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Original Article

Metabolic syndrome among postmenopausal women in a selected rural area of northern Bangladesh

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1. Background

Metabolic syndrome (MetS) is the manifestations of clustered pathophysiological conditions which increases the risk of cardiovascular disorders (heart disease, stroke etc) including type 2 diabetes [1]. Mets is also known as syndrome of insulin resistance characterized by impaired glucose tolerance compounded with obesity, dyslipidemia and hypertension [2]. However, pathogenesis of Mets though still remain unclear, insulin resistance often considered as its underlying cause abnormality, apart from that, diet and physical inactivity which may be associated with unknown genetic factors.

Men reportedly tend to have higher prevalence of MetS than age-matched pre-menopausal women. Abdominal obesity and low HDL cholesterol also remain significant factors which contributes to MetS in women, particularly among more than 45 years, potential due to menopausal state [3], [4]. Estrogen deficiency, a typical type of body fat distribution has been reported to be observed among postmenopausal women is thought by many to be an important feature in the diagnosis of MetS [5].

Increasing trend of chronic non-communicable diseases (viz. cardiovascular diseases and type 2 diabetes) [6] has been observed among Bangladeshi urban even among rural women poor and physically inactive being more vulnerable [7]. However, Among rural Bangladeshi women, metabolic syndrome was found 20.7% following modified ATP III, 11.2% using cut off of International Diabetes Federation (IDF) but it came down to 8.6% following WHO definitions [8].

According to WHO criteria, insulin resistance has been considered as one of the most functionally essential component for the diagnosis of MetS, while in the recently proposed (2005) definition by the International Diabetes Federation (IDF), abdominal obesity remaining a compulsory component with any two of the other 4 factors; elevated triglycerides, lower HDL cholesterol, raised blood pressure and higher fasting plasma glucose [9]. Whereas the US National Cholesterol Education Program: Adult Treatment Panel III (ATP III) defined MetS as a cluster of three or more of the above CVD risk factors [10]. Thus based on all these definitions and clinical criteria of MetS, identification of metabolic risk factors in postmenopausal women remain imperative and crucial for developing primary and secondary preventive care strategies decreasing the socioeconomic burden of cardiovascular diseases grossly considering these clinical and socio-economic issues we conducted this study designed to estimate the prevalence of Mets according to different criteria taking its associated risk determinants among postmenopausal women of Bangladesh.

2. Methods

2.1. Study participants

This cross sectional study was conducted using multistage random sampling from 12 union of Pirganj upazila situated in Thakurgoan district of northern Bangladesh among 316 postmenopausal subjects statistically calculated using the Mets in a recent study in Chaina [11]. With informed consent postmenopausal women aged 45–70 years, not taking any hormone therapy, having intact uterus being physically and mentally sound were subjected to a MetS screening program at the local community (union parishad) office. Prior to this study, postmenopausal women defined if they had reported their last menses two years before. With informed consent, 3.5 ml of IV fasting blood was collected postmenopausal women who only 10–12 h overnight fasting suitable for biochemical analysis. Sociodemographic information (age, housing, educational level, occupation, monthly income), family history of diseases, blood pressure & menopause

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duration), anthropometric measurements (height, weight, waist circumference, hip circumference & MUAC) were also recorded by using appropriate method.

Socio-economic classification was made according to 2006 Gross National Income (GNI) per capita and using the calculation of World Bank (WB). The groups were: low-income group (BDT ≤ 5360), middle to high-income group (BDT >5361) [12].

2.2. Anthropometric and clinical measurements

Height, body weight and waist circumferences were measured among the subjects on light clothing and no shoes by trained examiners. Portable standoimeter and platform beam scale were used to measure subject's height and weight. To calculate BMI, Body weight in kilograms divided by the square of height in meters (kg/m^2). Waist and hip circumferences were measured to the nearest 0.5 cm with a soft non-elastic measuring tape. Three consecutive measurements at 1 min interval on cubital region both arms in sitting position ensuring the recumbence in a calm and quite environment. Systolic and diastolic blood pressures were computed as the mean of the three measurements.

2.3. Biochemical analysis

Fasting blood sample was subjected to measure serum glucose, triglyceride (TG), total cholesterol and HDL & LDL cholesterol. Blood samples collected in plain test tube vacutainers (-ve pressured) allowed to clot for 30 min when serum was separated by standard centrifugation (10 min at 3000 rpm and the 600 μl serum was collected at least in each aliquot and the remaining aliquot was frozen at -30^0 C for further use. While serum was not allowed to thawed unless the assay started performing. Serum glucose was analyzed using, triacylglyceride was measured by enzymatic-colorimetric (GPO-PAP) methods and serum total cholesterol were analyzed using enzymatic endpoint method (cholesterol oxidase/peroxidase) (all using Radox, UK) while serum high density lipoprotein (HDL) by enzymatic-colorimetric (cholesterol CHOD-PAP) method.

