

Omentin-1 Levels in Obesity

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ABSTRACT

Omentin-1 is an anti-inflammatory adipokine secreted by stromal vascular cells. Inflammation and apoptosis of adipocyte tissue in obesity lead to decreased production of omentin-1. This study aims to find the difference in omentin-1 levels in the obese and non-obese groups and the correlation between levels of omentin-1 with BMI and waist circumference. This study was a cross-sectional study involving 70 subjects with 37 people in the obese group and 33 people in the non-obese group. Anthropometric data including weight, height, waist circumference, and BMI were measured. Serum omentin-1 levels were measured by ELISA. The statistical tests used were Chi-square, T-test, Mann-Whitney test, and Spearman test. Test results were significant if p-value < 0.05. Significant difference was observed in serum omentin-1 levels between obese and non-obese group (median 140,31 range (88.08 – 382.76) vs. 210,97 range (124,44–577,96) ng/mL), respectively; p < 0.001). Serum omentin-1 correlated negatively with BMI (p=0.001, r = - 0.398) and waist circumference (p=0.017, r = - 0.286). Obesity causes inflammation and increased death of adipocyte tissues due to apoptosis, autophagy, and fibrosis resulting in decreased production of omentin-1 by stromal vascular cells. Anthropometric parameters of waist circumference and BMI describe the distribution of adipocyte tissue and affect the secretion of omentin-1. Omentin-1 levels in the obese group were lower than in the non-obese group. The higher the BMI and waist circumference, the lower the omentin-1 level.

Keywords: Obesity, omentin-1

INTRODUCTION

Obesity is a global health problem with increasing prevalence in the last decade. According to World Health Organization (WHO), obesity is a complex metabolic disorder characterized by increasing adipocyte tissue mass. Classification of overweight and obesity in adults is based on the Body Mass Index (BMI) calculation obtained by dividing a person's weight in kilograms with a person's height, squared (kg/m²).^{1,2}

Based on WHO criteria, BMI can be categorized in 5 groups as follows: underweight if BMI < 18.5 kg/m², normal if BMI 18.5-22.9 kg/m², overweight if BMI 23-30 kg/m² and obesity if BMI > 30 kg/m² and severe obesity if BMI > 35 kg/m². Asian people use the Asian modified BMI categorized into 5 groups, i.e., underweight if BMI < 18.5 kg/m², normal if BMI 18.5-22.9 kg/m², overweight if BMI 23-24.9 kg/m², obesity I if BMI ≥ 25-29.9 kg/m² and obesity II if BMI > 30 kg/m². Besides BMI, another method for body anthropometry measurement is by measuring waist circumference. International Diabetic Federation

gave waist circumference size criteria 90 cm for Asian males and 80 cm for Asian females.^{1,2}

World Health Organization data shows that in 2015 more than 1.9 billion adults are overweight and 600 million people are obese. Obesity prevalence in Indonesia also keeps increasing from year to year. A study by Harbuwono *et al.* found that obesity prevalence and central obesity in the adult population was 23.1% and 28%.^{3,4}

Fat in the human body consists of 2 types, white fat (subcutaneous fat and visceral fat) and brown fat. Obesity and metabolic syndrome are characterized by the accumulation of Visceral Adipose Tissue (VAT) in the abdomen. Visceral adipose tissue is called ectopic fat that plays a role in metabolic and cardiovascular disorders. Visceral adipose tissue consists of adipocytes and other various cells such as macrophages, mast cells, fibroblasts, and stromal vascular cells.^{5,6}

Chronic inflammation, oxidative stress, dyslipidemia, and insulin resistance in obesity can cause metabolic disorders and cardiovascular disease. Insulin resistance that occurs in obesity is

caused by adipokine dysregulation. Adipokine acts systemically as an endocrine organ, playing a role in metabolic homeostasis, insulin sensitivity, inflammation response, neuroendocrine activity, bone metabolism, and cardiovascular function. Based on its effect against inflammation response, adipokine adipocyte tissues are divided into anti-inflammatory and proinflammatory adipokine. Omentin-1 is one of the anti-inflammatory adipokines that play a role in obesity, and is secreted by stromal vascular cells.⁵⁻⁸

