The Components of Metabolic Syndrome in Young Adults

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Abstract: *Background: Lifestyle changing increased the prevalence of metabolic syndrome. Aim of the study is to find out the prevalence of the components of metabolic syndrome among young adults. Methods: This is a cross sectional study of young adults age 15 - ≤ 39. AHA/NHLBI criteria was used for the diagnosis of metabolic syndrome. Waist circumference male ≥ 90 cm, female ≥ 80 cm. High triglycerides ≥ 150 mg/dL, low HDL-cholesterol male < 40 mg/dL and female < 50 mg/dL, elevated blood pressure ≥ 130/ 85 mmHg, and elevated fasting glucose ≥ 100 mg/dL. Metabolic syndrome, if ≥ 3 of the categorical cut points. Blood was taken in the morning after 12-hours fasting. Results: In this study, 967 young adults subjects 9o0p can be covered. No significant difference in age group between females and males i.e 31,45±6.08 and 31.73±6.04 years (p=0.0544). Central obesity was the highest component, 436 subjects (45.1%) followed by low HDL-cholesterols 352 (36.4%), elevated blood pressure 285 (29,5%), elevated triglycerides 276 (28,5%), and elevated fasting glucose only 75 individuals (7,8%). Central obesity, and low HDL cholesterol were significantly higher in females compared to males 50,5% vs 26,9% (p=0,001), and 40.1% vs 24.2% (p=0.001). Among males, elevated triglycerides and elevated fasting glucose were higher compared to females, 39.5% vs 25.3% (p=0.001) and 11.7 vs 7.8% (p=0.013). No significant difference in elevated blood pressure (p=0.059). Conclusions: Central obesity was the most prominent component of metabolic syndrome, followed by low HDL-cholesterol and elevated blood pressure, especially among females.*

Keywords: Metabolic syndrome, components, young adults

1. Introduction

Metabolic syndrome is defined as a clustering of metabolic abnormalities that has been found to be associated with risk of coronary heart disease, stroke, and cardiovascular mortality greater than that of its individual components.[1] In the last two decades, change of lifestyle including increase caloric consumption and less physical activity increased the prevalence of obesity worldwide.[2] In developing countries such as in Asia-Pacific regions, the prevalence of obesity increases by 2% per year.[2,3] As a consequence of rising in obesity, several cardiovascular risk factors are also increasing, followed by increasing the metabolic syndrome.[4,5].

Since the lack of unifying criteria, the prevalence as well as the components of metabolic syndrome difference between studies.[1,6,7] In 2001, the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (NCEP ATP III) defined a new clinical definition for the diagnosis of metabolic syndrome.[8] This criteria was designed to be more amenable for the measurement of this syndrome in clinical practice, Later in 2007, a revision of this clinical criteria was introduced by The American Heart Association/National Heart, Lung, and Blood Institute (AHA/NHLDI).[7] Following the Asian criteria of central obesity, most of the Asian countries used central obesity for male ≥ 90 cm and female ≥ 80 cm.[9]

Elderly subjects may have different prevalence of metabolic syndrome as well as the components, compared to the younger individuals. Very limited population based study of metabolic syndrome were published in Indonesian Medical Journal, especially among young adults. The purpose of this study is to report the prevalence of metabolic components among young adult individuals in a sub-urban population of Makassar.

2. Methods

Subjects in this study were part of the population based study of **LIFE**course study in **CAR**diovascular disease **E**pidemiology (LIFECARE). The study was performed from 2009-2011, in the sub-urban population Kecamatan Rappocini of Makassar, which consist of 10 kelurahan. Total population of adults in this area were 150, 627 subjects, and the target of the screening was to cover 10% of each kelurahan. In this population based study for collecting data we used the WHO step wise. The first step, demographic data by interviewing the studied subjects. The second step, physical examination data such as anthropometric measurement (weight, height and waist circumference) and blood pressure. Waist circumference was measured horizontally in the middle between the last arcus costae and anterior spina iliaca in the medial axillaris line (in centimeter unit). The blood pressure was measured three times in sitting position using standard mercury sphygmomanometer. The average of the three measurement was defined as the blood pressure of the subjects. The third step is performing laboratory examination including fasting plasma glucose and lipid profiles i.e. total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides. All blood samples were taken after 12-hour fasting, and examined in the Central Prodia Laboratory Makassar.

