HYPERTENSION SCREENING IN MULYOREJO PUBLIC HEALTH CENTER AT 2019: WHAT LESSONS LEARNED?

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ABSTRACT

Introduction: Hypertension is one of silent killer that become priority on health coverage era. Early detection and risk factors related must be conduct for effective prevention. **Methods:** This research aimed to detected earlier hypertension case in adult and elderly people in Mulyorejo Public Health Center (PHC), Surabaya, Indonesia. Survey was conduct from 12th to 19th November with the target adult and elderly that were visited PHC. Structured questionnary were used as a screening instrument, and examination using digital tensimeter were used as gold standard. Family history, smoking, physical activity, vegetable consumption, and fruit consumption were recorded as independent variable. Data were analyzed using chi-square test. Accidental sampling and total 0f 100 participants were joined this research, and 10% of them classified as hypertension based on examination using tensimeter, whereas 16% participants classified as hypertension based on structured questionnaire. **Result:** Validity was counted, and sensitivity showed 70%, spesifity was 87.78%, positive predictive value was 38.8%, negative predictive value was 96.34%. There's no significant relationship between the independent variables family history   (p=0.48 ; OR=1.64 ; 95% CI= 0.42<OR<6.29), smoking (p=0.21 ; OR=2.96 ; 95% CI= 0.52<OR<16.7), physical activity (p=0.46 ; OR=1.71 ; 95% CI= 0.4<OR<7.29), vegetable consumption (p=0.94 ; OR=0.95 ; 95% CI= 0.25<OR<3.62), fruit consumption (p=0.89 ; OR=1.09 ; 95% CI= 0.29<OR<4.03), salt consumption (p=0.66; OR=1.33; 95% CI= 0.25<OR<6.98). **Conclusion:** There's no relationship between independent variables with the hypertension during this study. In case, much effort from health worker to conduct medical check up massively would be needed, so that hypertension not become undetected.

Keywords: family history, hypertension, screening, smoking, vegetable consumption

INTRODUCTION

Hypertension is one of non communicable disease that still required attention and give significant health risk (Forouzanfar et al., 2016). Hypertension or high blood pressure defined as a condition where systolic value more than 140 mmHg and diastolic more than 90 mmHg on two times measurement with the range about five minutes and relax condition. The aforementioned blood pressure were permanent, lead to disturbance of nurients and oxygen intake which should be not clogged and transfered normally to the required body's tissues (Indonesia Ministry of Health, 2014). Health profile of East Java Province on 2018 were showed that the prevalence of hypertension in Surabaya was 31.13%, this more lower than previous year which noted as many as 45.32%. However promotive and preventive medicine still needed due to the prevalence still higher than national prevalence (Health Office, 2017, 2018) Worldwide targets aims to reduce prevalence of hypertension as many as 25% by 2025 (WHO, 2020). Common symptoms appear in patients were dizziness, nosebleeds, frequently headaches, shortness of breath. Two types of hypertension were identified—those are secondary hypertension that means as systemic increasing of blood pressure which causation still can't detected, while essential or primary hypertension can lead to increase risk of renal events, cardiac, and cerebral (Jennings & Touyz, 2013; Messerli, Williams, & Ritz, 2007).

Hypertension can resulting serious damage to many organs which mainly to the heart. Elevated pressure causing of arteries harden, suddenly decrease of blood flow and oxygen to the heart—including chest pain or frequently called as angina, heart attack, heart failure, and irregular heart beat. In rare case, this can cause suddenly death, due to the burst or block arteries that have role for supplying blood and oxygen to the brain (Elliott, 2006; WHO, 2020). Hypertension can act as a risk factor of cardiovascular disease, such as stroke, coronary artery disease, and heart failure (Ogah & Rayner, 2013; Opie & Seedat, 2005), that can affects 26% of adult population (Kearney et al., 2005).

WHO estimated as many as 1.13 billion population worldwide have hypertension, two-thirds of them were lived in low and middle-income countries. One of four men and one of five women tend to have hypertension. Many determinants were known as risk factor of hypertension—including sodium intake, alcohol, obesity, genetics, age (WHO, 2020), lifestyle, working conditions (Chen & Mccullough, 2013). Although medical treatment for hypertension using anti-hypertensive medications already provided, but this medications still questioned its effectiveness and also its side effects (Tedla & Bautista, 2016). CDC report showed 75 millions people worldwide have hypertension, in another words only 54% of people worldwide have normal blood pressure (CDC, 2020).

