



THE ASSOCIATION BETWEEN RISK FACTORS AND OBESITY OF THE INDONESIAN JAVANESE

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Abstract: *Background:* Obesity mainly in elderly people has a role in increasing degenerative diseases such as hypertension, diabetes, coronary heart disease, and atherosclerosis. *Objective:* The study aimed to assess the prevalence of obesity and its risk factors in The Javanese elderly people. *Design:* A cross sectional study towards nutritional status. *Setting:* Yogyakarta, Surabaya, and Semarang Cities represented urban areas, while for the rural areas represented by Magetan, Gunung Kidul, and Wonogiri Districts. *Participants:* The indicators of obesity towards 812 elderly Javanese (consisting of 295 men and 517 women) in December 2007. *Measurement:* Anthropometry measured using Omron Body Fat Analyzer HBF 352, microtoise, and SECA. *Results:* More than one fourth of respondents were obese (32.1%) and the others were normal weight (57.7%), and underweight (10.2%). High level of body fat percentage was twice higher (80.7%) than the high level of visceral fat (39.5%). The composition of respondents in the rural areas (55.5%) were almost similar to the urban areas (45.5%). Majority of respondents were female (63.7%) with low education (59.2%). Low to middle level of energy expenditure were mostly spent when they were aged 25 and 55 years of age. Most of respondents had lack of energy, protein, and fat intakes when they aged 25 and 55 years of aged. Rural and urban areas, gender, and employment status when the elderly aged 25 had a significant relationship with BMI ($p < 0.01$). Significant relationships were also found between BMI with visceral fat and percent body fat ($p < 0.01$). Female elderly people has the probability twice higher to be obese than male. *Conclusion:* Obesity need to be aware by the elderly people mainly female including risk factors because of their role in the increased incidence of obese elderly although underweight was still found in among the same population group.

Key words: Elderly people, obesity, risk factors, visceral fat, body fat percentage.

Introduction

The significant increased prevalence of obesity in elderly group especially in developing countries has still public nutritional health problem. Obesity is related to the increased of morbidity and mortality rate due to exposure of degenerative diseases such as diabetes, hypertension, coronary heart disease, atherosclerosis, etc (1). Quality of life of obese elderly is lower than non-obese elderly due to unhealthy lifestyle and its also contributes to functional ability and disability degradations on elderly. The latest research even showed that obesity is a risk factor in dementia among women elderly (2). Therefore, it is important to pay more attention to obesity considering on its role in improvement of health and welfare status of elderly in future. Obesity is marked by increasing body fat which measured from Body Mass Index (BMI) and Ratio of Hip and Waist. The physiological changes due to aging have increased variety of amount and distribution of muscle

and fat in the elderly (3). The 2007 Basic Health Survey revealed that the prevalence of obesity among above 14-year-old Indonesians is 19.1% using Ratio of Hip and Waist as the indicator (4). Unfortunately, there has not yet been any data on the prevalence of obesity among elderly in Indonesia especially among Javanese. This group has become the largest ethnic group of total population in Indonesia (41.7%). This group lives in mostly Central Java, DI Yogyakarta, and East Java. The proportion of elderly among Javanese is 48.6%, which is the biggest among other 4 ethnic groups in Indonesia, which are Sundanese, Malay, Bataknesse and Maduranese (5). Some studies have shown an association between obesity and other risk factors as genetic (6-7), environment (8), level of education (9), socio-economic (8), sex (9-11), health status (12), drugs and physical activities (13, 14), macro nutrition intake: energy, protein and fat (15, 16), live in urban and rural area (8, 17), and age (18). The purpose of this study was to determine the prevalence of obesity and its risk factors among Javanese elderly people in Indonesia.

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Received August 21, 2012

Accepted for publication August 22, 2012





Method

Study design

The cross-sectional study has been completed in December 2007 to February 2008 to determine the size of obesity prevalence with its risk factors of obesity among the Indonesian Javanese elderly.

