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THE CORRELATION OF OBESITY INDEX AND THE LEVEL OF TRIGLYCERIDE IN VILLAGERS

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ABSTRACT

The obesity index is a parameter that describes general and central obesity. Obesity prevalence tends to increase in the rural areas of Indonesia. The increased prevalence of obesity is correlated with increased cardiovascular prevalence and diabetes. Dyslipidemia is also a risk factor for cardiovascular disease and is closely related to obesity. Obesity is an accumulation of excessive triglyceride levels and stored in adipose tissue that can contribute to the onset of coronary heart disease. This was an analytical observational study with a cross-sectional design. Research subjects were the rural community in Bonjoroyo village, Kulonprogo Regency, DIY which fulfilled the inclusion criteria. The data obtained were obesity index data (Body Mass Index/BMI, Waist Circle/LP, Waist Round/RLPP Ratio, Body Waist Ratio/RLPTB) and triglyceride levels which were then analyzed statistically with normality test and continued with correlation Spearman test with a 95% confidence level. The results showed that BMI, LP, and RLPTB measurements were significantly positively correlated with moderate-to-weak correlation strength in fasting blood triglyceride levels (r:0.435; p:0.000; r:0.362; p:0.002; r:0.347; p:0.004) in males. Measurements of BMI, LP, and RLPTB were positively correlated with a weak correlation strength against fasting blood triglyceride levels (r: 0.193; p: 0.028; r: 0.226; p: 0.010; r: 0.214; p: 0.014) in females. The RLPP obesity index did not show significant correlations to fasting triglyceride levels in rural communities.

Key words: Obesity index, triglycerides, rural

INTRODUCTION

Obesity is a condition where fat accumulates excessively in the body due to the imbalance in calories consumed and calories used by the body. The prevalence of obesity in the world has increased twice since the year 1980. In 2014, there were more than 1,9 billion adults over 18 that had excess weight and more than 600 billion people had obesity.[1]

The results of National RISKEDAS (2013) stated there was a tendency of increase in obesity prevalence, both general and central obesity. The prevalence of adult males with obesity according to the BMI from 2013 was as much as 19.7% higher than in 2007 (13.9%) and 2010 (7.8%), hence the prevalence for obese female adults (> 18 years old 32.9%, have increased 18.1% from 2007 (13.9%) and 17.5% from 2010 (15.5%). Prevalence of central obesity was 26.6%, higher than the prevalence in 2007 (18.8%) [2].

The adult population in Indonesia in 2012 also showed a higher prevalence of obesity in females than in males. The society with lower education and social economy levels are more prone to obesity, and usually it happens to females.[3] The results of an experiment by Sunu *et al.* showed that 42.2% of people from rural areas with ages over 40 years old had obesity according to the BMI.[4] The results of Fenty showed that there were 40% of rural villagers that had central obesity.[5]

The increase in obesity prevalence is correlated positively with the increase in cardiovascular disease and diabetes.[1,6] Dyslipidemia is also a risk factor in cardiovascular disease and has a strong correlation with obesity. Obesity is an accumulation of triacyl glyceride in fat tissues.[7] Excess levels of triglyceride will be stored in adipose tissues and will contribute to the occurrence of coronary heart disease.[8]

The results of Chadha et al. stated that triglyceride was a lipid abnormality mostly found in healthy pilot respondents in India.[9] In Indonesia, the RISKESDAS (2013), stated that the proportion of abnormal triglyceride at age>15 years old was 13% of high borderline triglyceride levels and 11.9% of high and very high triglyceride levels.[2]

Many measurements measure the obesity index. Body mass index depicts body composition and general obesity, whereas waist circumference, waist circumference -hip ratio, and waist circumference-height ratio portray central obesity. Central obesity indices like WC, WHR, and WHTR is superior to BMI in predicting cardiovascular disease.[10]

Obesity and dyslipidemia, especially hyper triglyceride can be prevented by taking specific measures. A couple of experiments in other countries stated that there was a correlation between obesity index and lipid profile.[9],[11-15] Studies in Indonesia, especially in Yogyakarta proved that there was a consistent significant relation between obesity and lipid profile.[16-18]

Table 1. Male and female respondent characteristics

Characteristics	Male (n:68)	p	Female (n:130)	P
Age (years)	54.6 ± 16.8	0.2	51.8 ± 14.1	0.002*
BMI (kg/m^2)	21.8± 3.1	0.015*	23.5 ± 4.1	0.200
WC (cm)	71.6± 9.0	0.200	78.9 ± 10.4	0.200
WHR	0.84 ± 0.07	0.017*	0.88 ± 0.06	0.200
WHTR	0.45 ± 0.06	0.012*	0.53 ± 0.07	0.200
Triglyceride (mg/dL)	137.9 ± 66.2	0.000*	137.9 ± 64.4	0.000*

Explanation * : data is not distributed normally

This experiment aimed to determine that there was a relationship between obesity index with triglyceride blood levels in rural citizens, hence obesity indices may be used for screening and predicting cardiovascular disease in rural areas and is expected to prevent the prevalence of cardiovascular disease in the rural community.

