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OBESITY, HYPERTENSION AND CYCLE OF POVERTY IN URBAN POOR SOCIETY

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Abstract: This paper is about to prove that hypertension has been becoming as a major health problem among the working-aged population in Aceh's urban area, defined as those 18-64 years old. The employed procedures are pursuant to ethical standards of National Institute of Health Research and Development, Indonesia Ministry of Health. This research is conducted from April 2012 to November 2012 as a cross-sectional study with purposive sampling scheme in urban areas of Gampong Ceurih, Ulee Kareeng sub-district of Banda Aceh, Indonesian's province of Aceh. The inclusion criterions for the participants in this study are: 1) Married 2) categorized as poor people based on standard of Central Bureau of Statistic (BPS). Logistic regression with bivariate and multivariate analysis is employed to scrutinize linkage between several individual characteristics and hypertension. Bi-variate logistic regression confirms that age group, educational backgrounds, employment and housing status as well as obesity are statistically significant to hypertension stage-1; moreover, the probability of hypertension stage-1 increases progressively with increasing age and BMI. Multivariate logistic regression confirms that the individual characteristics of the poor those are significantly determining hypertension only age group and BMI class. For normal weight (BMI <25), the probability to get hypertension stage-1 at aged 18-30, 31-42, and 43-54 years are 7.05%, 25.36%, and 70.53%, respectively. For the obese (BMI ≥30), the probability to get hypertension stage-1 at aged 18-30, 31-42, and 43-54 years are respectively 36.18%, 71.76%, and 94.71%. This evidence implies that hypertension is a common health problem of the poor at elderly population. In short, government intervention should not only deal with curative aspect such as enforcing universal health coverage program to entire population in Aceh because this program may be ineffective to maintain health of the poor if the healthy foods are still hard to be obtained by poor families.

Key Words: Health Problem, Aceh, Poverty Issues

Introduction

Mortality due to noncommunicable diseases (NCDs) has been considered as the worldwide serious problem since it has killed more people each year than all other causes combined; moreover, almost of 80% NCDs deaths take place in low and middle income countries (World Health Organization (WHO), 2011). Obesity is related to a number of NCDs such as cardiovascular disease, osteoarthritis, diabetes, stroke, and hypertension; furthermore, some of studies also found that overweight and obesity are closely related to hypertension (Pang et.al 2008). The risk of developing cardiovascular disease was shown to be higher in hypertensive group than in a normotensive group (Qureshi et.al. 2005). The prevalence of cardiovascular disease which was about 16.6% had delivered Aceh to the second place among the Indonesian's province with the highest prevalence of cardiovascular disease in 2007 (Delima et.al 2009).

Health problem of the poor creates a set of poverty trap defined in economics as cycle of poverty. In other words, health problem of the poor weaken individuals skills and abilities as a result of their poverty, which in turn increases their poverty. Government interventions are required in order to build social protection system and to develop sufficient standard of healthy living. For years, during the civil war that ended at early 2005, the overwhelming cycle of poverty has steeled life and hope from numbers of families in Aceh. In 2010, the Government of Aceh has established Aceh Health Insurance Program (JKA) which aims to maintain health of the poor in Aceh Province (Juniatri, 2013). However, this program merely deals with curative aspects but lack of preventive aspects. This program would be ineffective without supported by another

program which deals with the preventive aspects since it is believed that the most influential precarious factor to health of the poor in Aceh is overweight and obesity problems.

In poor societies, the working-aged people are crucial to carry the burden of the family so that their vulnerability to the NCDs means a terror to the family sustainability; moreover, revealing the relationship of obesity and elevated blood pressure among the working-aged population in urban poor society may aid crucial information to the poverty reduction program in Aceh. The working-aged people who have a medical condition of hypertension are not only economically active population at the present time but also will become as a burden to the family as soon as they become part of elderly population. The objective of this study is to prove that hypertension has been becoming as a major health problem among the working-aged population in Aceh's urban area, defined as those 18-64 years old.

