



Research Article

PREVALENCE OF METABOLIC SYNDROME IN WOMEN OF DIFFERENT AGE GROUPS IN RURAL POPULATION OF ANDHRA PRADESH

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ABSTRACT

Background & Objectives: The main objective of the study is to identify the prevalence of Metabolic syndrome as people with the Metabolic syndrome are at increased risk for developing diabetes mellitus, cardiovascular disease as well as increased mortality from cardiovascular disease risk factors.

Materials & Methods: A total number of 60 female subjects participated in the study. The subjects were grouped into two different age groups i.e. 30-40 and 40-50 years age. The study was approved by the Institutional Ethics Committee. Lipid profile, Fasting blood glucose, Blood pressure, Height, Weight & Waist circumference were recorded in all the subjects.

Results: We observed that the prevalence of metabolic syndrome was 20% in women of 30-40 age group and 63.33% in women of 40-50 years of age group based on the NCEP ATP-III criteria.

Conclusion: Programs aimed at detection and treatment of dyslipidemia, hypertension, diabetes, and obesity may reduce the burden of Metabolic syndrome in our population. Metabolic Syndrome present in epidemic proportions among the elderly represents one of the major threats to longevity and healthy aging.

Keywords: Diabetes, Dyslipidemia, Hypertension, Insulin resistance.

INTRODUCTION

The metabolic syndrome is a cluster of interdependent cardiovascular abnormalities. Several definitions for the diagnosis of the metabolic syndrome have been proposed by different agencies. Metabolic syndrome (MS) can be considered as a combination of disorders which, when occurring together, increase the risk of developing cardiovascular disease and diabetes. As criteria for these disorders differ, several classifications for the Metabolic Syndrome have been proposed so far. The World Health

Organization (WHO)[1] defined Met Syn as the combination of the presence of diabetes mellitus (DM), impaired fasting glucose, impaired glucose tolerance or insulin resistance, combined with two of the following criteria: waist-to-hip ratio (WHR) > 0.90 in men or > 0.85 in women, serum triglycerides > 150 mg/dl or high density lipoprotein (HDL)-cholesterol < 35 mg/dl in men and < 39 mg/dl in women, urinary albumin excretion rate > 20 µg/min and blood pressure > 140/90mmHg. The American Association of Clinical Endocrinologists (AACE) [2] modified Met Syn definition as a high risk of insulin resistance, body mass index (BMI) > 25 kg/m² or

waist circumference > 102cm in men or > 88cm in women and two of the following criteria: fasting glucose > 110 mg/dl or postprandial glucose > 140mg/dl, arterial blood pressure > 130/85mmHg, HDL-cholesterol < 40 mg/dl in men or 50 mg/dl in women and triglycerides > 150 mg/dl. The National Cholesterol Education Program Adult Treatment Panel (NCEP-ATP III) [3] re-defined Met Syn as a cluster of at least three of the following abnormalities: waist circumference > 102 cm in men or > 88 cm in women, serum triglycerides > 150 mg/dl, HDL-cholesterol < 40 mg/dl in men or < 50 mg/dl in women, blood pressure > 130/85 mm Hg and serum fasting glucose > 110 mg/ dl . This definition was slightly modified in 2005. The International Diabetes Federation [4] proposed a revised definition for Met Syn based on the previous definitions already given by WHO and NCEP ATP III, by emphasizing on visceral obesity as the core feature of the syndrome. IDF considered visceral obesity measured by waist circumference an essential requirement for the diagnosis. They defined visceral obesity using specialized criteria in each ethnic population, based on waist circumference measurements obtained from regional studies[5].

Metabolic syndrome, based on the Asian criteria of the American Heart Association/National Heart, Lung, and Blood Institute, is diagnosed when 3 out of the following 5 categories are satisfied: 1) blood pressure of systolic blood pressure ≥ 130 mm Hg or diastolic blood pressure ≥ 85 mm Hg, or is taking an anti hypertensive drug, 2) fasting blood sugar ≥ 100 mg/dL, or is taking an anti diabetic drug, 3) triglyceride ≥ 150 mg/dL, or is taking an anti dyslipidemic drug, 4) low HDL-C (male < 40 mg/dL, female < 50 mg/dL), or is taking an anti dyslipidemia drug, or 5) the waist circumference applied is male ≥ 90 cm, female ≥ 80 cm.

