Correlation between Leptin and Uric Acid in Obese Adolescents in North Bolaang Mongondow Regency

John P Porotuo[*]**, Aaltje E Manampiring, Joice N Engka**
Faculty of Medicine, Sam Ratulangi University Jl Kampus Unsrat, Bahu Manado 95115, Indonesia

Original Research Article

Abstract: Leptin is a hormonal product of the ob gene that has important roles in balancing energy regulation, reducing food intake and increasing energy use. Hyperuricemia is a state in which a person uric acid blood level is higher than normal. Obesity is a pathological condition that characterized by the excessive accumulation of body fat. Hyperuricemia associated with obesity. Uric acid is significantly associated with obesity, diabetes mellitus, hypertension and ischemic heart disease. Hyperuricemia in obese people usually happens because uric acid synthesis is increasing while excretion of uric acid by kidneys is decreasing. To determine correlation between leptin and uric acid level in obese adolescents in North Bolaang mongondow regency. This research was used cross sectional method with 52 samples taken from students high schools in North Bolaang Mongondow regency that matched the inclusion and exclusion criteria from this research. The result showed that All subjects had central obesity which consisted of 32% men and 68% women. 28,8% of subjects had hyperuricemia and 15,4% had leptin levels ≥ 40 ng / dL. Correlation test results showed that there is a positive significant correlation between leptin levels and uric acid with ρ = 0.000 and R = 0.334. there was a significant correlation between leptin levels and uric acid.
Keywords: Leptin, Uric Acid, Obese.

INTRODUCTION

Leptin is a hormonal product of the ob gene which plays an important role in regulating energy balance, reducing food intake and increasing energy use [1].

Leptin is one of the proteins produced by adipocyte cells[2]. Leptin has receptors in the hypothalamus which function to suppress appetite and improve the process of thermogenesis in the body. Leptin will stimulate the process of fatty acid oxidation so that it will reduce the accumulation of ectopic fat in non-adipose tissue [2, 3]. Several studies have shown a correlation between leptin and fat mass percentage and BMI. This is due to the role of leptin in lipid metabolism [4].

Hyperuricemia is a state of increasing levels of uric acid in the blood exceeding normal. The prevalence of hyperuricemia varies widely throughout the world. In the United States, hyperuricemia is found in 2% of adult males, 7% in Spain and 17% in France. The prevalence of hyperuricemia in Denpasar Bali was 18.2% [5]. The survey results of WHO-ILAR COPCORD (World Health Organization - International league of Associations for Rheumatology Community Oriented Program for Control of Rheumatic Disease) in rural North Sulawesi and Manado found chronic uric acid associations with consumption patterns and lifestyle, including drinking and eating habits. Purine-rich foods [6]. Risk factors that can be changed and affect the incidence of hyperuricemia are obesity, food and alcohol intake, drug consumption, kidney disorders and hypertension [7]. North Sulawesi ranks second in Type II DM in Indonesia, first in hypertension, fifth the prevalence of heart failure at the age above 15 years, the fourth order of chronic kidney failure and stroke ranks sixth[8]. These diseases are a chronic complication of obesity and hyperuricemia.

Obesity is a pathological condition characterized by excessive accumulation of body fat.[9] According to the International Obesity Task Force (IOTF) more than 1.7 billion people have health risks associated with weight gain with a body mass index (BMI) ≥ 23. Every year there are> 2.5 million deaths related to BMI and this is predicted to double by 2030 based on the results of research from the Asia Pacific Cohort Study Collaboration.

The prevalence of obesity is increasing in adults, adolescents and children in both developed and developing countries including Indonesia. According to data from the Basic Health Research (Riskesdas) in 2007, the national prevalence of general obesity in the population aged 15 years and over is 10.3%. This figure is almost the same as the WHO estimate of 10% in the group of children aged 5-17 years [10]. The results of the 2010 prevalence of Riskesdas experienced an increase of 19.1%. North Sulawesi ranks highest for obesity prevalence in adulthood, namely 37.1% [11]. These data turned out to have increased three years later, namely the prevalence reached 26.6%.

