ORIGINAL ARTICLE

Frequency of Metabolic Syndrome on Diabetes Mellitus Patients in Surabaya

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ABSTRACT

Introduction: Metabolic syndrome is a syndrome characterized by central obesity, high blood glucose or impaired glucose tolerance, dyslipidemia, and high blood pressure. Nearly 70% to 80% of Diabetes melitus (DM) population was diagnosed with metabolic syndrome. We aimed to present the data of frequency of metabolic syndrome in patients with DM for a basis of future research**.**

Methods: This is a descriptive study design on DM patients based on NCEP ATP III criteria. The data was collected from direct measurements and laboratory results of all DM patients: waist circumference, weight, height, and blood pressure of the subjects, triglyceride status (TG), high-density lipoprotein cholesterol (HDL-C) status, and fasting blood glucose status.

Results: From 77 DM patients, results were obtained in this study were 69 (89.61%) patients with DM-metabolic syndrome (DM-MetS) and 8 (10.39%) patients with DM-non-metabolic syndrome. From 69 patients with DM-MetS, 52 (75.36%) were female and 17 (24.64%) were male.

Conclusion: A total of 69 (89.61%) patients with T2DM were diagnosed as metabolic syndrome.

Introduction

Metabolic syndrome (X syndrome, insulin resistance syndrome) is a syndrome characterized by abdominal obesisty, high blood glucose or impaired glucose tolerance, dyslipidemia, and high blood pressure which potentially increases the risk of diabetes mellitus (DM) and cardiovascular disease(1) National Health and Nutrition Examination Survey (NHANES) study in the United States with NCEP ATP III criteria has a metabolic syndrome prevalence of 22% of the adult population, increasing with age, where the age group of 20-29 years was 6.5% and the age group 60 - 69 years was 43.5%. According to gender, the greater prevalence of metabolic syndrome was found in women by 24% and 23.4% in men. Study in Makassar involving 330 men aged 30-65 years using the NCEP ATP III criteria obtained a 33.9% prevalence of metabolic syndrome. In the group of men central obesity, the prevalence increased to 62%.(2)

Risk factors of metabolic syndrome are vary, including obesity, especially central obesity; sedentary lifestyle for example, watching television, video or using a computer >4 hours a day are 2 times more at risk of getting metabolic syndrome; aging, metabolic syndrome affects 44% of the U.S. population. more than 50 years old; coronary heart disease (CHD), the prevalence of metabolic syndrome in CHD patients is 50%

lipodystrophy; and DM, ~ 75% of patients with DM or glucose impaired tolerance are exposed to metabolic syndrome.(3) As mentioned above, DM is one of the risk factors of metabolic syndrome with a high prevalence. Nearly 70-80% of the DM population is diagnosed with metabolic syndrome.(4) Looking at the high prevalence of diabetes mellitus as a risk factor for metabolic syndrome, researchers are interested to know the frequency of metabolic syndrome in patients with DM in metabolic endocrine outpatient clinic in RSUD Dr. Soetomo Surabaya.

Methods

This research is a descriptive study using primary and secondary data, conducted during May-June 2013. Population and samples were all DM patients in Endocrine Metabolic Outpatient Clinic of RSUD Dr. Soetomo Surabaya. The material used was the result of direct measurement on the subject and the laboratory results. There was no use of biological material in this study. The instrument of this study were the measurement of waist circumference, weight, height, and blood pressure of the subjects, triglyceride status (TG), high-density lipoprotein cholesterol (HDL-C) status, and fasting blood glucose status on DM patients in Endocrine Metabolic Outpatient Clinic of RSUD Dr. Soetomo Surabaya.

There were two types of data, primary and secondary data. Primary data is data taken directly by the researchers by measuring waist circumference, weight, height, and blood pressure on research subjects. In addition, primary data obtained by interviews in the form of name, age, gender, occupation, address, DM duration, BMI, family status, income, and tribe. While the secondary data is the data taken from the laboratory results of research subjects in the form of triglyceride status (TG), high-density lipoprotein cholesterol (HDL-C) status, and fasting blood sugar status. Both types of data are taken in the same time period.

