

Consumption of Salted Fish Containing High Level of Sodium Chloride (NaCl) with Hypertension Incidence among People in Area of Salted Fish Industry

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Abstract: Cardiovascular disease which one of its causes is hypertension is the major cause of death globally in which there are more people died because of cardiovascular disease than other causes. In Indonesia, based on Basic Health Research data for blood pressure measurement and direct interview to those aged older than 18 year, the highest prevalence of hypertension for Sumatera region was found in Bangka Belitung (30.9%), then followed by South Sumatera (26.1%). This study aimed to determine relation between consumption of salted fish containing high level of Sodium Chloride (NaCl) and hypertension incidence. This study used cross-sectional design and involved 90 persons as sample. Analysis used was univariate, bivariate and multivariate with logistic regression method. Results of study showed that respondents who consumed salted fish containing high level of NaCl were more likely to suffer from hypertension 2.024 times (95% CI 0.727-5.633) than respondents who consumed salted fish containing low level of NaCl after controlling or equalizing condition of consumption of fatty food, physical activities, body mass index and age. For respondent's age category, the older the age of respondents, they were more likely to suffer from hypertension 6.83 times (95% CI 2.279-20.469). In variable body mass index, it was concluded that respondents whose body mass index exceeding the normal limit (>24) were more likely to suffer from hypertension 1.863 times (95% CI 1.123-9.989). Meanwhile, in variable fatty food, respondents who consumed fatty food were found more likely to suffer from hypertension 0.312 times (95% CI 0.185-1.676). Based on results of study, any promoting and educational actions should be performed concerning on nutrition of high salty food, especially salted fish and fatty food that may cause hypertension. Then it needs any cooperation with cross sectors closed to communities such as Family Welfare Movement (PKK), religious organizations, health workers, etc for early detection as well as counseling of hypertension and any other particular non-infectious diseases. Palembang City Health Agency should cooperate with Palembang City Food and Drug Monitoring Agency (BPOM) to conduct socialization to salted fish sellers about the way of producing salted fish based on SNI standards.

Key words: Hypertension, salted fish, sodium chlorida, Palembang, socialization

INTRODUCTION

Cardiovascular disease which one of its causes is hypertension is the major cause of death globally in which there are more people died because of cardiovascular disease than other causes and about 17.5 million deaths occurred due to cardiovascular disease in 2012 as by 31% of deaths globally. Based on this data, there are

approximately 7.4 million people died because of coronary heart disease and 6.7 million deaths due to stroke (WHO, 2006, 2012, 2013, 2015).

In Indonesia, based on Basic Health Research data for blood pressure measurement and direct interview to those aged older than 18 year, the highest prevalence of hypertension was found in Bangka Belitung (30.9%) then followed by South Kalimantan (30.8%), East

Kalimantan (29.6%) and West Java (29.4%). The second highest prevalence of hypertension for Sumatera region after Bangka Belitung was South Sumatera (26.1%). Prevalence of hypertension in Indonesia on the group age = 18 years according to Basic Health Research was 25.8%. Results of Basic Health Research also showed that proportion of people aged = 10 year who consumed food risky of hypertension was 26.2% (salty food) and 77.3% (seasonings).

Hypertension in asian countries relatively more attacks younger population because of genetical interaction and environment as well as unbalanced nutrition at toddler age. Difference of any preventive act dynamics can be seen in each country. Preventive programs of cardiovascular disease in developing countries start at the time when epidemic of cardiovascular disease exist and people more aware of effects of cardiovascular disease. Counseling concerning on modification of lifestyle to reduce risk of this disease is already accepted among people. However asian countries are facing multiple problems which are problems before and after the change of disease and people's vigilance to effects of cardiovascular disease is not yet quite high (Nakagawa and Miura, 2004). The National Institute for Health and Clinical Excellence (NICE) explains that hypertension is the increase of blood pressure that is 140/90 mmHg or higher. Hypertension is non-infectious disease generally related to lifestyle and most could be prevented, also a disease which mostly causes deaths and generally related to aging (Vasan *et al.*, 2002). In primary hypertension, several factors such as age, sex, diet, smoking habit, alcohol consumption, cholesterol level, obesity and troubled glucose tolerance are likely to be the major factors (Agyei *et al.*, 2014).

