

Prevalence of Metabolic Syndrome in Patients With Type 2 Diabetes Mellitus in a Tertiary Care Hospital

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ABSTRACT

Introduction: Diabetes mellitus is associated with various metabolic disorders, which leads to the progression of the disease and its complications. The aim of the study is to find out prevalence of metabolic syndrome and its association with the components and demographic variables.

Methods: This cross-sectional study was conducted among diabetes mellitus patients at a Tertiary level teaching hospital over a period of one year (April 2015 to March 2016). The study involved the use of a questionnaire to obtain information on diabetes by performing anthropometric measurements and corroborating it with respective blood samples collected for the measurement of biochemical parameters, fasting blood glucose and lipid profile. Metabolic syndrome was defined according to the current guidelines, revised in 2005 by the National Heart, Lung and Blood Institute and the American Heart Association. Statistical Package for the Social Sciences Version 20 was used as a tool for statistical analysis.

Results: This cross-sectional study involved 200 type 2 diabetes mellitus patients. The prevalence of metabolic syndrome was 71% in the studied Nepalese population. Central obesity (77.5%) and hypertension (76.8%) were the commonest risk factors. It was followed by dyslipidemia among which 65.5% had high triglyceride level and 50.7% had low level of high density lipoprotein cholesterol. Higher prevalence of metabolic syndrome was seen in male patients with type 2 diabetes which accounted for 84 (73.3%). Three components of metabolic syndrome were seen among 70 (35%) and five components among 29 (14.5%) patients. Among the patients who were studied, the age group 45 to 54, 55 to 64 and 65 to 74 years had 14 (20%), 20 (28.6%) and 19 (27.1%) of more than three components of metabolic syndrome respectively.

Conclusions: The prevalence of metabolic syndrome was 71% among the patients with type 2 diabetes, where high prevalence was seen among males. In our study central obesity and hypertension along with increasing age were the most common component causing metabolic syndrome.

Key words: Diabetes mellitus; Metabolic syndrome.

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INTRODUCTION

The metabolic syndrome, as defined by the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria, is a constellation of fasting lipids/lipoproteins, waist circumference, glucose and blood pressure abnormalities. This has been associated with increasing risk for developing cardiovascular disease (CVD) and diabetes.^{1,2} Using the data from the National Health and Nutrition Examination Survey 1999 to 2002 database, 34.5% of participants met Adult Treatment Panel (ATP) III criteria for the metabolic syndrome compared to 22% in the third National Health and Nutrition Examination Survey (NHANES III, 1988 to 1994).^{3,4} Type 2 diabetes and metabolic syndrome has been regarded as a disease of adults for a long time.⁵

Type 2 diabetes accounts for 90-95% of diabetes. It is usually associated with family history, older age, obesity, physical inactivity, or a personal history of gestational diabetes.⁶ Obesity (particularly abdominal obesity), is associated with resistance to insulin on peripheral glucose and fatty acid utilisation, often leading to type 2 diabetes mellitus. Insulin resistance associated hyperinsulinemia, hyperglycemia, and adipocyte cytokines (adipokines) may lead to vascular endothelial dysfunction, an abnormal lipid profile, hypertension, and vascular inflammation, all of which promote the development of atherosclerotic cardiovascular disease (CVD).⁷⁻⁹ CVD and diabetes both have complications which may eventually handicap the patient. Since the components are modifiable the disease can be prevented significantly if proper interventions are taken on time.

However, metabolic syndrome is becoming increasingly common among the younger age groups which warns the need to correct the components promptly and with combined approach. The aim of the present study is to find out the prevalence, common components and demography of the metabolic syndrome in type 2 diabetes mellitus among Nepalese population.

METHODS

This cross-sectional prospective analytical study was held at a tertiary level teaching hospital in Kathmandu from April 2015 to March 2016. All those patients who were diagnosed with type 2 diabetes mellitus irrespective of the anti-diabetic medication visiting inpatient and outpatient service were included in the study. Sample size was calculated using consecutive sampling technique.

The study involved the use of a questionnaire to obtain history and information regarding diabetes mellitus undertaking anthropometric measurements such as waist circumference, height and weight. Blood samples were collected for the measurement of biochemical parameters such as fasting blood glucose and lipid profile.

Metabolic syndrome was defined according to the revised 2005 National Heart, Lung, and Blood Institute (NHLBI) and the American Heart Association (AHA)¹⁰ i.e.