Literature Review

As noted by Marwick (1997), the character of the health care problem, with escalating demands placed on health care services against budget constraints to meet them, continues to be a setback for policy makers and government services, especially in developing countries. Evaluation in health economics regularly neglects the condition that may arise when expenditure in one budget area brings about savings in another (Phillips, 2005; pg: 136-139); as a result, the policy makers merely consider the curative program such universal health coverage as the only way to maintain health for the poor. For example, the use of a new therapy for obesity in patients being treated in primary care would result in fewer the needs for NCDs rehabilitation. Health economic evaluations have to fulfill the need of efficiency, especially in relation to draw decision as to where additional resources should be used, or which areas should tolerate the impact of any cutbacks, within health care services.

Obesity is becoming a major problem throughout the world population affected by the nutrition transition. The increasing westernization, urbanization and industrialization taking place in most countries around the world is closely related with changes in the diet towards one of high fat, high energy-dense foods and a sedentary life style (Pomkin, 2001). A high BMI is associated with higher blood pressure and risk of hypertension, higher total cholesterol, LDL-cholesterol and triglyceride levels (Jung, 1997). The direct costs of obesity are predominantly from diabetes, cardio vascular disease and hypertension. Indirect costs, which are far greater than direct costs, include workdays lost, physician visits, disability pensions and premature mortality which all increase as BMI increases (Wolf and Colditz, 1996).

Based on a survey conducted by World Health Organization (WHO, 2011, p.2), elevated blood pressure is expected to cause 7.5 million deaths or approximately about 12.8% of all deaths in 2010. Raised blood pressure is a major risk factor for cardiovascular disease. The prevalence of raised blood pressure is generally lower in high-income than in low-income populations. On the other hand, overweight or obesity is believed as the cause of 4.8% of all deaths each year. The fastest rise in the prevalence of overweight is reported in the lower-middle-income countries. Contrary to popular opinion, elevated blood pressure and obesity is becoming as the serious problem in some of poor societies.

Troung and Stroum (2005) through their large national study had verified that in the United States, obesity was higher every year between 1986 and 2002 among adults in the lowest income group and the lowest education group than among those in the highest level, respectively. In a sample of more than 6,000 adults, Kim and Leigh (2010) also found that subjects who have low wages are found to have increased chance of being obese. Lee et.al (2009) has considered the limited budgets and choices for poor families as the cause of unhealthy behaviors since high-fat foods dense with energy are more affordable, last longer, easier to find, and more satisfy the hunger than fresh vegetables, fruits, lean meats and fishes.

Ibrahim and Damasceno (2012) noted that hypertension in urban areas is common in developing countries because of the low rates of awareness, treatment, and control. In India, prevalence of hypertension has grown each year by 116% in urban populations, and by and 25% in rural populations (Padmavati, 2002). In Nigeria, poverty creates socioeconomic barriers to hypertension, poor people without supported by government through sufficient financing of the health sector education, adequate health workers and facilities will not able to deal with health risks and their implications (Cooper et al., 1998; Kadiri, 2005; Seedat, 2007; Samali and Adebesi, 2013).

In particular, Indonesia had inadequate information for overweight of all age groups until the first national survey in 1996/1997 had collected data on BMI of adult male and female in urban areas; in addition, it was found that the prevalence of overweight among adult male was 14.9% while adult female was 24% (Atmarita, 2005). A recent study regarding obesity and poverty in Indonesia had been conducted by Usfar et al (2010) who noted that nutrition is the fundamental element to alleviate poverty, reduce under nutrition and consequently obesity. Romling and Qaim (2011) noted that obesity has been becoming as a pandemic in Indonesia since current health policy is not concerning nutrition awareness campaign as the preventive program in order to maintain health of the poor. In contrast with popular opinion, most researchers agree that the low rate income population tend to obtain unbalanced food intakes that cause disproportionate consumption in association with changes in lifestyle that will effect to a range of non-communicable diseases such as elevated blood pressure also should be considered as up-and-coming significant public health dilemma for Indonesia.