Hypertension incidence itself is tightly related to food consumption pattern on any age groups (Patience, 2013). The high consumption of high salty food is often associated with hypertension incidence. INTERSALT study described history of accumulation of study evidence by different method, identifying relation between salt intake and hypertension. This study showed relation between hypertension and cardiovascular disease and a bit described that salt intake could influence on the decrease of blood pressure among population so it could significantly reduce death because of cardiovascular disease (Patience, 2013). The Scientific Advisory Committee on Nutrition in 2008 recommended adults to consume salt not more than 6 gram/day as preventive way of hypertension incidence. Salts used to be added for several kinds of food and the use is difficult to be avoided. Total of sodium as much as 15-20% was found in food that came from both plants and animals; Scientific

Advisory Committee on Nutrition in 2003. Results of study conducted by Widajanti (2009) showed there was any increase of blood pressure in line with the older age and as a result of the high level of salt consumed. Risk of hypertension incidence for people who consumed more than 6 gram per day was 5-6 times higher than those who consumed salt less than 3 gram per day.

Indonesia as an archipelagic country has potential broad waters. It is estimated that 70% of Indonesia's territory consists of waters, both sea and freshwater. Fish is one of contributors in a big scale to a small scale in term of nutrition for Indonesian people, especially animal sources of protein. Fish is a commodity easy to have damages, therefore it needs to be preserved if it is not consumed in fresh. Ones of processing used in fish preservation are salting and drying. Dried and salted fish is called salted fish. Industry of salted fish in Indonesia has started from a big scale to a small scale (Widyaningrum, 2012; Yuniati and Almasyhuri, 1994).

South Sumatera with Palembang City as the capital city is one of provinces as the quite big producer of fish commodity in Indonesia. This is supported by Musi River flowing along Palembang City. Fish cultivation business in Palembang City continuously develops including intensive fish cultivation. Beside fishing production in Palembang City is to be consumed in fresh, some of fish are preserved and processed to be salted fish, by fermentation (bekasam fish) and by fogging (salai fish). Several kinds of freshwater fish are mostly processed to be preserved fish products such as salai (by fogging), salted fish such as fish from gabus type, sepat siam, baung, lais in which this industry of salted fish processing are mostly located in Musi riverbanks where 5 Ulu Subdistrict is the largest area of salted fish home industry.

Products of fish that have been preserved by salting process are generally consumed, also locally marketed in several traditional markets. Meanwhile, prevalence of hypertension for South Sumatera region remains high (26.1%) according to Basic Health Research data. Based on data of Palembang City Health Agency in 2015, absolute number of hypertension is as many as 2,900 cases for men and 4,292 cases for women. Food consumed by people in this case is dried fish as suspectedly become one of risk factors coming from environment that may trigger incidence of any diseases including hypertension. According to Nutrition Policy Issues, natrium intake has influence to hypertension and it is a risk factor of coronary heart disease incidence. Results of study conducted by Atun *et al.* (2014) showed a significant relation between natrium and blood pressure.

Palembang City is the quite big fish producer city, such as home industry producing salted fish, especially 5 Ulu Subdistrict area that is a quite large home industry. Beside selling salted fish to traditional markets, most of local people consume the salted fish. The 5 Ulu Subdistrict is one of subdistricts selected to be location of Integrated Service Post of Non-Infectious Diseases (Pos Binaan Terpadu Penyakit Tidak Menular/Posbindu PTM) by Hall of Environmental Health and Disease Handling (Balai Teknik Kesehatan Lingkungan dan Pengendalian Penyakit/BTKLPP) of Palembang. Of 6 Posbindu PTM developed by BTKLPP of Palembang, most of respondents' blood pressure checking results in 5 Ulu Subdistrict was higher than normal limit. The high people's blood pressure in this area is suspectedly as a result of any dried fish industry around the area.

Based on early information digging results, most of respondents often consumed salted fish, so study concerned on relation between natrium content in salted fish and hypertension incidence in Palembang City. Posbindu PTM itself had been conducted since September 2014 as performed quarterly, however, there was no any blood pressure change found yet based on such regular checking results. Most of the local people's blood pressure was still high. Therefore, a further study to determine relation between salted fish consumption and hypertension incidence in Palembang City is considered important in order to take concrete actions for handling such problems. Moreover, any similar study has not been conducted yet in this region.