- Fasting glucose ≥ 100 mg/dL (or receiving drug therapy for hyperglycemia)
- Blood pressure $\geq 130/85$ mm of Hg (or receiving drug therapy for hypertension)
- Triglycerides ≥ 150 mg/dL (or receiving drug therapy for hypertriglyceridemia)
- HDL-C < 40 mg/dL in men or < 50 mg/dL in women (or receiving drug therapy for reduced HDL-C)
- Waist circumference for Asian: ≥ 90 cm (35 inches) in men or ≥ 80 cm (32 inches) in women

Metabolic syndrome was diagnosed when a patient had at least three of the above five conditions.

The analysis was done using Statistical Package for the Social Sciences (SPSS) software Version 20. Simple descriptive analysis and Chi-square test was used to determine the risk factors. Institutional ethical clearance was obtained and informed consent was taken from the patients.

RESULTS

The present study included 200 patients with type 2 diabetes mellitus among which males were 56.5% and females were 43.5% with mean age of 57.56 years. Metabolic syndrome was diagnosed in 142 (71%) type 2 diabetic patients based on the revised guidelines of National Heart Lung and Blood Institute (NHLBI) and the American Heart Association (AHA). Among the patients with metabolic syndrome, 84 were males and 58 were females.

Based on the distribution of prevalence of components of metabolic syndrome, according to the revised NHLBI and AHA, the levels of waist circumference (WC), blood pressure (BP), triglycerides (TGR) were high in 77.5%, 76.8% and 65.5% of the samples respectively. In contrast, high density lipoprotein-cholesterol (HDL-C) was low in only 50.7% of the patients (Table 1).

The most common risk factors were central obesity, as indicated by increased WC (77.5%) and high blood pressure (76.8%) followed by hypertriglyceridemia (65.5%). Regarding the distribution of patients according to the number of components of metabolic syndrome, 70 (35%) and 29 (14.5%) participants had three and five components respectively (Figure 1). It was also observed that the patients in age groups 45-54, 55-64 and 65-74

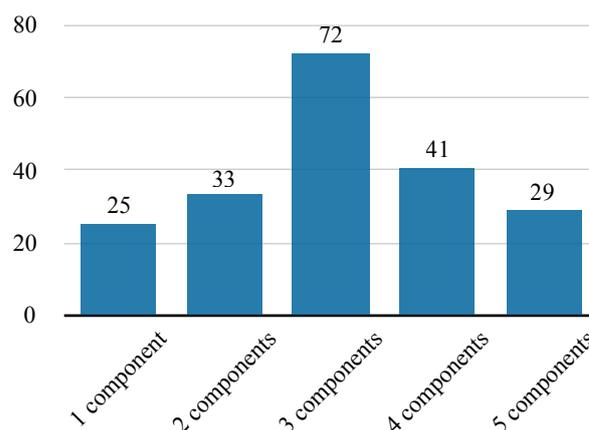


Figure 1. Frequency of components of metabolic syndrome among 200 diabetic patients

years had more than three components of metabolic syndrome (Figure 2).

DISCUSSION

The prevalence of metabolic syndrome amongst the patients in our study was 71%. The prevalence worldwide ranges from 45.8% and 96.3%.¹¹⁻¹² Similar study done at diabetes centre in Galle, Sri Lanka showed the prevalence of metabolic syndrome in Type 2 DM population to be 70% which was consistent with our study.¹³

Our study showed 84 male and 58 female participants had metabolic syndrome which was not similar to the study by Ford et al.⁴ and Nsiah K et al.¹⁴ which showed higher prevalence of metabolic syndrome in females. This variation may be due to less number of female patients who approached for hospital services during the study period.

There was high prevalence of central obesity in diabetic patients in the study group, accounting for 77.5%. Similar result was seen in the study done at regional diabetes centre in Galle, Southern Sri Lanka, which showed raised waist circumference as an important predictor for metabolic syndrome defined by all three World Health Organisation (WHO), NCEP-ATP III, and International Diabetes Federation (IDF).¹³ Increased waist circumference is a strong indicator of central obesity and is a health risk factor. Specifically, waist circumference (WC) provides a simple and practical anthropometric measure for assessing central

Table 1. Percentage of the parameters within the metabolic syndrome

Parameters	Metabolic syndrome	
	Yes n (%)	No n (%)
Blood pressure $\geq 130/85$	109 (76.8%)	18 (31.0%)
Triglyceride level ≥ 150	93 (65.5%)	6 (10.3%)
Low HDL-C	72 (50.7%)	5 (8.6%)
Increased waist circumference	110 (77.5%)	8 (13.8%)
Known case of hypertension	86 (60.6%)	14 (24.1%)
History of cardiac disease	24 (16.9%)	10 (17.2%)