Research Methods

Study Subjects

The employed procedures in this study are pursuant to ethical standards of National Institute of Health Research and Development, Indonesia Ministry of Health. This research is conducted from April 2012 to November 2012 as a cross-sectional study with purposive sampling scheme in urban areas of Gampong Ceurih, Ulee Kareeng sub-district of Banda Aceh, Indonesian's province of Aceh. The inclusion criterion for the participants in this study are: 1) Married 2) categorized as poor people based on standard of Central Bureau of Statistic (BPS) in which are determined as people with monthly income ≤ IDR360,000,-or daily income ≤ IDR12,000.-. Fortunately, 166 married men and women subjects were interviewed; of those, 146 subjects were 18-64 years old. The survey included health and socio-economic examination.

In the analysis, age is divided into four groups: 18-30, 31-42, 43-54, and 55-64. BMI was designed as ratio of weight (in kilograms) and squared height (in meters). Height was calculated without shoes, eyes looking straight ahead, and against the wall. Weight was measured without shoes using calibrated weigher. According to the World Health Organization (WHO), subjects with BMI < 18.5 were classified as underweight, BMI ≥ 18.5 (kg/m^2) and ≤ 24.99 (kg/m^2) were classified as normal weight, BMI ≥ 25.0 (kg/m^2) and ≤ 29.99 (kg/m^2) were defined as pre-obese, and those with BMI ≥ 30 (kg/m^2) were considered as obese.

Blood pressure was measured in the morning until noon by medical personnel of National Institute of Health Research and Development using mercury tension meter and stethoscope after the subjects had been lying at least 5 minutes. The tension meter cuff was tied on the upper arm, about 2 fingers toward the shoulder above the elbow crease. Then, stethoscope was placed on the brachial artery at the elbow crease. When the pulse can be heard, the pressure was raised by pumping the tension meter until the beat dim; then, lowered the pressure within the tension meter so that at the time of the pulse began louder, the pressure is called systolic blood pressure (SBP). Finally, the second beat that weaker than the first pulse is called diastolic blood pressure (DBP). Pre-hypertension is defined as which SBP was between 120 and 140 mmHG and DBP between 80 and 90 mmHG.

Then stethoscope placed on the brachial artery at the elbow crease was, he happened to hear the pulse, the pressure in tension meter rose by pumping until the pulse is not heard from again, then lowered the pressure within tension meter. At the time of the pulse began again, read the pressure on the surface of the mercury contained in tension meter. So the pressure is called systolic pressure. In the measurement process, the pressure remains lowered tension meter. The second pulse sound will be weaker than the first pulse recorded as diastolic pressure. Normal blood pressure according to JNC-7 is systolic <120mmHg and diastolic <80 mmHg.

Empirical Framework

Logistic regression will be conducted to reveal the association among hypertension, obesity and socio-economic variables. The bivariate analysis through the odds ratios will reveal the hypertension probabilities for each potential risk factor (p-value ≤ 0.25). Furthermore, backward stepwise technique in multivariate analysis will provide several individual characteristics which are determined hypertension probability at 95% confidence interval.

In statistics, logistic regression is a type of regression analysis used for predicting the outcome of a categorical dependent variable (a dependent variable magnitudes are not meaningful but whose ordering of magnitudes may or may not be meaningful) based on one predictor variables as bivariate analysis or many predictor variables as multivariate analysis (Wooldridge, 2003, pp. 530-533). As a binary response model, interest lies primarily in the response probability of hypertension as follows:

$$\boldsymbol{P(y = 1|x) = G(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)} \quad \text{.....(1)}$$

where G(z) is a function with values exactingly between 0 and 1 for all real values of z. In this case, y is a hypertension indicator while x is fulfilled by various individual characteristic of the study subjects such as age group, BMI, educational background, employment and housing status, and sex.

The probability of hypertension is defined as following equation:

$$\boldsymbol{Prob.HT = (1 + e^{-z})^{-1}} \quad \text{.....(2)}$$

In short, the primary goal of logistic regression is to explain the effects of the individual characteristics among the poor on the response probability of hypertension.

Results

The general characteristics of the study subjects are presented in Table 1. Mean BMI is higher in females than in males. The prevalence rate of pre-obese in men and women is 4.11% and 34.93%; and the prevalence rate of obesity also lower in men than in women (2.74% vs. 10.96%). Moreover, the prevalence rate of hypertension stage-2 is 0% in men so that the further analysis will only observe the hypertension stage-1. BMI classification for underweight population is also omitted in bivariate analysis because of 0% prevalence of hypertension stage-1 at this class.