This study aimed to analyze relation between consumption of salted fish containing high level of Natrium Chloride (NaCl) and hypertension incidence in 5 Ulu Subdistrict, Palembang City in 2016. This aim was to answer how the relation between salted fish consumption to hypertension incidence among people in 5 Ulu Subdistrict after controlled by risk factors causing hypertension (age, sex, family records, body mass index, physical activities, smoking habit, fatty food-consuming habit, stress, education, occupation).

MATERIALS AND METHODS

Study design: The study design was cross-sectional as conducted on April-June 2016 in 5 Ulu Subdistrict, Palembang City, South Sumatera Province.

Population and sample: Population in this study was all people domiciled in 5 Ulu Subdistrict, Palembang City, South Sumatera Province. Sample was taken by using cluster method. This method was selected because survey

study used to use large population, so sample was not possibly taken in random that is the best sample taking method. Sample was taken by the following steps:

- Data of neighborhood (Rukun Tetangga/RT) in 5 Ulu Subdistrict was obtained from 5 Ulu Subdistrict Office
- Three of total of neighborhood/RT namely 1 neighborhood/RT nearest salted fish industry
- Of several neighborhoods/RT, several houses and samples of individuals willing to be measured and interviewed would be taken
- Inclusion criteria: respondents aged = 18 years
- Exclusion criteria: pregnant women respondents, hypertension sufferers who consumed antihypertension drug, hypertension sufferer with heavy diseases such as cancer

Calculation of sample: Based on formula above, total of sample was 41 persons. Sample was multiplied by two because there would be two groups namely group of hypertension sufferer respondents who consumed salted fish containing high level of NaCl and group of hypertension sufferer respondents who consumed salted fish containing low level of NaCl. So that, total of sample needed was 82 persons. The study used 95% Confidence Interval (CI) and formula used in this study was for estimation of population average.

$$n = \left\{ \frac{\{ 80\% - \alpha / 2 \sqrt{2 \cdot 0.87 (1 - 0.58)} + Z1}{-\beta \sqrt{0.87 (1 - 0.87)} + 0.58 (1 - 0.58)^2} x^2 \right\} + 10\%$$

Where:

$$n = 37 + (37 \times 10\%)$$

$$n = 41$$

Based on formula above, total of sample was 41 persons. Sample was multiplied by two because there would be two groups namely group of hypertension sufferer respondents who consumed salted fish containing high level of NaCl and group of hypertension sufferer respondents who consumed salted fish containing low level of NaCl. So that, total of sample needed was 82 persons. The study used 95% Confidence Interval (CI) and formula used in this study was for estimation of population average

Data collecting: Data concerning risk factors of hypertension quoted some of instruments of Health Ministry's Integrated Service Post of Non-Infectious

Disease (Posbindu PTM). Data concerning stress level used NSAD Stress Questionnaire from International Stress Management Association United Kingdom (IMSA). Data concerning physical activities used Global Physical Activity Questionnaire (GPAQ) version 2 from Department of Chronic Diseases and Health Promotion Surveillance and Population-Based Prevention of World Health Organization. Measurement of body height used stadiometer. Systole and blood pressure measurement used sphygmomanometer merk ABN and stethoscope as conducted by nurse.

Sample taking of salted fish sold in 5 Ulu Subdistrict that was most consumed from each neighborhood/RT selected as sample was then taken as much as 250 gram, further samples were sent to and the NaCl level was to be checked at Faculty of Fisheries Product Technology, Bogor Agricultural University. To determine pattern of salted fish consumption, it was questioned through questionnaire of risk factors of hypertension.

Secondary data were taken in the forms of data of blood pressure, body mass index, smoking habit, stress, fatty food consumption from Posbindu PTM by BTKLPP Class I Palembang, hypertension data of 2015 from Palembang City Health Agency and data of numbers of family heads at 5 Ulu Subdistrict Office.

Data analysis: Data was analyzed in univariate and bivariate with chi square test and logistic regression. Univariate analysis was to see distribution of frequency of dependent variable (hypertension), major independent variable (consumption of salted fish containing high level of NaCl) and covariate variables (age, sex, family records, smoking habit, body mass index, physical activities, fatty food consumption, stress, education, occupation).