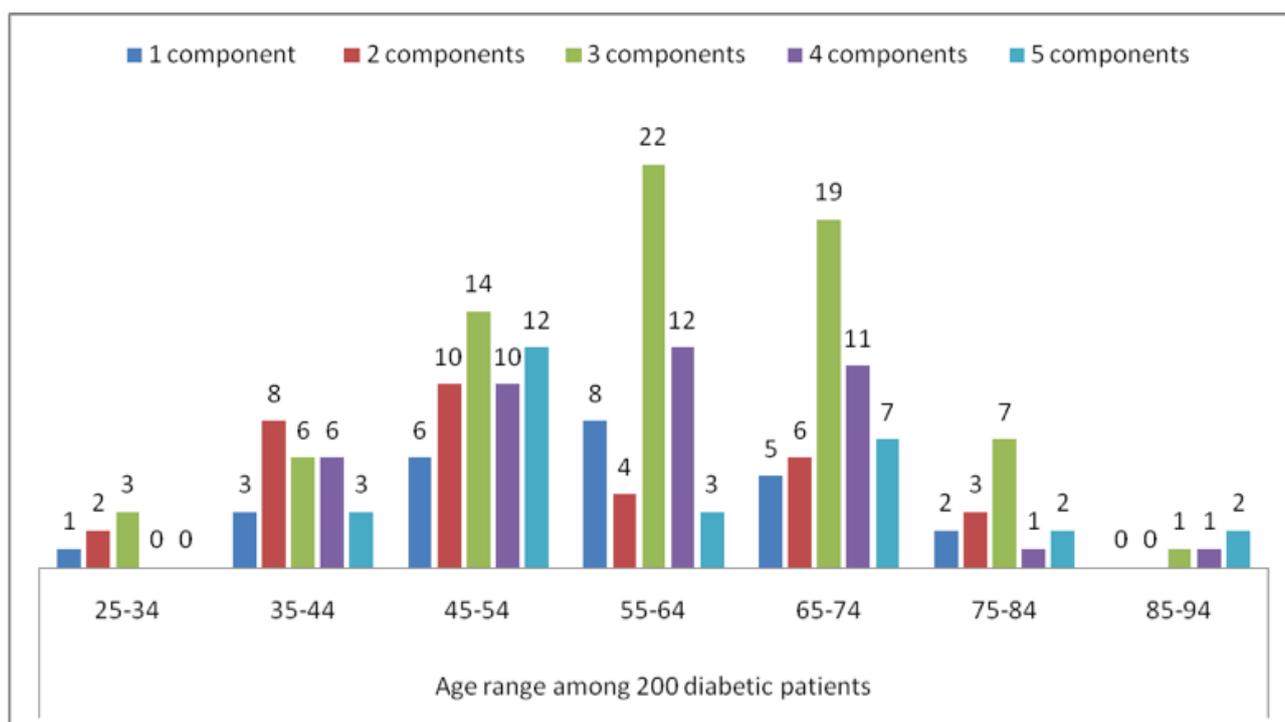


Figure 2. Bar diagram showing the distribution of components of metabolic syndrome according to different age groups

adiposity, and an increasing number of studies are reporting strong associations between WC, visceral adipose tissue, and obesity-related health risks.¹⁵

Hepatic production of very low density lipoprotein with consequent release of high TGR in blood is associated with insulin resistance resulting from central obesity.¹⁶ This is consistent with our study which showed more than 50% of the participants had low HDL. Hypertension was found to be the other commonest component (76.8%) in the participating population. This result corresponds to the study done by Nsiah K et al.¹⁴

In our study 25 (12.5%) patients had at least one component of metabolic syndrome and 33 (16.5%) had two components. This group of population probably suffers from the syndrome within a short period if timely interventions are not taken and lifestyle is not changed. The number of components of metabolic syndrome also shows evidence in the risk of development of cardiovascular diseases (CVD). It also helps to establish interventions and to plan strategies to prevent CVD in this population.¹⁷ Additionally, in our study 70 (35%), 41 (20.5%) and 29 (14.5%) of the patients had

three, four or five altered components of metabolic syndrome respectively, which were higher than those found among diabetics in other study.¹⁷

Age groups 45-54, 55-64 and 65-74 years who had more than three components of metabolic syndrome were 14 (20%), 20 (28.6%) and 19 (27.1%) respectively, which indicates that the participants of the age group 45-54 years are likely to have a high prevalence of metabolic syndrome, irrespective of sex. Hence, prevention and control measures should be taken when the age approaches since the prevalence of metabolic syndrome increases with age.¹⁸

CONCLUSIONS

The prevalence of metabolic syndrome was 71% among the patients with type 2 diabetes mellitus. It also showed that the prevalence of metabolic syndrome increases with advancing age. The most prevalent component was central obesity and hypertension, followed by, hypertriglyceridemia and low HDL-C.

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Conflict of Interest: None declared

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