

Original Article

**RELATIONSHIP OF BODY FAT PERCENTAGE AND APO B/APO A-1 RATIO AS
CARDIOVASCULAR RISK MARKER IN RURAL ADULTS OF YOGYAKARTA INDONESIA**

FENTY, ARIS WIDAYATI, PHEBE HENDRA*

Faculty of Pharmacy Universitas Sanata Dharma Yogyakarta, Indonesia
Email: phebe_hendra@usd.ac.id

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ABSTRACT

Objective: Prevalence of obesity and cardiovascular disease has increased in both urban and rural areas Indonesia. High body fat percentage (BF%) is associated with a high cardio metabolic risk. The apolipoproteins (Apo) B/Apo A-1 ratio is a better risk predictor for cardiovascular disease. This study aimed to explore the relationship of BF% and Apo B/Apo A-1 ratio among rural adults in Yogyakarta Indonesia.

Methods: This cross-sectional study included 40 men and 62 women (40-60 y old). Those who had cardiometabolic diseases, edema or currently taking cardio metabolic medicines were excluded. Information about sociodemographic details was obtained by using a self-administered questionnaire. The questionnaire also assessed smoking status, reproductive history and medical history. Anthropometric measurement, apo B, Apo A-1, fasting blood glucose and blood pressure were measured.

Results: The prevalence of high BF% was 12.7% and 6.9% in men and women, respectively. There was negative correlation between BF% and apo A-1 and positive correlation between BF% and apo B as well as BF% and apo B/apo A-1 ratio. A significant weak correlation was observed between BF%-apo B/apo A-1 ratio in women ($r: 0.280$; $p: 0.027$).

Conclusion: BF% is associated with apo B/apo A-1 ratio among women adults in rural area of Yogyakarta Indonesia findings support the importance of using BF% to predict cardiovascular disease in rural area.

Keywords: Body Fat Percentage, Apo B/apo A-1 ratio, Relationship

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INTRODUCTION

The prevalence of obesity and cardiovascular disease (CVD) has increased in developing countries, including Indonesia [1-3]. Based on the household health survey in Indonesia (2004), the study demonstrated that the prevalence of overweight was 7.2% and 10.4% for men and women, respectively. The prevalence of overweight was higher in urban areas (10.8%) than in rural areas (7.5%) [1]. A national survey showed that the highest incidence of central obesity was 36.9% among adults 45 to 54 y old, and the percentage of abnormal low-density lipoprotein (LDL) and high-density lipoprotein (HDL) profile is more prevalent in rural Indonesia. The CVD prevalence was greater in urban compared with rural population (23.4% and 19.5%, respectively) [2]. Another study indicated that the prevalence of prehypertension and hypertension were relative high among young Indonesian adults in primary health care of rural area [4]. Our previous study found that prevalence of metabolic syndrome in rural areas of Yogyakarta was 25%, female more prevalent than male subjects [5]. According to World Health Organization (WHO), more than 1.9 billion adults (≥ 18 y) were overweight in 2014, and of this, over 600 million were obese [6]. The increased of obesity is closely associated with elevated risk of CVD and obesity is an independent risk factor for all-cause mortality as well as for CVD [7, 8].

Frequently, obesity is diagnosed using body mass index (BMI), however this measurement has been criticized because could not identify fat distribution and low specificity regarding body composition [9, 10]. Deurenberg-Yap *et al.* [11,12] who studied Singaporean adults confirmed the high BF% increases the risk factor for CVD in normal and low-BMI and the relationship between BF% and BMI is different among three ethnic groups in Singapore; whereas Kim *et al.* [13] who studied Korean reported the same. Body fat percentage as anthro pometric measurement has not been extensively used in epidemiological studies in Indonesia. Our unpublished study showed that there was significant correlation

between BF% with lipid ratio as a CVD risk factor in the urban adolescents and in rural adult's area.