Bivariate analysis was conducted to get candidate for logistic regression analysis. Variables that would be examined were variable salted fish consumption with hypertension variable. Moreover, other risk factors would also be examined which covariate most influential to salted fish consumption and hypertension. First, all variables were included to logistic regression test to get early model. In multivariate analysis, interaction test would be conducted if any variable interacting substantially, then one by one variable with the highest p value would be dropped out of early model (gold

standard), further considering change score of Odds Ratio (OR) for major independent variable in which if any OR change occurred more than 10%, dropped out variable kept excluded. However, if OR change occurred >10%, the dropped out variable should be re-included into model. Such process was continuously performed up to there was no more variable whose value >0.05.

RESULTS AND DISCUSSION

Results of study: Bivariate analysis. Bivariate analysis was conducted to see cross tabulation between dependent variable with major independent variable and covariate variable.

Relation between consumption of salted fish containing high level of sodium chloride and hypertension: Relation between consumption of salted fish and hypertension incidence could be seen at the following table: Based on Table 1, in conclusion, respondents consuming salted fish with high level of NaCl had 2.25 times risk (95% CI 0.946-5.353) to suffer from hypertension than those consuming salted fish with normal level of NaCl.

Results of laboratory test of NaCl content in salted fish:

To determine level of salted fish sodium on 3 samples taken from location of study, laboratory test was conducted by Faculty of Fisheries Product Technology, Bogor Agricultural University with results as follows:

Based on Table 2, the highest level of NaCl was found in salted kepala batu fish by percentage 21.06%. This total of percentage exceeded normal level of NaCl as regulated by National Standard Agency that is < 20%.

Relation between characteristics of respondents and hypertension incidence:

Relation between variable characteristics of respondents and hypertension in 5 Ulu Subdistrict could be seen in the following table: Based on Table 3, variable age of respondents older than 48 year

Table 2: Results of NaCl level analysis

Parameter of analysis	Code of analysis	Code of sample	Results (%)
NaCl	054 A	Salted bilis fish	17.77
	055 A	Salted pare fish	18.94
	056 A	Salted kepala batu fish	21.06

Table 1: Bivariate analysis of variable consumption of salted fish containing NaCl and hypertension incidence among people in area of salted fish industry 5 Ulu Subdistrict Palembang City in 2016

Salted fish consumption	Hypertension		Non hypertension		OR (95% CI)	p-value
	n	(%)	n	(%)		
Consumption of salted fish with high level of NaCl (salted kepala batu fish)	36	65.5	19	34.6	2.25 (0.946-5.353)	0.067
Consumption of salted fish with normal level of NaCl (salted pare nd bilis fish)	16	45.7	19	54.3		
Total	52	57.8	38	42.2		

Table 3: Bivariate analysis of respondents' characteristics (age, sex, education and hypertension records) with hypertension incidence among people in area of salted fish industry 5 Ulu Subdistrict Palembang City in 2016

Variables	Hypertension		Non hypertension		OR (95% CI)	p-value
	n	(%)	n	(%)		
Age						
≥48 years old	34	77.27	10	22.73	5.288 (2.106-13.281)	0.0001
<48 years old	18	39.13	28	60.87		
Sex						
Male	10	55.5	8	44.4	0.892 (0.315-2.528)	0.831
Female	42	58.3	30	41.6		
Education						
Low level of education (Uneducated/elementary school/junior high school)	49	59.76	33	40.24	2.474 (0.553 – 11.067)	0.236
High level of education (senior high school/higher education)	3	37.5	5	62.5		
Family records						
Yes	25	62.5	15	37.5	1.419 (0.608-3.314)	0.418
No	27	54.0	23	46.0		
Fatty food						
Yes	12	44.44	15	55.56	0.46 (0.184-1.149)	0.097
No	40	63.49	23	36.51		
Smoking habit						
Yes	12	60	8	40	1.125 (0.409-3.095)	0.82
No	40	57.1	30	42.8		
Stress						
High	15	53.5	13	46.4	0.780 (0.317 – 1.917)	0.588
Low	37	59.6	25	40.3		
Physical activities						
Low	15	78.9	4	21.1	3.446 (1.041 – 11.409)	0.043
High	37	52.1	34	47.9		
Body mass index						
≥24	26	63.41	15	36.59	1.533 (0.656 – 3.579)	0.323
< 24	26	53.06	23	46.94		

