

Frequency of the metabolic syndrome in type 2 diabetic subjects attending the diabetes clinic of a tertiary care hospital

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Abstract

Objective: To determine the frequency of the metabolic syndrome in patients with type 2 diabetes mellitus who attended the diabetes clinic of Liaquat National Hospital, Karachi.

Method: A descriptive study was conducted at the diabetes clinic of Liaquat National Hospital from June 2004 to December 2004. We enrolled 233 subjects with type 2 diabetes mellitus.

Frequency of metabolic syndrome was estimated according to the criteria proposed by National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III), with adoption of the Asian criteria for abdominal obesity and recently proposed International Diabetes Federation (IDF) diagnostic criteria for metabolic syndrome.

Results: There were 233 patients with type 2 diabetes mellitus in whom 49.8% were men and 50.2% were women. Mean age was 49.9 years. By applying NCEP-ATP III criteria, metabolic syndrome was found in 79.7% type 2 diabetics, (45.5% women and 34.3% men), by applying IDF criteria, metabolic syndrome was identified in 68.1% of type 2 diabetics (43.7% women and 24.4% men).

Conclusion: In our study the frequency of the metabolic syndrome was found significantly high, especially in women and at a relatively young age of 49.9 years (JPMA 57:239;2007).

Introduction

The Indo-Pak subcontinent is undergoing epidemiological transition as non-communicable diseases like coronary heart disease and type 2 diabetes mellitus are fast replacing infections as the leading cause of morbidity and mortality.¹

The risks of coronary heart disease and diabetes with metabolic syndrome are greater than those for simple obesity alone, and therefore, an understanding of the pathogenesis, and through it, a rational approach to its therapy are of prime importance.² Insulin resistance is the basis of most, if not all of the features of this syndrome.³ Thus hyperinsulinaemia, glucose intolerance, type 2 diabetes mellitus, hypertriglyceridaemia, and low HDL cholesterol concentrations could be accounted for by resistance to the actions of insulin on carbohydrate and lipid metabolism.² A proinflammatory state also contributes to the syndrome.⁴

Metabolic syndrome is defined as a condition characterized by a set of clinical criteria: insulin resistance, obesity, hypertension, and atherogenic dyslipidaemia.⁵

Gerald Reaven in 1988 was the first scientist to name this cluster as syndrome X.¹ In addition to general obesity, the distribution of body fat is independently associated with the metabolic syndrome in older men and women, particularly among those of normal body weight.⁴ Abdominal subcutaneous adipose tissue with expression of inflammatory cytokines is a potential mechanism linking obesity with its metabolic comorbidities.⁶ Peroxisome proliferators-activated receptors (PPARs) are ligand-activated transcription factors that control glucose and lipid metabolism, as well as the inflammatory response. Thus PPARs appear good drug targets for the correction of the global risk profile that predis-

poses an individual to the cardiovascular diseases.^{7,8}

The aim of our study was to determine the frequency of the metabolic syndrome in type 2 diabetic adults so that the magnitude of this rapidly rising and serious global health issue in our setup could be estimated and find out the ways and means to prevent this constellation of syndrome. We believe that the magnitude and seriousness of this problem has largely been underestimated in Pakistan.

Subjects and Methods

This was a descriptive study conducted at the diabetes clinic of Liaquat National Hospital, a private tertiary healthcare centre in Karachi, from June 2004 to December 2004. All type 2 diabetics with different ethnic backgrounds of the country were included in the study.

Following variables were measured for the metabolic syndrome according to the National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III) 2001 and the new International Diabetes Federation (IDF) guidelines:

NCEP-ATP III Guideline

1. Blood glucose fasting >110 mg/dl or known case of type 2 diabetes mellitus.
2. Blood pressure \geq 130/85-mmHg or known hypertensive.
3. Waist circumference #; man \geq 90 cm, woman=80 cm (Asian criteria).^{9,10}
4. Triglyceride \geq 150 mg/dl.
5. HDL-C; man \leq 40 mg/dl, woman \leq 50 mg/dl.