Prevalence of hypertension in East Java based on Basic Health Research conducted by Indonesian Ministry of Health showed 8.01% for hypertension based on doctor diagnose. Those value shows increasing if compared with the result of Basic Health Research on 2013, with the increasing value 9.9% (Indonesian Ministry of Health, 2019). Clinical manifestation of hypertension are headache, nose bleeding, heavy neck, ringing on the ears, insomnia, frequent dizziness, and blurred vision (Sustrani L, 2006). Some determinant of hypertension in Indonesia have been identified-- including age, man, low education level, smoking, regularly caffeine consumption more than one servings every day, alcohol consumption, lack of physical activity, and obesity (Rahajeng & Tuminah, 2009).

Preventive medicine have an important role on the prevention of cardiovascular disease that can be conduct by early detection namely screening, in order to minimize complication. Health screening on health coverage era classified as two, those are screening for primary prevention/historical health and screening for secondary prevention (limited on people with cronical disease and cancer detection). Primary screening is a priority on Indonesian health coverage regarding to minimize economic burden (Indonesia Ministry of Health, 2020). Health screening already used for long decade as an instrument that easily to use and cheap, with the target to prevent premature death (Bowers & Johnson, 2017). A valid screening instrument need to be developed so that it will be easier and risk factor can be identified. Validity can reveal the suitability of an instrument to find case. This research was conducted to detect hypertension case, and reveal the sociodemographic and lifestyle factors associates with hypertension.

METHOD

Analytical observational study with cross sectional design were carried out from November 12th to November 15th 2019. The population were people whom visited Mulyorejo Public Health Center, while the sample were adult and elderly whom have willingness to participate during this study. Accidental sampling were conducted and a number of 100 people participated in this study, every participant were given explanation of the purpose of this study and then signed an informed consent. Participant were interviewed using structured questionnaire. Independent

variables that were observed in this study were age, gender, body mass index, family history, smoking, physical activity, vegetable consumption, salt consumption, and fruit consumption, while the dependent variable was hypertension. Blood pressure were measured two times by qualified nurse using automated sphygmomanometer. Measurement were conducted two times with the position of patient was seated, and range within measurement was about 5 minutes. Average of two measurement were recorded.

Age were classified into six groups, those were 17-25, 26-35, 36-45, 46-55, 56-65, and >65 years old. Gender were classified as man and woman. Body mass index were classified as <25 kg/m^2 and ≥25 kg/m^2. Family history classified as "Yes" if participant has a hypertension history from one or both their biological parents. Smoking variable classified as "Yes" if participant were an active smoker. Vegetable and fruit consumption categorized as "Adequate" when consume vegetable/fruit five servings in a week. Physical activity classified as adequate if participant doing exercise at least 30 minutes everyday. Salty consumption categorized into two groups, participant whom consume about more than 5 mg each day or equal with one spoon of salt, and participant whom consume less than 5 mg each day. Participants categorized as hypertension when the average of two measurement of blood pressure showed value ≥140/90 mmHg (Indonesia Ministry of Health, 2014) .

Structured questionnaire divided into risk factor and clinically symptoms. Clinically symptom consisting of headache, epistaxis/nose bleeding, insomnia, heavy neck, frequent dizziness, and blurred vision. Questionnaire was arranged used Indonesian language, otherwise when participant didn't understand, it was explained by researcher using Java language. Question point were formed based on (CDC, 2020) about hypertension. Scoring were categorized from 1-3. Score 1

for risk factor question, score 2 for clinilcally simptoms that often experienced by participant. Score 3 were given for clinically symptom that often appear when hypertension level was high. Participant were categorized as hypertension if getting score ≥5, prehypertension if getting score 3-4, normal if getting score 0-2. Body weight and body height were recorded to get data of Body Mass Index. Validity of questionnaire were calculated using positive predictive value (PPV), negative predictive value (NPV), sensitivity, and spesifity. Data of risk factor were analysed using chi-square test, if p showed <0.05, it can be noted have significant association with the occurrence of hypertension. Below were the formula for measuring validity of questionnaire.

$$Sensitivity = \frac{True\ Positive}{True\ Positive + False\ Negative}$$

$$Spesifity = \frac{True\ Negative}{Fales\ Positive + True\ Negative}$$

$$PPV = \frac{True\ Positive}{True\ Positive + False\ Positive}$$

$$NPV = \frac{True\ Negative}{False\ Negative + True\ Negative}$$

This study design had been approved by Ethical Committee Faculty of Medicine Universitas Airlangga with the number 201/EC/KEPK/FKUA/2019.

