ORIGINAL RESEARCH

To Determine Association of Anthropometric Parameters and Metabolic Risk Factors as a Marker for Cardiovascular Morbidity in Perimenopausal and Postmenopausal Women

R. Sunandini[1], Shashikant Somani[2], Sonali Rathi Somani[3]

ABSTRACT

Introduction: The perimenopause and postmenopause is a period of hormonal fluctuation. These women are at risk of metabolic & cardiovascular complications. So they needs thorough evaluation.
Material and Method: Present study was conducted in Osmania Medical College Hospital, Hyderabad. One hundred and thirty patients were randomly selected of which 62 were perimenopausal women and 68 were postmenopausal. Height, weight, body mass index & waist-hip ratio were calculated. Blood pressure was measured. The serum levels of triglycerides, cholesterol, low density lipoprotein, very low density lipoprotein, high density lipoprotein & fasting blood sugar were measured. Data was analysed by unpaired students t-test and Chi-square test.
Results: Body mass index, waist-hip ratio, blood pressure, triglycerides, very low density lipoprotein, cholesterol and fasting blood sugar level were significantly high; while serum high density lipoprotein was significantly low in postmenopausal women ($p<0.05$).
Conclusion: There is a positive correlation between, body mass index, waist-hip ratio, blood pressure, triglycerides, very low density lipoprotein, cholesterol and fasting blood sugar level which make them prone to develop cardiovascular risk. Early sceening of these parameters may help in maintaining healthy life and away from metabolic disorder & cardiovascular morbidity.

Keywords: Anthropometric parameter, Cardiovascular morbidity, Metabolic risk factors, Perimenopausal women, Postmenopausal women

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INTRODUCTION

The perimenopause and postmenopaue is a challenging period of life for many women and for clinicians because it is a time period when many women become symptomatic for the first time in their life.
According to council affiliated to menopause societies, perimenopause is the period immediately before the menopause when the endocrinological, biological and clinical features of approaching menopause commence.[1] Term menopause is derived from Greek word, mensos (month) and pausis (cessation) that means cessation of monthly menses. It is defined as the permanent cessation of menstruation resulting from loss of ovarian follicular activity. Postmenopause is the period twelve months after the last menstrual period.[2]
After, menopause, loss of a protective hormone estrogen or unmasking of androgen, triples the risk of cardiovascular diseases through its metabolic and vascular consequences. Cardiovascular disease is the leading cause of morbidity & mortality in peri & post-menopausal woman, this is due to variations in the hormones apart from age-related increases in weight (central obesity), blood pressure and cholesterol level. The cause of increase in central obesity are multi factorial like reduced physical activity, reduced resting metabolic rate & increased stress in about 65% of women.[3]
The increase in obesity, particularly abdominal adiposity, contributes to insulin resistance, dyslipidemia, hypertension and diabetes. These metabolic modifications are associated with premature atherosclerosis & increased risk for cardiovascular disease.[4-6]
Although body mass index is commonly used index to assess the degree of body fat but many studies shown that despite normal body mass index (BMI) with increased waist circumference (WC) & waist hip ratio (WHR), there is two fold increase in cardiovascular dysfunction. Therefore, these anthropometric parameters should be used to diagnose abdominal obesity, while high triglyceride (TG) and low high density lipoprotein-cholesterol (HDL-C) are used to define dyslipidemia. These two markers are risk factors for atherosclerotic cardiovascular disease and stroke.[7]
With ever increasing population and increased life expectan-

cy, all over the world, it assumed that almost 1/3rd of women lives in the perimenopausal and postmenopausal period. This changing demographic pattern is one of the important aspects of geriatric gynaecology. Although appropriate care of these geriatric women will put a tremendous strain on the health care system of our nation. But they have a right to live a long life in good health rather than one of pain and misery due to metabolic and cardiovascular disorder.

The measurement of WHR, blood pressure are easy, non-invasive and effective tool to assess the health status of women. This prompted us to find out the association of anthropometric parameters and metabolic risk factors as a marker for cardiovascular morbidity, which help us in early identification & screening during menopausal transition in our scenario thus reducing morbidity and mortality due to cardiovascular disease.

MATERIALS AND METHOD

Present cross sectional comparative study was conducted in Osmania Medical College Hospital, Hyderabad after taking approval from ethical committee, from December 2013 to July 2014. One hundred and thirty patients were randomly selected, of which 62 were perimenopausal and 68 were postmenopausal women.