Metabolic syndrome is diagnosed when 3 or more criteria are fulfilled.

IDF Guideline

According to the new IDF definition, for a person to have the metabolic syndrome should have;

Central obesity: waist circumference men \geq 90 cm, women \geq 80 cm.

Plus any 2 of the following 4 factors:

1. Blood glucose fasting $>$ 100 mg/dl or known case of type 2 diabetes mellitus.
2. Blood pressure \geq 130/85-mmHg or known hypertensive.
3. Triglyceride \geq 150 mg/dl.
4. HDL-C; men \geq 40 mg/dl, women \geq 50 mg/dl.

Waist circumference was measured midway between iliac crest and lower rib margin.

Blood pressure was measured using auscultatory method by a mercury sphygmomanometer with patient seated comfortably in outpatient setting.

Serum HDL-C and triglycerides were measured by enzymatic in vitro assay by Roche automated clinical chemistry analyzers.

Plasma glucose was estimated by hexokinase method by Roche chemical analyzers.

Data analysis was performed using statistical programmes SPSS version 10.0.

Descriptive statistics are presented as a percentage of the total number of the population. Cross tabulation was used to determine the relationship of different variables of the metabolic syndrome. Chi square test was applied for determination of P values. P value less than 0.05 was considered significant.

Results

A total of 233 were included in the study in which 116 (49.8%) were males and 117 (50.2%) females. Mean age of study population was 49.9 years ranging from of 25-85 years.

Of the total 75.2% patients fulfilled the criteria for raised waist circumference; with 28.8% and 46.4% males and females respectively (Table1).

Hypertension was found in 43.2% patients with the ratio of men to women being 18.4% and 24.8% respectively.

Hypertriglyceridemia was found in 51.5% of patients; men and women were 26.2% and 25.3% respectively. Low HDL-C was seen in 64.4% of patients; men and women were 27.9% and 36.5% respectively.

By applying ATP III criteria, 15% of the patients fulfilled all five criteria for metabolic syndrome; men 3.86%, and women 11.15% (Table 2). While applying ATP III criteria, metabolic syndrome was identified in 79.78% of type 2 diabetics in whom men were 34.3% and women were 45.4 % (table3). By applying IDF criteria, metabolic syndrome was identified in 68.1% in whom women were

43.7% and men were 24.4%.

Discussion

The incidence of the metabolic syndrome is rising worldwide. This is partly due to a significant increase in the prevalence of obesity.¹¹ The etiology of the metabolic syndrome is multifactorial such as the high prevalence of excess body fat, abnormal body fat distribution, hypertriglyceridemia, and insulin resistance. These risk factors might begin at a young age and its high frequency has been consistently recorded in Asian populations irrespective of their geographic locations.¹² Furthermore, increasing energy consumption, decreasing energy expenditure, or combination of both has led to a positive energy balance and a marked increase in weight.¹³ International data indicates that the epidemic of metabolic syndrome is not merely confined to the western world but is in fact a global health problem. The prevalence of obesity is rising in other developed and affluent countries and is now spreading to less affluent countries like Pakistan.¹³ Obesity-related type 2 diabetes is also rapidly rising in prevalence, not only in west but also in Asians largely because of increased longevity and sedentary lifestyles.^{14, 15}

Observational cross-sectional studies as well as demographic health surveys from Middle East point out that the prevalence of obesity increases from an average of 6% in healthy children to 20% in adolescent males and to a further 23% in elderly patients.¹¹ According to the National

Table1. Frequency of the components of the metabolic syndrome.

