

Articles (/) » August 1, 2015 (/201508/August-1-2015.html) » Anthropometric and Atherogenic Risk of...

Anthropometric and Atherogenic Risk of Cardiometabolic Disorders in Women

Women, especially during their menopausal age, are predisposed to various cardio metabolic risk. This puts women at the risk of future development of various cardiovascular diseases and type 2 diabetes. Objective: The aim of the present study was to assess role of various anthropometric and atherogenic risk factors on development of cardio metabolic syndrome in both pre and post menopausal Indian women. Materials & Methods: A comparative cross sectional study was conducted among 70 premenopausal age 30-45 years) and 55 postmenopausal (age 46-60 years) women. Metabolic risk factors were defined following NCEP ATP III and modified Asia Pacific criteria. Obesity indices like Body Mass Index (BMI), waist circumference (WC), and waist hip ratio (WHR) were recorded. Atherogenic indices recorded were high density lipoprotein-cholesterol/ total cholesterol (HDL-C/TC), high density lipoprotein-cholesterol/ low density lipoprotein cholesterol (HDL-C/ LDL-C) and triglyceride/ high density lipoprotein-cholesterol (TG/HDL-C) ratio. Results: The overall metabolic syndrome in women as per NCEP ATP III criteria was 32.1% and according to modified Asia Pacific criteria was 38.0%. The predominant anthropometric marker of metabolic syndrome in women was found to be waist circumference. The most significant atherogenic marker of metabolic syndrome in women were altered HDL-C/TC, HDL-C/LDL-C and TG/ HDL-C ratio. Conclusion: Central obesity and altered lipid profile were the main predictors of metabolic syndrome in both premenopausal and postmenopausal women. Studies with larger samples are warranted to confirm the findings. Key words: Anthropometric markers, atherogenic indices, metabolic syndrome, women. Running Title: Cardiometabolic disorders in women.

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Introduction

Prevalence of obesity and related disorders are increasing alarmingly among general population in recent years. Obesity is closely associated with various atherosclerotic changes and is a major contributor for development of metabolic syndrome and other related disorders. The problem is now not confined only to affluent society and developed countries. It has now become a global problem effecting all strata of the society.^{1,2} Prevalence of metabolic syndrome is high among Asians including Indians, which is worsening with continuous urbanization and migration among Indians.³⁻⁵

Though pathogenesis is complex, metabolic syndrome is the cluster of risk factors which involve interaction of obesity and various pro inflammatory factors.^{6,7} Obesity is the most common disorder associated with menopausal transition in women. This places women at the highest risk of developing cardio metabolic disorder.⁸ Various studies reported a wide range of prevalence in metabolic syndrome in women. However, most of the studies revealed

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that the rate of prevalence is significantly more in postmenopausal women compared to their premenopausal counterparts.⁹⁻¹¹

The criteria used for determining the prevalence rate and life style factors play important role in identifying the prevalence of cardio metabolic risk of a given population. The most frequently used criteria for determining the prevalence of metabolic syndrome is the one suggested by National Cholesterol Education Program Adult Treatment Panel III (NCEPATP III) criteria. The NCEP ATP III criteria were based on the association of factors with subsequent development of coronary heart diseases in Caucasian population. Indians have higher body fat content than their western counterparts for the same BMI. Therefore, lower cut offs of waist circumference is suggested in Asia Pacific guidelines. That is why, it is important to take up population specific prevalence rate and risk factor evaluation of metabolic syndrome.¹²⁻¹⁵ This helps to suggest appropriate lifestyle modifications to prevent future outbreak of cardiovascular diseases and type 2 diabetes. Scanty information is available on relative influence of various anthropometric and atherogenic risk factors of cardio metabolic syndrome in Indian women.

Hence, the present study was carried out to determine the prevalence of metabolic syndrome and its components among a mixed Indian population of premenopausal and postmenopausal women using both NCEP ATP III and modified Asia Pacific criteria and to assess the relative influence of various anthropometric and atherogenic risk factors on prevalence of cardio metabolic risk profile of Indian women.

Materials & Methods

Data were collected from 125 Indian women (age 30-60 years), who agreed to participate in the study voluntarily. After explaining details of the study protocol, informed consent was obtained from each of the participating subject. Ethical clearance for the study was obtained from Institutional Human Ethical Committee.

Only healthy, non-smoker, non-alcoholic, nonusers of hormonal contraceptives or hormone replacement therapy (HRT) were included for the study. Known diabetics, hypertensive and subjects on lipid lowering drugs were excluded from the study. The study also excluded subjects suffering from polycystic ovary (PCO) or any other form of cancer.

Information regarding marital and menstrual status, history of pregnancy along with personal and family history of the subject were recorded. Menopause was defined as at least 12 consecutive months of amenorrhea with no other medical cause. Accordingly

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subjects were classified in to two groups: premenopausal (70 subjects) and postmenopausal (55 subjects).

Anthropometric indices like height, weight, BMI, waist circumference, hip circumference and WHR were recorded. Subjects were weighed with light cloths by using a human weighing machine (Libra, India). The height was recorded in a stadiometer (Bio Plus, india), subject standing erect without any footwear. Waist circumference was measured at a level midway between the bottom rib cage and superior margin of iliac crest. The hip circumference was measured at the maximal diameter of buttock.

