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A Comparative Study of Anthropometric Characteristics and Blood Pressure between Pre and Post – Menopausal Women in Poor Urban Area, Goyala Vihar, Delhi

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ABSTRACT

Background - Hypertension is a frequently encountered multifactorial disorder and its prevalence is reported to increase in postmenopausal females. Cardiovascular disease is the leading cause of death in women. Furthermore, there is evidence that hormonal changes also leads to anthropometric changes associated with hypertension.

Aim – To compare the anthropometric measures and blood pressure of pre and post- menopausal women and find the association between anthropometric measures and hypertension.

Methodology – A comparative study was conducted on 50 pre and 50 post-menopausal women. The sampling method was purposive sampling and conducted in Goyala Vihar of Delhi. The door to door survey was conducted and data was collected using kobo tool. The measurements of BP, weight, height, hip and waist circumference was done following the protocols. The data was analysed using SPSS software.

Result and conclusion – The result was significant for all variables (Age, Wt, BMI, HC, WC, WHR and BAI) except Ht. Independent T test was used to compare. Correlation and regression depicted that age is the predictor for diastolic blood pressure in pre- menopausal women and for post- menopausal women age, Ht, Wt, BMI, WC and HC are predictor of diastolic blood pressure. Women in post-menopausal stage were at high risk of HTN compared to pre-menopausal women.

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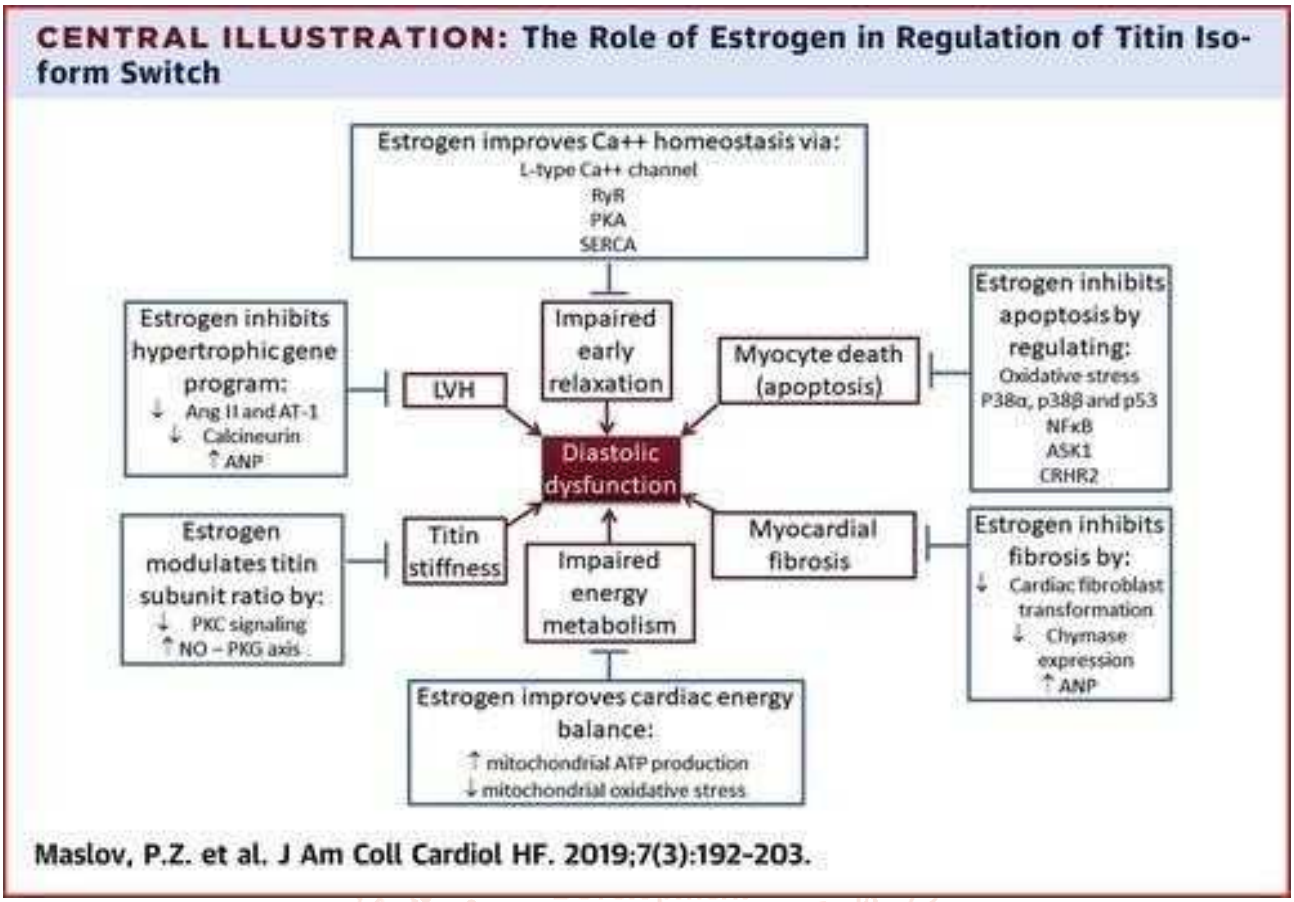
KEYWORDS: *Anthropometric measures, HTN, pre-menopausal women and post- menopausal women*