RESULTS

Validity of Screening Instrument's

Validity refers to the level of how result interpretation from certain study can be counted as valid. In another words, it can be defined as level of a measurement can reveal the truth of the attribute that counted (Porta, M., Greenland, S., Hernán, M., dos Santos Silva, I., & Last, 2014). Validity of a questionnaire as a measurement

instrument in public health survey can be influenced by many factors, such as length of question, appearance of questionnaire, cultural and social differences regarding to the understanding of question, and kind of questionnaire (de Bruin, A., Picavet, H.S., & Nossikov, 1996). An easy questionnaire can be identified by how's the respondent in the field can understand the survey questionnaire. Many ways can be conducted to evaluate a questionnaire through review from experts, focus groups, cognitive test, field pretest, and statistical evaluation. External data for survey and various indicators which applied during one survey were the method to estimate validity. In case, data external have purpose to made an assumption regarding to the availability of a "gold standard". Sensitivity and specificity used as the main parameters. Sensitivity shows the number of persons whom had positive values through survey and gold standard (true positives), then divided by number of persons whom had positive score in the gold standard (false negatives and true positives). While, specificity is a result of number of persons whom had scored negative values through survey and gold standard (true negatives), then divided by number of person whom had negative score in gold standard (false positives and true negatives) (Shrout, P.E., & Fleiss, 1979). Based on the comparison with gold standar examination, seven participants categorized as true positive, three participants as false negative, eleven participants as false positive, seventy nine participants as true negative. Validity was counted, and sensitivity showed 70%, spesifity was 87.78%, positive predictive value was 38.8%, negative predictive value was 96.34%. contents of this questionnaire were modified from European Union Health Interview Survey which consist of some health determinants including – weight and height, physical activity/exercise, consumption of fruit and vegetables, smoking, and alcohol consumption. Despite of the validity of screening instrument, sociodemographic

factors is also need to be recorded regarding to analyse case distribution and other health determinant that would be interact.

Sociodemographic Factors

A total of 31 men and 69 women were participated in this research (shows in Table 2). Based on the gold standard examination, 10% of participants were categorized as hypertension. Of those 26 participants were in age 46-55 years old, 18 participants were categorized in 36-45 years old, and the minority were in 17-25 years old. Ninty percents had normal body mass index (<25 kg/m^2), while 10 percents had body index ≥ 25 kg/m^2. Most of participants already finished high school (33%). While the most occupation of participant were private sector (29%). Most of participants were Moslem.

Relationship between Family History and Hypertension

Table 3 shows that most of participants have no family history with hypertension (70%). Chi-square test shows that p= 0.48 (p<0.05), it is indicated that there is no relationship between family history and hypertension. OR results shows 1.64 (95% CI = 1.64 < OR < 6.29) means that participants with the family history of hypertension are 1.64 times tend to be at risk of hypertension than participants without family history of hypertension.

Relationship between Smoking and Hypertension

Table 3 shows that most of participants have no smoking activity (91%). Chi-square test shows that p= 0.21 (p<0.05), it's indicated that there is no relationship between smoking activity and hypertension. OR results shows 2.96 (95% CI = 0.52< OR < 16.7) means that participants that smoking are 2.96 times tend to be at risk of hypertension than participants that have no smoking activity.

Relationship between Physical Activity and Hypertension

Table 3 shows that most of participants have inadequate physical activity (79%). Chi-square test shows that p= 0.46 (p<0.05), its indicated that there is no relationship between physical activity and hypertension. OR results shows 1.71 (95% CI = 0.4 < OR < 7.29) means that participants with the inadequate physical activity are 1.71 times tend to be at risk of hypertension than participants with adequate physical activity.

Relationship between Vegetable Consumption and Hypertension

Table 3 shows that most of participants have adequate vegetable consumption (61%). Chi-square test shows that p= 0.94 (p<0.05), its indicated that there is no relationship between vegetable consumption and hypertension. OR results shows 0.95 (95% CI = 0.25 < OR < 3.62) means that participants with the inadequate vegetable consumption are 0.95 times tend to be at risk of hypertension than participants with adequate vegetable consumption.

Relationsip between Fruit Consumption and Hypertension

Table 3 shows that most of participants have inadequate fruit consumption (52%). Chi-square test shows that p= 0.89 (p<0.05), it is indicated that there is no relationship between fruit consumption and hypertension. OR results shows 1.09 (95% CI = 0.29 < OR < 4.03) means that participants with the inadequate fruit consumption of hypertension are 1.09 times tend to be at risk of hypertension than participants with adequate fruit consumption of hypertension.