Inclusion Criteria

All perimenopausal & postmenopausal women attending out patient department of Gynecology

Exclusion Criteria

1) Refusal for participation in study. 2)Women with surgical or radition induced menopause. 3) History of treatment with drug influencing lipid profile or on Hormone replacement therapy

All patients were explained in detail about study and written consent was taken. A detailed history and examination was done. Height was measured, with an accuracy of 0.5cm. Weight was measured, up to nearest 100 gm. Body mass index (Quetelet index) was calculated as weight in kilograms/ height in square meters. According to WHO, normal BMI ranges from 18.5 to 24.9 kg/m^2. BMI between 25-29.9 kg/m^2 is overweight, while a BMI > 30 kg/m^2 is considered obese. Using meter tape, waist circumference was measured midway between lowest rib and iliac crest.[8] Hip circumference was measured at the widest level on the greater trochanter.[9] The Waist to hip ratio was calculated using the formula WHR= waist circumference (cm)/ hip circumference (cm). WHR > 0.85, was considered as android type obesity.[10] Blood pressure was measured by sphygmomanometer in right arm in supine position after 10 minutes of rest using appropriate cuff sizes. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were taken at the 1st and 5th Korotkoff sounds respectively.

With fasting of 8 hours, under all aseptic precautions 8-10 ml of blood was collected and analysed for fasting blood sugar and lipid profile. Triglycerides were measured by Glycerol phosphate oxidase/ Peroxidase (GPO/POD) colorimetric endpoint method. Cholesterol and HDL were measured by cholesterol oxidase/ Peroxidase (CHOD/POD) colorimetric endpoint method. LDL measured directly using semi-auto analyzer by enzymatic method. VLDL was calculated as 1/5th of triglycerides. Women were diagnosed as having dyslipidaemia according to American Association of Clinical Endocrinologists Guidelines.[11]

According to guidelines of International Diabetes Federation (IDF), National Heart, Lung, Blood Institute (NHLBI), World Health Federation and other international associations[12,13]; females with metabolic syndrome should have any three of the following five components: (1) Waist measurement >80 cm (2) TG levels of ≥ 1.7 mmol/ L (3) HDL-C < 1.29 mmol/ L (4) BP ≥130/85 mm Hg (5) FBS ≥ 5.6 mmol/L.

STATISTICAL ANALYSIS

All parameter were expressed as mean and standard deviation (mean ±SD). They were tabulated in microsoft excel sheet, analysed and compared using unpaired students t-test and Chi square test. 'p' value less than 0.05 was considered significant.

RESULTS

The mean age of postmenopausal women (55.75 ± 3.2 years) was significantly higher ($p < 0.05$) than perimenopausal women (43.78 ± 2.9 years). Weight, BMI & WHR were significantly higher in post-menopausal women (Table 1).

Both SBP & DBP were significantly higher in postmenopausal women ($p < 0.05$) (Table 2).

TG, VLDL, cholesterol & fasting blood sugar level were significantly higher in post-menopausal women ($p<0.05$), while serum HDL was low in post-menopausal women but was not statistically significant (Table 3).

DISCUSSION

In present study, 68 postmenopausal women were compared with 62 perimenopausal women. During perimenopausal transition, most of the women experience gain in; weight, fat mass and central obesity. Women with menopause had significantly higher BMI compared with perimenopausal women ($p< 0.05$) which is similar to finding of Achie LN,[8] Green KA.[10] (Table-1).

Rise in blood pressure in postmenopausal women may be attributed to increased BMI. This is consistent with studies of other authors[10,14-16] (Table-2). Zaydun G et al[17] concluded that menopause augments the age-related increase in arterial stiffness which can be partly related to estrogen deficiency. Also due to decrease in estrogen levels, plasma renin activity and sympathetic activity are increased and prevention of

S.No	Parameter	Perimenopausal Group (n= 62)	Postmenopausal Group (n= 68)	' p' value
1	Age (in years)*	43.78 ± 2.9	55.75 ± 3.2	< 0.05
2	Height (in meters)	1.51 ± 0.02	1.50 ± 0.38	> 0.05
3	Weight (in kg)*	55.04 ±7.34	59.37 ± 8.71	< 0.05
4	Body mass index (kg/m^2)*	24.14 ±4.28	26.39 ± 4.16	< 0.05
5	Waist-Hip Ratio*	0.85 ± 0.03	0.98 ± 0.04	<0.05
*Statistically significant				
Table-1: Distribution of Anthropometric Parameter (mean ± SD) (N=130)				

