CORRELATION BETWEEN BODY MASS INDEX AND APO B / APO A1 RATIO AMONG ADULTS IN RURAL AREA OF YOGYAKARTA INDONESIA

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Abstract: Prevalence of cardiovascular disease tends to increase among Indonesians. Many studies show relationship between obesity and cardiovascular diseases (CVD). Body Mass Index (BMI) is a cheap and easy method to determine obesity. Apo B/Apo A1 ratio can predict the risk of cardiovascular disease. However, measurement of Apo A1 and Apo B is challenging especially among people in rural area in terms of cost for laboratory test. Therefore, it is urgent to explore method that suitable for rural people in predicting CVD. Aim of this study was to investigate correlation between Body Mass Index (BMI) and Apo B/Apo A1 ratio. This study was an observational research with a cross-sectional design. This study was conducted in Cangkringan, Yogyakarta Special Province. Male or female who were 40-60 years old were included in this study. Those who had cardiometabolic diseases, edema or currently taking cardio metabolic medicines were excluded. Subjects were recruited purposively. Data of BMI were gathered using anthropometric measurements. Data of Apo B and Apo A1 were measured using laboratory tests. Data of demographics and socio-economic status were collected using a questionnaire. Data were analyzed using Spearmen to test correlation between ApoB/ApoA1 ratio and BMI. A total of 102 subjects were recruited. They were 40 males and 62 females. Mean of age for male and female are 51.6 ± 0.8 years and 48.8 ± 0.7 years, respectively. Based on the BMI value most of male in this study was normal (52.5%) and most of female (40.3%) was overweight. Mean of BMI of male and female were 23.2 ± 0.4 and 25.9 ± 0.6, respectively. ApoA1 of male is 129.0 ± 2.5 and the female is 134.4 ± 2.2. Apo B of male is 98.3 ($63.7 - 180.5$) and the female was 92.0 ± 3.0. Median of ratio of Apo B and ApoA1 was 0.75 ($0.5-1.0$) and 0.7 ($0.3-1.3$) for male and female, respectively. Correlation between BMI and Apo B/ApoA1 ratio was positive, weak and not significant statistically in both male and female in this study, i.e.: $r=0.186$; $p = 0.251$ and $r=0.349$; $p=0.121$, respectively. Although weak and no statistically significant, this study adds evidence that there was an association between BMI and Apo B/ApoA1 ratio.

Keywords: BMI, Apo B/Apo A1, cardiovascular, rural

Introduction

Cardiovascular disease (CVD) is the main cause of mortality worldwide (WHO, 2013). In Indonesia, the prevalence of CVD tends to increase. The CVD prevalence among urban people is 23, 4%, while 19, 5% among rural population (Kementrian Kesehatan RI, 2013). The recent data showed that CVD causes 30% mortality among the Indonesians (WHO-NCD, 2011).

Many studies show that obesity, dyslipidemia, hypertension and hyperglycemia are positively correlated with CVD (Lipoeto et al., 2007; Shieldes et al., 2012; WHO-NCD, 2011; Ugwuja et al., 2013; Franklin and Wong, 2013; Agyemang et al., 2009). These risk factors describe the metabolic syndrome (Grundy, et al, 2004). These risk factors are prevalent among the Indonesians, not only in urban but also in rural areas (Kementrian Kesehatan RI, 2013). The prevalence of metabolic syndrome is high relatively. It is 18% and 6.6% among the Indonesian elderly men and women, respectively (Kamso, 2007). A study involved the Indonesians found a significant correlation between metabolic syndrome and microvascular complication (Wulandari and Isfandiari, 2013).

Apolipoprotein A1 (Apo A1) and Apolipoprotein B (Apo B) are structural proteins for the High Density Lipoprotein (HDL) and the Very Low Density Lipoprotein (VLDL) - Low Density Lipoprotein (LDL), respectively (Marcovina and Packard, 2006). The ratio of Apo B and Apo A1, therefore, reflects the balance of cholesterol. Walldius, et al (2001) through the AMORIS (The Apolipoprotein related mortality risk) study stated that the increase of Apo B/Apo A1ratio leads to the increase of risk of CVD. The Apo B/Apo A1 ratio could identify individual who has risk of CVD, although their LDL level is normal. A study examined adolescent Brazilians (Alburquerque, et al, 2015) and North Indian females (Mahto, et al, 2015) show similar result with the AMORIS. The ratio also shows a significant correlation with coronary artery lesions among the diabetic Chinese patients (Hong, et al, 2015).

Table 2: Value of Apo B, Apo A1 and Apo B/Apo A1 ratio among male and female

Parameters	Male	Female
Apo B	98.3 (63.7 – 180.5)	92.0 ± 3.0
Apo A1	129.0 ± 2.5	134.4 ± 2.2
Apo B / Apo A1	0.75 (0.5 – 1.0)	0.70 (0.3 – 1.3)

High level of Apo B reflects the high level of LDL – VLDL; while, the Apo A1 level is strongly correlated with HDL level (Marcovina and Packard, 2006). The increase of the ratio of Apo B and Apo A1 reflects the increase of CVD risk as is found by two remarkable studies, i.e. AMORIS study (Walldius, et al, 2001) and INTERHEART study (Yusuf, et al, 2004). Correlation between BMI and ApoB/ApoA1 found by this present study is positive, weak and not significant statistically in both male and female, i.e.: $r=0.186$; $p=0.251$ and $r=0.349$; $p=0.121$, respectively. Since Apo B and Apo A1 ratio is closely related with risk of CVD, finding of the present study adds the existing evidence that obesity associates with CVD risk (Mahto, et al, 2016; Nordstrand, et al, 2011, and Kamso, 2007). A meta-analysis by Lee, et al (2008) concluded that central obesity is better than BMI in predicting CVD risks, particularly waist to height ratio. However, measurement of abdominal obesity is more difficult than BMI, especially among rural people.

There is some limitation in this study that should be considered. Firstly, the small number of subjects may be unable to provide strong significant correlation. Secondly, unadjusted variables, such as lipid profiles, may be influence the analysis.

Conclusion

This study enriches information that obesity is associated with the ratio of ApoB and ApoA1. However, in this study such an association between BMI and the ratio is weak and not significant statistically.

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