The purpose of this study was to determine the relationship between leptin levels and hyperuricemia in obese adolescents in North Bolaang Mongondow regency.

MATERIALS AND METHODS

This study used a cross-sectional design conducted in high schools in North Bolaang Mongondow Regency, North Sulawesi province.

This study uses cross-sectional design. At the beginning of the research activities were conducted screening of students in Primary and Senior High Schools in North Bolaang Mongondow Regency. The subjects carried out a brief explanation of the purpose and benefits of the research as well as the sampling process to be carried out on the subject. The waist circumference was then measured randomly for 1019 students from 7 schools spread across several districts in Bolaang Mongondow regency.

The target population of this study was adolescents aged 13-18 years. The subject of the study is an affordable population that meets the following research criteria:

Inclusion criteria
- High school students aged between 13-18 who are obese
- Willing to be a research participant by signing an approval letter.

Exclusion Criteria
- Being or had suffered from kidney disease, lung disease, heart disease, blood disorders, skin diseases, and hormonal disorders
- Being or having used diuretics, aspirin, uricosuric, and pyrazinamide acid
- Is pregnant
- Not willing to take blood samples.

Subjects requested to fill the informed concent after receiving concent from the parents. This study approved by the research ethics committee of the medical faculty of Sam Ratulangi University. In this study anthropometric measurement includes measurement of height (HM) using microtoise, body weight (BW) using electric scale, waist circumference (WC) using the meter gauge. Criteria for obesity based on waist circumference according to the IDF 2007: WC $\geq$ 90 for males and $\geq$ 80 for females. Blood pressure measurement performed when the patient seated quietly for 5 minutes, the upper arm placed on the table. Blood pressure measured 2 times and the average taken as the value of the subject's blood pressure. Laboratory tests are only performed on 160 students for lipid profile (LDL, HDL, total cholesterol, triglycerides) and blood pressure measurement using Nova® mercury sphygromanometer tool. Blood sampling performed after fasting subjects between 10-12 hours. Blood samples were analyzed in clinical laboratory in Manado. Data were analyzed using SPSS for Windows version 22 for univariate test and bivariate correlation analysis with Pearson correlation test if the data is normally distribute and / or Spearman if the data is not normally distributed.

RESULTS AND DISCUSSION

A total of 1019 students performed anthropometric measurements in the form of.measurements of waist circumference, height and weight. From the total population, the prevalence of obese students was 5.1% (52 students). 52 students met the inclusion criteria and blood samples were taken for examination of uric acid and leptin levels. All subjects had central obesity which consisted of 46,2% male and 53,8% female. 28,8% of subjects had hyperuricemia and 15,4% had leptin levels $\geq$ 40 ng / dL.

Table-1: Distribution of age-based, high leptin and hyperuricemia samples in central obese adolescents

Variabel	Criteria	(n)	(%)
Gender	Male	24	46,2
	Female	28	53,8
Uric Acid	Man>6,4, Female>4,9 mg/dL	15	28,8
	man≤6,4, Female≤4,9 mg/dL	37	71,2
Leptin	≥40 ng/dL	8	15,4
	<40 ng/dL	44	84,6

The results of this study were lower than the prevalence in adolescents in the city of Tomohon which amounted to 35% [12]. In addition, the prevalence of hyperlepteptemia in obese adolescents was 15,4% lower than the results of research in Brazil of 25.9%[13]. In theory, leptin levels are determined by gender and also the status of puberty. It is also said that young women experience puberty earlier than boys. This is because in adolescent girls experience excess adiposity which can affect the early onset of puberty.

The prevalence of hyperuricemia in North Bolaang Mongondow regency is higher than the data in the United States which is 21.4% [15], but lower than the data in Taiwan of 57.7%[16].