METHODS

This study was an analytical observational cross-sectional design and used the purposive non-random sampling. This experiment had been ethically approved by no. 408/C.16/ FK/2017. The subjects of this experiment were citizens of Desa Bonjoroyo, Kabupaten Kulonprogo, DIY. The inclusion criteria for this study consisted of males, and females with an age of 17 years old or older who had been fasting for 8 – 12 hours, no history of cardiovascular disease or diabetes mellitus and were willing to participate in this study by signing a letter of agreement. Exclusion criteria were pregnancy, edema, and consumption of lipid-lowering medications.

Instruments used in this study are tools to measure obesity index consisting of Butterfly tape measurer, GEA Medical scales, and Stature height measurement. Obesity indices measured were Waist Circumference (WC), Waist-Hip-Ratio (WHR), Waist to Height Ratio (WHtR) and Body Mass Index (BMI). Accutrend POCT Plus calculated triglyceride levels. The waist circumference measurements were done by circling the tape measure around the waist across the belly button of the subjects in an upright standing condition while breathing normally. The hip circumference was the largest part of the hip. Data obtained were analyzed statistically. Kolmogorov-Smirnov normality test was done to examine the data distribution and Spearman correlation study to see the relationship between obesity indices with fasting blood triglyceride levels.[19-20]

RESULTS AND DISCUSSION

There were 198 subjects in this experiment comprising 68 males and 130 females, with these characteristics (Table 1).

In Table 1, it can be seen that female respondents had a mean obesity index that was higher than in males. Experiment results showed that 92 respondents (34%) were overweight and obese according to the South Asian BMI categories, with the female proportion (36%) higher than males (11%). According to the waist circumference, there were 67 respondents (34%) who had central obesity according to the IDF (International Diabetes Federation), with the proportion of the female respondents (32%) higher than males (2%).[21]

The experiment results were like those of Widyawati et al. who stated that the proportion of adult females that were obese based on BMI in rural areas were higher than adult males (30.7% vs. 5%).[22] Abdominal obesity prevalence in adult females was higher than in males (56% vs. 24%).[5] Another experiment in Tumaluntung in 180 females aged 30–50 years old showed that 66.7% had central obesity and 80% were overweight and obese.[23]

In DKI Jakarta, the prevalence of central obesity was higher in females than in males, with females having a more significant chance than in males, while males had a more significant chance of general obesity.[24] Obesity that has a higher risk in females caused DM. The results of Soetiarto *et al.* stated that central obesity had a 2.26 times more chance of becoming DM compared to individuals that did not have central obesity.[25]

In Table 2, there was a significant moderate correlation between BMI, and triglyceride levels, significantly low correlation between WC and WHtR towards triglyceride levels in the blood, according to the strength of correlation criteria.[26] Waist-Hip-Ratio parameter did not show a correlation towards triglyceride levels in male respondents.

The results of another experiment stated there was a significant moderate correlation between BMI, WC, and WHtR with triglyceride levels in males, but WHR showed a significant but low correlation.[13] Wai *et al.*, showed that obesity parameters (BMI, WC, WHR, and WHtR) have a moderate strength correlation towards triglyceride levels in male respondents.[15] Study results of Fenty *et al.* in the Cangkringan village stated a low correlation of anthropometric parameters WC, WHR, WHtR, and body fat percentage to triglyceride/HDL ratio, while BMI showed a weak correlation that was insignificant.[5] Pangesti *et al.* stated that triglyceride blood levels had a positive significant weak correlation with BMI, WC, and WHR parameters in young male adults in the urban village.[16] Christasani *et al.* state that BMI had a weak correlation with triglyceride blood levels in male respondents.[17]

Knowles *et al.* and Wai *et al.* stated that obesity indices BMI, WC, and WHtR had a significant moderate correlation in female respondents.[13,15] A study in Iran

Table 2. The correlation of obesity index to triglyceride levels in males

Obesity index	r	p
BMI	0.435	0.000*
WC	0.362	0.002*
WHR	0.179	0.144
WHTR	0.347	0.004*

*: significantly different statistically

correlation in female respondents.[13,15] A study in Iran noted that BMI was a better predictor in males towards risk factors for cardiovascular disease such as dyslipidemia, diabetes while in females, WC was better. [11]

The study location might cause the differences in this study results (rural vs. urban), also the population of the study, related to age and race, the sample size and possibly measuring methods for anthropometric or triglyceride measurement (POCT vs. chemical analyzer).

Table 3. Relationship of obesity indices with triglyceride levels in females

Obesity index	r	p
BMI	0.193	0.028*
WC	0.226	0.010*
WHR	0.119	0.176
WHtR	0.214	0.014*

* : significant statistical difference

Even though there were variations of the study results, the results of this experiment supported a correlation between obesity indices to fasting triglyceride blood levels in adult citizens in rural areas. This could be used as a simple method of using obesity indices to know dyslipidemia conditions, especially hyper triglyceride.

CONCLUSION AND SUGGESTIONS

Measurement of obesity indices (BMI, WC, and RWCT), had a significant positive correlation of triglyceride levels towards fasting triglyceride levels in rural citizens. These obesity indices could be used as a simple method to know the hyper triglyceride condition in the blood.

Further studies should be conducted to support the correlation of obesity indices towards other lipid components in teenagers or young adult population for early prevention of the cardiovascular disease risks.

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