Prevalence of Metabolic Syndrome in Young Adults

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Abstract: *Metabolic syndrome is increasing world wide including in the South East Asian countries. Limited information is available about this syndrome in young adults from our country. Early detection of this syndrome is imperative to early prevention of diabetes mellitus and cardiovascular disease. The aim of the study is to determine find out the prevalence of metabolic syndrome and its components among young adults. This is a population cross sectional study among young adults age < 39 years old. Anthropometric examinations including weight, height, waist circumference, and blood pressure. After 12 hours fasting blood was taken for fasting plasma glucose and lipid profiles including total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides. The diagnosis of metabolic syndrome in this study followed used the AHA/NHLBI criteria with modification of waist circumference for Asian people. Statistical analysis using Statistical Package for the Social Sciences (SPSS) for Windows 22.0 (SPSS Inc.,) Illinois, Chicago), significant statistical p value <0,05. Comparison of risk factors between subgroup populations were performed using Pearson Chi-Square, and Fisher Exact test for testing the significance level of the risk factors. The results were shown in tables and figures. During the study, 3502 subjects can be covered, among them 967 subjects or 27.6% were young adults. One hundred and sixty five adults subjects fulfill the criteria of metabolic syndrome, or a prevalence of 17.1%. Totally females were more common compared to males, 130 were females (17.5%) and 35 males (15.7%), but not statistical difference (p=0.536). Following the criteria used in this study, central obesity was the highest component, 436 subjects (45.1%) followed by low levels of HDL-cholesterols 352 (36.4%), elevated blood pressure 285 (29,5%), elevated triglycerides 276 (28,5%), and hyperglycemia being the lowest one only 75 (7,8%). It was also found 134 subjects had three components (13.9%), 29 subjects with four components (3.0%), and only two subjects had five components (0,2%). The prevalence of metabolic syndrome increased with increasing age (0.002), especially among females. This difference was seen among females (p=0.019) but not in males (p=0.149). Low HDL cholesterol, one of the an important independent cardiovascular risk factor was most frequent found among females. From this population based study metabolic syndrome is prevalent in Makassar. There is a trend of increasing prevalence metabolic syndrome with increasing age. Central obesity is the prominent metabolic component among both gender.*

Keywords: metabolic syndrome, young adults, obesity.

1. Introduction

In the last two decades, change of lifestyle including increased calorie consumption and less in physical activities, increased the prevalence of obesity worldwide.[1] In the 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 increased, followed by increasing of a syndrome namely the metabolic syndrome.[4,5] Since metabolic syndrome is a cluster of metabolic and non-metabolic cardiovascular risk factors, there were several criteria used for the diagnosis for this disease such as the World Health Organization criteria (WHO), the European Group for Study of Insulin Resistance (EIGER), National Cholesterol Education Program (NCEP), and International Diabetes Foundation (IDF).

In 2006, The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) introduced a clinical criteria for defining the metabolic syndrome.[6] In clinical practice, this criteria was simple, since it can be used by the clinicians to identify subjects with metabolic syndrome who are high risk for atherosclerotic cardiovascular disease. The NCEP ATP criteria consist of 5 components of cardiovascular risk factors, these were abdominal obesity which correlated with insulin resistance, elevated triglycerides, reduced HDL-cholesterol levels, elevated blood pressure, and elevated fasting plasma glucose. The metabolic syndrome is diagnosed in the presence of at least 3 components of those factors. The American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement (AHA/NHLBI), revised the NCEP ATP III criteria by minor changing in fasting plasma glucose to $\geq$ 100 mg/dL.[7] Following the Asian criteria of central obesity, most of the Asians countries used the central obesity for male $\geq$ 90 cm and female $\geq$ 80 mg/dL.[8]

Because of the lack of unifying criteria, the prevalence of metabolic syndrome difference between studies.[9,10,11,12] Very limited research of metabolic syndrome among young adults reported from our country. The purpose if this study, is to report the prevalence of metabolic syndrome and its characteristics among young adults in Makassar.

2. Method

Subjects of this study were part of the population based study of **LIFE** course study in **CAR**diovascular disease Epidemiology (LIFECARE). Screening were performed from 2009-2011 in Kecamatan Rappocini Makassar, which consist of 10 Kelurahan. The population of adults in Kecamatan Rappocini were 150.627 subjects. The target of the screening was 10% of each kelurahan. For this study, we use the WHO Step Wise in collecting data. The first step is collecting demographic factors by interviewing the studied

subjects. The second step is conducting physical examination 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 anterior spina iliaca in the medial axillaris line (in centimeter unit). The blood pressure was measured in sitting position using standard mercury sphygmomanometer. The third step is performing laboratory examination including fasting plasma glucose and lipid profiles i.e. total cholesterol, LDL cholesterol, HDL cholesterol, and triglyceride level. All blood samples taken after 12-hour fasting, and were examined in Prodia Makassar Laboratory.