INTRODUCTION

Hypertension is a common but dangerous condition. High blood pressure increases risk for heart disease, stroke, kidney disease, cancer, osteoporosis and dementia. As per National Family Health Survey-4, 2015-16, prevalence of hypertension for men and women are 14.8% and 11% respectively but many (46%) are unaware they have it because there are no warning signs, which is why it's called the " silent killer"[1]. WHO provides alarming data which says 2/3rd of these cases are in low and middle income country which make difficult to achieve the Global target of reducing the prevalence by 33% between 2010 and 2030 with poor health infrastructure[2] .The prevalence and severity of hypertension rise markedly with age, and blood pressure control becomes more difficult with aging in both genders, particularly in women. In addition, there are forms of hypertension that occur exclusively in women, e.g., hypertension related to menopause, oral contraceptive use, or pregnancy (e.g., chronic hypertension, gestational hypertension, pre-eclampsia or eclampsia)[3]. A women in her lifetime pass through many biological changes specifically in pre and post-menopausal stage. Cardio protective effect on premenopausal women is believed to be imposed by adequacy of endogenous estrogen level produced during menstrual cycle. This could be the possible reason for declined rate of coronary heart disease in fertile women than men. However, by the end of reproductive life ovaries fail to produce significant amount of estrogen instigating postmenopausal women more prone to disease associated with estrogen deficiency like heart diseases (atherosclerosis), osteoporosis, and dyslipidemia[4]. Estrogens have been shown to be antioxidative and to

modulate both vasoconstrictor and vasodilator systems. For example, estradiol is known to increase NO synthase synthesis and activity and to reduce expression of the angiotensin (Ang) type 1 receptor (AT1R). Therefore, loss of estrogen production with menopause should be associated with increases in oxidative stress mediated by the renin–Ang system (RAS) because of increased expression of AT1Rs[5].

POISSON'S EQUATION (R)=
8 Π L /n r^4(atherosclerosis and HTN)



Obesity is a well-established risk factor of atherosclerosis and cardiovascular events. However, a generalized obesity index such as body mass index (BMI) cannot fully reflect the risk of obesity-related metabolic complications. Instead, waist circumference (WC) and waist-to-hip ratio (WHR) are widely used, because anthropometric measures of abdominal obesity appear to be more strongly associated with metabolic risk factors[6]. The body mass index is commonly used as an index to assess the degree of body fat and various studies shown that with normal body BMI with increased waist hip ratio have two fold increases in cardiovascular dysfunction. WHR is a better predictor to assess the risk of development of CVD in women compared to BMI. The measurement of WHR, BP is easy and aid as non-invasive and effective tool to assess the health status of women[7]. Hence the purpose of this study is to establish the relationship of BMI, WHR and BP and to identify their effectiveness to screen the postmenopausal women.