Table 1. General Characteristics of the Study Subjects

Variable	MALE	FEMALE	TOTAL
Age*	40.70±12.07	38.81±11.49	39.16±11.58
Weight*	63.04±13.62	57.89±12.23	58.84±12.61
Height*	161.04±7.94	149.33±12.60	151.49±12.70
BMI*	24.44±4.84	25.61±5.22	25.39±5.15
Underweight	1.37%	4.79%	6.16%
Normal weight	10.27%	30.82%	41.10%
Pre-obese	4.11%	34.93%	39.04%
Obese	2.74%	10.96%	13.70%
Normotensive	9.59%	41.78%	51.37%
Pre-HT	6.85%	21.92%	28.77%
Hypertensive stage-1	2.05%	12.33%	14.38%
Hypertensive stage-2	0.00%	5.48%	5.48%

*Mean±SD

Table 2. Socio-economic factors and obesity influence to hypertension stage-1 (HT-1)

Characteristics		HT-1 n=21		Normotensive N=68		Odds Ratio	CI 95%	p>|z|
		n	%	N	%			
SEX								
□	male*	3	14.3%	12	17.6%	1.00	Reference	
□	female	18	85.7%	56	82.4%	1.29	(0.326-5.070)	0.72
AGE								
□	18-30*	1	4.8%	27	39.7%	1.00	Reference	
□	31-42	6	28.6%	24	35.3%	6.75	(0.758-60.147)	0.087[a]
□	43-54	6	28.6%	14	20.6%	11.57	(1.265-105.823)	0.030[a]
□	55-64	8	38.1%	3	4.4%	72.00	(6.553-791.092)	0.000[a]
EDUCATION								
□	No formal Educ*	8	38.1%	7	10.3%	1.00	Reference	
□	Basic Educ	7	33.3%	33	48.5%	0.19	(0.051-0.682)	0.011[a]
□	High School	5	23.8%	19	27.9%	0.23	(0.056-0.947)	0.042[a]
□	College/Higher	1	4.8%	9	13.2%	0.10	(0.010-0.971)	0.047[a]
EMPLOYEMENT								
□	Unemploy*	14	66.7%	42	61.8%	1	Reference	
□	Self-employed	2	9.5%	19	27.9%	0.32	(0.065-1.529)	0.152[a]
□	Laborer	5	23.8%	7	10.3%	2.14	(0.586-7.841)	0.250[a]
HOUSING								
□	Owner*	14	66.7%	48	70.6%	1	Reference	
□	Rented	7	33.3%	20	29.4%	1.20	(0.421-3.417)	0.733
BMI								
□	Normal*	7	16.7%	35	46.7%	1.00	Reference	
□	pre obese	8	19.0%	26	34.7%	1.54	(0.495-4.783)	0.142[a]
□	Obese	6	14.3%	7	9.3%	4.29	(1.101-16.685)	0.187[a]

Note: *reference ; [a]significant at p-value ≤ 0.25

From bivariate logistic regression, we found that age group, educational backgrounds, employment and housing status as well as obesity are statistically significant to hypertension stage-1. Table 2 shows that the probability of hypertension stage-1 increases progressively with increasing age and BMI. People who do not own their own home would be more risky to hypertension stage-1. Unemployed people and laborer would be more vulnerable to hypertension stage-1 than self-employed people. In addition, education would diminish the probability of hypertension stage-1. Although gender factor is not statistically significant, the odd ratio confirms that female population had 1.29-fold risk to get hypertension stage-1 compare to male population. Housing status odd ratio also confirms that people who do not have their own home had 1.20-fold risk to get hypertension stage-1 compare to people who live in their own property.