Paper ID: NOV153066

The criteria of young adults in this study was age between 15 - ≤ 39 years old, both males and females. For the diagnosis of metabolic syndrome, we used the AHA/NHLBI criteria with the modification of waist circumference followed the Asian criteria. The AHA/NHLBI components of Metabolic syndrome are as followed: central obesity waist circumference ≥ 90 cm for male and ≥ 80 cm female, high triglyceride levels ≥ 150 mg/dL or those on drug treatment for elevated triglycerides, low HDL-cholesterol < 40 mg/dl for males and < 50 mg/dl for females or on medication for increasing HDL-cholesterol, elevated blood pressure systolic ≥ 130/ ≥ 85 mmHg or those on treatment anti-hypertension drug, and elevated fasting plasma glucose ≥ 100 mg/dl or thoseon medication for elevated glucose. Diagnosis of metabolic syndrome, if three or more of the above mentioned categorical cut points.

Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) for Windows 22.0 (SPSS Inc. Illinois, Chicago) with significant statistical p value of < 0,05. Comparison of the prevalence of metabolic syndrome between subgroup populations were performed using Pearson Chi-Square, The results were shown in tables and figures.

3. Results

Prevalence of Metabolic Syndrome
In this study, 165 young adult's subjects fulfill the criteria of metabolic syndrome, or a prevalence of 17.1%. Totally females were more common compared to males, 130 in females (17.5%) and 35 males (15.7%), but the difference was not statistical different (p=0.536). There was also no statistical dif
females and
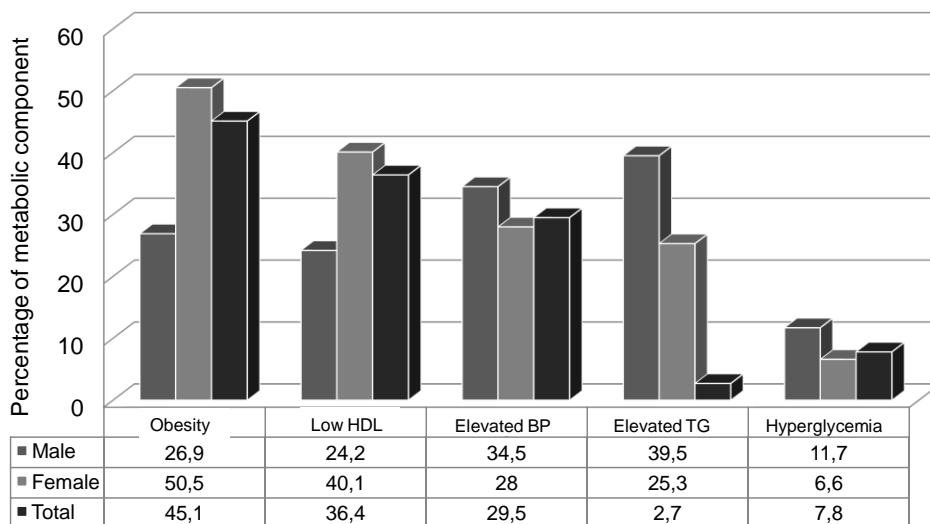subsequently (

Prevalence of the Components
During the study, 3502 subjects can be covered, more females than males, 2549 and 953 subsequently. There were 967 young adults in this study, 744 females and 223 males. There was no significant statistically difference in age group between females and males i.e 31,45±6.08 years and 31.73±6.04 years (p=0.0544). Among the 967 young adults, central obesity was the highest component, 436 subjects (45.1%) followed by low HDL-cholesterols 352 (36.4%), elevated blood pressure 285 (29,5%), elevated triglycerides 276 (28,5%), and elevated fasting plasma glucose being the lowest one only 75 individuals (7,8%). Central obesity, and low HDL cholesterol were significantly higher in females compared to males 50,5% vs 26,9% (p=0,001), and 40.1% vs 24.2% (p=0.001). Among males, elevated triglycerides and hyperglycemia were higher compared to females, 39.5% vs 25.3% (p=0.001) and 11.7 vs 7.8% (p=0.013) subsequently. There was no significant difference in elevated blood pressure (p=0.059). (table 1)

Table 1: The prevalence of metabolic components among 967 young adults

Component	Male (n=223)		Female (n=744)		Total (n=967)		P[1]
	n	%	n	%	n	%	
Obesity	60	26,9	376	50,5	436	45,1	0.000
Low HDL	54	24,2	298	40,1	352	36,4	0.000
Elevated BP	77	34,5	208	28,0	285	29,5	0.059
Elevated TG	88	39,5	188	25,3	26	2,7	0.000
Hyperglycemia	26	11,7	49	6,6	75	7,8	0.013

BP = blood pressure, TG = triglycerides
[1]Pearson's Chi-Square test

	Obesity	Low HDL	Elevated BP	Elevated TG	Hyperglycemia
Male	26,9	24,2	34,5	39,5	11,7
Female	50,5	40,1	28	25,3	6,6
Total	45,1	36,4	29,5	2,7	7,8

Figure 1: The prevalence of metabolic components

The prevalence of the components according to age trend
Following grading to age groups, only central obesity, elevated blood pressure, and elevated triglycerides increased significantly with the increasing of age, the highest being in the age group of 35-39 years. The other two components, low HDL cholesterol and hyperglycemia did not significantly increased, even though the prevalence of these two components were higher among the age group of 35-39 years old. (table 2).