Relationship between Salt Consumption and Hypertension

Table 3 shows that most of participants consume >5 mg of salt each day (70%).

Chi-square test shows that p= 0.71 (p<0.05), its indicated that there's no relationship between salt consumption and hypertension. OR results shows 1.35 (95% CI = 0.26 < OR < 7.07) means that participants with the salt consumption more than 5 mg are 1.35 times tend to be at risk of hypertension than participants with salt consumption less than 5 mg each day.

Table 1. Validity of screening instrument

Based on questionnaire	Based on gold standar	Validity of questionnaire			
		Sensitivity	Specivity	Positive Predictive Value	Negative Predictive Value
16	10	70%	87.78 %	38.8%	96.34 %

Table 2. Sociodemographic Characteristics of Participants

Variable	Frequency	Percentage
Gender	31	31%
Men	69	69%
Women		
Blood Pressure		
Normal	90	90%
Hypertension	10	10%
Age		
17-25	6	6%
26-35	11	11%
36-45	18	18%
46-55	26	26%
56-65	22	22%
>65	17	17%
Body Mass Index		
<25 kg/m^2	90	90%
≥25 kg/m^2	10	10%
Educational Level		
Uneducated	8	8%
Elementary graduate	22	22%
Middle school graduate	11	11%

Variable	Frequency	Percentage
High school graduate	33	33%
College graduate	26	26%
Occupation		
Civil Servant	8	8%
Army	1	1%
Police	3	3%
Private sector	29	29%
Retired	11	11%
Enterpreneur	7	7%
Student	4	4%
Trader	4	4%
Housewife	22	22%
Yet working		11%
Religion		
Moslem	91	91%
Christian	6	6%
Catolic	1	1%
Hindu	2	2%
Buddha	0	0%
Total	100	100%

Table 3. Chi Square Tes Results between Risk Factors and Hypertension

Variable	Hypertension		p	OR
	Yes	**No**		
Family History				1.64 (0.42 <OR<6.29)
Yes	4	26	0.48	
No	6	64		
Smoking				2.96 (0.52<OR <16.7)
Yes	2	7	0.21	
No	8	83		
Physical Activity				1.714 (0.4<OR< 7.29)
Adequate	3	18	0.46	
Inadequate	7	72		
Vegetable Consumption			0.94	0.95(0.25< OR<3.62)
Adequate	6	55		
Inadequate	4	35		
Fruit Consumption			0.89	1.09(0.29< OR<4.03)
Adequate	5	43		
Inadequate	5	47		
Salt Consumption			0.66	1.33 (0.25<OR <6.98)
<5 mg/day	2	14		
>5 mg/day	8	76		

DISCUSSION

A total of 100 people consist of adult and ederly were participated and screened in this study. Based on to the gold standar examination, we found 10 of the participants categorized as hypertension, whereas based on screening instrument is 16 participants. Validity of this screening instrument shows enough value, with the sensitivity value was 70%, specifity 87.78%, positive predictive value 38.8%, negative predictive value 96.34%. Based on Table 1, this study was highlighted some lifestyle as risk factor of hypertension, but in this study it's variable didn't shows significant association with the occurrence of hypertension.

Validity of Screening Instrument

Hypertension screening actually could reduce cardiovascular disease. The specifity and sensitivity value in this study in line with the study of (Lima-Costa, Peixoto, & Firmo, 2004). Health screening especially for the disease that can lead to much complication due to the late prevention is important. Rare frequency of health screening in developing country influenced by many factors, one of it was associated with the high cost of examination and health beliefs. 2004; Holland, Stewart, & Masseria, 1933. All of the participant with the hypertension in this study were said that never joined health screening before, it is because of feeling healthy and feeling not necessary to do screening. This causation also in line with the study of (Anttila et al., ; Spadea, Bellini, Kunst, Stirbu, & Costa, 2010). This phenomenon can be a consideration for policy maker in health coverage area regarding to increase promotive and preventive medicine, so that citizen will be aware with their health status (Jin, Louange, Chow, & Fock, 2013). Therefore, continuously study and observation related to the citizen's perception on health screening were needed. Valid screening instrument must be developed. The more valid of the instrument, the more valuable result that will get. Increasing validity of instrument can be done through continuously do the literature review about risk factor and clinical manifestation of a disease.