The clinical features of the metabolic syndrome are associated with increased risk of cardiovascular disease, including a higher risk of coronary heart disease (CHD), and premature death. Adipose tissue, apart from an energy storage depot, secretes endocrine hormones including leptin, cytokine and other metabolic mediators. Increased free fatty acid (FFA) turnover and increased levels of circulating FFA'S found in obesity are also closely associated with insulin resistance. Besides insulin resistance , the other features of the Metabolic Syndrome include impaired glucose tolerance/type 2 diabetes , hypertension , lipid triad (increased triglycerides, decreased high-density lipoprotein cholesterol (HDL-C), increased small dense low-density lipoprotein cholesterol (LDL-C) , obesity/visceral adiposity , elevation of inflammatory markers , increased prothrombotic and antifibrinolytic factors . Other components of the Metabolic Syndrome that have been suggested were hyperhomocysteinemia, microalbuminuria and hyperuricaemia.

Careful examination of the four definitions of Metabolic Syndrome that were reviewed indicates many similarities and also, some disparities. The WHO definition includes those persons with high risk of developing diabetes as well as individuals diagnosed with Type 2 diabetes. The obesity component can be measured by waist to hip ratio or BMI

and includes microalbuminuria, which links the syndrome with risk for developing chronic kidney disease. The WHO definition has been criticized for including Type 2 diabetics in the definition and not reserving the diagnosis of Metabolic Syndrome for those who are at risk for developing diabetes. The WHO definition includes impaired glucose tolerance measured by oral glucose tolerance test (OGTT) or 2-hour post glucose challenge as part of its criteria.

Inflammation plays an important role in the pathogenesis of atherosclerosis. Excess adiposity is associated with release of inflammatory “adipocytokines”. These factors may contribute to an increase in the level of C-reactive protein, a marker of inflammation which was recently recognized as a cardiovascular risk factor. Elevated C-reactive protein has been found in subjects who meet criteria for the metabolic syndrome. Increased release of inflammatory adipokines may mediate increase in fibrinogen and plasminogen activator inhibitor (PAI-1) levels. Elevated PAI-1 levels may reflect impaired fibrinolysis and thus may be associated with increased risk for arterial thrombosis; a clinical association between PAI-1 levels and insulin resistance is also well established. Proposed mechanisms that directly link insulin resistance and hyperinsulinemia to increased blood pressure include the following: Direct vascular effects, impairment of insulin mediated vasodilatation, or vasoconstriction. Insulin normally mediates vasodilatation; however resistance to this effect of insulin has been reported in obese and diabetic patients. In addition, cellular cation transport may be altered in association with insulin resistance which might play a role in promoting vasoconstriction .Hyperinsulinemia driven sodium retention i.e., Insulin acutely enhances renal sodium retention because this effect is reportedly retained in obese patients with resistance to insulin metabolic effects. Hyperinsulinemia is envisaged as a cause of sodium retention. Hyperinsulinemia driving Sympathetic nerves system (SNS) Activity i.e., increase SNS activity has been documented in association with obesity and all the SNS over activity might itself be a cause of insulin resistance.

MATERIALS AND METHODS

Aims & Objectives: People with the metabolic syndrome are at increased risk for developing diabetes mellitus and cardiovascular disease as well as increased mortality from cardiovascular disease. As the implications of the metabolic syndrome for health care are substantial, we sought to establish the prevalence of this condition.

The total number of subjects who participated in the study was 60. The following Bio-Chemical tests were done during the study: Lipid Profile, Fasting Blood Glucose. Lipid Profile Test consists of estimation of Serum Total Cholesterol, Serum Triglycerides, Serum HDL, Serum LDL and Serum VLDL. For the estimation of serum total cholesterol , KIT method was used (Erba Diagnostics).The fasting Blood sample was collected by venipuncture technique under strict aseptic conditions .The collected blood samples were centrifuged and serum is separated and stored in specimen test tubes for the investigations. Triglycerides kit belongs to Erba diagnostics.