Subject and location

There were 812 elderly aged more than 55 years old (517 women and 295 men) who participated in the study. The selection of Magetan, Gunung Kidul, and Wonogiri Districts representing rural area in East Java, DI Yogyakarta, and Central Java Provinces because they had the largest proportion of elderly among other districts due to the low fertility rate and high out-migration rate (5). Meanwhile, the urban areas were represented by Yogyakarta, Semarang, and Surabaya. The Two Stages Stratified Random Sampling Method was used to select the locations through 2 stages of selection at the sub-district and village level. The selection of sub-district and village was done randomly. Sample of research was also selected randomly using Simple Random Sampling in each selected village. The data collection was carried out by trained nutritionists in December 2007 to February 2008. The criteria of research inclusion was elderly living/being around in the community either men or women who were above 55 years old, had parents who were Javanese, lived alone or with family, healthy or able to stand up, did not have stroke or amnesia (able to remember past event in a good way), and able to communicate. This study has been approved by the Commission of Ethics of the Research and Development Board of the Ministry of Health on December 2007.

Anthropometry, food consumption, and daily physical activity data collection

The measurement of weight using SECA step-on scale with 0.1 kilogram of precision. Every elderly was asked to wear light clothing. After they prepared the scale, the elderly was asked to stand on the scale for around 1 minute until the result appeared and the officer in charged recorded the result. Height measured using microtoa with 0.1 precision (19). Respondents were interviewed about the food consumption history using FFQ semi-quantitative when they aged 25 to 55 years old. The questionnaire covered the frequency of consuming rice as their daily primary rice, their habit of consuming calcium-contained food between the age 25 and 55 years old, physical activity (daily activity, spare-time activity, and sport/exercise) that they did when they were

between 25 and 55 years old. Physical activity data included the daily physical activity, spare time activity and exercise activity that are collected in the 2 periods when they were 25 years old and 55 years old.

Statistical analyses

Demographic profile includes sex, age, education, and occupations/jobs they took at the age 25 years old and 55 years old; the intake of macro nutrition when the respondent was 25 and 55 years old; respondent's nutrition status based on BMI, body fat percentage, and visceral fat was presented in the frequency distribution. The relation between outcome variable i.e. the nutritional status, and independent variables were analyzed by using Chi Square Test, where the significance level was marked from $< 0,05$.

Result

Percentage of respondents living in urban area was bigger than the ones in rural area. Most of the respondents were women and the lower education level had higher proportion than the higher one. The proportion of respondents who were 55-65 years of age was bigger than those who are 66-83 years of age. The respondents were mostly still working when they were at the age 25 and 55 years old (Table 1).

Table 1
Characteristics of demographic

Variables	Frequency (n)	Percent (%)
Area of Living:		
- Village	451	55,5
- Urban	361	44,5
Sex:		
- Women	517	63,7
- Men	295	36,3
Age group:		
- 55-65 years	618	76,1
- 66-83 years	194	23,9
Final education level:		
- Low	481	59,2
- High	331	40,8
Working status at 25 years of age		
- Unemployed	171	21,1
- Employed	641	78,9
Working status at 55 years of age		
- Unemployed	319	39,3
- Employed	493	60,7

Table 2 presents the level of energy expenditure, energy and protein intake when the respondents were 25 and 55 years of age. Most of the respondents had lower and moderate level of energy expenditure either at the age of 25 or 55 years old. Also with the lack of energy and protein experienced by the respondents in those two period of time. The respondent's nutritional status using





BMI as indicator was grouped based on underweight, normal, and overweight /obesity. The underweight and overweight/obesity were grouped into malnutrition. Proportion of respondents with higher body fat percentage was four times bigger than the normal ones. While the normal visceral fat was still two times bigger than high level (Table 3). The relation between socio-demographic characteristics, level of energy expenditure, energy-protein intake, and the BMI-based nutritional status is presented in Table 4. Variables of area of living, sex, and working status when respondents were 25 years of age have significant relation with BMI-based nutritional status ($p < 0.05$). The respondents who live in the urban area mostly had overweight and underweight compared to the respondents who live in rural area.