Collected data was processed according to predetermined criteria, then described in the form of tables and diagrams with the help of excel program.

Results

This research was conducted in Endocrine Metabolic Outpatient Clinic RSUD Dr. Soetomo in DM patients from May 2013 until June 2013. During the study, 100 cases subject were patients with type 2 diabetes mellitus (DMT2) consisted of 30 (30%) male and 70 (70%) women (Table 1)

In the study subjects, metabolic syndrome was established based on NCEP-ATP III criteria that have been modified according to Asian characteristics, where the diagnosis was made when it meets three of the five components in a patient. Because of the subject of this research were DM patients. the diagnosis was made

when meeting at least two criteria. In this study, 100 patients with DM were asked to be respondents but 23 patients can not be categorized as metabolic syndrome or non-metabolic syndrome, so the total subjects used to know the frequency of metabolic syndrome in patients with DM were 77 patients. The research obtained as many as 69 (89.61%) diabetic patients were diagnosed with metabolic syndrome and only 8 (10,39%) were non-metabolic syndrome. Of the 69 patients diagnosed with metabolic syndrome, 52 (75.36%) were female and 17 (24.64%) were male. DM patients diagnosed with metabolic syndrome have not done a lipid profile examination, only 37 (53.62%) of patients who have had a lipid profile. However, according to three criteria of NCEP-ATP III, waist circumference, blood pressure, and fasting blood sugar (including DM), 32 (46.38%) patients who have not checked the lipid profile levels were hvaing metabolic syndrome. (Figure 1)

Table 1 The basic characteristics of the study subjects

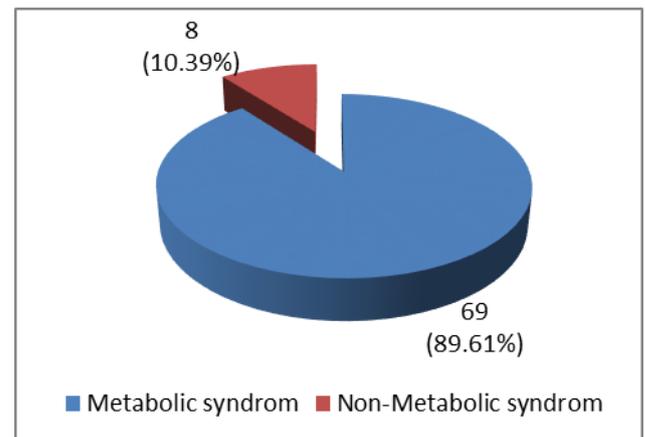| Variable	
Age (years)	37 - 83 (58,67 ± 9,38)
Gender	
• Male	30 (30%)
• Female	70 (70%)
Marital Status	
• Married	80 (80%)
• Widower	19 (19%)
• Widower	1 (1%)
DMT2 Duration	1 month - 23 years (6,76 ± 5,62 years)
BMI (kg/m²)	17,78 – 39,03 (24,90 ± 3,95)

Figure 1 The frequency of metabolic syndrome in patients with DM

Women's waist circumference is said to be abnormal (central obesity) if it has waist circumference ≥ 80 cm and it is said to be normal if it has waist circumference <80 cm. In this study we found as many as 50 (96.15%) female patients grouped into central obesity and 2

(3.85%) female patients did not suffer central obesity. Meanwhile, waist circumference of men is said to be abnormal if waist circumference ≥ 90 cm and can be said normal if have waist circumference <90 cm. In this study, 12 (70.59%) male patients were grouped into central obesity and 5 (29.41%) of men did not suffer from central obesity (Table 2).