NEED FOR STUDY

1. Post – menopausal guidance, knowledge and awareness is less among common population and the needs are generally ignored.
2. Status of women in Indian society is among vulnerable population and are liability as considered whether in pre or post- menopausal phase.
3. To understand and assess health needs of post-menopausal clinics and HRT.

OBJECTIVES

➢ GENERAL OBJECTIVES:

1. To compare the anthropometric and blood pressure results of pre and post-menopausal women in Goyala Vihar, Delhi.

➢ SPECIFIC OBJECTIVES:

1. To compare the findings of pre and post-menopausal women.
2. To check the association of anthropometric measure with blood pressure of pre and post-menopausal women.

RESEARCH QUESTION

Is there high risk of hypertension among post-menopausal women along with anthropometric changes compared to pre-menopausal women of urban poor area Goyala Vihar, Delhi?

METHODOLOGY

Study Design: A comparative study, quantitative study.

Study Area and Study Population: Study was conducted in collaboration with urban primary health centre (UPHC) covered under National Urban Health Mission and undertaken in the community served by ASHAs PSU 1 under Ms. Kavita Sharma (approximately 500 households) in southwest region of Delhi.

Sampling Technique: Purposive sampling technique was carried out for the study on the basis of feasibility and accessibility in order to collect maximum information from the participants.

Eligibility Criteria:

Inclusion Criteria: The women who gave consent from street no. 3,4B,4C,5A,6 above 25yrs.

Exclusion Criteria: The women of dairy were excluded along with the one in lactating or pregnant stage. Women undergoing issues related to regular menstrual cycle. Also resident of street no. 1,2, 4A, 4D and 5B.

Sample size: 100 women, 50 pre and 50 postmenopausal women**. Study Duration**: 20 days of door to door field visit.

Method of Data collection and Analysis:

1. Household data and individual data were collected and entered in a Kobo Collect android application, containing a structured questionnaire (11 household questions, 98 individual questions).
2. The questionnaire included close-ended questions related to demographic details, diet, stress, physical activity, alcohol and tobacco details along with this measurements were taken considering the guidelines by WHO.
3. The data was analysed using independent t test, Pearson's correlation and regression on both groups.

ANTHROPOMETRIC MEASUREMENTS TAKEN WERE:

1. Blood pressure measured using digital apparatus in sitting and relaxed position. Three readings were taken and average was calculated.

	SBP	DBP
Normotensive	<140	<90
Mild-HTN	140-180	90-105
Borderline HTN	140-160	90-95
Moderate To Severe HTN	>180	>105
Isolated Systolic HTN	>140	<90

2. BMI (B0dy-mass Index) = weight in kg/ height in m^2

BMI INTERPRETATION

<18.4 underweight

18.5–24.9 normAL

25–29.9 overweight

>30 obese

3. WAIST HIP RATIO = waist circumference at naval level in cm/hip circumference in cm

MALE	FEMALE	RISK LEVEL
<0.95	<0.80	LOW
0.95–1	0.80–0	
>1		

4. BASAL ADIPOSITY INDEX = [hip circumference (cm) ÷ height (m) $^{1.5}$] – 18
5. MEAN ARTERIAL PRESSURE= MAP = DP + 1/3(SP – DP)

The readings were recorded as per WHO guidelines. The data was analysed using SPSS software.

REVIEW OF LITERATURE

1. (Chalwe JM et al, 2021)[8] This study was conducted in Twatasha Compound of Kitwe and Ndeke Community of Ndola. Blood pressure (BP), weight, height and dietary intakes (24-h recall) were measured in 153 women (> 50 years) from households. The South African Hypertension Society (SAHS), the World Health Organization (WHO) and estimated average requirements (EARs) guidelines were followed for HT, obesity and dietary intake definitions, respectively. Statistical Package for the Social Sciences (SPSS) version 26 was used for descriptive and inferential statistical analyses. Prevalence of HT was 70%, whilst 37.25% and 28.10% of the participants were overweight and obese, respectively. The median interquartile range (IQR) dietary intakes showed inadequate intakes for most nutrients, except for carbohydrates (170 g [133; 225]). The total fat intake represented 14% of total energy intake. All median fatty acid intakes and sodium intakes (409 mg [169; 662]) were below the recommended levels. Only body mass index (BMI) correlated with HT ($r = 0.268$; $p = 0.001$).
2. (Liu S etal, 2018)[9] A case-control design, clinical and laboratory data were collected. Conditional logistic regression with stratified analysis was conducted to identify the association between GPER and hypertension. The GPER level was significantly lower in the case group than in the control group (126.3 ± 21.6 vs. 133.6 ± 27.3, P=0.000). The GPER levels of the hypertension cases with and those without menopause were significant (120.5 ± 11.8 and 127.2 ± 12.1,