Table 3. The Results from Backward Stepwise Technique for Multivariate Logistic Regression

Characteristics	B	SE	Z	p > z	Odds Ratio exp(B)	CI 95%	
						lower level	upper level
AGE							
• 18-30*	0.00	-	-	-	1.00	-	-
• 31-42	1.50	3.180148	2.11	0.034	4.48	1.12	18.01
• 43-54	3.45	27.24863	4	0	31.57	5.82	171.38
BMI							
• Normal*	0.00	-	-	-	1.00	-	-
• Obese	2.01	5.66498	2.66	0.008	7.48	1.69	33.01
CONSTANT	-2.58	0.04056	-4.82	0	0.08	0.03	0.22

Table 3 shows the results from backward stepwise technique, the individual characteristics of the poor those are significantly determining hypertension only age group and BMI class; however the last age group (55-64) and pre-obese class are not statistically significant at 95% confidence interval. Surprisingly, the probability of hypertension stage-1 increases suddenly with increasing aged not only among the obese but also normal weight people. For normal weight (BMI <25), the probability to get hypertension stage-1 at aged 18-30, 31-42, and 43-54 years are 7.05%, 25.36%, and 70.53%, respectively. For the obese (BMI ≥30), the probability to get hypertension stage-1 at aged 18-30, 31-42, and 43-54 years are respectively 36.18%, 71.76%, and 94.71%.

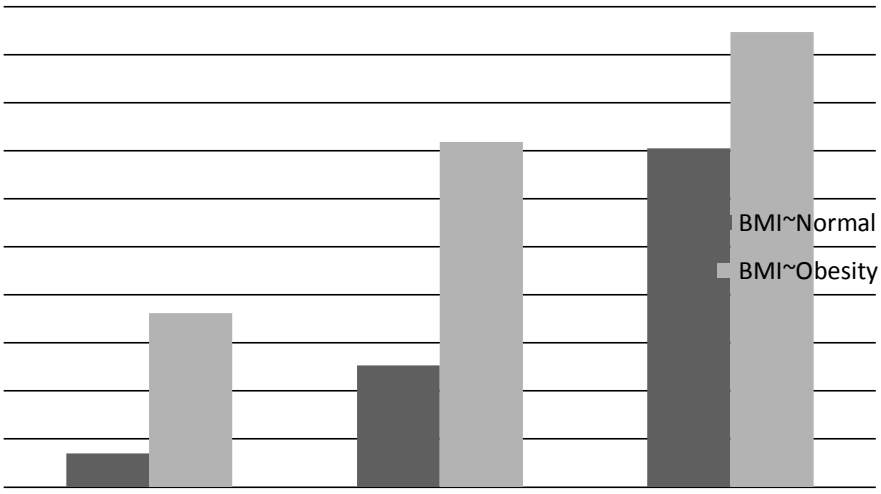

Figure 1. The Probability to Get Hypertension among all Aged Group

Discussions and Conclusions

It is believed that obesity epidemic and its consequences have been globally increasing at a frightening rate. In Aceh, overweight and obesity will potentially create a serious problem to poverty since the prevalence of overweight and obesity among the working-aged people in poor society are more than 52%. Base on multivariate logistic regression, obese people at aged 18-30 years have 5.13-fold risk to get hypertension stage-1 while obese at aged 31-42 and 43-54 years only have respectively 2.83-fold risk and 1.34-fold risk compare to normal weight people at the same level of aged. This evidence implies that hypertension is a common health problem of the poor at elderly population.

Cycle of poverty that built by hypertension problem among the working-aged population in poor urban society may be expressed as follows:

- When they become ill, their entire household can become trapped in a downward spiral of lost income because of workdays loss even though high healthcare costs had been carried by a certain financial mechanism
- When they suffer premature mortality, their children cannot achieve a sufficient standard level of education threaten their human capital level in future.
- Unlike healthy people, the poor with hypertension problem cannot have more resources to devote to savings that provide funds for capital investment.

In short, government intervention should not only deal with curative aspect such as enforcing universal health coverage program to entire population in Aceh; moreover, this program may be ineffective to maintain health of the poor if the healthy foods are still hard to be obtained by poor families. Healthy eating and sufficient physical activity should be facilitated by government so that the risk of obesity and associated health problem, especially hypertension in urban poor population, may be diminished. Policies in other sectors which are critically imperative are food security with adequate access to healthy foods as well as safe water, sanitation and energy.

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