The different clinical parameters recorded include measurement of height and weight of the subject, measurement of waist circumference of the subject; Blood pressure by using sphygmomanometer. The height and weight Instrument belongs to KNDS Company. Waist circumference was measured by using the measuring tape, readings were taken in cms. Blood Pressure of the subject was measured by using sphygmomanometer (ELCO

Company) by auscultatory method. For recording the Blood Pressure the subject was asked to sit in erect posture . Systolic and Diastolic blood pressure readings were recorded in mm of Hg. The Chem – 7 analyser is a compact, high performance, 16-bit micro controller based biochemistry analyzer for routine Chemistries. Electrolytes, immunoassays, Hormones, coagulation and Drug test.

Table 1: Showing mean ±SD of the different parameters in women

Variable	30-40 years	40-50 years	p value	Inference
Mean Waist Circumference(cm)	88.5 ± 11.77	90.58 ± 12.38	0.2507	NS
Mean TRIGLYCERIDES(mg/dl)	126.56 ± 43.90	189.66 ± 76.37	< 0.001	HS
HDL-C(mg/dl)	36.46 ± 1.57	36.6 ± 1.89	> 0.05	NS
Mean SBP mmHg	121 ± 9.6	129.33 ± 6.4	< 0.005	HS
Mean DBP mmHg	78.66 ± 6.29	81 ± 6.07	> 0.05	NS
Fasting Blood glucose (mg/dl)	76.23 ± 11.77	81.7 ± 13.25	> 0.05	NS

TABLE I Showing Mean ± SD of the different parameters in women

RESULTS

We studied 60 women in two different age groups i.e. 30-40 and 40-50 years age. When all the criteria used were taken into consideration, the most common component of the metabolic syndrome was low serum HDL cholesterol, found in the 100% of the population studied. We observed from our results that the prevalence of metabolic syndrome was 20% in women of 30-40 age group and 63.33% in women of 40-50 years of age group based on the ATP-III criteria.

In the women of 30-40 years of age group, 100% of women has HDL-C < 50 mg/dl, 13.32% had blood pressure (BP) > 130/85 mmHg, 19.98% had serum triglycerides > 150 mg/dl ; 3.33% had FBG > 110mg% and 46.62% had waist circumference ≥ 88 cms ,when each one of these criteria were considered separately according to the NCEP ATP-III criteria.

In women of 40-50 years age group, 100% of women had HDL-C < 50 mg/dl; 23.31% of women alone had B.P ≥ 130/85 mmHg; 53.28% of women had triglycerides > 150 mg/dl and 6.66% of women had FBG ≥ 110mg/dl and 63.27 % of women had WC > 88 cms when each one of these criteria was considered separately as per NCEP ATP-III criteria. The Mean Waist Circumference (in cms) in women of 30-40 and 40-50 years of age (88.5 ± 11.77 and 90.58 ± 12.38 respectively) when compared was statistically not significant (p = 0.2507). The mean Triglycerides in mg/dl in women of 30-40 and 40-50 years of age (126.56 ± 43.902 and 189.66 ± 76.37 respectively) when compared, we observed a significant increase in serum triglycerides in women of 40-50 years (p-value < 0.05 highly significant).

The Mean HDL-C in mg/dl in women of 30-40 and 40-50 years (36.46 ± 1.57 and 36.60 ± 1.89 respectively) when compared, we found an increase in Serum HDL in women of 40-50 years which is not statistically significant (p > 0.05 not significant). The Mean Systolic Blood Pressure in women of 30-40 and 40-50 years of age (121 ± 9.6 and 129.33 ± 6.4 mmHg respectively) when compared we observed a significant increase in the mean SBP in women of 40-50 years (p < 0.05 highly significant).

The Mean Diastolic Blood Pressure in women of 30-40 and 40-50 years of age (78.66 ± 6.29 and 81 ± 6.07 mmHg respectively) when compared , we found an increase in DBP which is not significant (p > 0.05 Not significant). The mean Fasting Blood Glucose (in mg/dl) in women of 30 to 40 and 40-50 years (76.23 ± 11.77 and 81.7 ± 13.25 respectively) when compared , we did not find any significance statistically (p > 0.05 Not significant). We observed a greater percentage of increase in serum triglycerides and waist circumference in women of 40-50 years age when compared with 30-40 years age group.