Table 2 Characteristics of DM patients diagnosed with metabolic syndrome

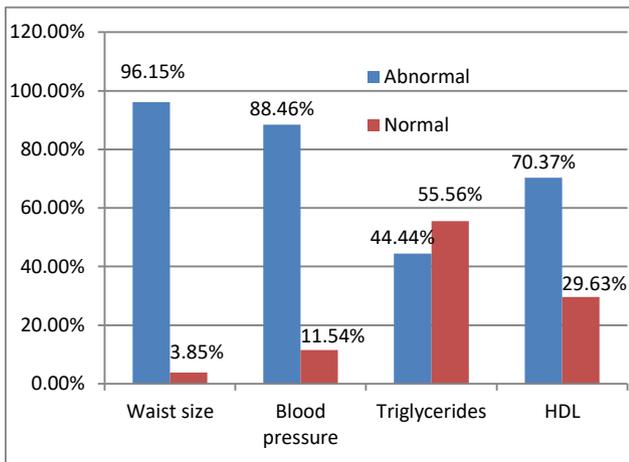| Variable	Female	Male
Gender	52 people (75,36%)	17 people (24,64%)
Waist size (cm)	68-117 (89,83 ± 8,39)	72-102 (92,06 ± 7,66)
Blood pressure (mmHg) • **Systolic** • **Diastolic**	90-190 (144,52 ± 21,26) 53-114 (80,19 ± 12,31)	117-174 (144,59 ± 14,58) 56-92 (71,47 ± 9,30)
Triglycerides (mg/dl)	36-489 (177,67 ± 106,32)	67-489 (173,30 ± 138,23)
Cholesterol HDL (mg/dl)	28-65 (44,44 ± 8,89)	27-59 (37,80 ± 10,35)

Figure 2 Profile of metabolic syndrome component in DM-MetS female patients

Grouping of DM-MetS patients based on blood pressure can be divided into two, both female and male patients who have systole <130 mmHg or diastole <80 mmHg (normal) and those with systole ≥ 130 mmHg or diastole ≥ 80 mmHg (abnormal or hypertension). Women patients who have normal blood pressure were 6 (11.54%) people and abnormal or hypertension as many as 46 (88.46%) people. Whereas in male patient only 2 (11,76%) have normal blood pressure and 15 (88,24%) abnormal or hypertension.

DM-MetS patients who have performed a lipid profile examination, their status of metabolic syndrome can be based on triglyceride levels. Women and men patients who have triglyceride levels ≥ 150 mg/dl (abnormal or hypertriglyceride) were 12 (44.44%) female patients and 3 (30%) of them were men. While patients who have triglyceride levels <150 mg/dl (normal) were 15 (55.56%) female patients and 7 (70%) male patients. (Figure 2)

In addition to triglyceride profiles, the metabolic syndrome component profile in DM-MetS patients can be seen from HDL levels. Patients with HDL <40 mg/dl for men (abnormal) were found to be 7 (70%) people and HDL <50 for women (abnormal) as many as 19 (70.37%) people. Meanwhile, patients with HDL> 40 mg/dl for men (normal) were 3 (30%) and HDL> 50 for women (normal) of 8 (29.63%) people. (Figure 3)
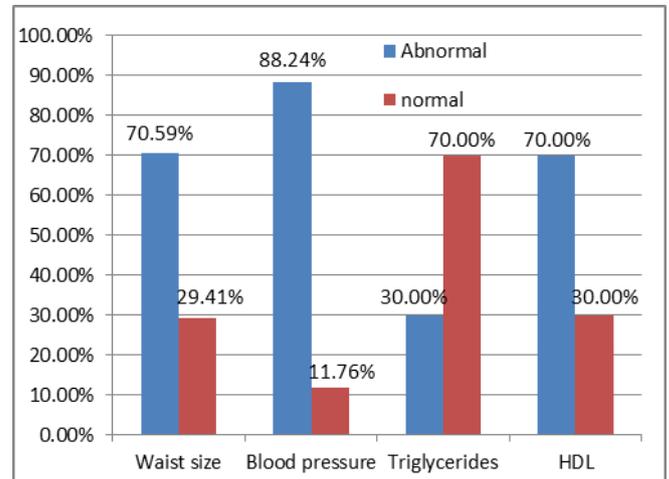