For this study, the criteria of young adults was 15 - ≤ 39 years old, males and females. The diagnosis of metabolic syndrome in this study we used the AHA/NHLBI criteria with the modification of waist circumference followed the Asian criteria. The AHA/NHLBI components of MetS are as followed: waist circumference ≥ 90 cm for males and ≥ 80 cm females, high triglycerides ≥ 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 drug treatment for reducing HDL-cholesterol, elevated blood pressure systolic ≥ 130/ ≥ 85 mmHg or those on drug treatment in patients with a history of hypertension, and elevated fasting glucose ≥ 100 mg/dl or on drug treatment for elevated glucose. The diagnosis of metabolic syndrome if three or more of the above mentioned categorical cutpoints.

Statistical analysis using Statistical Package for the Social Sciences (SPSS) for Windows 22.0 (SPSS Inc.,) Illinois, Chicago) with significant statistical p value <0,05. Comparison of risk factors between subgroup populations were performed using Pearson Chi-Square, and Fisher Exact test for testing the significance level of the risk factors. The results were shown in tables and figures.

3. Results

Prevalence of cardiovascular risk factors among 967 young adult subjects

During the study, 3502 subjects can be covered, more females than males, 2549 and 953 subsequently. The age range of the population was between 16 to 87 years old.

From the whole population, the young adults subjects were 967, or 27.6% from the whole studied subjects, consist of 744 females and 223 males. There was no significant difference in age 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 subjects, central obesity was the highest component, 436 subjects (45.1%) followed by low levels of HDL-cholesterols 352 (36.4%), elevated blood pressure 285 (29,5%), elevated triglycerides 276 (28,5%), and hyperglycemia being the lowest one only 75 (7,8%). Central obesity, and low HDL cholesterol were significantly higher in females compared to males 50,5% vs 26,9% (p=0,000), and 40.1% vs 24.2% (p=0.000). Among males, elevated triglycerides and hyperglycemia were higher, 39.5% vs 25.3% (p=0.000) and 11.7 vs 7.8% (p=0.013) subsequently. There was no significant difference in elevated blood pressure (p=0.059).

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

Component	Male (n=223)		Female (n=744)		Total (n=967)		p
	n	%	n	%	n	%	
Obesity***)	60	26.9	376	50.5	436	45.1	0.0001)
Low HDL***)	54	24.2	298	40.1	352	36.4	0.0001)
Elevated blood pressure	77	34.5	208	28.0	285	29.5	0.0591)
Elevated TG***)	88	39.5	188	25.3	276	28.5	0.0001)
Hyperglycemia*)	26	11.7	49	6.6	75	7.8	0.0131)

1)Pearsons Chi-Square test
*)Significant at the 0,05 level (2-tailed)
***)Significant at the 0,001 level (2-tailed)

The prevalence of metabolic syndrome

In this study, 165 young adults subjects fulfill the criteria of metabolic syndrome, or a prevalence of 17.1%. Totally females were more common compared to males, 130 were females (17.5%) and 35 males (15.7%), but not statistical difference (p=0.536). Table 2 also showed no statistical difference between gender according to aged groups. There was also no statistical difference between the mean age of females and males, 33.05+5.43 years and 33.57+5.21 subsequently (p=0.615). Following the criteria used in this study, 134 subjects had three components (13.9%), 29 subjects with four components (3.0%), and only two subjects had five components (0,2%).

Table 2: The prevalence of metabolic syndrome in females and males

Age		Metabolic Syndrome								p
		Male		n	Female		N	Total		
		N	%		n	%		n	%	
16-19	10	1	10.0	29	2	6.9	39	3	7.7	0.7511)
20-24	23	2	8.7	95	12	12.6	118	14	11.9	1.0002)
25-29	44	6	13.6	113	15	13.3	157	21	13.4	1.0002)
30-34	61	6	9.8	200	31	15.5	261	37	14.2	0.2671)
35-39	85	20	23.5	307	70	22.8	392	90	23.0	0.8881)
Total	223	35	15.7	744	130	17.5	967	165	17.1	0.5361)

1)Pearsons Chi-Square test 2)Fisher Exact test

The prevalence of metabolic syndrome according to age trend

Table 3 / figure 1 showed the prevalence of metabolic syndrome according to aged groups. Totally, prevalence of

metabolic syndrome increased with increasing age, being highest in the aged group of 35 through 39 years old (p=0.002). This difference was seen among females (p=0.019) but not in males (p=0.149).