DISCUSSION

The prevalence of MS varies worldwide. In European countries, the prevalence varies from 4–36% depending on age and definition of Metabolic Syndrome. The prevalence of Metabolic Syndrome is reported to be highly age-dependent, increasing with increasing age.

In the women of 40-50 yrs age group, the most prevalent risk factors were low HDL-C (100 %), high waist circumference (63.27%), high triglycerides (53.28%) and high blood pressure (23.31%). Also, 6.66% had one risk factor, while two risk factors were present in 15% .Of those having one risk factor, low HDL-C was the most

frequent, while low HDL-C together with high triglycerides were the most common among those with two risk factors present.

The prevalence of MS varies considerably worldwide. Some of the differences in the prevalence of Metabolic Syndrome might arise from varied definitions of the syndrome. Trevisan et al [6] reported a prevalence of 3 – 3.5% in Italy on the basis of the presence of all five criteria. However, a wide variation in the prevalence can be observed even with using the same diagnostic criteria. The frequency of Metabolic Syndrome in a sample of the Chinese population was observed to be 9.8% for men and 17.8% for women from the study of Gu D , Reynolds K et al [7] . In a rural area of South Korea, Greenlund KJ et al ., [8] observed that Metabolic Syndrome was found to affect 29.4% of the adult population above 40 years of age. Similar values were established in Mexico, where 26.6% of the population studied exhibited the metabolic syndrome observed by Azizi F et al. Our study demonstrated a higher prevalence of metabolic syndrome among women which is in accordance with most of the studies {Stefania Maggi [10] ; J Liu [11]} . Women also had a higher prevalence of low HDL and central obesity. This could partially be attributed to the lower cut-off for waist circumference and higher cut-off for HDL in women as compared to men. Therefore, probably more women were classified as having central obesity or low HDL.

Several studies attempted to quantify the positive association between the metabolic syndrome and cardiac morbidity. Alexander et al [12] reported that 19.2% of patients with the metabolic syndrome and type II diabetes had prevalent CHD based on the National Health and Nutrition Examination Survey (NHANESIII), compared to 13.9% with metabolic syndrome but no diabetes and 7.5% with diabetes but no metabolic syndrome. They reviewed about the NCEP-Defined Metabolic Syndrome, Diabetes, and Prevalence of Coronary Heart Disease among NHANES III Participants Age 50 Years and Older. Metabolic syndrome is very common, with 44% of the U.S. population over 50 years of age meeting the NCEP criteria.

Similarly, Girman et al [13] found an approximately 50 % greater risk of major coronary events in patients with the metabolic syndrome across two large clinical trials, the specific factor closely associated with increased risk being the presence of low levels of High Density lipoprotein Cholesterol. Insulin resistance is thought to be an underlying feature of the metabolic syndrome. Genetic abnormalities, fetal malnutrition, and visceral adiposity may play roles in the pathophysiology of insulin resistance and the metabolic syndrome. Although insulin resistance among patients with the individual components of the metabolic syndrome is common, significant proportions of these patients do not have insulin resistance.

The most prevalent risk factors among individuals with Metabolic Syndrome were, in descending order, low HDL-cholesterol, high waist circumference, high triglyceride levels, high blood pressure, high plasma glucose. The NCEP ATP III definition of the metabolic syndrome, when applied to an Asian population, underestimates the prevalence of the metabolic syndrome and fails to identify

many individuals at risk for future CVD. A key discrepancy is likely to lie in the definition of central obesity using the waist circumference. Obesity, impaired glucose metabolism, hypertension, and dyslipidemia are recognized as independent risk factors for CVD morbidity and mortality.

In middle aged Swedish population ,the prevalence of Metabolic Syndrome was 14.8% among men and 15.3% among women, with an increase by age among women only, 10% to 25% . Among individuals with MS the most frequent risk factor was large waist circumference, present in 85% of men and 99% of women, followed by high blood pressure, high triglycerides, high glucose and HDL cholesterol (38% and 47% respectively) [14].

