



## Original Article

## Prevalence and determinants of metabolic syndrome among newly diagnosed type 2 diabetic subjects according to different criteria



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## ABSTRACT

**Background and aim:** Metabolic syndrome (MS) is becoming a serious global public health problem. The prevalence of MS differs in different population by using different definitions. Present study aimed to find out the prevalence and determinants of MS among newly diagnosed type 2 diabetes (NDT2D) according to different criteria.

**Subjects and methods:** This cross-sectional analytic study was conducted among 281 subjects selected purposively from the OPD of BIRDEM. Information on lifestyle factors and disease history were collected using a semi-structured questionnaire by face to face interview. The three definitions of MS used in this study are from the International Diabetes Federation (IDF), a modified version of the ATP III criteria for Asian populations (modified ATP III) and World Health Organization (WHO) criteria.

Adjusted odds ratio and confidence limit were generated through logistic regression.

**Results:** The overall prevalence of metabolic syndrome among the study subjects according to modified ATP III, WHO and IDF criteria were 79% (95% CI: 74.2–83.8), 81% (95% CI: 76.4–85.6) and 68% (95% CI: 62.6–73.5) respectively. The prevalence of metabolic syndrome among female were higher compared to males in all the criteria's. Female gender (OR = 5.93), family history of diabetes (OR = 1.92), overweight (OR = 6.2), and obesity (OR = 5.13) were found as important confounders associated with metabolic syndrome.

**Conclusion:** The prevalence of the metabolic syndrome among NDT2D is considerably higher in our population which may indicate considerable risk of cardiovascular diseases in future. Female gender, family history of diabetes, overweight and obesity are important confounders of MS in this population.

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### 1. Introduction

The rapid emergence of metabolic syndrome (MS) has been recognized as a major public health problem which considered to be a driver of the modern day epidemics of diabetes and cardiovascular diseases (CVD) [1,2]. It is a frequent and increasing problem everywhere in the world, affecting around a quarter of the

world's adult population [3]. On the other hand, many studies have shown that metabolic syndrome, irrespective of its definition, is an independent clinical indicator of macrovascular and microvascular complications in diabetics [4].

The metabolic syndrome (MS) is a cluster of several medical disorders that occur together, increasing the risk of cardiovascular disease (CVD) and diabetes [5]. The components of this condition are central obesity, hypertension, elevated insulin levels and dyslipidemia. Insulin resistance is the cornerstone of metabolic syndrome. Current epidemiological data suggested that, people with metabolic syndrome are twice as likely to die from and three times as likely to have a heart attack or stroke compared with people without the syndrome [3]. In addition, people with

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metabolic syndrome have a fivefold greater risk of developing type 2 diabetes [6]. A number of studies have confirmed that the risks of developing CVD, and of both cardiovascular and all-causes of mortality, are increased by the presence of MS [7–10].

The prevalence of metabolic syndrome in adult population worldwide varies from 8 to 24.2% [11,12] in males and from 7 to 46.5% [13,14] in females. South Asians have high prevalence of metabolic syndrome [15,16] and a usually high tendency to develop type 2 diabetes mellitus and atherosclerotic cardiovascular disease (ASCVD) [17]. Rapid demographic, nutritional, and economic changes as are occurring in South Asians. Most importantly, globalization of diets and consumption of nontraditional fast foods have occurred at a rapid pace in urban areas. In addition, modern people are less physically active, and a sedentary lifestyle is increasing, migration from villages to cities is increasing. These intracountry migrants become urbanized and mechanized, resulting in nutritional imbalance, physical inactivity [18]. Recent studies have reported that physical activity and physical fitness are associated with lower prevalence and incidence of metabolic syndrome and individual CVD risk factors (e.g., high blood pressure, insulin resistance, abdominal adiposity, and dyslipoproteinemia [19]. In fact all expert groups [20–22] agree on the core components of the MS-visceral obesity, glucose intolerance, dyslipidemia and arterial hypertension. However, they provide different clinical criteria to identify such a cluster.

In our country, we do not have enough data on the metabolic syndrome of newly diagnosed diabetics which is responsible for increasing morbidity and mortality in all age groups. As metabolic syndrome is considered a global health problem it is required for more studies and control method in treatment regimes control diabetes, good quality of food and physical activity. The change in environmental condition and dietary habits among different population, which differ from one country to the other necessitate the determination of biochemical and anthropometric parameters which evoke metabolic syndrome among Bangladeshi NDDM population. The aim was to determine the prevalence and determinants of metabolic syndrome and its components in subjects newly diagnosed with type 2 diabetes.