P=0.000). No significant difference in the GPER level between the controls with and those without menopause was observed (P=0.241). Logistic regression revealed that the GPER quartile was related to hypertension (odds ratio [OR]: 0.63, 95% confidence interval [CI]: 0.13-0.93, P=0.018) after adjusting for potential confounding factors. Stratified analysis revealed that the GPER quartile was not associated with hypertension in premenopausal women, and the fourth GPER quartile showed a predictive association with hypertension (OR: 0.43, 95% CI: 0.29-0.90) in menopausal women.

3. (Muchanga m et al, 2016)[10] The study aimed to assess the prevalence of prehypertension and its associated factors in a population of Congolese pre and postmenopausal women. We had consecutively recruited 200 women (100 premenopausal and 100 postmenopausal) aged 40 - 60 years at the department of Gynecology and Obstetrics, University of Kinshasa Hospital, and AKRAM Medical Center in Kinshasa, DRC. An interview was carried out using a questionnaire that comprised questions related to lifestyle, menses characteristics, medical history of diabetes, CVD, hypertension, current antihypertensive medication and use of traditional medicine. In addition, physical examination and biological measurements were performed. Multivariate logistic regression analysis was used to assess associated factors with prehypertension. Of the participants, 34% were normotensive, 38.5 % prehypertensive and 27.5% hypertensive. Compared to normal blood pressure, prehypertension was common in the older (age>50 years of age) women. Menopause, the use of traditional medicine and older age were associated with prehypertension. However, only menopause (aOR: 2.71; 95%CI: 1.10-3.52) and the use of traditional medicine (aOR: 2.24; 95% CI: 1.07-4.7) remained associated with prehypertension in a multivariate logistic regression analysis.

4. (Garauet et al,2002)[11]The association of systolic and diastolic blood pressure with body mass index, waist hip ratio, the sum of three trunk skinfolds, the sum of the six skinfolds, the ratio of the sum of the trunk to the sum of the extremity skinfolds and relative fat pattern index and the correlations between each of these were examined among 30 hypertensive and 30 normotensive post-menopausal women of Udaipur city. Anthropometric measurements and indices like weight, height, WHR, abdominal obesity, body mass index were higher in hypertensive women. Adiposity measures had consistant relationship with blood pressure. The correlation coefficients of the adiposity measure and blood pressure are intercorrelated with a few exceptions in both groups.

5. (Warsy A et al, 2012)[12] This study was carried out to identify the nature of correlation between anthropometric measures and hypertension in pre- and post-menopausal Saudi females. The study group comprised of 126 females (18 to 75 years), grouped as premenopausal (94) and postmenopausal (32). The body mass index (BMI), waist/hip ratio and hip circumference were significantly lower ($p<0.001$) in the premenopausal females (27.015.45 Kg/m2, 0.770.06, 81.3812.4 cm, respectively) compared to their postmenopausal counterpart (29.853.63 Kg/m2, 0.870.07 and 96.77.2 cm, respectively), though the weight and waist circumference did not differ significantly. The systolic blood pressure (bp) range (mean ±2SD) was 111.111.42 mm/Hg in the premenopausal and 124.7218.98 mm/Hg in postmenopausal females ($p<0.001$), while the diastolic bp range was 72.310.10 mm/Hg and 74.6611.35 mm/Hg in the two groups, respectively ($p>0.05$). Prevalence of abnormality of systolic and diastolic bp was significantly higher in the postmenopausal females (37.5 % and 28.13 %, respectively), compared to 4.3 % and 7.4 % in the premenopausal group. Both BMI and waist/hip ratio showed a significant and positive correlation with systolic and diastolic blood pressure ($p< 0.001$). It was concluded that the both systolic and diastolic blood pressure are higher in the postmenopausal Saudi females.