Apolipoproteins are proteins associated with lipids in lipoprotein particles. The ratio of apolipoprotein B (apo B) and apo A-1 represents the balance between apo B-rich potentially atherogenic cholesterol particles and apo A-1-rich anti-atherogenic cholesterol particles. The apo B/apo A-1 ratio are the best predictor of CVD related to lipids as compared with other lipids ratio [14].

Other studies have reported apo B/apo A-1 ratio might be of greatest value in diagnosis and treatment in people who have common lipid abnormalities, but have normal or low concentrations of LDL-cholesterol [15]. People with the unfavorable apo B/apo A-1 had more atherogenic lipid profile, therefore apo B/apo A-1 ratio can be considered as a sensitive marker of atherogenic risk [16].

In this study, we determined the relationship of BF% and ratio apo B/apo A-1 among rural adult people in Indonesia.

MATERIALS AND METHODS

Design and sample

This cross-sectional evaluation was carried out in Cangkringan Sub-District, a rural area in Yogyakarta Indonesia. This study was conducted from June 2016 to August 2016 involved a total number of 102 adults people who lived in Cangkringan. Adults aged 40 to 60 y were eligible to participate in the study after signing a written consent form according to Helsinki Declaration.

Those who had cardiometabolic diseases, edema or currently taking cardio metabolic medicines were excluded. Each subject gave a written informed consent for participating in the study, which was approved with approval number KE/FK/048/EC/2016. by Medical and Health Research Ethics Committee (MHREC) Faculty of Medicine Gadjah Mada University Indonesia.

Measurements

Measurements were taken using standardized equipment. Anthropometric measurements, biochemical assessments and self-reported questionnaire were used for data collection. Clinical data including blood pressure (BP) was also obtained. Biochemical assessments included estimation of fasting blood glucose, apo A-1 and apo B. The questionnaire was constructed to assess socio-demographic details, smoking habits, reproductive history and medical history.

BF% was determined by the sum of the thickness of three skinfolds (triceps, suprailiac, and abdominal), measured using a Skinfold Caliper (Pzi dou fi®) and calculated by Siri's equation [17-19]. We used a modified Jackson-Pollock 3-site equation because the 3-site equation analysis method is simpler and faster than other methods. Previous study showed there was a strong correlation between the equation and dual-energy X-ray absorptiometry (DEXA) as a gold standard ($R^2 = 0.98$, $p: 0.0001$) [20]. Based on American College of Sports Medicine (ACSM's), BF% associated with optimal health of 20-32% for women and 10-22% for men [21-22].

Blood sample were collected from the subjects by registered nurses in the morning after a fasting period of 10-12 h. The apo A1, apo B and fasting blood glucose were measured on Architect Ci8200-intergrated-system (Abbott Laboratories, USA) in certified laboratory of Yogyakarta.

BP was measured using a digital automatic apparatus (Omron, HEM-7203, Japan), in a sitting position. Two measurements were taken with interval of 3 min between consecutive measurements.

Statistical analysis

Statistical analysis was done using SPSS version 20.0. Continuous variables are expressed as mean±standard deviation (SD) if data were distributed normally or median (minimum-maximum) if data were not distributed normally. Categorical variable were expressed as percentages. The statistical significance of differences in subjects cardiovascular risk factors based on BF% was analyzed using the ANOVA test. Correlations between the indices were assessed using the Spearman's rank correlation. A p-value of less than 0.05 was considered as statistically significant.

RESULTS

Using purposive sampling technique a total of 102 adults were recruited, men were 39% and women were 61%. The characteristics of study participants were summarized in table 1. BF% of men and women were 17.9±0.9 and 26.5±0.8 respectively. Among men and women, systole arterial pressure, diastolic arterial pressure, fasting blood glucose levels were comparable. Serum apo A1 as expression of plasma HDL levels was higher in women than men. Apo B as expression of LDL was lower in women than men subjects. Apo B/apo A-1 ratio were higher in men compared to women subjects.