The age-standardized prevalence of the Met Syndrome varied by ethnic group, ranging from as high as 45% among Native Indian women to as low as 8% among Inuit men. Compared with Canadians of European origin, Indians had a worse metabolic Profile, while Inuit had a better metabolic profile except for a high rate of abdominal obesity [11].

The prevalence of Metabolic Syndrome among urban Indian diabetic patients was 77.2% and was significantly higher in women (87.71%) as compared to men (69.33%). The most prevalent risk factors for Metabolic Syndrome were hypertension, followed by hypertriglyceridemia, in men, and central obesity, followed by hypertension, in women. SP Surana et al concluded that Metabolic Syndrome is highly prevalent in the urban Indian diabetic population [15]. The Italian Longitudinal Study on Aging (ILSA), an epidemiological study conducted in Italy reported a prevalence rate of 31.3% in men and 59.4% in women, with consistently higher rates in women in each age group [10]

In women the prevalence of the metabolic syndrome increased significantly from 32.2–39.1% based on the NCEP definition, and from 38.0–45.3% based on the IDF definition among Finnish Men and Women as observed by Gang Hu et al [16] . Sharifi F et al observed from their study that the prevalence of the metabolic syndrome was 23% in the whole population: 25.1% among men and 7.6% among women in an Adult Urban Population of the West of Iran [17] . In the Chinese population aged 35 to 74 years, the age standardized Prevalence of dyslipidemia, hypertension, diabetes, current smoking, and overweight was 53.6%, 26.1%, 5.2%, 34.4%, and 28.2%, respectively. The age standardized prevalence of overweight was higher in women than in men. [18]

The age-standardized prevalence of the metabolic syndrome in middle east was about 34.7% based on the ATP III criteria, 37.4% based on the IDF definition, and 41.6% based on the ATP III/AHA/NHLBI criteria [19] .The exact reasons for high prevalence of MS in our study remain to be determined, but it is evident that substantial socioeconomic changes have occurred in the population over the past decades and the transition from a traditional to a western-like urban lifestyle has been associated with adverse changes in lifestyle habits. Dietary modification and enhanced physical activity may delay or prevent the transition from impaired glucose tolerance to type 2

diabetes mellitus and provide relevant treatment paradigms for patients with the metabolic syndrome.

CONCLUSION

Results of our study provided evidence that there are age differences in the way metabolic syndrome is expressed and also the pattern in which the different metabolic syndrome combinations were associated with mortality rise, as all the risk factors were more prevalent in the older than younger adults. A limitation of the study was its reliance on estimates derived from a cross sectional study. Cross-sectional studies do not allow for quantification of the importance of risk factor clustering in the incidence of CVD and also, in cross-sectional study all data are based on single measurements there is also a risk of overestimation. Programs to enhance efforts aimed at prevention, detection, and treatment of dyslipidemia, hypertension, diabetes and overweight may greatly reduce the future burden of CVD in our population. Metabolic Syndrome which is present in epidemic proportions among the elderly represents one of the major threats to longevity and healthy aging. Weight loss through reduced caloric intake and increased levels of physical activity should be encouraged in all overweight persons. Prevention of weight gain also should be emphasized for all persons.

The increased prevalence of the metabolic syndrome is likely to lead to future increase in diabetes and cardiovascular disease. Because the syndrome is reversible, health care professionals can guide their patients with this syndrome to adopt preventive lifestyles that are conducive to developing and reversing this syndrome. In addition, health care professionals should assist patients with the metabolic syndrome in delaying progression to diabetes, cardiovascular disease, and other complications. LDL cholesterol should continue to be the primary target of cholesterol lowering therapy. Greater emphasis should be placed on elevated triglycerides as a marker for increased risk for CHD. First-line therapy for elevated serum triglycerides should be therapeutic lifestyle changes. For management of atherogenic dyslipidemia, emphasis in management should be given to life style modification, weight control and increased physical activity. The root cause of the metabolic syndrome for the majority of patients are improper nutrition and inadequate physical activity, the high prevalence of this syndrome underscores the urgent need to develop comprehensive efforts directed at controlling the obesity epidemic and improving physical activity levels.

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