6. (Hernández-Ono et al,2002)[13] A cross-sectional population-based random sample study. Ninety-eight postmenopausal women (age 50–65 y). Visceral and subcutaneous fat areas by computer axial tomography, anthropometry, lipid profile, fasting glucose and insulin, diet, physical activity, smoking status and alcohol intake. Compared to women with low VAT, women with high VAT (>117.8 cm^2) had a less favorable metabolic profile with significantly higher fasting glucose (120±50 *vs* 98±39), insulin (7.9±10 *vs* 5±8), triglycerides (172±69 *vs* 127±72), apolipoprotein B (119±24 *vs* 98±32) and significantly lower HDL-C (38±10 *vs* 46±14) values in the whole sample (n=98). A similar profile was found in women without diabetes and hypertension (n=39). In multiple regression models, VAT explained a portion of the variance of TG (6.2%) in the entire sample and of total cholesterol (12.4%), LDL-C

(15.8%), triglycerides (16.3%), apolipoprotein B (11.6%), and fasting glucose (28.4%) in the group of non-diabetic or hypertensive women. Our VAT cut-off point of 117.8 cm^2 corresponded to a waist circumference of 84 cm.

7. (Kaur N et al,2010)[14] Different anthropometric measurements such as body mass index (BMI), waist to hip ratio (WHR), waist and hip circumferences (WC and HC) and skin fold thickness are the important indicator to investigate the risk factors for cardiovascular diseases. Therefore, this cross-sectional study was undertaken to assess the interrelationship between blood pressures with body mass index (BMI), waist to hip ratio (WHR) and subcutaneous fat. Three hundred university-going Punjabi Sikh and Hindu females were surveyed for blood pressures, pulse rate, height, weight, waist and hip circumferences, four skin folds (biceps, triceps, subscapular and suprailiac). All these measurements were taken from each subject using standard procedure. The relation between blood pressure and different anthropometric variables were assessed in multiple regression models. No significant differences of all the measured mean values of the traits have found between these two groups. However, further analysis of the data showed that BMI, WHR and skin folds measurements have significant ($p< 0.05$) effect on blood pressure phenotypes. The results of the present cross-sectional study indicated that BMI and WHR would be the good predictors for the chronic disease like hypertension. Primarily among female WHR should be used as a good predictor for elevated blood pressure.

8. (Deibert, P et al,2007)[15] The present study examines changes in body weight, fat mass, metabolic and hormonal parameters in overweight and obese pre- and postmenopausal women who participated in a weight loss intervention. Seventy-two subjects were included in the analysis of this single arm study (premenopausal: 22 women, age 43.7 ± 6.4 years, BMI 31.0 ± 2.4 kg/m^2; postmenopausal: 50 women, age 58.2 ± 5.1 years, BMI 32.9 ± 3.7 kg/m^2). Weight reduction was achieved by the use of a meal replacement and fat-reduced diet. In addition, from week 6 to 24 participants attended a guided exercise program. Body composition was analyzed with the Bod Pod®. Blood pressures were taken at every visit and blood was collected at baseline and closeout of the study to evaluate lipids, insulin, cortisol and leptin levels. BMI, fat mass, waist circumference, systolic blood pressure, triglycerides, glucose, leptin and cortisol were higher in the postmenopausal women at baseline. Both groups achieved a substantial and comparable weight loss (pre- vs. postmenopausal: 6.7 ± 4.9 vs 6.7 ± 4.4 kg; n.s.). However, in contrast to premenopausal women, weight loss in postmenopausal women was exclusively due to a reduction of fat mass (-5.3 ± 5.1 vs -6.6 ± 4.1 kg; $p < 0.01$). In premenopausal women 21% of weight loss was attributed to a reduction in lean body mass. Blood pressure, triglycerides, HDL-cholesterol, and glucose improved significantly only in postmenopausal women whereas total cholesterol and LDL-cholesterol were lowered significantly in both groups

