ORIGINAL ARTICLE

METABOLIC SYNDROME: FREQUENCY AND GENDER DIFFERENCES AT AN OUT - PATIENT CLINIC

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ABSTRACT

Objective: To determine the frequency of metabolic syndrome among patients attending an out-patient clinic of a teaching hospital and to compare the clinical features regarding metabolic syndrome among males and females.

Study Design: Cross-sectional study.

Place and Duration: Aga Khan University Hospital (AKUH), Executive and Family Medicine Clinics, from December 2004 to April 2005.

Patients and Methods: All adults, above 25 years, attending the clinics for an executive check-up and giving informed consent were included in the study. Data was collected through a structured questionnaire administered to those eligible to participate. Metabolic syndrome was defined according to ATP-III guidelines.

Results: There were 250 participants in this study. Mean age of study participants was 48.94 (SD10.62) years, while approximately two-thirds, 157 (62.8%), were male. Metabolic syndrome (those who had 3 or more risk factors) was present in 35.2% of adults. Fasting blood sugar level was raised in 36.4% of study participants while significant number of participants (78.8%) had a Body Mass Index (BMI) Ž 25 (p = 0.02).

Conclusion: Frequency of metabolic syndrome was significantly high in this study with preponderance of males and prevalence similar to that observed in developed countries. Majority of patients had obesity and high fasting blood sugar levels. Males demonstrated higher levels of triglycerides and low levels of High-density lipoprotein (HDL) compared to females while blood pressure reading was observed to be the same in both males and females.

KEY WORDS: *Metabolic syndrome. Health risk. Gender difference.*

INTRODUCTION

Metabolic syndrome is a collection of health risks that increase the chance of developing heart disease, stroke and diabetes.[1] The prevalence rate in many western countries is 22-23%. According to a national health survey, more than one in 5 Americans has metabolic syndrome. Recently released third report of the National Cholesterol Education Program Expert Panel on detection, evaluation, and treatment of high blood cholesterol in adults (ATP-III) draws attention to the importance of the metabolic syndrome and provides a working definition of this syndrome for the first time,[2] which may be defined as presence of (i) central obesity among men with waist Ž 102 centimeter(cm) (40 inches) and among women with waist Ž 88 cm (34 inches), (ii) blood pressure Ž 130 /85 mmHg, (iii) triglycerides Ž 150 mg/dl, (iv) HDL: men < 40 mg/dl and women < 50 mg/dl and (v) fasting glucose Ž 110 mg/dl. The diagnosis is made when three or more of these risk factors are present. Acquired factors such as excess body fat and physical inactivity may also lead to metabolic syndrome.[3,4] For adults in Asia-Pacific region, BMI more than 23 is overweight while BMI greater than 25 is termed obesity according to WHO International Association for the study of obesity and international obesity task force that increases the risk of metabolic syndrome. Metabolic syndrome is on the rise worldwide. Relevant information regarding distribution of metabolic syndrome is limited in local literature. The aim of this study was to determine the frequency of metabolic syndrome among patients attending an out-patient clinic of a teaching hospital and to compare the clinical features regarding metabolic syndrome among males and females.

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PATIENTS AND METHODS

It was a cross-sectional study, conducted at the out-patient clinics of the Aga Khan University Hospital (AKUH), Karachi, from December 2004 to April 2005.

Inclusion criteria were males or females of at least 25 years of age and appearing for a regular check-up at the Family Medicine and Executive Clinic set-up of AKUH, were eligible to participate in the study.

All those who were eligible but did not give their informed consent to participate in the study were excluded.

Data were collected for height (cm), weight (kg), waist circumference (cm) – at narrowest point between umbilicus and ribcage, systolic and diastolic blood pressure (mmHg), fasting serum levels for sugar, triglycerides (TG), total cholesterol Low Density Lipoprotein(LDL) and High Density Lipoprotein (HDL).

Metabolic syndrome was characterized to be present when any three of the following were found to be positive as defined by ATPIII guidelines: (i) waist circumference for males Ž 102 cm; for females Ž 88 cm, (ii) blood pressure Ž 130 /85 mmHg, iii) triglycerides Ž 150 mg/dl, (iv) HDL for males < 40 mg/dl for

females < 50 mg/dl or (v) fasting blood glucose Ž 110 mg/dl.

Body Mass Index (BMI) was calculated by the standard formula; weight in kg/height in meter.[2]

Frequencies and percentages were computed to report the primary objective of the study. We compared between gender differences for age, weight, height, waist circumference, blood pressure, fasting serum levels for sugar, triglycerides, total cholesterol, LDL and HDL by using the t-test. Differences between males and females regarding number of metabolic syndrome risk factors were assessed using the chi-square test. Fischer's exact test was used where the cell count was less than 5. Data were analyzed using Statistical Package for Social Sciences (SPSS).