Table 1: Characteristics of study participants

Variables	Men (N=40)	Women (N=62)
Age (y)	51.6±0.8	48.0±0.7
Body Fat Percentage (%)	17.9±0.9	26.2±0.8
Systole arterial pressure (mmHg)	133.5 (98.5-196.5)	138.8±2.9
Diastolic arterial pressure (mmHg)	80.5±1.7	82.7±1.5
Fasting blood glucose (mg/dl)	81 (62-276)	82.5 (68-220)
Apo A-1 (mg/dl)	129.1±2.5	134.4±2.2
Apo B (mg/dl)	98.3 (63.7-180.5)	92.0±3.0
Apo B/Apo A-1 ratio	0.75 (0.5-1.0)	0.7(0.3-1.3)

Table 2 shows, in women, there are 13 obese (12.7%); 37 normal (36.3%); 12 underweight (11.8 %), respectively. In men, there are 7 obese (6.9%); 31 normal (30.4%); 2 underweight (1.9%),

respectively. Based on BF%, the overall prevalence of obese (ACSM) was 19.6% in rural area of Yogyakarta Indonesia. Women (12.7%) showed higher prevalence when compared with men (6.9%).

Table 2: Prevalence of obesity among adult in rural area based on BF%

Subjects	Prevalence (%)		
	Women	Men	Total
Underweight	11.8	1.9	13.7
Normal	36.3	30.4	66.7
Obese	12.7	6.9	19.6

Table 3: Spearman correlation coefficients between the apo A1, apo B, apo B/apo A-1 ratio and BF%

	BF%			
	Men		Women	
	Spearman, r	P-level	Spearman, r	P-level
apo A-1	-0.264	0.100	-0.141	0.247
apo B	0.080	0.224	0.240	0.060
apo B/apo A-1	0.118	0.467	0.280	0.027

Among men and women, there was significant negative correlation between BF% and apo A-1 and positive correlation between BF% and apo B as well as BF% and apo B/apo A-1ratio (table 3). A significant weak correlation was also observed between BF% and apo B/apo A-1 in women ($p<0.05$).

DISCUSSION

In our study, we examined the relationship between BF% and apo B/apo A1 ratio as a better marker for predicting CVD than conventional another marker.

Prevalence of obese based on BF% according is 19.6% in rural area of Yogyakarta Indonesia, whereas women more prevalent than men. Similar findings have been reported in other studies that obesity prevalence was higher in women than men according to BF% [9, 13, 23-25].

Our study demonstrated that BF% had negative correlation with apo A-1 and positive correlation with apo B and apo B/apo A-1 ratio. Only apo B/apo A-1 ratio showed significant weak correlation with BF% in women subjects ($r: 0.280$; $p: 0.027$). Previous studies showed BF% was only weakly associated with predicted CVD risk compare to other body composition indices and body mass index and waist-to-hip ratio were better predictors of CVD risk than BF% [26, 27]. Although the correlation between BF% and apoB/apo A-1 ratio was weak, however this finding strengthen that BF% is associated with cardio metabolic risks.

Our study has a few limitations. Firstly, the small number of subjects with cross-sectional design may be unable to provide strong and significant correlation. The directionally of the correlation can be suggested. Secondly, we used skinfold thicknesses measurement to measure BF%. DEXA as a gold standard to measure BF%, but it is not used commonly in clinical setting because it is expensive and inconvenient [13]. However, another study showed strong correlation between the modified Jackson-Pollock 3-site equation and DEXA [20]. Thirdly, the results of this study cannot be generalized to other population because the subjects were adults only between 40-60 y in rural area with different socio-cultural characteristics from other population.

CONCLUSION

Our results demonstrate that BF% is weakly associated with apo B/apo A-1 ratio among women adults in rural area of Yogyakarta Indonesia. However these findings support the importance of using BF% in to predict cardiovascular disease in rural area.

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CONFLICT OF INTERESTS

Declared none

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