9. (Esmaillzadeh et al, 2006)[16]This study was conducted on 5073 women aged 18–74 years, participants of the Tehran Lipid and Glucose Study. Demographic data were collected. Anthropometric indices were measured according to standard protocols. Mean (±standard deviation) age of women was 39.9 ± 14.6 years; mean BMI, WC, WHR and WHtR were 27.1 ± 1.5 kg m–2, 86.5 ± 13.5 cm and 0.83 ± 0.08 and 0.55 ± 0.08, respectively. Of the four anthropometric measures, WC had the highest sensitivity and specificity to identify subjects with risk factors in both the 18–39 year and the 40–74 year age categories. WC was seen to have a higher percentage of correct prediction than BMI, WHR and WHR.

DATA ANALYSIS AND INTERPRETATION

OBJECTIVE 1. To compare the blood pressure and other anthropometric measurements of pre and post-menopausal women of Goyala Vihar, Delhi (table 1).

	PRE-MENOPAUSAL WOMEN		POST-MENOPAUSAL WOMEN					
VARIABLE	(Mean ± SD)	SEM	(Mean ± SD)	SEM	T Stat	P value	T critical	S/NS
Age (yrs)	34.58± 5.904305	0.14199	59.4 ± 7.90763	0.1451	-17.7838	2.30E-03	1.98637	S
Ht (cm)	153.92± 4.91495	0.062	151.56 ± 7.0628	0.081134	1.939373	0.065	1.987608	NS
Wt (kg)	58.8± 8.905	0.1856	63.228 ± 12.05383	0.21438	-2.08448	0.0399	1.986675	S
BMI (kg/m	24.87± 3.91	0.117	27.45757 ± 4.608759	0.124385	-3.02336	0.00320	1.984984	S
WC (cm)	87.0196± 12.29155	0.1863	93.5576 ± 9.667703	0.141351	-2.95634	0.00394	1.985802	S
HC (cm)	100.7224± 9.61881	0.1355	103.1096 ± 9.229634	0.128543	-1.26625	0.20842	1.984467	S
WHR	0.862451± 0.0714	0.01	0.907941 ± 0.0606633	0.008999	-3.39713	0.00096	1.985251	S
SBP	115.06± 13.30706	0.175443	139.38 ± 21.75643	0.260617	-6.57799	4.73E-09	1.99045	S
DBP	78.54± 9.1410	0.145871	84.44 ± 10.59295	0.163026	-2.98173	0.00363	1.984984	S
MAP	90.7133± 10.0222	0.148814	102.7533 ± 12.56255	0.175265	-5.11676	1.69E-06	1.986086	S
BAI	34.82639± 5.405919	0.1295	37.44771 ± 5.942969	0.137343	-2.30718	0.02317	1.984723	S

TABLE 1- Descriptive statistics for different characteristics of 50 pre and 50 post-menopausal women of urban poor area Goyala Vihar, Delhi.

Table 1 is the data analysed using independent T test, shows standard deviation and comparison of different measurements (age, Ht, Wt, BMI, WC, HC, WHR, SBP, DBP &MAP, BAI) of pre and post- menopausal women. The means of all except height was significantly($p<0.05$) higher in post- menopausal women. Hence, we reject the H0 for other variables and accept for height.

H0= There is no difference between the variable of the two groups. (NS)

H1=There is difference between the variable of the two group. (S)

OBJECTIVE 2. To check the association of anthropometric measure with blood pressure of pre and post-menopausal women (table 2, 3 and 4).

VARIABLES	PRE-MENOPAUSAL			POST-MENOPAUSAL		
	SBP	DBP	MAP	SBP	DBP	MAP
Age(yrs)	0.3115058*	0.17255	0.24279	0.044768	0.29889*	0.14218
tft(cm)	0.0621697	0.10168	0.03431	-0.11271	0.279508*	0.092059
Wt(kg)	0.05939	0.09485	0.08396	-0.02064	0.465730**	0.249892
BMI(kg/m^2)	0.026899	0.126681	0.088935	0.043011	0.398986**	0.249117
WAIst circumference(cm)	0.070827	0.125079	0.1074	0.141109	0.347654*	0.276892
tfip circumference(cm)	-0.05703	0.007765	0.0205	0.179507	0.270297	0.255572
WAIst hip rATio	0.185673	0.198909	0.203124	-0.00298	0.207237	0.114775
BAI	-0.08555	0.051604	0.00649	0.219843	0.044173	0.151744