Figure 3 Profile of metabolic syndrome component in DM-MetS male patient
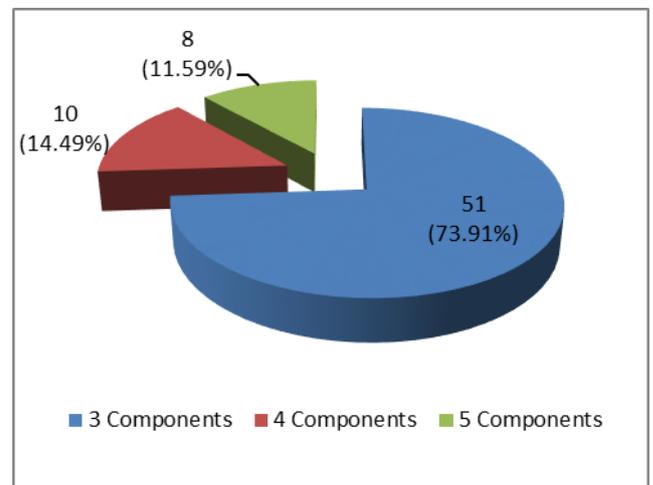

Figure 4 Frequency of metabolic syndrome component in DM-MetS patients

DM-MetS patients can be grouped based on how many components are met from the NCEP-ATP III criteria. However, as described above, because the

subject of this study is DM patients then the diagnosis was made when meeting at least two criteria. The results of this study showed three components (including DM) as many as 51 (73.91%) patients, four components (including DM) as many as 10 (14.49%) patients, and five components (including DM) of 8 (11.59 %) patient (Figure 4)

Discussion
In this study, the metabolic syndrome was determined by NCEP-ATP III criteria that had been modified and adapted to Asian characteristics. With these criteria a person can be said to metabolic syndrome if it meets at least 3 of 5 criteria including waist circumference ≥90 cm for men or ≥80 cm for women, triglycerides (TG) ≥150 mg/dL, HDL-C <40 mg/dL in men or <50 mg/dL in women, systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥ 85 mmHg, fasting blood sugar> 110 mg/dL (including diabetes).(5)

In this study, 100 DM patients were subjected but 23 patients can not be categorized as metabolic syndrome, so the total subjects used to investigate the frequency of metabolic syndrome in patients with DM were 77 subjects. The results obtained in this study were 69 (89.61%) diabetic patients diagnosed with metabolic syndrome and 8 (10.39%) patients with non-metabolic DM syndrome. The percentage of the above results is similar to the research conducted by Eckel saying that ~ 75% of patients with DM or glucose tolerance disorder are exposed to metabolic syndrome..(3)

Of the 69 patients diagnosed with metabolic syndrome, 52 (75.36%) were female and 17 (24.64%) were male. This is in contrast to studies of prevalence rates of metabolic syndrome in Finland with WHO criteria of 38.8% in males and 22.2% in females.(6) However, the National Health and Nutrition Examination Survey (NHANES) study in the United States with the NCEP ATP III criteria found the prevalence of metabolic syndrome according to the larger sex was found in women by 24% while in males by 23.4%.

The waist circumference component of DM-MetS patients was classified based on gender, the average of female patients waist were 89.83±8.39 cm and men 92.06±7.66 cm. Average systolic blood pressure of women were 144,52 ± 21,26 mmHg and men were 144,59 ± 14,58 mmHg while mean diastolic blood pressure of 80,19 ± 12,31 mmHg for women and 71,47 ± 9,30 mmHg for men. The average triglyceride level was classified by sex, 177,67±106,32 mg/dl for women and male were 173,30 ± 138,23 mg/dl. The mean HDL cholesterol of women were 44.44 ± 8.89 mg/dl and men were 37.80 ± 10.35 mg/dl.