Table 4: Hierarchically Well Formulated (HWF) Model of Salted Fish Consumption toward Hypertension Incidence in 5 Ulu Subdistrict Palembang City in 2016

Variable	OR	95% CI	Rang	SE	p-value
Salted fish consumption	1.972	0.616	-6.317	1.715	0.253
Education	0.840	0.121	-5.801	0.828	0.860
Sex	1.663	0.187	-14.786	1.854	0.648
Smoking	2.687	0.476	-15.156	2.372	0.263
Fatty food	0.341	0.066	-1.739	0.283	0.196
Hypertension records	1.339	0.436	-4.111	0.766	0.610
Stress	0.359	0.103	-1.243	0.227	0.106
Physical activities	2.046	0.418	-10.024	1.659	0.377
Body mass index	3.351	0.018	-592.309	8.849	0.647
Age	9.707	2.761	-34.127	6.226	0.000
Sex *body mass index	1.038	0.071	-15.178	1.421	0.978
Fatty food *body mass index	1.856	0.161	-21.314	2.311	0.619

were more likely to suffer from hypertension 5.28 times (95% CI 2.106-13.281) than those aged younger than 48 years. In variable sex, males were more likely to suffer from hypertension 0.892 times lower (95% CI 0.315 - 2.528) than female respondents. In variable education level, respondents with the low level of education (uneducated/graduated from elementary school/junior high school) were more likely to suffer from hypertension 2.475 times (95% CI 0.553-11.067) than respondents attaining high education. Furthermore, for variable family records, this study did not found relation between hypertension records and hypertension ($p = 0.413$). Respondents that had family records of suffering from hypertension more likely to suffer from hypertension 1.419 times (95% CI 0.608-3.314) than those who did not have

family records of suffering from hypertension. In variable consumption of fatty food, there was a conclusion that risk of a person who did not consume fatty food was more likely to suffer from hypertension 0.46 times lower (95% CI 0.184-1.149). In variable smoking habit, smoker respondents were more likely to suffer from hypertension 1.125 time (95% CI 0.409-3.095). For variable stress, there was no relation found between stress and hypertension ($p = 0.588$) and respondents who had high level of stress were more likely to suffer from hypertension 0.780 times (95% CI 0.317-1.917) than respondents who had low level of stress. Based on Table 4 above, respondents with low physical activities and suffered from hypertension was 78.9% (15 persons) with p value = 0.043 ($p > 0.25$), so in conclusion, there was a significant relation between

Table 5: Table of final model of multivariate analysis of salted fish consumption with hypertension incidence among people in area of salted fish Industry 5 Ulu subdistrict, Palembang city in 2016

Variable	β	OR	95% CI	Rang	SE	p-value
Salted fish consumption	0.705	2.024	0.727	-5.633	1.057	0.177
Fatty food	-0.592	0.553	0.182	-1.676	0.312	0.295
Physical activities	1.312	3.717	0.954	-14.480	2.579	0.058
Body mass index	1.209	3.350	1.123	-9.989	1.867	0.030
Age	1.921	6.831	2.279	-20.469	3.824	0.001
Constanta	-1.595	0.202	0.062	0.657	0.121	0.008

physical activities and hypertension incidence. According to the table above, respondents who had body mass index = 24 and suffered from hypertension was 63.41% (26 persons) with p value = 0.340 ($p > 0.25$), so in brief, there was no any significant relation found between body mass index and hypertension incidence.

Multivariate analysis: The first step in modelling strategy for examining hypothesis is making a model that involved all the existing potential confounder and effect modifier. This model is named Hierarchically Well Formulated (HWF) model or the most complete model (Hulya *et al.*, 2015). The following is HWF model in this study.

The next step is eliminating effect modifier. In HWF model, there could be seen which interaction had p value higher than α ($\alpha = 0.05$). Interaction of physical activities body mass index, sex body mass index and fatty food*body mass index had $p > 0.05$, so potentially dropped out of model. Dropping out interaction was conducted gradually, started by interaction that had the highest p value namely physical activities*body mass index. Variable education, sex, smoking, hypertension records and stress were not confounder because the variables did not cause any OR change on relation of salted fish consumption. After confounding test was conducted, there was a result that variable age, education, physical activities, fatty food consumption and body mass index were confounder.