Table 2: The prevalence of metabolic components among according to age trend

Risk Factor	Age										p[1]
	15-19 (n=39)		20-24 (n=118)		25-29 (n=157)		30-34 (n=261)		35-39 (n=392)		
	N	%	n	%	n	%	N	%	n	%	
Central Obesity	9	23,1	38	32,2	58	36,9	109	41,8	222	56,6	0,000
Elevated BP	9	23,1	31	26,3	35	22,3	75	28,7	135	34,4	0,041
Low HDL-C	10	25,6	40	33,9	51	32,5	90	34,5	161	41,1	0,115
Elevated TG	3	7,7	18	15,3	31	19,7	52	19,9	106	27	0,005
Hyperglycemia	0	0	10	8,5	11	7	16	6,1	40	10,2	0,112

[1]Pearson Chi Square test

Prevalence of the components according to educational status

Educational status was classified into three different groups, high school students, University students, and post graduate. There was no significant different for most of the components among the three groups, except for elevated blood pressure which was higher in University students. Obesity was more common among high school students, but there was no statistically difference between the three groups.

Table 3: The prevalence of metabolic components according to education

Risk Factor	High school student (n=806)		University student (n=142)		Post graduate (n=19)		p[1]
	n	%	n	%	n	%	
Central Obesity	365	45,3	63	44,4	8	42,1	0,946
Elevated BP	230	28,5	53	37,3	2	10,5	0,020
Low HDL-C	301	37,3	47	33,1	4	21,1	0,233
Elevated TG	170	21,1	35	24,6	5	26,3	0,566
Hyperglycemia	61	7,6	15	10,6	1	5,3	0,434

[1]Pearson Chi Square test

4. Discussion

Metabolic syndrome is increased in developed and developing countries.[10,11,12,13,14,15] In Indonesia several studies among adults have been reported.[16,17,18] This is the first population based study of young adults in Indonesia, which covered 967 subjects. Widjaja et al from Jakarta[19] studied a very small selected cases among students, which covered only 70 young adult students. In our study we found that metabolic syndrome is common among young adults in Indonesia.

The components of metabolic syndrome depend on several factors such as criteria, age, socio-economic status, educational state, and also difference in ethnicity. Among the components of metabolic syndrome, we find that central obesity is the highest prevalence, followed by hypertension and low HDL cholesterol levels. Ahmad M et al[20] from Pakistan found that low HDL cholesterol was the most prominent of metabolic component and followed by obesity. The same result was also reported by Matson et al[21] where low HDL cholesterol was the highest frequency followed by high triglyceride levels and hypertension. Soysal et al[22] from Turkey reported different results, hypertriglyceridemia as the highest followed prevalence, follow by low HDL cholesterol and hypertension. This difference might be due to differences in the criteria they used for metabolic syndrome, selected age groups, and also by the amount of screened subjects. The criteria use for the diagnosis of metabolic syndrome is one of the important difference in the prevalence of this syndrome. Matson et al[21] compared three different criteria for the diagnosis of metabolic syndrome, IDF, NCEP ATPIII, and EGIR criteria. The highest prevalence was found with IDF criteria, followed by NCEP criteria. The three studies [20,21,22] used the classical NCEP ATP criteria with abnormal waist circumference for male > 102 cm, and female > 88cm, while our study used the AHA/NHLBI with different criteria of waist circumference (modified Asian criteria).

The prevalence of metabolic syndrome increased with increasing age. Our study showed that all the metabolic components except for hyperglycemia increase with increasing age especially in the range age of 30-39 years old. Matson et al[21] reported the same results except for low HDL-cholesterol. Soysal et al[22] in his study of 567 subjects, age range from 20-39 years old which they divided in two groups, 20-29 and 30-39-year-old, reported that all of the metabolic components is significantly higher among the 30-39 years old. The age range for young adults in The Pakistani study was younger compared to our study age between 17- 25 years old, and the total of adolescents subjects is only 193.[20] This study shows that educational status is not an important role in the metabolic components. Central obesity is still the highest percentage of metabolic component in all three groups.

In conclusion this study proved that metabolic syndrome among young adults in Indonesia is common. In this study, central obesity, low HDL cholesterol and elevated triglycerides, being the highest components. As we all know that these three factors belong to the high risk factors for cardiovascular disease. Early intervention among adolescents is needed for the prevention of cardiovascular disease. Further study, especially follow up study should be done to monitor the impact of these components..

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5. Conflict of interest

No potential conflict of interest relevant to this study was reported.

6. Acknowledgments

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