S.No	Parameter	Perimenopausal Group (n= 62)	Postmenopausal Group (n= 68)	' p' value
1	Systolic BP*	124.76 ±0.84	140.72 ±1.47	< 0.05
2	Diastolic BP*	61.54 ±0.38	88.56 ±1.26	< 0.05
* Statistically significant				
Table-2: Distribution of Blood Pressure (mm Hg) (mean ± SD) (N=130)				

S.No	Parameters (mg/dl)	Perimenopausal Group (n= 62)	Postmenopausal Group (n= 68)	'p' value
1	TG*	185.60 ± 39.67	238.75 ±0.29	< 0.05
2	HDL	47.34 ±5.46	38.31 ±7.70	>0.05
3	LDL	98.17 ±14.75	118.45 ±26.21	>0.05
4	VLDL *	37.12 ±1.38	47.75 ±2.05	< 0.05
5	Cholesterol*	198.90 ±7.86	226.14 ±7.63	<0.05
6	FBS*	86.04 ± 2.28	116.06 ± 3.24	< 0.05
* Statistically significant TG: Triglycerides, HDL: High Density Lipoprotein, LDL: Low Density Lipoprotein, VLDL: Very Low Density Lipoprotein, FBS: Fasting Blood Sugar.				
Table-3: Distribution of Lipid profile and Fasting Blood Sugar Levels (mean ± SD) (N=130)				

conversion of Angiotensin I to Angiotensin II is reduced. Thus blood pressure regulating mechanism is lost. Additionally sensitivity to dietary sodium intake seems to be accentuated in post-menopausal women, contributing to increase in blood pressure. There is also increased smooth muscle proliferation which determines an increase in systemic vascular resistance.[17,18]

The mean levels of TG, VLDL and cholesterol were significantly higher in postmenopausal women than in perimenopausal ($p<0.05$), also there was a significant decrease in HDL in postmenopausal women (Table-3). This can be explained by obesity and insulin resistance[19] Plasma concentration of estradiol and estrone tend to be 40 % higher in obese women than in nonobese women with levels ranging from 25 to 40 pg/ml. Estrone increases linearly with increasing weight. Estradiol also increases with increasing body mass, with mean levels ranging from 3–6 pg/ml. This is consistent with the fact that aromatization of androstenedione and testosterone to estrone and estradiol occurs principally in the adipose tissue and skin. This propensity of visceral adipose tissue to cause insulin resistance may be more common in postmenopausal women. Central obesity progressively increases hepatic and adipose tissue insulin resistance and its resultant metabolic abnormalities like glucose intolerance, low HDL-C, elevated TG and hypertension.[20] Two hypotheses have been proposed[21] to explain relationship between intra-abdominal fat accumulation and insulin resistance. First, intra-abdominal adiposities are biologically more active and are located near portal vein which carries blood from intestine to liver. Therefore substances released from intra-abdominal fat, including free fatty acids enters portal circulation and liver and subsequently influence glucose metabolism as well as blood lipids production.[22] Secondly, visceral adipose tissue and its macrophages produce more inflammatory cytokines like tumor necrosis factor-alpha (TNF- α) and interleukin-6 (IL-6) and less adiponectin.[23] This increase in cytokines decreases synthesis of glucose transport protein, GLUT 4 & causes insulin resistance.

Thus increase in BMI, WHR, Blood Pressure; and atherogenic lipid profile poses postmenopausal women for greater cardiovascular risk.

CONCLUSION

From present study it is concluded that, there is a positive correlation between, body mass index, central obesity, blood pressure, atherogenic lipid profile and fasting blood sugar with cardiovascular risk in postmenopausal women. Early screening of these parameters will help in early intervention. As a primary prevention, women should be given effective counselling to adopt healthier lifestyles (regular exercise, yoga) to control their weight and lipid levels to protect themselves from metabolic disorder & cardiovascular morbidity.

Following were the limitations of the present study.

It was performed in a single hospital, therefore sample may not be representative of all Indian women. The single determination of lipid profile as done in present study instead of serial measurements in longitudinal studies may lead to mis-

leading data. We recommend a cross-sectional multicentric study to confirm results of present study

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