Based on Table 5, consumption of salted fish with high level of sodium tend to have risk 2.024 times (95% CI 0.727-5.633) to suffer from hypertension than consumption of salted fish with low level of sodium after controlling or equalizing condition of fatty food consumption, physical activities, body mass index and age. Equation mode of logistic regression as follows:

$$\begin{aligned} \text{Logit (Hypertension)} = & -1.595 + \\ & 0.705 (\text{salted fish consumption}) \\ & -0.592 (\text{fatty food}) \\ & +1.312 (\text{physical activities}) + \\ & 1.209 (\text{body mass index}) + 1.92 (\text{age}) \end{aligned}$$

This study used cross-sectional design in which data of dependent variable (effect variable) and independent variable (risk factor) were taken simultaneously, so it was

unknown which variable occurred earlier or the major cause of effect occurrence. This design had several weaknesses such as condition of respondents was seen only once at the time of observation and measurement was conducted at the time of check only. In case of hypertension, a person's blood pressures tend to change appropriate with the person's condition and environment at that time. Therefore, this study made measurement standards namely measurement was conducted twice, but if the first and the second measurement were different more than 10 mmHg, there was the third measurement conducted.

Characteristics of respondents: The total of respondents involved in this study was 90 persons with female respondents by 80% and most of respondents aged younger than 48 years (51.1%). Prevalence of hypertension in 5 Ulu Subdistrict area was quite high (57.8%). In Indonesia, based on Basic Health Research data, for blood pressure measurement and direct interview to those aged older than 18 years, it was found that the second highest prevalence of hypertension for Sumatera region after Bangka Belitung was South Sumatera (26.1%). Prevalence of hypertension in Indonesia on the group of age = 18 years according to Basic Health Research was 25.8%. Results of Basic Health Research also showed proportion of population aged = 10 years who consumed food risky of hypertension was 26.2% (salty food) and 77.3% (seasonings).

Hypertension problem becomes more a concern because its prevalence is quite high. More than 10% of adult population in Indonesia suffer from hypertension. Symptoms of hypertension are often hidden or without any symptom, so sufferers do not know that they suffer from hypertension. Most sufferers are indeed suffering from mild hypertension, so this is often less noticed. Bad controlled hypertension will cause changes or damages of important body organs. It may cause stroke in brain, chronic kidney failure in heart and kidney, then cause subconjunctival haemorrhage (bleeding in the eye) in eye organ that results blind eyes and other disorders. Proportion of respondents who consumed salted fish with high NaCl level (salted kepala batu fish) in this study was

61.1% (55 persons). This was because most of local people's occupation was salted fish sellers. 5 Ulu Subdistrict is quite known as center of home-made salted fish industry. Besides selling salted fish, they also consumed the salted fish as daily food. Proportion of respondents' normal body mass index (body mass index <24) was 53.3% and proportion of smoker respondents was 26.2%. Respondents that consumed fatty food were only 30%. This was because the local people were people with lower-middle economy.

Relation between salted fish containing high level of nacl and hypertension: This study found that respondents that consumed salted fish containing high level of NaCl (salted kepala batu fish) were more likely to suffer from hypertension 2.074 times (95% CI 0.719-6.013) than those who consumed salted fish containing low level of NaCl (salted bilis and stingray fish). This result of study was in line with study conducted by Rawaslah that found relation between salted fish consumption and hypertension incidence. Study conducted by Andersen *et al.* (2003) also found relation between salted fish consumption and hypertension among elderly at Manado Ranomuut Primary Health Care. The high number of hypertension in this area was because of the high consumption pattern among respondents in 5 Ulu Subdistrict. Besides selling salted fish, most respondents consumed the salted fish as daily food. The total of sodium intake suggested was 2,300 mg day⁻¹.

In this study, after checking level of NaCl contained in salted fish most consumed by people in 5 Ulu Subdistrict, there was found that salted kepala batu fish contained the highest level of NaCl (21.06%). This is not in accordance with standards made by National Standard Agency in SNI 2721-1:2009.

Age: For category age of respondents in this study, the older age of respondents, they were more likely to suffer from hypertension 6.83 times (95% CI 2.279-20.469). Such result of study was in line with study conducted by Bulpitt (2001), in which risk of age to suffer from hypertension was 1.34 times. This was also in line with study conducted by Uhermik (2008) in Croatia that also found that prevalence of hypertension increased in accordance with the older ages. Other studies in 6 big cities such as Jakarta, Padang, Bandung, Denpasar, Makassar and Yogyakarta on elderly (55-85 year old) found prevalence by 52.5% (Rahajeng, 2007). Hypertension generally attacks men older than 31 year and women older than 45 years (after menopause).

