Prevalence of Metabolic Syndrome in An Urban Indian Diabetic Population Using The NCEP ATP III Guidelines

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Abstract
Objective: To study the prevalence of metabolic syndrome (MetS) in an urban Indian diabetic population.

Research Design and Methods: A total of 5088 type 2 diabetes patients (2908 men and 2180 women) presenting to endocrinology clinics at four centers across Mumbai (a large metropolitan city in India) were selected for the study. Anthropometric (waist circumference), clinical (blood pressure) and biochemical (serum triglycerides, HDL, fasting and post-prandial blood glucose) data were recorded. Patients receiving treatment for hypertension or dyslipidemia were also included in the study and these were considered in the diagnosis of MetS even if the parameters were normal. The National Cholesterol Education Program Adult Treatment Panel III guidelines were used to diagnose MetS. The chi-square test was used to determine statistical significance, which was taken as a p value <0.05.

Results: The prevalence of MetS among urban Indian diabetic patients was 77.2% and was significantly higher in women (87.71%) as compared to men (69.33%) (p<0.0001). The most prevalent risk factors for MetS were hypertension, followed by hypertriglyceridemia, in men, and central obesity, followed by hypertension, in women.

Conclusions: MetS is highly prevalent in the urban Indian diabetic population. It should be identified by regular screening in individuals from the general population to avert or delay the progression to type 2 diabetes in order to reduce diabetes-related morbidity and mortality. ©

INTRODUCTION

Type 2 diabetes is associated with increased morbidity and mortality, and the prevalence of this disease continues to rise.1,2 Individuals with metabolic syndrome (a cluster of central obesity, glucose intolerance, hypertension and dyslipidemia) are at increased risk of developing type 2 diabetes.3-5 Metabolic syndrome (MetS) has been observed in many ethnic groups and it is estimated that it is prevalent in about a quarter of the world’s adults.6

MetS is associated with increased cardiovascular disease leading to increased cardiovascular (CV) morbidity and mortality.7-12 It is also an independent predictor of cerebrovascular events7 and is also related to an increased risk of all-cause mortality.7,9,11 Even in adults without diabetes, MetS is associated with an increased all-cause and CV mortality.8,11 Despite these adverse associations, it remains unclear whether the syndrome is a disease entity, by itself, or just a mere constellation of risk factors.

In a developing country like India, increasing urbanization and lifestyle changes have led to an increased incidence of diabetes.13 It is projected that, by the year 2030, India will have the most number of diabetic patients worldwide, double the number from China (which would be second), in addition to the maximum increase in the absolute number of diabetic patients.14 Though a limited amount of data exists on the prevalence of metabolic syndrome in India, prevalence data from the diabetic population is lacking. We explored the prevalence of metabolic syndrome in an urban Indian diabetic population using the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III guidelines.15

MATERIAL AND METHODS

Over 16,000 diabetic patients were screened from the large metropolitan city of Mumbai (India), who presented to endocrinology clinics at K. J. Somaiya Hospital and Research Centre, Lilavati Hospital, Diabetes and Thyroid Care Centre and Guru Nanak Hospital and Research Centre. Of these, 5088 patients (2908 men and 2180 women) had complete biochemical (serum triglycerides, HDL, fasting and post-prandial blood glucose), clinical (blood pressure)
and anthropometric (waist circumference) data and were selected for the study. Patients previously diagnosed with and taking medications for hypertension, diabetes or dyslipidemia were also included in the study.

Blood pressure was measured on the right arm after a 20-minute rest in the sitting position using a mercury sphygmomanometer by the auscultatory method in accordance the American Heart Association protocol.16 Waist circumference was measured on bare skin during mid-inspiration at the narrowest indentation between the tenth rib and the iliac crest using a plastic anthropometric tape. The lipid profile was measured by different diagnostic centers as selected by the patients. According to the NCEP ATP III criteria,15 the diagnosis of metabolic syndrome was made when three or more of the following was present: waist circumference >102 cm in men and >88 cm in women, fasting glucose 110 mg/dl (6.1 mmol/l), systolic blood pressure >130 mmHg or diastolic blood pressure >85 mmHg, fasting triglycerides >150 mg/dl (1.7 mmol/l), and HDL cholesterol <40 mg/dl (1.0 mmol/l) in men and <50 mg/dl (1.3 mmol/l) in women. Patients with normal blood pressure, normal serum triglycerides and normal serum HDL were considered as having these risk factors if they were taking medications for the same. All patients were receiving anti-diabetic medications and were considered to have diabetes even if they had normal blood glucose. The chi-square test were used to determine statistical significance, which was taken as a p value <0.05.