Omentin-1 has a molecular weight of 38 kilodaltons and consists of 313 amino acid groups. Omentin-1 is also found in endothelial cell and plays a role in endothelial function. Omentin-1 can activate endothelial 5 AMP activate protein kinase and Nitrite Oxide Synthase (NOS) thus playing a role in energy hemostasis at a cellular level and regulation of vascular tonus. Omentin-1 also increases insulin signal transduction, increase glucose transport, which is stimulated by insulin and plays role in lipid metabolism.^{5,7,9,10}

Decreased levels of omentin-1 are found in insulin resistance and proinflammatory states such as type 2 diabetic mellitus, obesity and polycystic ovary syndrome. Adipocyte tissue inflammation and an increase in adipocyte tissue death due to apoptosis, autophagy, and fibrosis of adipocyte tissues led to a decrease in omentin-1 production by stromal vascular cells. Omentin levels are correlated negatively with other obesity markers such as BMI and waist circumference.^{7,11,12} A study by Alizadeh *et al.*, in 2017 states that there is a significant difference in omentin-1 levels at various degrees of obesity. Elsaid *et al.* found a significant negative correlation between omentin-1 levels with BMI and waist circumference in the obese diabetic group and the group without obesity.^{12,13}

Research about omentin-1 levels in adults with obesity in Indonesia, particularly in Makassar has never been done, thus the author is interested in doing this research.

METHODS

This research is observational research with a cross-sectional approach. The research was done at the Clinical Pathology Laboratory Installation Hasanuddin University Hospital for sampling and researched at Research Unit Faculty of Medicine, Hasanuddin University/Hasanuddin University Hospital. The research was held from September-October 2020.

The research population was young adult nondiabetic volunteers. The sample was the population that met the research criteria (inclusion criteria) consisting of seventy adults classified as obese or non-obese with no history of diabetic mellitus, hypertension, and malignancy. Anthropometry parameters of weight, height, waist circumference and hip circumference were measured with Omron HBF-214 scale and measuring tape. Body Mass Index (BMI) was calculated by dividing weight (g) with height squared (m^2). The classification of obesity and non-obesity was based on BMI. Research subjects with $BMI \geq 25$ were classified into the obesity group and subjects with $BMI < 25$ were classified into the non-obesity group. Fasting blood glucose levels were measured with an enzymatic method using ABX Pentra 400. Omentin-1 level serum measured with ELISA method (Human Omentin-1 Elisa Kit, Bioassay Technology Laboratory) in ng/mL.

Data analysis was carried out with SPSS 22 Version. The statistical method used is the calculation of frequency distribution and statistic test. Data normality test using Kolmogorov Smirnov. The statistic test used is Chi-Square, unpaired T-test, Mann-Whitney test, and Spearman test, significant if $p < 0.05$.

This research was done after ethical clearance by considering respect for subjects, beneficence, non-maleficence, and justice from The Health Studies Ethics Committee of Hasanudin University, Faculty of Medicine-RSPTN UH/Dr. Wahidin Sudirohusodo Hospital, Makassar with Number 548/UN4.6.4.5.31/PP 36/2020.

RESULTS AND DISCUSSIONS

This research involved 70 subjects who met inclusion and exclusion criteria, consisting of obese and non-obese volunteers. Subjects showing fasting blood glucose results indicating diabetes mellitus, and icteric or lysed samples were excluded. Table 1 shows the characteristics of the obese and non-obese groups.

The sample characteristics in Table 1 show that are more females (57%) with obesity than males (43%). This is in line with the research done by Prasad *et al.*, where prevalence of obesity was higher in females compared to males.¹⁴

Table 2 describes that there is a significant difference in anthropometry parameters between the obese and non-obese group with a p -value < 0.05 .

Table 1. Sample characteristic based on obese and non-obese group

Characteristic	Obese (n=37)	Non-Obese(n=33)	p
Gender			
Male	16 (43%)	17 (52%)	0.489*
Female	21 (57%)	16 (48%)	
Age (years old)			
Mean±SD	31.3±4.9	29.0±4.4	0.042**
Blood pressure (mmHg)			
Systole (mean±SD)	117,2±8.4	113±8.8	0.101***
Diastole (mean±SD)	76.8±5.3	74.2±6.6	0.091***
GDP (mg/dL)			
Mean±SD	90.9±10.7	87.9±8.3	0.211**

Description: * Chi-Square test** unpaired T-test *** Mann-Whitney test GDP=Fasting Blood Glucose