In this study, based on variable physical activity, it could be concluded that the higher physical activities of a person, the lower risk of the person to suffer from

hypertension up to 3.717 times (95% CI 0.954-14.480). This was in line with study conducted by Chacon *et al.* (2008) that a person who did not do sports would be more likely to suffer from hypertension 4.73 times than those who regularly did. Blood pressure could be influenced by physical activities. Blood pressure would have changing measurement. Blood pressure measurement would be higher when going to do physical activities and lower when going to take a rest (Armilawati, 2007). Less physical activities would increase risk of hypertension and other degenerative diseases. People with less physical activities tend to have higher frequency of pulse, so muscles would pump blood harder and more often. This would cause higher pressure on artery walls (Price & Lang, 2006).

Body mass index: In variable body mass index, respondents that had body mass index exceeding the normal limit (>24) were more likely to suffer from hypertension 1.863 times (95% CI 1.123-9.989). This was in line with study conducted by Irwin (2007) that found people with obesity were more likely to suffer from hypertension 2.5 times. Obesity is excessive fat cell accumulation (adipose tissue) based on body height, body weight, sex and tribe of a person, so it causes health problems (Babu *et al.*, 2013). Obesity is defined as an increasing body weight more than 20% of normal body weight or body mass index which is a number reached from body weight result in kilogram as divided by body height in meter square. Body weight is normal if body mass index between 18.5-24.9 kg/m². Body weight is excessive if body mass index 25-27 kg/m² and it is obesity if body mass index > 27 kg/m². Excessive body weight and obesity are called general obesity.

Fatty food consumption: For variable fatty food in this study, respondents who consumed fatty food were more likely to suffer from hypertension 0.312 times (95% CI 0.185-1.676). This was in line with study conducted by Appel *et al.* (2005) finding that low fat diet, especially saturated fat could decrease systolic blood pressure as many as 1.3 mmHg. Intake of high fat food in daily life could increase the risk of hypertension incidence. A habit of consuming saturated fat is closely related to the increase of body weight and will increase the risk of atherosclerosis incidence; both are tightly related to the higher blood pressure. Several facts in epidemiological study showed significant relation between the high intake of saturated fat and blood pressure and some population with blood pressure under the average consumed total fat and low saturated fatty acid (Kotchen *et al.*, 2006). Moreover, consumption of saturated fat increases the risk

of body weight increase that is the risk factor of hypertension. Intake of excessive saturated fat would increase cholesterol level in blood and be risky of atherosclerosis incidence that further caused hypertension (Irza, 2009).

CONCLUSION

Most people in area of 5 Ulu Subdistrict often consume salted fish containing high level of salt by percentage 60%. Prevalence of respondents who consume salted fish containing high level of NaCl and suffer from hypertension is 65.5%. Respondents who consume salted fish containing high level of natrium are more likely to suffer from hypertension 2.034 times (95% CI 0.727-5.633) after controlled by other variables including age, education, fatty food, physical activities and body mass index.

RECOMMENDATION

For the authorized party, Integrated Service Post of Non Infectious Diseases (Posbindu PTM) program should not only be performed monthly by integrated services unit (UPT) of Health Ministry, but also health facilities, such as primary health care then be reported regularly as the action for screening risk factors, provide training for cadres in order to make people able to independently come for checking risk factors of hypertension through Posbindu PTM and enlarge scope of checking area so each area will be covered by the program of Directorate of Non-Infectious Disease Handling. Moreover, any promoting and educational actions concerning on nutrition of food containing high level of salt, especially salted fish and fatty food that may cause hypertension, should be performed.

Making cooperation with cross sectors closest to communities, such as Family Welfare Movement (PKK), religious organizations, health cadres, etc for early detection as well as counseling of hypertension and other particular non-infectious diseases. Palembang City Health Agency should cooperate with Food and Drug Monitoring Agency (BPOM) to make a socialization to salted fish sellers concerning salted fish processing based on SNI standards.