2.4. Diagnosis of MetS

For the diagnosis of Mets three types of criteria were followed: 1. World Health Organization (WHO) 2. Modified Adult Treatment Panel III (ATP III) 3. International Diabetes Federation (IDF). In WHO criteria for metabolic syndrome; insulin resistance considered as a required component for diagnosis as defined one of the followings: type 2 diabetes; impaired fasting glucose (IFG); impaired glucose tolerance (IGT), or for those with normal fasting glucose values (<6.1 mmol/l), a glucose uptake below the lowest quartile for background population under hyperinsulinemic, euglycemic conditions. In addition to insulin resistance, 2 other risk factors from the followings: antihypertensive medication and/or blood pressure ≥140 mm Hg systolic or ≥90 mm Hg diastolic; plasma triglycerides ≥150 mg/dl (≥1.7 mmol/L); HDL cholesterol <39 mg/dL (1.0 mmol/L) and BMI ≥30 kg/m^2 and/or waist: hip ratio >0.85. In ATP III criteria, presented with three or more of five risk determinants: high fasting glucose (≥5.6 mmol/l or ≥100 mg/dl), abdominal obesity (>80 cm), increased serum TG (≥150 mg/dl or ≥1.7 mmol/l), decreased HDL-C (<50 mg/dl or <1.29 mmol/l), and increased blood pressure (≥130/85 mmHg). Women taking oral hypoglycemic or antihypertensive medications prescribed by a physician were considered as diabetic or hypertensive independent of the serum or blood pressure finding. According to the new (2005) IDF definition, a person to be defined having metabolic syndrome must have ethnicity specific central obesity as waist circumference >80 cm which is recommended for South Asian women and any two or more of the following four factors: raised TG levels ≥150 mg/dl (1.7 mmol/l) or specific treatment for this lipid abnormality; reduced HDL-C <50 mg/dl (1.29 mmol/l) or specific treatment for this lipid abnormality; raised blood pressure as systolic BP ≥ 130 or diastolic BP ≥ 85 mmHg or treatment of previously diagnosed hypertension; and raised fasting blood glucose ≥100 mg/dl (≥5.6 mmol/l) or previously diagnosed diabetes.

2.5. Data management

The data were collected, tallied, cleaned and analyzed using SPSS Windows version; 21. While the prevalence of Mets and its components were determined using percentages. Kappa test were performed to examine the agreement among the dentition of Mets diagnosis and for comparing the proportional variation between two group X^2 test was performed. Logistic regression model were also fitted to identify plausible risk factors related to develop Mets A p value of <0.05 was considered statistically significant (CI of 95%) and were presented in two tailed.

2.6. Ethical consideration

All participants were informed about the aims of study and they gave their written consents. Ethical issues were followed according to the guideline of Bangladesh Diabetic Somiti (BADAS) ethical Review Committee which followed Helsinki guidelines.

2.7. Results

The highest prevalence (41.5%) of Mets found following modified ATP III criteria while the lowest prevalence (7.6%) following WHO criteria (Fig. 1).

Subjects classified as having Mets following IDF criteria, all of them (85) also met the criteria of ATP III. However, 35.1% (46 out of 131) were identified as Mets following ATP III criteria were not found same following IDF criteria. Good agreement was observed between ATP III and IDF criteria (k = 0.683). Whereas, agreement between WHO and IDF were very low. Further finding on metabolic syndrome by IDF criteria was only 12.9% (11 out of 85) met the WHO criteria contrarily, 95.3% subjects without having any Mets according to WHO criteria yielded to be positive following IDF criteria (k = 0.09). On the other hand, 37% participants without any positive syndrome following WHO criteria

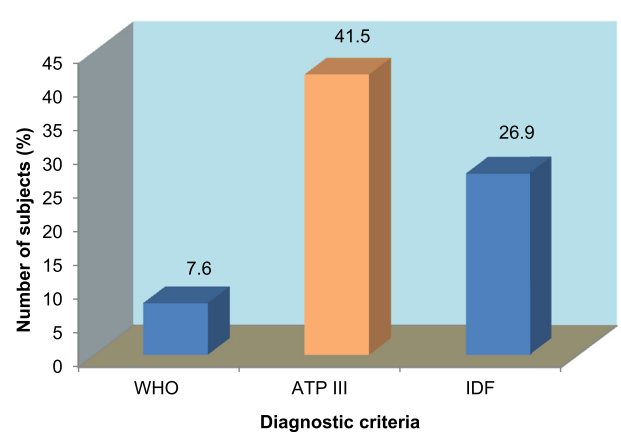

Fig. 1. Prevalence of the metabolic syndrome (MetS) using WHO, modified ATP III and IDF criteria (n = 316).

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