Metabolic Syndrome in Adolescents in North Bolaang Mongondow District

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Abstract: Obesity is currently one of the health problems that attack not only in adulthood but also in adolescence. Based on the Basic Health Research in 2013, North Sulawesi which is one of the provinces in Indonesia that has the highest prevalence in Indonesia. The increase in the prevalence of obesity in the world was accompanied by prevalence elevation of metabolic syndrome events. This study aims to find out the prevalence of obesity and metabolic syndrome in obese adolescents in North Bolaang Mongondow district. This study was a cross-sectional design. Research was started with students screening at high schools in the North Bolaang Mongondow district. The students carried out a brief explanation of the purpose and benefits of the research and the sampling process that would be carried out on the subject. Then a waist circumference measurement was randomly assigned to 1019 students from 7 schools spread across several sub-districts in Bolaang Mongondow district. As many as 52 students who were obese as research samples were measured by blood pressure, anthropometry measurements and laboratory tests for blood sugar and lipid profiles. The prevalence of obesity in adolescents in North Bolaang Mongondow district is 5,1%, prevalence of metabolic syndrome among obese adolescents in North Bolaang Mongondow regency is 15,4%.
Keywords: Metabolic syndrome, hyperuricemia, gout, obese.

INTRODUCTION

Obesity is one of the nutritional problems in Indonesia. This is caused by various factors such as an increase in people's income which causes changes in lifestyle such as diet.

Changes in eating patterns are accelerated with the increasing influx of foreign cultures through the advancement of information technology and economic globalization which has an impact on lifestyle changes including diet [1].

The prevalence of obesity is increasing in adolescence in both developed and developing countries. In Indonesia the prevalence of obesity in adolescents has increased by 19.1% in 2010 [2], 26.6% in 2013 [3] and in 2018 is 30.2% [4]. The description of the increase in cases of obesity was very associated with the increasing prevalence of the metabolic syndrome.

The metabolic syndrome called insulin resistance syndrome or X syndrome is a clusster of risk factors that play a role in increasing cardiovascular disease, atherosclerosis, type 2 diabetes mellitus, renal disease and others. Metabolic syndrome criteria according to the National Cholesterol Education Program (NCEP) and Adult Treatment Panel III (ATP III) are: central obesity, increased triglyceride levels, low HDL levels, increased blood pressure and increased blood sugar levels. A person is diagnosed with metabolic syndrome if he has at least 3 of the above criteria [5, 6].

The incidence of metabolic syndrome increases with increasing cases of obesity [7]. In the past 2 decades, the prevalence of obesity has doubled in the adult population, and has increased fourfold in the juvenile population [8]. The prevalence of metabolic syndrome in obese patients is 40.2% [9]. The prevalence in the United States is 6.7% at the age of 20-29 years, 43.5% aged 60-69 years, and 42% at ages above 60-70 years [10]. National Cholesterol Education Adult Treatment Panel III Program (NCEP-ATP III) reports that there is an increase in the prevalence of metabolic syndrome in adolescents, from 4.2% in the period 1988 - 1992 to 6.4% in the period 1999 - 2000[11]. Sibarani *et al*. reported the prevalence of the metabolic syndrome in adolescents of Chinese descent in Indonesia who were obese at 19.14% in men and 10.63% in women [12]. In Semarang, the prevalence of the metabolic syndrome in the adolescent group was

31.6%[13]. In Minahasa the prevalence of metabolic syndrome in obese adolescents is 41.9%[14] and in Bitung City by 36%[15]. However, data regarding the prevalence of metabolic syndrome in adolescents in North Bolang Mongondow regency are not yet available.

MATERIALS AND METHODS

The study was conducted for 10 months, from February to December 2018. The research locations were in senior high school and junior high school or equivalent in the North Bolang Mongondow Regency of North Sulawesi Province. The target population of this study was adolescents aged 13-18 years. The subjects were affordable populations that met the inclusion criteria as follows: High school students aged between 13-18 were obese.

The stages of research are carried out as follows:
- Request permission for research as well as requests for Ethical Clearance to the Research Ethical Committee of the Faculty of Medicine, Sam Ratulangi University, Manado.
- Request permission from the school through the Department of Youth and Sports Education in North Bolaang Mongondow Regency.