TABLE 2 DEPICT PEARSON'S CORRELATION

* correlation is significant at 0.05 level(2-tailed) ** correlation is significant at 0.01 level

The person's correlation was done on SPSS as shown in table 2. Depicts that in pre-menopausal women age are positively associated with SBP while in post – menopausal women age, Ht, Wt, BMI were positively associated with DBP.

Variables	Pre-Menopausal Women		Post–Menopausal Women	
	SBP	DBP	SBP	DBP
	Regression ± Se	Regression ± Se	Regression ± Se	Regression ± Se
Age(yrs.)	0.327371±0.060	0.100374±0.90	0.045942±0.052	0.28155±0.10
tft(cm)	0.056313±0.053	0.1033±0.077	0.114244±0.0466	0.264355±0.094
Wt.(kg)	0.055936±0.1121	0.09441±0.1625	0.020878±0.080	0.4644066±0.148
BMI (kg/m^2)	0.0269±0.045	0.12607±0.065	0.043069±0.0308	0.406153±0.058
Waist circumference(cm)	0.070828±0.132988	0.12507±0.1925	0.141109±0.063	0.3476 ±0.123
tfip circumference(cm)	0.05704±0.104	0.0077±0.15	0.1795±0.060	0.27029±0.1210
Waist hip ratio	0.185±0.00077	0.1989± 0.001	0.002983±0.000406	0.2072±0.06
BAI	0.08555±0.058	0.051604±0.085	0.2198±0.038	0.044173±0.0808

TABLE 3 – Shows result of regression and standard error

STEP-WISE REGRESSION ANALYSIS:

VARIABLES	PRE-MENOPAUSAL				POST MENOPAUSAL			
	CONFIDENCE ± SE	F VALUE	SIGNIFICANT	P-VALUE	CONFIDENCE± SE	F VALUE	SIGNIFICANT	P VALUE
Age(yrs)	0.702±0.309	5.159	0.028	<0.05*	0.400±0.185	4.709	0.035	<0.05*
Ht(cm)					0.419±0.208	4.068	0.049	<0.05*
Wt(kg)					0.409±0.112	13.295	0.01	<0.05*
BMI(kg/m^2)					0.917±0.304	9.088	0.04	<0.05*
Waist circumference(cm)					0.381±0.148	6.599	0.013	<0.05*
Hip circumference(cm)					0.310±0.159	3.783	0.05	<0.05*
Waist hip ratio								
BAI								
					SBP			
					DBP			

TABLE 4 Result of step-wise regression analysis significant predictor variable and regression coefficient

Table 3 and 4 Regression and step-wise regression depicted that age is the predictor for systolic blood pressure in pre- menopausal women and for post- menopausal women age, Ht, Wt, BMI, WC and HC for DBP. Women in post- menopausal stage were at high risk of HTN compared to pre-menopausal women as $p<0.05$.

DISCUSSION

The present study has shown that post- menopausal women have comparatively high blood pressure and other anthropometric measurements. There are other studies who have shown that:

1. The sample of the cross-sectional study was collected from June to October 2010 and 165 consecutive menopausal women who had attended the Health and Treatment Centre and Endocrine Research Centre of Firoozgar Hospital in Tehran, Iran were assessed. Age, weight, height, WC, waist-hip ratio(WHR), CI and fat mass were measured. Systolic and diastolic blood pressure (SBP and DBP), fasting blood glucose, insulin, low-density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C) and total cholesterol (TC) levels were also determined. All statistical analyses were performed by SPSS version 17 (SPSS Inc, Chicago, IL, USA). Results showed that BMI was positively and significantly associated with SBP (r = 0.21; p = 0.009). WC was positively and significantly correlated with SBP (r = 0.26; p = 0.02) and DBP (r = 0.16; p = 0.05). WHR was also significantly and positively associated with SBP (r = 0.29; p = 0.001). Age and WC were associated with CI quartiles at the 0.05 significance level. The correlation of CI quartiles with SBP and weight were at the 0.01 significance level. We showed a significant association of WC with SBP and DBP, and that BMI could be an important determining factor of SBP[17].
2. The CoLaus/OsteoLaus cohort included 1,500 postmenopausal women (age range 50-80). We analyzed correlations between: 1) measurements of body composition assessed by anthropometric measures, BIA, and DXA. In the 803 included participants (mean age 62.0 ± 7.1 y, mean body mass index 25.6 kg/m2 ± 4.4), correlations between total fat mass measured by BIA and total fat mass, android fat, gynoid fat, or VAT measured by DXA are very strong (from *r* =