## 2. Materials and methods

A cross-sectional study was carried out at the out patient department (OPD) of the Bangladesh Institute of Research & Rehabilitation on Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka. Two hundred and eighty one (97 male and 184 female) newly diagnosed type 2 diabetic subjects, were selected purposively for this study. Age group in both male and female were taken from 25 to 60 years. Patients with incomplete information, type 1 diabetic, gestational diabetic cases, with serious comorbid diseases (infection, stroke, myocardial infarction, major surgery, malabsorption, etc.) and history of using insulin sensitizing drugs (like thiazolidinediones or metformin, oral contraceptive containing levonorgestrel, etc.) were excluded from the study. Newly diagnosed patients in the hospital routinely undergo thorough clinical and bio-chemical investigation for determination of diabetic profile and complication.

Data were collected using semi-structured questionnaire based on the objectives with simple and understandable language by face to face interview. All clinical and biochemical measurements data of first visit were retrieved from the patient's diabetic guidebook. Participants were identified as hypertensive according to the International Diabetic Federation (IDF) criteria if they were on antihypertensive medications or if they had a systolic blood pressure  $\geq 130$  mm Hg or diastolic blood pressure  $\geq 85$  mm Hg. Patient's glycemic status and all selected parameters of blood lipids (total cholesterol, triglycerides, high density lipoprotein

cholesterol (HDL-C) were collected from their recent diagnosis report which was recorded in their guidebook.

Three definition of metabolic syndrome of three well accepted institutes were selected for diagnosis of metabolic syndrome. They are as follows: International Diabetes Federation (IDF)<sup>20</sup>, World Health Organization (WHO) [21] and Modified NCEP ATP III [22].

Each of the participants was informed about the research objectives, methods and techniques in detailed and written informed consent were taken. Data were collected ensuring the privacy and confidentiality by face to face interview and document's review. The study approved by the Ethical Review Committee of Diabetic association of Bangladesh (BADAS).

After collection, all data were checked thoroughly for consistency and completeness. Data were cleaned, edited and verified daily to exclude any error or inconsistency. Statistical Package for Social Sciences (SPSS) for Windows version 11.5 was used to analyze the data. All the data were expressed as the mean  $\pm$  SD, frequency and percentage as appropriate. Student's *t*-test was used to compare continuous variables. Comparisons were accomplished between male and female genders. Logistic regression was applied to estimate the odds ratio (OR) and corresponding 95% confidence intervals (CI) for the different explanatory variables used to predict the metabolic syndrome. A significance level of 0.05 was considered as proper, and thus *p*-values of less than 0.05 were considered statistically significant.

## 3. Results

Of the 281 newly diagnosed type 2 diabetic patients included in the study, 97 were male and 184 were female with a mean ( $\pm$ SD) age of  $46 \pm 11$  years. Among the study subjects 93% were Muslim and 92% came from urban areas, 49% belonged to lower-middle income group and more than 60% of the participants had under graduate level (1–12 years) of education (Table 1).

A total of 225 (79%), 231 (81%) and 193 (68%) patients met the Modified ATP III, WHO and IDF criteria for metabolic syndrome, respectively. Prevalence of metabolic syndrome was higher among female by all diagnostic criteria (Fig. 1).

Higher levels of mean BMI, waist circumference, waist-hip ratio, diastolic blood pressure, fasting blood glucose, were present in female subjects compared to their counterparts. The Mean  $\pm$  SD

**Table 1**

Distribution of the study subjects according to their sociodemographic characteristics (*n* = 281).

Variables	Number (%)
Age (mean $\pm$ SD)	46 $\pm$ 11
Sex	
Male	97 (34)
Female	184 (66)
Living area	
Urban	260 (92)
Rural	21 (8)
Family income in BDT	
Low (<6000)	37 (13)
Lower middle income (6001–24000)	137 (49)
Upper middle income (24001–74000)	97 (35)
High income (>74,000)	9 (3)
Education	
Illiterate	63 (22)
Undergraduate	166 (60)
Graduate and above	52 (18)
Family history of diabetes	
Yes	112 (40)
No	169 (60)

Results are expressed as number (percentage) and mean  $\pm$  SD.

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