RESULTS

A total of 250 subjects were enrolled in this study. Of these, 157 (62.8%) were male. The average age of the study participants was 48.94 years ± Standard Deviation (SD) 10.62. Their mean age, compared to females, was not significantly different (Table I). Information on smoking was available for 100 participants only. Of the 57 males, who provided information on smoking, 13 (22.8%) reported current smoking. Males differed from females when compared for waist circumference, TG, HDL and BMI. While they were similar regarding fasting blood sugar (p-value 0.58) and other factors (Table I).

Using standard cut off levels of individual risk factors for metabolic syndrome, the distribution was as follows; of the 47 (30%) males had a waist circumference Ž 102 cm while 54 (58%) among females had a waist circumference Ž 88 cm. A quarter of males, 38 (24.2%) and a similar proportion of females, 24 (25.8%), had blood pressure Ž 130/85 mmHg. The difference among males and females regarding triglyceride levels was only marginal, where 87 (55.4%) and 63 (67.7%) respectively had triglyceride levels Ž 150 mg/dl (p-value 0.05). A greater proportion of both males and females had HDL levels within recommended levels i.e. 92 (58.6%) males had HDL concentration • 40 mg/dl; while 57 (61.3%) females had HDL concentration • 50 mg/dl. No significant difference was found between males and females, with respect to fasting blood glucose levels, where 105 (67%) and 55 (59%) respectively demonstrated fasting blood glucose levels Ž 110 mg/dl (p-value 0.22).

Table I: Comparison of male and female study participants regarding metabolic syndrome risk factors.

Factors	Male (n = 157)		Female (n = 93)		P-value
	Mean	Standard deviation	Mean	Standard deviation	
Age (in years)	48.57	11.19	49.57	9.62	0.47
Waist (in cm)	96.61	11.64	89.35	9.02	0.00
BMI*	27.09	4.91	28.58	5.07	0.02
TG†	164.42	97.54	134.34	64.27	0.01
HDL‡	40.18	7.60	48.09	10.51	0.00
Cholesterol	190.60	34.75	198.27	44.41	0.13
LDL§	119.59	28.62	121.06	35.30	0.72
Systolic BP‖ (mmHg)	128.63	21.71	143.05	139.93	0.21
Diastolic BP (mmHg)	82.23	10.13	80.66	11.09	0.25

** Body mass index, † triglycerides, ‡ high density lipoproteins, § low density lipoproteins and ‖ blood pressure.*

Overall metabolic syndrome, as defined earlier, was found in 87 (35%) study participants i.e. those who had three or more than three risk factors present (Table II). Among the males, 31.8% had metabolic syndrome while the proportion of females with metabolic syndrome was 39.8%. The females were found to be only marginally different (p-value 0.05) compared to males regarding presence of at least four risk factors (Table II). Age adjusted distribution of 87 participants with metabolic syndrome showed that 38 (43.7%) were in the age group 51-60, while 24 (27.6%) were in the age group 41-50 (Table III).

DISCUSSION

The diagnosis of metabolic syndrome in patients might hold promise for enhanced prevention of diabetes and cardiovascular disease. According to ATP-III guidelines, the diagnosis of metabolic syndrome is made when at least three factors among obesity, raised blood pressure, raised fasting blood glucose, raised triglycerides or decreased HDL are present in an individual. Based on these guidelines, more than 1/3rd of the study participants had metabolic syndrome.

Table II: Frequency of risk factors for metabolic syndrome among study participants (n=250).

Factors	Male (n = 157)		Female (n = 93)		p-value
	n	%	n	%	
0	23	(14.6)	14	(15.1)	0.93
1	41	(26.1)	18	(19.4)	0.22
2	43	(27.4)	24	(25.8)	0.79
3	32	(20.4)	16	(17.2)	0.54
4	14	(8.9)	16	(17.2)	0.05
5	4	(2.5)	5	(5.4)	0.30*

**Fischer's exact test used, due to low cell count*

Table III: Metabolic syndrome in different age groups.

Age groups	Metabolic syndrome (n = 87)	
	n	%
< 30	0	0.0
31-40	15	17.2
41-50	24	27.6
51-60	38	43.7
61-70	8	9.2
71+	2	2.3

In the United States, 24% men and 23% women had metabolic syndrome whereas a cohort study showed increasing frequency in metabolic syndrome with an increase in age. [5-7] Increase in blood pressure, waist circumference and hypertriglyceridemia accounted for much of the increase in prevalence, particularly in women. In this study also hypertriglyceridemia was more common in women as compared to men while 58% women were centrally obese that is waist circumference >88cm. Overall high blood pressure was seen in 24.8% of our study population, where both males and females were similar regarding systolic and diastolic blood pressure. Physical inactivity and excess weight have been shown to be the main underlying contributors to the development of metabolic syndrome.[8]