Table 2

Level of energy release and macro nutrition intake when respondents were 25 and 55 years of age

Variables	Frequency (person)	Percent (%)
Level of energy expenditure at 25 years old:		
- Low and moderate	542	66,7
- High	270	33,3
Level of energy expenditure at 55 years old		
- Low and moderate	542	66,7
- High	270	33,3
Energy intake at 25 years of age		
- Less	630	77,6
- Sufficient	182	22,4
Energy intake at 55 years of age		
- Less	626	77,6
- Sufficient	186	22,4
Protein intake at 25 years of age		
- Less	484	59,6
- Sufficient	328	40,4
Protein intake at 55 years of age		
- Less	484	59,6
- Sufficient	328	40,4

Table 3

Nutritional status based on BMI, body fat percentage, and visceral fat

indicators	Level				Total	
	High		Normal		n	%
	n	%	n	%	n	%
Body fat percentage	655	80,7	157	19,3	812	100
Visceral fat	321	39,5	491	60,5	812	100

Malnutrition was more common among female elderly than male. Respondents who were unemployed had bigger overweight and underweight status compared to the respondents who were employed. Even though there was no meaningful correlation, there was a research variable that describes that tendency such as the one shown in respondents that had low-moderate energy expenditure tend to have bigger proportion of malnutrition compared to the higher one. While some other variable such as the level of macronutrient intake,

which includes energy and protein when respondents were 25 and 55 years of age did not show similar pattern to the previous variables. Table 5 shows the correlation between visceral fat and percentage of body fat. The level of visceral fat and body fat percentage were closely related to the BMI status. Respondents with high level of visceral fat had three times more malnutrition status than normal as well as the percentage of respondents with high level of body fat had higher malnutrition level than normal. Table 6 presents the analysis of Multiple Regression for the BMI risk factors. The most influential risk factor for the BMI status was sex (OR = 2,564; 95% Confidence Interval = 1,737 – 3,783) showed that elderly women had 2.6 times probability of overweight/obesity than men after other risk factors were adjusted.

Table 4

Association between socio-demographic characteristics, energy release, and energy- protein intake with nutritional status

Variables	Nutritional Status				Total	p
	Malnutrition		Normal			
	n	%	n	%	n	%
Area:						
Urban	217	48,1	234	51,9	451	100
Rural	135	37,4	226	62,6	361	100
Sex:						
Women	258	49,9	259	50,1	517	100
Age	94	31,9	201	68,1	295	100
Age group:						
55-65 years	280	45,3	338	54,7	618	100
66-83 years	72	37,1	122	62,9	194	100
Last education level:						
Low	207	43,0	274	57,0	481	100
High	145	43,8	186	56,2	331	100
Employment status at the age of 25:						
Unemployed	99	57,9	72	42,1	171	100
Employed	253	39,5	388	60,5	641	100
Employment status at the age of 55:						
Unemployed	152	47,6	167	52,4	319	100
Employed	200	40,6	293	59,4	493	100
Energy expenditure level at the age of 25						
Low-moderate	244	45,0	298	55,0	542	100
High	108	40,0	162	60,0	270	100
Energy expenditure level at the age of 55						
Low-moderate	246	45,4	296	54,6	542	100
High	106	39,3	164	60,7	270	100
Energy intake at the age of 25:						
Less	262	41,6	368	58,4	630	100
Sufficient	90	49,5	92	50,5	182	100
Energy intake at the age 55 :						
Less	279	44,6	347	55,4	626	100
Sufficient	73	39,2	113	60,8	186	100
Protein intake at the age 25:						
Less	208	43,0	276	57,0	484	100
Sufficient	144	43,9	184	56,1	328	100
Protein intake at the age 55:						
Less	218	45,0	266	55,0	484	100
Sufficient	134	40,9	194	59,1	328	100





Table 5
Correlation between visceral and body fat percentage with nutritional status

Indicators	Nutritional Status				Total		p
	Malnutrition		Normal		n	%	
	n	%	n	%			
Visceral fat level:							
High	237	73,8	84	26,2	321	100	0,00
Normal	115	23,4	376	76,6	491	100	
Body fat percentage level:							
High	297	45,3	358	54,7	655	100	0,02
Normal	55	35,0	102	65,0	157	100	