Table 2. Anthropometry characteristics obese and non-obese group

Anthropometry Characteristic	Obesity (n=37) (Mean±SD)	Non-Obesity (n=33) (Mean±SD)	p
Weight (kg)	78.9±16.9	59.5±7.4	<0.001*
Height (m)	1.62±0.87	1.62±0.84	0.878*
BMI (kg/m ²)	30±4.6	22.7±1.5	<0.001*
Waist circumference (cm)	93.7±11.8	79.4±6.3	<0.001*

Description: * Mann-Whitney test source: primer data BMI=Body Mass Index

Table 3. The comparison of omentin-1 levels in obese and non-obese group

Omentin-1 (ng/mL)	Obesity (n=37)	Non-Obesity (n=33)	p
Mean±SD	165,48±65.67	272,46±145,14	< 0.001*
Median (min-max)	140,31 (88.08-382,76)	210,97 (124,44-577,96)	

Description: *Mann-Whitney test

Table 2 describes the difference or anthropometry parameters between the obese and non-obese groups. Based on Table 2, height was not significantly different between obese and non-obese group. Weight, BMI, and waist circumference were significantly higher in the obese group compared to the non-obese group with p-value < 0.001. This finding is following Aras *et al.*, who stated that anthropometry parameters in the obese group are higher than the control group. The measurement of BMI and other anthropometry parameters in diagnosing obesity is already used widely and has clinical importance. Body fat distribution is associated with insulin resistance and type 2 diabetes mellitus. Visceral adipose tissue excess is a risk factor of metabolic syndrome compared with subcutaneous fat and excess lower body fat.¹⁵

Table 3 shows the difference between omentin-1 level in the obese and non-obese group showing a significant difference in mean omentin-1 levels (p < 0.001).

Table 3 shows a significant difference in mean omentin-1 levels between the obese and non-obese

groups with a p-value < 0.001. This result is in accordance with previous research by Ouerghi *et al.*, which found that omentin-1 levels decreased in the obese subjects compared with the subject with normal weight.¹⁶ Obesity can cause adipocyte tissue inflammation and increasing adipocyte tissue death due to apoptosis, autophagy, and fibrosis from adipocyte tissue causing a decrease in the production of omentin-1 by stromal vascular cells. Omentin-1 in adipocyte tissue increases glucose uptake stimulated by insulin and increases protein kinase B phosphorylation. Omentin also increases Insulin Receptor Substrate (IRS) activity by activating AMP Protein-Kinase (AMPK). Omentin-1 also decreases nuclear factor kappa B (NF-κB) activation and effects anti-inflammation by decreasing cytokine inflammation C-Reactive Protein (CRP), interleukin (IL)-6, Tumour Necrosis Factor (TNF)-α secretion. Low omentin-1 levels are associated with insulin resistance complications in obese subjects.^{6,8,11,17}

Spearman test was performed to assess the correlation between BMI and waist circumference

with omentin-1 levels. Table 4 shows a correlation between omentin-1 levels with waist circumference and BMI, which shows a medium correlation.

Table 4. Correlation omentin-1 level with BMI and waist circumference

Anthropometry Parameter	Omentin-1 (ng/mL)	
	p*	r
BMI (kg/m ²)	0.001	-0.398
Waist circumference (cm)	0.017	-0.286

Description: *Spearman test BMI=Body Mass Index

Body fat distribution, waist circumference, and hip circumference describe the condition of visceral adipocyte tissues. The difference in adipocyte tissue distribution can affect adipokine secretion. Correlation between omentin-1 levels with BMI and waist circumference is shown in Table 4 and shown that there is a negative correlation between omentin-1 level with BMI with p=0.001 and waist circumference with p=0.017. This shows that the higher the BMI and/or waist circumference, the lower the omentin-1 levels. This is in line with Elsaid *et al.* stating that there is a significant negative correlation between omentin-1 levels with BMI and waist circumference in the obese group with diabetes and non-obese group.¹³

This research used a cross-sectional research design, so it cannot explain the causality between obesity and non-obesity with omentin-1 levels.

The results of this study are expected to be the basis for further research in obesity and to be a reference for clinicians in the management of obesity.

CONCLUSIONS AND SUGGESTIONS

There is a significant difference in omentin-1 levels between the obese and non-obese group. A negative correlation was found between omentin-1 levels with BMI and waist circumference, which shows that the higher the BMI and/or waist circumference, the lower the omentin-1 levels.

Further research needs to be done using larger samples with additional variables and different subjects.

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