Tabel-2: Correlation leptin dan uric acid level

	Statistic parameters	Leptin
Uric Acid	Koefisien correlation	0,332
	p	0,000
	n	52

Based on Table 2, the results of the correlation test showed a very significant positive relationship between Leptin and Uric Acid levels with a significance value $\rho = 0,000$ and the correlation coefficient value R = 0.332. This is show that leptin levels are directly proportional to levels of uric acid or in other words an increase in leptin in a person will be accompanied by an increase in uric acid which results in hyperuricemia.

The results of this study are in line with the results of previous studies which stated that leptin is responsible for increasing uric acid levels in obesity, which directly affects kidney function resulting in a decrease in uric acid excretion [14].

CONCLUSION

From the results of the study, it was found that there was a significant relationship between leptin and hyperuricemia in obese adolescents in North Bolaang Mongondow regency.

ACKNOWLEDGEMENT

REFERENCES
1. Hoggard N, Hunter L, Duncan JS, Williams LM, Trayhurn P, Mercer JG. Leptin and leptin receptor mRNA and protein expression in the murine fetus and placenta. Proc natl Acad sci USA. 1997;30:94(20):11073-8.
2. Minokoshi Y, Kahn BB. Role of AMP-Activated Protein Kinase in Leptin-Induced Fatty Acid Oxidation in Muscle. Biochem Soc Trans. 2003;31(Pt 1):196-201.
3. Lewis GF, Carpentier A, Adeli K, Giacca A. Disordered fat storage and mobilization in the pathogenesis of insulin resistance and type 2 diabetes. Endocrine reviews. 2002 Apr 1;23(2):201-29.
4. Hynes GR, Jones PJ. Leptin and its role in lipid metabolism. Current opinion in lipidology. 2001 Jun 1;12(3):321-7.
5. Wisesa IB, Suastika K. Hubungan Antara Konsentrasi Asam Urat Serum Dengan Resistensi Insulin Pada Penduduk Suku Bali Asli Di Dusun Tenganan Pegringsingan Karangasem. Jurnal Penyakit Dalam. 2009;10(2):110-2.
6. Padang C, Muirden KD, Schumacher HR, Darmawan J, Nasution AR. Characteristics of chronic gout in Northern Sulawesi, Indonesia. The Journal of rheumatology. 2006 Sep 1;33(9):1813-7.
7. Saag KG, Choi H. Epidemiology, risk factors, and lifestyle modifications for gout. Arthritis research & therapy. 2006 Apr;8(1):S2.
8. World Health Organization, editor. Global tuberculosis report 2013. World Health Organization; 2013.
9. World Health Organization. Obesity: preventing and managing the global epidemic. World Health Organization; 2000.
10. World Health Organization. Global tuberculosis control: surveillance, planning, finances: WHO Report 2007. World Health Organization; 2007.
11. Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia. Research Report on Basic Health Indonesia. Jakarta. 2010.
12. Manampiring A, Bodhy W. Laporan Penelitian Iptek dan seni. LPPM Unsrat. 2011.Available from http://repo.unsrat.ac.id/251/1/Prevalensi_Hiperuris emia_pada_Remaja_Obese_Di_Kota_Tomohon.pd f
13. Foschini D, dos Santos RV, Prado WL, Piano AD, Lofrano MC, Martins AC, Carnier J, Caranti DA, Sanches PD, Tock L, Mello MT. Platelet and leptin in obese adolescents. Jornal de pediatria. 2008 Dec;84(6):516-21.
14. Bedir A, Topbas M, Tanyeri F, Alvur M, Arik N. Leptin might be a regulator of serum uric acid concentrations in humans. Japanese heart journal. 2003;44(4):527-36.
15. Zhu Y, Pandya BJ, Choi HK. Prevalence of gout and hyperuricemia in the US general population: the National Health and Nutrition Examination

Survey 2007–2008. Arthritis & Rheumatism. 2011 Oct 1;63(10):3136-41.

16. Ko YC, Wang TN, Tsai LY, Chang FT, Chang SJ. High prevalence of hyperuricemia in adolescent Taiwan aborigines. The Journal of rheumatology. 2002 Apr 1;29(4):837-42.