	Total		Men		Women		P-values
	n	%	n	%	n	%	
Diabetes	233	100	116	49.8	117	50.2	--
Raised Waist circumference	175	75.2	67	28.8	108	46.4	<0.0001
Hypertension	101	43.2	43	18.4	58	24.8	0.054
LowHDL-C	150	64.4	65	27.9	85	36.5	<0.008
Raised TG	120	51.5	61	26.2	59	25.3	0.742

Table 2. Number of patients fulfilling the criteria of metabolic syndrome.

	5 criteria		4 criteria		3 criteria	
	No.	%	No.	%	No.	%
Men (n=116)	9	3.8	29	12.4	42	18.0
Women (n=117)	26	11.1	37	15.8	43	18.4
Total (n=233)	35	14.9	66	28.2	85	36.4

Table3. Frequency of the metabolic syndrome.

Total	ATP III Criteria			Total	IDF Criteria		
	Men	Women	P-Value		Men	Women	P-Value
79.7	34.3	45.4	0.02	68.1	24.4	43.7	0.001

Health Survey 1990-1994, 1% of Pakistani population was obese and 5% were overweight in 15-24 age group.¹⁶ This shows that obesity is not restricted to adults only but also spreading in children and adolescents¹⁶.

World Health organization estimates the prevalence of obesity to be 4.8% in less affluent countries, 17.1% in countries undergoing economic transition, and 20% in the developed world.⁹ In 1991, 53% men and 44% women in United Kingdom were obese.⁹ In our study, 75% of the population fulfilled the criteria for obesity by applying Asian cut-off for waist circumference. This high incidence of obesity contributes to a very high frequency of metabolic syndrome in our patients, especially in women. In our patients obesity was much more prevalent than quoted by World Health Organization study.

Applying the ATP III and IDF criteria for diagnosing the metabolic syndrome, a significantly high frequency was seen in women. This was because obesity was a mandatory factor in IDF criteria. We assume that IDF criteria may underestimate the frequency of the metabolic syndrome especially in male subjects. It is important to note that 15% of our patients fulfilled all five criteria of metabolic syndrome in which women contributed to 11%. This is a serious issue in this subgroup of patients.

In the Middle East, prevalence of metabolic syndrome in non-diabetic adults is estimated to be 15-25%.¹¹ In the FINRISK cohort, the metabolic syndrome was present in 75% of the subjects with impaired glucose tolerance¹⁷, but this cohort showed much greater frequency of the metabolic syndrome in men than women, which is contrary to our results. Incidence of metabolic syndrome rises as age advances. In our study metabolic syndrome was identified in 66% of patients above the age 40 years. Hypertension and low HDL cholesterol was higher in women than in men and hypertriglyceridemia was found to be equal in both genders. Low HDL cholesterol is the second commonest abnormality found after obesity in type 2 diabetes mellitus.

There is now a consensus that obesity plays a central role in causing metabolic syndrome, so the fundamental approach to this syndrome is weight reduction and increased physical activity.^{18,19} However, drug treatment could be appropriate for diabetes and cardiovascular disease risk reduction.¹⁸

Pharmacological therapy consists of metformin, statins, fibrates, angiotensin converting enzyme inhibitors, and thiazolidinediones, all of which can decrease the risk and incidence of cardiovascular diseases. Sibutramine is also useful for weight reduction on a short-term basis.^{20,21}

Bariatric surgery can be considered for those with morbidly obese.²²

Conclusion

Our study clearly showed that the frequency of the metabolic syndrome was significantly high in our type 2 diabetic patients. Frequency was much higher in women than men. Obesity is a key element in causing the metabolic syndrome and this factor was also more prevalent in women. High density lipoprotein cholesterol was also found much lower in women. Therefore women are more prone to suffer from cardiovascular morbidity and mortality.

Recommendation

It is mandatory to adopt healthy lifestyle changes to prevent this deadly complication. In this regard health care providers can play an important role in patient's monitoring, weight reduction and physical activity counseling.

Clinicians should screen patients for obesity and offer intensive counseling and behavioral interventions. Preventive action should be targeted to control all the features of the metabolic syndrome.

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