Blood pressure was recorded using a sphygmomanometer in sitting posture. Venous blood was collected in the morning after an overnight fast, for total blood count and estimation of glucose and lipid profile. Blood count was carried out on an automated cell counter (PE-6800, Prokan, India). Blood glucose and lipid profile was estimated on a semiautoanalyse (Analytica, RMS, India) using commercial kits. Atherogenic indices calculated include HDL-C/TC, HDL-C/LDL-C and TG/ HDL-C ratio.

Results

The anthropometric parameters recorded in the subject are presented in table I. All the parameters show a significantly higher value in postmenopausal women than the premenopausal women.

Table II represents the haematological values of haematological parameters recorded in the subject. Both total RBC count and haemoglobin concentration were found to be significantly less in postmenopausal women.

Among the cardio metabolic parameters recorded in subjects, the postmenopausal women showed a significantly lower value for HDL-C and HDL-C/TC ratio. All other markers are found to be significantly high in postmenopausal women (Table III).

The prevalence of metabolic syndrome found in our study is 22.2% and 28.8% in premenopausal; and 43.5% and 48.7% in postmenopausal women according to NECP ATP III and modified Asia Pacific criteria (Table IV).

The most prominent risk factor identified in both the groups are increased waist circumference followed by elevated triglyceride and reduced HDL-C level in both pre and postmenopausal women (Table V).

Comparison of cardio metabolic risk factors between subjects with and without metabolic syndrome of both the groups revealed all the parameters show a high risk value in subjects with metabolic syndrome than in subjects without metabolic syndrome (Table VI).

Discussion

In the present study, metabolic syndrome was found to be 32.1% in women by NCEP ATP III criteria and 38.0 % by modified criteria as per Asia Pacific guidelines. The prevalence of metabolic syndrome was significantly higher among postmenopausal women as compared to premenopausal women in the current study following both NECP ATP III and modified Asia Pacific criteria. Pandey et.al. in their study among pre and postmenopausal women

from western India also observed a higher prevalence of metabolic syndrome in postmenopausal (56%) than premenopausal (44%) women.⁹ Silvaraj et.al. observed that 44.2% occurrence of metabolic syndrome among women from 41-50 years age group and 25.2% occurrence in women from 30-40 years age group.¹⁰ In a recent study, we observed 28.46% prevalence of metabolic syndrome in a sample of premenopausal women.¹⁶ In the present study, we observed 22.2% and 28.8% in premenopausal; and 43.5% and 48.7% in postmenopausal women according to NECP ATP III and modified Asia Pacific criteria (Table IV). The difference in prevalence rate observed may be attributed to the difference in study area, and different definitions of metabolic syndrome used.¹⁷ High occurrence of metabolic syndrome in women after menopause is explained by estrogen deficiency during menopause. Estrogen is linked to improved insulin sensitivity and reduces the risk of development of diabetes and associated metabolic disorders.¹⁸

The most prevalent component of metabolic syndrome observed in our study for both pre and postmenopausal women was abdominal obesity with a frequency of 79.7% and 91.6% by NECP ATP III and modified Asia Pacific criteria respectively. The finding is consistent with reports from various studies from different parts of world. Even though many features of metabolic syndrome emerge with estrogen deficiency characteristics of menopause, a considerable percentage of premenopausal women in our present study as well as various previous studies were found to be predisposed for development of cardio metabolic syndrome. Central obesity, observed among premenopausal women with metabolic syndrome, may have diluted the protective effect of premenopausal estrogen level in this group of women.¹⁹ Abdominal obesity is quite prevalent in South Asians, with females outnumbering males.²⁰ Higher abdominal fat is known to be risk factor for hypertension, hypertriglycedaemia, hyperinsulinaemia and diabetes. The central obesity is associated with changes in many biochemical variables, especially with various adipokines like leptin and adiponectin, which are found to be associated with insulin resistance and components of metabolic syndrome.²¹

The other important component of metabolic syndrome identified in our study is reduced HDL-C and elevated triglyceride. Atherogenic dyslipidaemia is common in South Asians who have lower HDL-C level and higher levels of small, dense, low density lipoprotein (LDL-C) compared to Caucasians across all strata of the society.^{22,23} Elevated serum triglyceride is more common in affluent Indians and migrant Indians.²⁴ This findings are in agreement with other findings that suggest a strong relationship of TG/HDL-C ratio with insulin resistance leading to metabolic syndrome.²⁵ Various studies reported a weak correlation between hypertension and insulin resistance, consistent with these findings o, we also observed a weak correlation between hypertension and development of metabolic syndrome in our study.^{26,27} Our study revealed that all the anthropometric and atherogenic risk factors shows a high risk value in subjects with metabolic syndrome in comparison to subjects without metabolic syndrome.

Conclusion

In conclusion, inclusion of modified cut -offs of waist circumference according to modified Asia-Pacific criteria, in NECP ATPIII guidelines, yielded a higher rate of metabolic syndrome in a sample consisting of both premenopausal and postmenopausal Indian women. Waist circumference along with altered HDL-C/TC, HDL-C/LDL-C and TG/ HDL-C ratios are the most important anthropometric and atherogenic predictors of metabolic syndrome in women. However, studies with larger sample size need to be conducted to validate the present findings.

Competing Interest

The authors certify that they have no commercial associations that might pose a conflict of interest in connection with the article.

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