0.531, [99% confidence interval (CI), 0.443-0.610] to r = 0.704, [99% CI, 0.640- 0.758]). Body mass index and waist circumference have a higher correlation with VAT (r = 0.815, [99% CI, 0.772-0.851] and r = 0.823 [99% CI, 0.782-0.858], respectively) than BIA (r =0.672 [99% CI, 0.603-0.731]). Among the anthropometric measurement and the measurements derived from DXA and BIA, VAT is the parameter most strongly associated with cardio metabolic risk factors[18].

3. A Cross-sectional study on 136 premenopausal and 193 postmenopausal Chinese women with body mass index (BMI)<30 kg/m^2. Significant correlation coefficients between age, general obesity, central obesity and cardiovascular disease risk factors were noted. Through the menopausal transition, the BMI and total body fat percentage wereincreased significantly. After adjustments for age and BMI, the postmenopausal women showed higher android fat percentage, centrality index, glycosylated hemoglobin A1c, serum concentrations of total cholesterol, low-density lipoprotein (LDL) cholesterol and atherogenic indices than the premenopausal women[19].
4. A comparative study on mortality, nonfatal coronary heart disease (CHD), and congestive heart failure (CHF) risk across BMI categories in white, African American, and Hispanic women was conducted, with a focus on severe obesity (BMI ≥ 40), and examine heterogeneity in weight-related CHD risk. Mortality, nonfatal CHD, and CHF incidence generally rose with BMI category. For severe obesity versus normal BMI, hazard ratios (HRs, 95% confidence interval) for mortality were 1.97 (1.77-2.20) in white, 1.55 (1.20-2.00) in African American, and 2.59 (1.55-4.31) in Hispanic women; for CHD, HRs were 2.05 (1.80-2.35), 2.24 (1.57- 3.19), and 2.95 (1.60-5.41) respectively; for CHF, HRs were 5.01 (4.33-5.80), 3.60 (2.30-5.62), and 6.05 (2.49-14.69). CVRF variation resulted in substantial variation in CHD rates across BMI categories, even in severe obesity. CHD incidence was similar by race/ethnicity when differences in BMI or CVRF were accounted for[20].
5. The results of comparative study on association between blood pressure phenotypes and menopause with respect to certain other metric variables were examined in a random sample of 489 pre- and 191 post-menopausal Punjabi women. Post-menopausal women had a higher blood pressure and pulse rate than pre-menopausal women[21].

RECOMMENDATION

1. Post – menopausal health awareness to all women.
2. Male education and health awareness campaign in area with use of IEC material. 3.Yoga, park to be established to enhance physical activity.
3. College students and NGOs visit to such area.
4. Digitalize ASHA work like Anganwadi workers and use of notifications for follow up.
5. Elderly clubs could be set up.

LIMITATION

1. Male dominant society.
2. The blood investigation on blood glucose would enhance the finding and would also suggest many precautions to be followed.

CONCLUSION

The study was significant for all variables (Age, Wt, BMI, HC, WC, WHR and BAI) except Ht. Independent T test was used to compare results. Correlation and regression depicted that age is the predictor for blood pressure in pre- menopausal women and for post- menopausal women age, Ht, Wt, BMI, WC and HC are predictor of diastolic blood pressure. Women in post- menopausal stage were at high risk of HTN compared to pre-menopausal women hence must undergo regular health check-up and maintain healthy lifestyle.

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