In a study conducted by Widodo on 35 DM-MetS subjects at Outpatients Clinic RSUD Dr. Soetomo got average waist circumference of patients were 88,9 ± 7,4 cm of men and 89,7 ± 7,9 cm of women. HDL cholesterol average level were low, 41.54 ± 5.85 mg/dl for men and 48.91 ± 11.24 mg/dl for women. Blood

pressure components obtained average systolic blood pressure value of 148.43 ± 23.42 mmHg and diastolic blood pressure of 91.80 ± 11.06 mmHg. The triglyceride component was found to be 191,02 ± 127,64 mg/dl..(7)

Similar result also reported by Saijo et al on 409 subjects, there was a low average HDL rate of 46.4 ± 12.1 mg/dl, average triglyceride levels of 189 mg/dl, average systolic blood pressure was 136 ± 15.5 mmHg and diastolic blood pressure was 86 ± 11,0 mmHg and fasting blood sugar level was 114,7 ± 37,2 mg/dl.(8)

With the criteria mentioned above in this study we found as many as 50 (96.15%) female patients and as many as 12 (70.59%) male patients diagnosed with central obesity; hypertension in female patient counted to be 46 (88,46%) people and for male patient counted to 15 (88,24%) people; hypertriglycerides in female patients as many as 12 (44.44%) people and 3 (30%) in male patients; and patients with low HDL levels 7 (70.37%) for male and 19 (70%) for female patients. The prevalence of metabolic syndrome components in the total population in the United States was central obesity (38.6%), hypertriglyceride (30%), low HDL cholesterol (37.1%) and increased blood pressure or who used anti-hypertension (34%) and 12.6% with elevated fasting blood glucose levels or those taking anti diabetic therapy.(9) While in the study conducted by Pranoto et al reported the proportion of central obesity was 85.29%, hypertriglyceride was 85.29%, low HDL cholesterol was 52.94 %, increased systolic blood pressure was 82.35% and increased diastolic blood pressure was 55.88% and fasting blood sugar increased to 41.17%.(10)

Patients with DM-MetS can be grouped based on how many components are met from the NCEP-ATP III criteria. However, as described above, because the subject of this study is DM patients, the diagnosis was made when meeting at least two out of five criteria. The results of this study showed three components (including DM) as many as 51 (73.91%) patients, four components (including DM) as many as 10 (14.49%) patients, and five components (including DM) of 8 (11.59 %) patients. Shanty reported the profile of metabolic syndrome component were 7.1% with one component, 92.9% with two components, 63.1% with three components, 33.3% with four components and 13.1% with five components..(11) Research conducted by Ford et al obtained an individual prevalence with one component of metabolic syndrome was 71.2%, two components were 43.9%, three components were 23.7%, four components were 10.4% and five components were 2.7% .9 While research conducted at Outpatients Clinic RSUD Dr. Soetomo by Widodo found 17 (48.6%) patients with three components, 14 (40%) patients with four components and 4 (11.4%) patients with 5 components of metabolic syndrome..(7)

In this study there were limitations, for example the incomplete lipid profile data (especially triglycerides and HDL) from the study subjects. The lipid profile is included in the NCEP-ATP III component which is the criterion for determining the subject including the

metabolic syndrome or not.(5) In addition, a larger number of samples will yield more accurate data.

Conclusion

This study showed that 69 of 77 (89.61%) diabetic patients diagnosed with metabolic syndrome. The most profile of metabolic syndrome component in female DM-MetS was waist circumference, in hypertension, and low HDL level. The most profile of metabolic syndrome component in DM-MetS men was waist circumference, hypertension and at low HDL level. The frequency of the metabolic syndrome component was 73.91% in the three components

Conflict of Interest

The author stated there is no conflict of interest

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