People living in 5 Ulu Subdistrict should do sports regularly every week as it can be initiated by Posbindu cadres or local community's organizations to reduce risk of hypertension. Another study should be conducted with better methods, one of which is cohort method to determine causality of relation between salted fish consumption and hypertension.

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REFERENCES

- Achmadi, U.F., 2012. [Region-Based Disease Management]. Raja Grafindo Publisher, Depok, Indonesia (In Indonesian).
- Agyei, B., M. Nicolaou, L. Boateng, H. Dijkshoorn and V.D.B.J. Born *et al.*, 2014. Relationship between psychosocial stress and hypertension among Ghanaians in Amsterdam, the Netherlands-the GHAI study. BMC. Public Health, 14: 1-10.
- Andersen, L.F., B. Lande, G.H. Arsky and K. Trygg, 2003. Validation of a semi-quantitative food-frequency questionnaire used among 12-month-old Norwegian infants. Eur. J. Clin. Nutr., 57: 881-888.
- Andersen, L.F., H. Tomten, P. Haggarty, A. Lovo and B.E. Hustvedt, 2003. Validation of energy intake estimated from a food frequency questionnaire: A doubly labelled water study. Eur. J. Clin. Nutr., 57: 279-284.
- Appel, L.J., F.M. Sacks, V.J. Carey, E. Obarzanek and J.F. Swain *et al.*, 2005. Effects of protein, monounsaturated fat and carbohydrate intake on blood pressure and serum lipids: Results of the Omni Heart randomized trial. Jama, 294: 2455-2464.
- Atun, L., T. Siswati and W. Kurdanti, 2014. Source sodium intake, sodium potassium ratio, physical activity and blood pressure hypertension patients. Micro Nutr. Med. Indonesia, 6: 63-70.
- Babu, G.R., T. Mahapatra and R. Detels, 2013. Job stress and hypertension in younger software professionals in India. Indian J. Occup. Environ. Med., 17: 101-107.
- Bulpitt, C.J., 2001. Clinical study to investigate the productive parameter hypertension in epidemiology of hypertension. J. Hypertens, 19: 523-528.
- Chacon, E.M., S.C. Ulloa and B.L. Rosero 2008. Factors associated with hypertension prevalence, unawareness and treatment among Costa Rican elderly. BMC. Public Health, 8: 1-11.
- Hulya Yardimci, Ayse Ozfer Ozcelik, Metin Saip Surucuoglu, Yahya Ozdogan 2015. Relationship Between Hypertension and Consumption Frequency of Certain Foods Pak. J. Nutr., 14: 94-99.
- Nakagawa, H. and K. Miura, 2004. Salt reduction in a population for the prevention of hypertension. Environ. Health Preventive Med., 9: 123-129.

- Patience, S., 2013. Understanding the relationship between salt intake and hypertension. *Nurs. Standard*, 27: 45-47.
- Uhermik, A.I., 2008. Association between BMI and nutritional habits with hypertension in an adult population of Croatia. *Public Health Nutr.*, 1: 97-104.
- Vasan, RS., A. Beiser, S. Seshadri, M.G. Larson, W.B. Kannel, R.B. DâTMAgostino and D. Levy, 2002. Residual lifetime risk for developing hypertension in middle-aged women and men-the framingham heart study. *J. Am. Med. Assoc.*, 287: 1003-1010.
- WHO, 2013. A global brief of hypertension. WHO, Geneva, Switzerland.
- WHO., 2006. Basic epidemiology second edition. World Health Organization, Switzerland.
- WHO., 2012. Hypertension fact sheet. Departement of Sustainable Development and Healthy Environment, USA.
- WHO., 2015. Cardiovascular disease. WHO, Geneva, Switzerland. <http://www.who.int/mediacentre/factsheets/fs317/en/>.
- Widajanti, L., 2009. [Nutrient Consumption Survey]. Penerbit Universitas Diponogoro, Semarang, Indonesia (In Indonesian),.
- Widyaningrum, S., 2012. [Relationships Food Consumption of Genesis of Hypertension in the Elderly]. Fakultas Kesehatan Masyarakat Universitas Jember, Indonesia (In Indonesian),.
- Yuniati, H. and A. Almasyhuri, 1994. [Content of sodium (Na) and Salt (NaCl) in crude and dried salted fish fried in bogor Pasar Anyar (In Indonesian)]. *J. Nutr. Food Res.*, Vol. 17,