Table 3: The prevalence of metabolic syndrome according to age trend

Age	n	Male		n	Female		n	Total		psex)
		n	%		n	%		n	%	
16-19	10	1	10.0	29	2	6.9	39	3	7.7	0.7511)
20-24	23	2	8.7	95	12	12.6	118	14	11.9	1.0002)
25-29	44	6	13.6	113	15	13.3	157	21	13.4	1.0002)
30-34	61	6	9.8	200	31	15.5	261	37	14.2	0.2671)
35-39	85	20	23.5	307	70	22.8	392	90	23.0	0.8881)
total	223	35	15.7	744	130	17.5	967	165	17.1	0.5361)
pAge)		0.1491)			0.0191)			0.0021)		

1)Pearsons Chi-Square test
2)Fisher Exact test
Sex)The p value for comparison between male and female
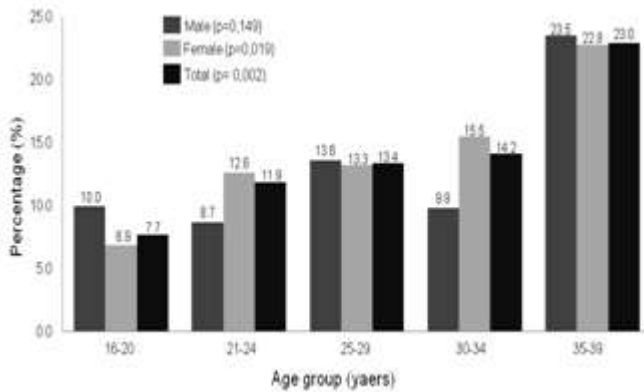Age)The p value for comparison between age groups

Figure 1: The prevalence of metabolic syndrome according to age groups

Prevalence of metabolic components in 163 metabolic syndrome

Among the 165 patients, central obesity, low-HDL cholesterols, elevated blood pressure, and triglycerides were the highest components. There was no significantly difference between females and males in central obesity, elevated blood pressure, and elevated triglycerides. Low HDL-cholesterols was found to be significantly higher in females compared to males (p=0.000) but hyperglycemia was higher among males (p=0.006).

Table 4: Prevalence of cardiovascular risk factors 165 in patients

Component	Male (n=35)		Female (n=130)		Total (n=165)		p
	n	%	n	%	n	%	
Obesity***)	28	80	115	88.5	143	86.7	0.2602)
Low HDL***)	20	57.1	110	84.6	130	78.8	0.0001)
Elevated blood pressure	24	68.6	85	65.4	109	66.1	0.7241)
Elevated TG***)	25	71.4	76	58.5	101	61.2	0.1621)
Hyperglycemia*)	16	45.7	29	22.3	45	27.3	0.0061)

1)Pearsons Chi-Square test
2)Fisher Exact test
**)Significant at the 0,01 level (2-tailed)
***)Significant at the 0,001 level (2-tailed)

4. Discussion

In the last two decades, obesity is increasing worldwide, especially in Asian countries. In this population based study 967 adults subjects can be covered. Central obesity was the commonest cardiovascular risk factors, it covered around 45.0% of the total adults subjects, more frequent among females around 50%. Other studies reported the same results.[13,14,15,16] The prevalence metabolic syndrome depend on several factors such as ethnicity, aged variation, and the criteria used for the diagnosis. In this study using AHA/NHLBI criteria, the prevalence of metabolic syndrome was 17,1%. Mattson and his colleagues from Finland[14] studied young adults age 24-39 years old, reported different results using different criteria, the highest was the IDF criteria 14.9% and NCEP criteria was only 13.0%. Moran et al[17] in their study of children and adults age between 10-18 years, using the NCEP criteria reported metabolic syndrome only 6.5%. Vasan et al[18] from India, studied young adults aged between 14-25 years, reported a prevalence of 22.1%. Another study in Indonesia, used IDF criteria which covered only small population, students aged 18-25 years old, reported a prevalence of 18.5%.[19] These differences mostly caused by the selection of young adults age variation of the population study.

The prevalence of metabolic syndrome increased with increasing age. The Third National Health and Nutrition Examination Survey in Unites States reported the prevalence of metabolic syndrome only 6.7% among participants aged 20 through 29 years, and increased to more than 40.0% among aged 60-69 years.[9] The same results was reported by Pradana et al[13] from Indonesia where participants aged of thirties increased two to three times compared to aged of twenties. Our study even in young adults the prevalence of metabolic syndrome increased with increasing age. Other studies in young adults or all adults report the aged trend and the increasing prevalence of metabolic syndrome.[9,13,14,15]

Obesity is increasing in the most development countries. Our population study, central obesity among the young adults was 45.0%. Central obesity is one of the prominent component of metabolic syndrome. In this study, central obesity was the highest component, 87.0% of all the metabolic syndrome subjects. The same result reported by other studies, either in young adults or all adults subjects.[9,13,15] Interestingly, two other cardiovascular factors, low-HDL cholesterol and elevated blood pressure were the second high components in this study. Proportionally Low HDL-cholesterol was significant higher among females, this result is the same as reported by other studies in young adults (Vasan)[18] as well as adults (Pradana)[13].

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5. Conclusion

The prevalence of metabolic syndrome in young adults varied with age of the studied subjects and criteria used for the diagnosis. This study show that among young adults in Makassar is highly prevalent. Central obesity is the commonest metabolic component, similar to the finding that near 50% of the adults in this young population were obese.

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