable and sit at least for 5 minutes in the chair before measurement. Two readings were taken 5min apart and if B.P was high another reading taken half an hour apart and the average of three readings taken as blood pressure.5. Waist circumference (cm) was taken at the level midway between the lower rib margin and iliac crest with the tape all around the body in horizontal position.6. Hip circumference (cm) was taken over minimal clothing, at the level of greatest protrusion of gluteal (buttocks) muscles. The subject stands erect with weight evenly distributed on both the feet with legs slightly parted. Two consecutive recordings of both Waist circumference and Hip circumference was taken and the mean of two sets of values was used. After taking all parameters following indices like BMI, WHR & WHtR were derived from the measurements taken.

Statistical Analysis:

All the recorded data was entered in the Microsoft Office Excel Worksheet to create the "Master Chart". For Statistical analysis, the data was imported in the SPSS 16 statistical software and was analysed for descriptive frequencies of all the variables. Then the correlates of anthropometric parameters and systolic blood pressure

and diastolic blood pressure were analysed to look for any statistical significant association among them.

Table 1: General features of study population punjab / Haryana.

Variables	Punjab (n-600)	Haryana (n-600)
Age	20.42 ± 2.42**	19.94 ± 1.93
Height (m)	1.59 ± 0.05	1.59 ± 0.05
Weight (kg)	54.03 ± 10.01	53.58 ± 9.95
Pulse rate (min)	74.03 ± 4.11**	73.45 ± 3.29
SBP	119.0 ± 8.28	119.18 ± 8.36
DBP	79.85 ± 5.66**	78.94 ± 4.66
BMI	21.36 ± 3.96	21.19 ± 3.89
WC	70.18 ± 9.08**	68.90 ± 8.79
WHR	0.75 ± 0.05	0.75 ± 0.05
WHtR	0.44 ± 0.05*	0.43 ± 0.05

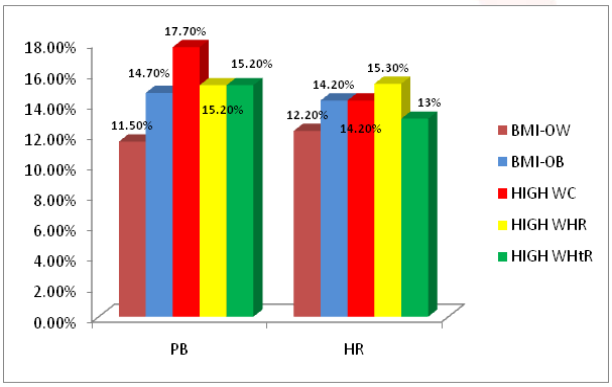
** P Value significant at 0.01 level, * P Value significant at 0.05 level

Table 2: Prevalence of overweight and obese subjects punjab & Haryana.

	Overweight & obese		P Value
	Number	Percentage	
Punjab (N=600)	157	26.16	NS
Haryana (N=600)	158	26.33	NS

Prevalence of dearranged anthropometric parameters in study population: 11- 18 % female subjects of Punjab and 12- 16% Haryanvi females showed deranged anthropometric parameters (Fig. 1)

Fig. 1: Deranged anthopometric parameters in punjab and Haryana.



Prevalence of prehypertension and hypertension in study population: Prevalence of prehypertension was found to be more in Haryanvi females while female subjects of Punjab had more prevalence of hypertension (Fig. 2).

Fig. 2: Prevalence of prehypertension and hypertension in punjab and Haryana.

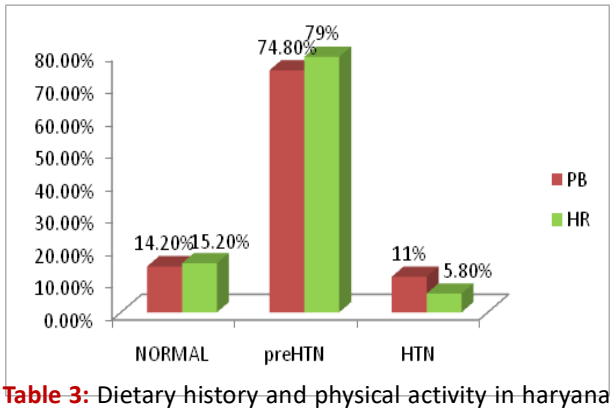


Table 3: Dietary history and physical activity in haryana and punjab.

	Punjab (N-600)	Haryana (N-600)
Non-vegeterian diet	144 (24%)	73 (12.2%)
High fat intake	372 (62%)	290 (48.3%)
High salt intake	222 (37%)	187 (31.2%)
Sedentary life style	147 (24.5%)	206 (34.3%)

Table 4: Correlation of anthropometric variables with blood pressure in females of punjab and Haryana.

Variables	SBP		DBP	
	Punjab	Haryana	Punjab	Haryana
Weight	.193**	.138*	.154**	.164**
BMI	.247**	0.113	.194**	.172**
WC	.140*	.132*	.200**	.142*
WHR	.145*	.135*	.146*	0.035
WHtR	.172**	0.113	.216**	.144*

A positive correlation of weight, BMI, WC, WHR and WHtR with SBP & DBP was observed in study population and it was found to be significant. There was a strong positive correlation between blood pressure and weight, BMI &, WHtR in Punjabi females while only DBP has strong positive correlation with weight and BMI Haryanvi females (Table 4).