- Dissemination to students in schools regarding the purpose of this study.
- Interviews to prospective subjects to get willingness to be the subject of this study by reading and signing informed concent.
- Perform physical examinations such as body weight using electric scale, measurement of height (HM) using microtoise, waist circumference (WC) using the meter gauge. and blood pressure measured 2 times and the average taken as the value of the subjects blood pressure using Nova®mercury sphygromanometer tool.
- Perform blood sampling for further analysis in the clinical laboratory.

RESULTS AND DISCUSSION

Anthropometric measurements have been carried out on 1019 students from 7 schools spread across several sub-districts in Bolaang Mongondow district. Based on the results of measurements found as many as 52 obese students.

In table 1, shows that the sample age ranges from 14-18 years, fasting blood sugar (FBS)varies greatly (63 - 197 mg / dL). Similarly HDL (16-37 mg / dL), TG (41 - 203 mg / dL), cystolic blood pressure (80 - 160 mmHg), diastolic blood pressure (60 - 95 mmHg).

Table-1: General description

Variabel	Descriptive Analysis			
	n	Minimum	Maximum	Average ± SB
Age (year)	52	14	18	15,7 ± 1, 207
FBS (mg/dl)	52	63	197	73,21 ± 37,16
HDL (mg/dl)	52	16	37	45,5 ± 3,277
Triglyceride(mg/dl)	52	41	203	106,8 ± 46,932
Cystole(mmHg)	52	80	160	96,32 ± 16,216
Diastol(mmHg)	52	60	95	76,63 ± 8,381

Indicator of the occurrence of central obesity through measurement of waist circumference. The degree of obesity is determined by the size of the waist circumference. The research subjects were obese adolescents, meaning men had WC ≥ 90 cm and all women had WC ≥ 80 cm.

The research subjects were categorized as metabolic syndrome if these obese adolescents had ≥ 2 other SM components, namely: high GDP, low HDL, high blood pressure and hypertriglycerides according to IDF criteria [20].

Waist circumference is one indicator of central obesity. A greater waist circumference indicates the degree of obesity in a person which indicates an increase in visceral fat accumulation. Central obesity is associated with degenerative diseases such as coronary heart disease, hypertension and diabetes mellitus which begins with chronic metabolic disorders characterized

by abnormal cytokine production, an increase in reactants and inflammatory mediators [16, 17]. In addition. Central obesity that occurs in adolescence needs attention because it will continue in the state of obesity in adulthood with various risks of metabolic disorders.

Table 2 shows that 10% of subjects had more than normal Triglyceride levels, 69% of subjects had less than normal HDL levels, 5% of subjects had hyperglycemia, 15.4% of subjects had systolic blood pressure ≥ 130 mmHg, 28.8% had blood pressure diastole ≥ 85 mmHg. From the 52 adolescents who were obese it turned out that 15.4% had 3 components of metabolic syndrome.

The results of this study are lower than in Semarang, the prevalence of the metabolic syndrome in the adolescent group was 31.6% [13] and some data on prevalence of SM abroad such as in Beijing 28.6% [18],

Kuwait 21.3% [19], Philippines 19% [20]. Metabolic syndrome and its components have been found in individuals with central obesity. Especially in North Sulawesi province, this result are lower than in Minahasa district is 41.9%[14] and in Bitung City is 36%[15].

Table-2: Distribution of samples based on components of the metabolic syndrome

Variabel	criteria	N	Percentage (%)
TG	≥150 mg/dL	10	19,2 %
	≤ 150 mg/dl	42	80,7 %
HDL	Male<40mg/dL, Female <50mg/dL	36	69,2 %
	Male>40mg/dL, Female >50mg/dL	16	30,8 %
FBS	≥100 mg/dL	5	9,6 %
	<100 mg/dL	47	90,4 %
BP	SYSTOLE ≥ 130 mmHg	8	15,4 %
	< 130 mmHg	44	84,6 %
	DIASTOLE ≥ 85 mmHg	15	28,8 %
	< 85 mmHg	37	71,2 %
MS Component	1	16	30,8 %
	2	28	48,1 %
	3	8	15,4 %
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Information: TG : Tgriglyceride, HDL= High Density Lipoprotein, FBS=fasting blood sugar, TG=triglycerides, BP = Blood Pressure, SYST=systole, DIAST=diastole, MS=metabolic syndrome.

CONCLUSION
The prevalence of obesity in adolescents in North Bolaang Mongondow districs is 5,1%, prevalence of metabolic syndrome among obese adolescents in North Bolaang Mongondow district is 15,4%.

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