A study comparing two possible definitions of metabolic

syndrome showed two different prevalence rate that is 23.9%, using ATP-III guidelines and 25.1%, using WHO definition.[9] A previous study in Pakistan reported a 2.7% prevalence of metabolic syndrome, however, this study did not follow ATP - III guidelines to define metabolic syndrome.[10] Some of the studies conducted in the west have shown similar prevalence of 35% as reported in this study. Jaber has reported 23% prevalence of metabolic syndrome among Arab Americans by using ATP-III guidelines, prevalence increased with age and BMI in both genders. However, the most important components were low HDL and glucose intolerance.[11] This study has also shown that a greater proportion of study participants had glucose intolerance (64%) as well as low HDL (59.6%). Metabolic syndrome has previously been found in 21% of study participants in Oman with 19.5% males and 23% females. In the same study, low HDL was demonstrated as prominent component while abdominal obesity was present among 24.6% participants without any gender difference.[12] However, we have shown a significant difference regarding mean HDL concentration among males and females.

Obesity was common in this study where 78.8% of total participants had BMI more than 25. Males had a significantly higher mean waist circumference (mean ± SD: 96.6 cm ±11.64) compared to females (89.35 cm ± 9.02) which highlights the importance of central obesity as a risk factor for metabolic syndrome.[13,14] This study also demonstrated a significant difference in the average BMI of males (27.09 ± 4.91) and females (28.58 ±5.07). [15,16]

Male Pakistani migrants have previously been shown to have significantly more abdominal adiposity relative to total adiposity in a study conducted to measure generalized obesity and regional distribution of adiposity among adult white and migrant Muslim males from Pakistan in Peterborough, Canada.[17] However, female participants were more obese than male study participants with a significantly higher mean BMI.

In a previous study which involved women of age Ž 25 years from an urban setting in Karachi, Pakistan, 42% and 8% were found to be overweight and obese respectively. This shows a preponderance of obesity among females in similar settings.[18]

Rogers described impact of metabolic syndrome on long-term outcomes in simultaneous kidney – pancreas transplantation. Out of 241 patients, 59% of pre-transplantation patients had metabolic syndrome. Presence of metabolic syndrome at one year was associated with long-term renal dysfunction after kidney pancreas transplantation.[19]

The goal of identifying metabolic risk factors is to prevent morbidity and mortality due to type 2 diabetes and cardiovascular disease. In individuals who have even normal LDL levels, there is a high risk of getting premature coronary artery disease.[20] The role of family physicians is important as they are the first line of health care providers to encounter patients and to provide preventive measures besides taking steps to reverse metabolic syndrome in those who have a combination of risk factors [21] (Table II).

Age adjusted distribution of metabolic syndrome in this study showed that out of 87 patients who had metabolic syndrome, 43.7% were in the age range of 51-60 years and 27.6% were in the age range 41-50 years.[5-7,11,12] (Table III). Since physical inactivity and excessive weight gain are the main underlying contributors to the development of metabolic syndrome, as demonstrated in this study also, getting more exercise and loosing weight can help reduce or prevent the complications associated with this condition. Most of the risk factors are preventable and, identifying these at early stage at screening clinics might be of significant help, as done elsewhere.[22]

The worldwide epidemic of type 2 diabetes is fuelled in large part by a parallel epidemic of obesity and physical inactivity, clearly pointing to prevention of obesity as the most direct route to prevention of metabolic syndrome and its squalor.[23] Hypertension, diabetes, obesity and ischemic heart disease have become a problem of public health magnitude with substantial economic burden not only in developed but also in the developing countries.[24,25] It is a family practitioner's responsibility to detect these non-communicable diseases in patients' first encounter with the physician and dealing with each component either through a treatment strategy or prevention of disease to prevent atherosclerotic cardiovascular diseases and diabetes which are the principal causes of death, disability and excess health care cost.[26 -28]

It is well established that metabolic syndrome is difficult to manage and this study reports a similar burden as reported in most of the western countries. One of the main contributory factors is central obesity, which needs to be addressed more aggressively among females who had a significantly higher BMI compared to males, although males had a significantly higher waist circumference. Individual risk factors need to be corrected, however, prevention of these factors in the community requires more awareness. Dietary and physical activity practices that are learned at young age may be carried into adulthood, establishing healthy lifestyles at an early age. Testing effective strategies for prevention should have a high priority in subsequent research involving metabolic syndrome. Preventive measures require substantial political will and financial investment; they should yield a rich dividend to society in the long-term.

CONCLUSION

Frequency of metabolic syndrome in this study was significantly high with predominant involvement of males and prevalence is similar to that observed in developed countries. Majority of patients had obesity and high fasting blood sugar levels. Males demonstrated higher levels of triglycerides and low levels of High-density Lipoprotein (HDL) compared to females while blood pressure reading was observed to be the same in both males and females.

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