Regression analysis of obesity measures with blood pressure

Table 5: Dependent variable systolic blood pressure (SBP).

Groups	Predictors	β	R^2	Significance
Punjab	BMI	0.687	0.108	0.001
Haryana	BMI	0.266	0.015	0.002

Table 6: Dependent variable diastolic blood pressure (DBP).

Groups	Predictors	β	R^2	Significance
Punjab	WC	0.223	0.127	0.001
Haryana	BMI	0.278	0.054	0.001

In the present study population BMI is a better predictors of blood pressure for females of both Punjab and Haryana. (Table 5& 6).

DISCUSSION AND CONCLUSION

Obesity is prevalent among all age groups and is on rise among adults especially, women both in developed and developing countries. Obesity results from interaction of genes and lifestyle. Obesity and overweight has a potential detrimental effect on blood pressure. Anthropometry is a simple non-invasive method that study relationship between body composition and health risk. As prevalence of obesity is increasing both in developed and developing countries and it is found to be highest among the north Indian states of India[1]. Present study is thus taken to find out prevalence of obesity and hypertension especially in young population, so as to suggest preventive strategies for health care at early age.

Table 7: Comparison of parameters of central obesity with other studies.

Study	Study group	Age group	WC	WHR	WHtR
Present study (n-1200), 2012	Punjab	18-40yrs	70.18±9.08	0.75±0.05	0.44±0.05
	Haryana	18-40yrs	68.90±8.79	0.75±0.05	0.43±0.05
Badruddoza et al. (N-300), 2010	Sikh	20-26yrs	71.11±8.06	0.76±0.05	-
	Hindu	20-26yrs	70.95±7.70	0.76±0.05	-
Deshmukh et al (N-2746), 2006	Rural Population	18 yrs. & above	65.3±16.6	0.77±0.12	0.43±0.12

A total of 1200 young unmarried females in the age group of 18-40 yrs were chosen for the study belonging to states of Punjab and Haryana. As per BMI overweight and obesity was found in 26% of our study population, no significant difference seen between females belonging to Punjab and Haryana region (Table 2). Study done on college going females of Amritsar district in Punjab reported prevalence of over- weight and obesity to be 43.2% [13]. However Deshmukh et al. in a study done in young females of rural Wardha reported the prevalence of overweight and obesity to be 5.1% and 6.5% respectively. The prevalence of overweight and obesity is much less in present study as compared to a study done in Jain females in Delhi (overweight 43.8% and obese 18.8%) [14]. This difference could probably be because of difference in age range of study population. The present study included only unmarried females of age ranging 18-40yrs to exclude pregnancy related weight gain while age was ranging between 30-60yrs in above mentioned study.

11- 18 % of female subjects of Punjab and 12-16 % Haryana females showed deranged anthropometric parameters of both general and regional obesity but the difference is not statistically significant (Fig. 1).

Average WC, WHR and WHtR are corresponding with those reported by Badrddoza et al[15] but there is significance difference (p=0.0001) in all parameters of central obesity in a study done on rural females of Wardha [16], this difference is probably because of the large variability of age (average age in present study 20yrs and Deshmukh et al 18yrs and above).

In present study prehypertension was seen to be on higher side in both regions, significantly higher in Haryanvi females (p<0.001) but Hypertension was significantly higher in Punjabi females (Fig2). Study done on adult Jain females of Delhi reported prehypertension 37.5% (SBP) and 18.8% (DBP), Hypertension 35.4%(SBP) and 18.8% (DBP), the reason could be higher age group of Jain population due to which more females had fallen into category of Hypertension[14] where as in our study alarming percentage of prehypertension is seen indication faulty lifestyle as culprit.

A positive correlation was observed between blood pressure and anthropometric parameters and their derived indices (Table 4).

Significant number of Punjabis were found to be non-vegetarians (p<0.001) with high fat and salt intake in diet while sedentary lifestyle was higher in Haryanvi females (p<0,001) (Table 3) Significant correlation of sedentary life style with blood pressure was found in study done on three different groups of females (bishnoi, sikh, and Hindu) belonging to Punjab and Rajasthan region .However no correlation was found between diet and blood pressure [17].

In the present study it was found that BMI was a better predictor of blood pressure among females of Haryana and BMI and WC were better predictors of blood pressure in Punjabi females. (Table 5&6). Badarudoza et al indicated in their study on Punjabi sikh and Hindu females that BMI and WHR would be the good predictor for the chronic diseases like hypertension [15].

Study done in rural Wardha reported BMI and WC to be very important predictor of hypertension [16]. Study done in Rural and Urban Jat females of Haryana have shown that WC and BMI as important predictors of hypertension in urban females and BMI in case of Rural Jat females [18].

The young female population of our study had shown high salt and fat intake with sedentary life style leading to derangement of anthropometric parameters and their derived indices. So lifestyle modification can be proposed as preventive strategy in the form of increased exercise and low salt and fat intake starting at an early age.

Conflicts of Interests: None

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