

# Correlation between Body Mass Index and Apo B / Apo A1 Ratio among Adults in Rural Area of Yogyakarta Indonesia

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Correlation between Body Mass Index and Apo B / Apo A1 Ratio among Adults in Rural Area of Yogyakarta Indonesia

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### Problem Statement

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.

### Purpose of study

The aim of this study is to investigate correlation between Body Mass Index (BMI) and Apo B/Apo A1 ratio.

### Methods

This study is 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 Spearman to test correlation between ApoB/ApoA1 ratio and BMI.

### Findings and Results

A total of 102 subjects were recruited. They were 40 males and 62 females. Mean of age for male and female are  $51.6 \pm 0.8$  years and  $48.8 \pm 0.7$  years, respectively. Based on the BMI value most of male in this study is normal (52.5%) and most of female (40.3%) is overweight. Mean of BMI of male and female are  $23.2 \pm 0.4$  and  $25.9 \pm 0.6$ , respectively. ApoA1 of male is  $129.0 \pm 2.5$  and the female is  $134.4 \pm 2.2$ . Apo B of male is 98.3 (63.7 – 180.5) and the female is  $92.0 \pm 3.0$ . Median of ratio of Apo B and ApoA1 is 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 is 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.

### Conclusions

Although weak and no statistically significant, this study adds evidence that there is an association between BMI and Apo B/ApoA1 ratio.

### Recommendations

It is suggested to explore association between Apo B/Apo A1 ratio and other anthropometrics, such as waist-hip ratio.

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

### 10 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; Shiekles *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 (Kamsu, 2007). A study involved the

Indonesians found a significant correlation between metabolic syndrome and microvascular complication (1) (Iulandari and Isfandiari, 2013).

Apolipoprotein A1 (Apo A1) and Apolipoprotein B (Apo B) (5) 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). (16) 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 A1 ratio 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 (Albuquerque, 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).

Early identification of the risk factors of CVD, such as obesity, hypertension, dyslipidemia, and hyperglycemia could prevent the incident of CVD. However, in the Indonesia context, particularly in rural areas, implementation of health technology to identify such risk factors is challenging (WHO, 2008). This issue leads to the difficulty in preventing CVD among rural population in Indonesia. Therefore, it is urgent to find out an accessible technique to identify risk factors of CVD especially for people in rural areas.

Anthropometric measurements could be a promising technique to be implemented in rural population to investigate risk factors of CVD. The anthropometric measurements are simple, easy and cheap. Studies among the Indonesian population show significant correlations between anthropometrics and CVD risk factors (Fenty, Kiswanto, and Raras, 2014; Fenty, et al., 2011; Utami and Fenty, 2011; Natalia and Fenty 2011; Soembarwati and Fenty, 2011). Body Mass Index (BMI) is parameter of obesity which can (3) easily measured using anthropometric technique. This study is aimed to explore correlation between BMI and Apo B/Apo A1 ratio among people of rural areas of Indonesia. As the ratio is closely related to CVD risk, it is expected that results of this study could support anthropometric technique for early and accessible detection (8) CVD risk factors among rural people. This study hypothesized that BMI has a positive correlation with Apo B/Apo A1 ratio.

## Metho (2)

This is an observational research with cross-sectional design. This study is part of a big project investigate the best predictor of CVD among rural population in Indonesia. Ethical clearance was obtained from the Ethic Committee UGM (Universitas Gadjah Mada) Yogyakarta. Study population was people of Cangkringan Village, Yogyakarta Special Province, Indonesia. The inclusion criteria of subjects were those both male and female who were 40 to 60 years old. 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. Numbers of subjects were 102, i.e.: 62 females and 40 males, who were purposively approached. The subjects had to do fasting overnight for 10 to 12 hours. The subjects had to sign an informed consent stated they participate in this study voluntary. (15)

Data of BMI were gathered using anthropometric measurements. Data of Apo B and Apo A1 were measured in a certified (14) oratory. Data of demographics and socio-economic status were collected using a questionnaire (6). Data were analyzed statistically using the assistance of SPSS version 20.0. The dependent variable is Apo B/Apo A1 ratio and the independent variable is BMI score. BMI score was calculated using this following formula, i.e.:  $\text{weight in Kg} / [\text{height in meter}]^2$ . Status of obesity was determined using the category of BMI for Asian. Correlation between variables was determined by Spearman analysis.

## Results and Discussion

Using purposive sampling technique a total of 102 subjects was recruited. They were 40 males and 62 females. Mean of age for male and female are  $51.6 \pm 0.8$  years and  $48.8 \pm 0.7$  years, respectively.

Table 1: Proportion of BMI score among male and female

Category of BMI	Male (%); n=40	Female (%); n=62
Underweight (< 18.5)	5	3.2
Normal (18.5 – 23)	52.5	25.8
Pre-obese (23.1 – 27.4)	37.5	40.3
Obese ( $\geq 27.5$ )	5	30.7

Based on the BMI value as described in Table 1 most of male in this study is in normal weight (52.5%) and most of female (40.3%) is pre-obese. Mean of BMI of male and female are  $23.2 \pm 0.4$  and  $25.9 \pm 0.6$ , respectively. The sum of proportion of pre-obese and obese in female is 71%; while, in male is 42.5%. These findings show that women tend to be obese. This is in line with finding of the previous study in the same Province (Dewi, et al, 2010). Furthermore, obesity phenomenon is influenced by many factors, such as: physical activity and nutrition intake. Regarding physical activity, women in rural areas of Indonesia tend to be active. They normally do their household chores by themselves and also a daily additional works at their fields (Vaezghasemi, et al, 2014). Based on the nature tasks of the Indonesian rural women, obesity phenomenon among this population seems to be caused dominantly by other factors except physical activity, for example nutrition intake. People in rural area tend to have limitation in selecting their nutrition intake that accommodates nutrition calculation balance. This limitation could be due to lack of knowledge and affordability to choose good quality food. This finding authentically convinces that intervention to reduce obesity prevalence should involve woman in rural areas.

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 Kamsu, 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 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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