Table 6
Analysis of BMI risk factors

Variable	Coefficient	S.E.	P Wald	OR	95% C.I. OR
Sex	0.941	0.199	0.000	2.564	1.737 - 3.783
Living area	0.690	0.171	0.000	1.993	1.425 - 2.787
Employment status at the age of 25	0.521	0.20	0.009	1.684	1.137 - 2.496
Final education	0.427	0.171	0.013	1.533	1.096 - 2.143
Age	0.412	0.204	0.043	1.510	1.013 - 2.252

Discussion

Visceral fat and body fat percentage had significant correlation to the nutritional status. The higher visceral fat and body fat percentage, the higher nutritional status, the tendency of overweight and obesity were also bigger. The increased of adipose visceral tissue was more active compared other adipose tissue to increase body weight. There was a significant difference between visceral fat tissue with the BMI among elderly men in Africa (23). Body fat percentage also had significant correlation with BMI, the higher the body fat percentage the bigger BMI value was. Area of living or living in urban or rural area also had significant correlation in this study. This finding was in line with the study on elderly people found that obesity had close relation with living area (24). Compared to elderly in the village, the elderly living in urban area had the tendency to be obese twice bigger due to high consumption of healthy food, lifestyle such as consuming junk food, low daily physical activities, and their access to recreational places. The second study on the elderly in Iran that correlated between obesity and socio-economic factor found that the proportion of obese elderly was bigger in the urban than rural area. This difference was caused by their high access to modern lifestyle facilities such as fast food, western food, and low physical activity. But the second study showed that rural elderly had bigger tendency to be obese than urban elderly. This might because of limited facility and exercise program in the village. The limitation of obesity used here was when their BMI \geq 30. Women had bigger proportion of being obese than men (BMI \geq 30). This finding was in line with the study conducted to some elderly in Taiwan (25). Elderly women had the bigger percentage (36.8%) compared to elderly men (29%). The percentage of

obesity among elderly aged 66-83 years old was lower than among elderly aged 55-65 years old. The BMI tended to increase along with the increased age up to 65 years old, then declines. The weight will increase until 65 years old on men and 75 years old to women. Reducing weight caused by decreased fluid and muscle cell masses. While BMI among men and women decreased after they reached the age of 70-75 years old. One of the study's finding related to overweight/obesity was the occupation status. This was inconsistent with the study among African-American elderly women, which discovered that there was no correlation between occupational status with the prevalence of obesity (14). Some irrelevant risk factors to obesity were the level of energy and protein intake and the level of energy expenditure. This finding was inconsistent to the finding of the first study proved closed relation between obesity and low physical activity. The second study also showed that obese African-American elderly had higher score of low physical activity (14, 26). The percentage of body fat and visceral fat had positive correlation to the BMI. The bigger the above two indicators of obesity, the higher their BMI. Percentage of body fat among elderly depend on their age, menopause status, and body weight. Weight consisting of fat mass and fat free mass among elderly tends to increase due to decreased physical activity and increased energy intake. The weight is closely related with visceral fat because it is one of the indicators of body fat calculation. The result of this study was in line with previous two studies that found BMI played its role in the increase of visceral fat among elderly (27-28). The next two studies that also supported the findings were the study using variation of BMI and percentage of body fat among Spanish elderly (29) and study conducted on 97 elderly men (30). Two studies stated that body composition changed due to aging, fat mass, and visceral fat. Women have bigger risk becoming obese than men due to fat and patho-physiology distribution differences. Women have to carry excess fat in their hips and waist while men in their abdomen. After menopause, women's fat tissue will be distributed to abdomen while their estrogen level is decreasing and this accelerates obesity. This study finding was consistent with the study on Korean elderly which found that 42.2% of elderly women and 31% of men were obese (31). Overall, the elderly women have bigger proportion becoming obese than men. Obesity in elderly was connected to their risk factors such as living area (urban-rural), sex, and working status when they aged 25 years old. Percentage of fat and visceral fat were related to BMI and vice versa. It is necessary to have different concept in understanding sex-related obesity to handle obesity among elderly in rural and urban areas through increasing daily physical activity and maintaining balanced diet and food consumption.





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