**RESULTS**

Complete anthropometric, biochemical and demographic information was available for 5088 patients, of which 2908 (57.15%) were men and 2180 (42.85%) were women. Using the ATP III guidelines, metabolic syndrome was found in 3928 patients (77.2%), of which 2016 (51.32%) were men and 1912 (48.68%) were women. Clinical, demographic and laboratory data of all patients are presented in Table 1 and prevalence of individual components of metabolic syndrome are presented in Table 2.

Considering the entire cohort of 5088 diabetic patients, metabolic syndrome was significantly more prevalent in women as compared to men (p<0.0001). Central obesity (p<0.0001) and low HDL (p<0.0001) were also significantly more prevalent in women. Men were more likely to have hypertension (p=0.001). There was no significant difference in the prevalence of hypertriglyceridemia (p>0.5).

Considering the 3928 diabetic patients also diagnosed with metabolic syndrome, it was found that 748 (19.04%) were positive for all five risk factors, 1428 (36.35%) had four risk factors, and 1752 (44.6%) had three risk factors (Fig. 1). Women had a significantly higher prevalence of central obesity (p<0.0001) and low HDL (p<0.0001), while men were significantly more likely to have hypertension (p<0.0001) and hypertriglyceridemia (p<0.0001).

In all patients (irrespective of the diagnosis of metabolic syndrome), the two most prevalent risk factors for metabolic syndrome were central obesity, followed by hypertension, for women, and hypertension, followed by hypertriglyceridemia, for men.

**DISCUSSION**

A major finding of this study was a high prevalence of metabolic syndrome in diabetic patients, with a higher prevalence in women. Central obesity and low HDL cholesterol were more prevalent in women, while hypertension was more prevalent in men. Understanding these differences can help in tailoring treatment strategies for diabetic patients.
of metabolic syndrome among individuals with type 2 diabetes. Our study also provides the first estimates of the prevalence of metabolic syndrome in an urban Indian diabetic population. Approximately 77% of the cohort had metabolic syndrome when the ATP III criteria was applied; more than two-fold higher than the 31.6% prevalence in the general urban Indian population. 

Previously published studies measuring prevalence of metabolic syndrome in type 2 diabetes reveal prevalence nearly identical to that found by our study. Imam et al. reported a prevalence of 79.7% from Pakistan, Bruno et al. reported a prevalence of 75.6% from the USA and Foucan et al. reported a 77% prevalence of metabolic syndrome in diabetic Indian immigrants in the USA.

Our study also demonstrated a higher prevalence of metabolic syndrome among women as compared to men. 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. However, the average waist circumference was still higher and the serum HDL was lower in women as compared to men. Men were more likely to have hypertension and hypertriglyceridemia. Similar trends in the distribution of these risk factors among men and women have been reported by other studies. The prevalence of the various risk factors was also higher among individuals with metabolic syndrome as compared to those who did not classify as having metabolic syndrome.

It is well known that individual components of metabolic syndrome are high risk factors for cardiovascular morbidity and mortality. Further, in adults who have type 2 diabetes, the presence of metabolic syndrome is associated with a fivefold increase in CV risk independent of age, sex, smoking status, and glycated hemoglobin (HbA1c). Therefore, it is imperative that aggressive therapy be aimed at controlling dysglycemia, dyslipidemia and hypertension. Substantial benefits of such a multifactorial intervention have been documented by the Steno-2 study.

In conclusion, our data demonstrates that metabolic syndrome is extremely common among diabetic patients, making it a risk factor for the development of diabetes and, subsequently, its complications. Therefore, non-diabetic individuals with metabolic syndrome should be identified from the general population and screened regularly, as this comprises a highly susceptible group for the development of type 2 diabetes.

REFERENCES

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