Relationship between Family History and Hypertension

Identifying family history experienced hypertension was important regarding to the similar genes that composed blood. Some relatives also lead to dispose hypertension to their offspring, related to the habits like diet, exercise intensity, and smoking activity (CDC, 2020). However, in this study, family hypertension didn't show significant association with hypertension. Thus, this results didn't suitable with some studies that reported family hypertension strongly associated with the hypertension (Muldoon, Terrell, Bunker, & Manuck, 1993; Ranasinghe, Cooray, Jayawardena, & Katulanda, 2015; Winnicki et al., 2006). Family level (parents, grandparents, children, siblings) in people with family history with hypertension significantly show association with the occurrence of hypertension (Ranasinghe et al., 2015). In case, physical activity can be a confounder with the effect of family history on hypertension, as revealed by (Shook et al., 2012) that showed decreasing hypertension risk from 21 to 43 percents on people whom have family history with the hypertension but regularly doing exercises. Relate with this, a study advice obviously 6 minutes/hour low-intensity physical activity have valuable outcome on hypertension prevention (Dempsey et al., 2016). Similarity of lifestyle—including diet in family with the history of hypertension revealed by Japan's researcher increase obesity as a risk factor of hypertension (Liu et al., 2014). Cardiovascular disease can be a threaths in person with family history of hypertension didn't improve their lifestyle (Lascaux-Lefebvre et al., 2001). Studies in young adult populations shows association between rare frequency of physical activity and hypertension (Carnethon et al., 2010; Chase, Sui, Lee, & Blair, 2009). Globally studies reported showbete significantly association between physical activity and increasing risk of hypertension already—

including Denmark, Italy, France, Saudi Arabia, Thailand, Korea, and China (Asferg et al., 2011; Holzgreve, 2018; Jae et al., 2012; Palatini et al., 2010; Pouliou, Ki, Law, Li, & Power, 2012; Salman & Al-Rubeaan, 2009; Thawornchaisit et al., 2013;).

Relationship between Smoking and Hypertension

Smoking directly related with nicotine consumption inside of cigarette. Nicotine could play adrenergic agonist which can mediated local and systemic catecholamine and lead to vasopresin releasing (Cryer, Haymond, Santiago, & Shah, 1976). In this study, smoking didn't show significant association with the hypertension, this paradoxically with the study from some published report (Lee, Ha, Kim, & Jacobs, 2001; Minami, Ishimitsu, & Matsuoka, 1999). Effect of smoking on hypertension can be a bias regarding to some confounding like ethnic, body weight, alcohol intake, coffee intake, and physical activity (Green, Jucha, & Luz, 1986).

Relationship between Physical Activity and Hypertension

Physical activity defined as kind of routinely body movement resulting from skeletal muscles contraction and produce energy expenditure that more higher than during rest levels,—including occupational task, commuting, and household activities in order to producing health benefits. Other than that, exercise can be defined as well planned physical activity, systhematic, and continuously in purpose to maintainance health status (Sigmundsson, Englund, & Haga, 2017). This screening was reveal no significant relation with the occurrence of hypertension. The result are not in line with another report that exercise/physical activity showed significant effect on systolic blood pressure reduction (Communications, 2004). Blood pressure reduction mechanism caused by physical exercise hypothesized due to the attenuation

of peripheran vascular that lead to neurohormonal and structural response, reductions in symphatetic nerve caused increasing of arterial lumen diameters (Hamer, 2006). Study from (Kim et al., 2010) indicated slow progression of being pra-hypertension and hypertension were seen in people whom conduct regularly exercise. This also supported with the study in China's population that showed people with low exercise 40% tend to be high risk of hypertension (Zheng et al., 2010). Neverthless, this mechanism still need further investigation.

Relationship between Dietary (Fruit, Vegetables, and Salt Consumption) and Hypertension

Dietary point in this questionnaire showed no significant association with the occurrence of hypretension. Other than that, healthy diet have been known as a preventive way to reduce blood presure. Adapted the DASH (Dietary Approaches to Stopping Hypertension) recommended eating plan that can decrease blood pressure about 8-14 mmHg—consist of vegetables, fruits, low fat dairy products, whole grain, poultry, fish, nuts, limited red meat, and limited salt (Azadbakht et al., 2011). Healthy food may affect blood viscosity, reducing salt intake in range 5 gram per day effectively reduce systolic and diastolic blood pressure more than 10 mmHg (WHO, 2020). Mean salt intake associated with mean SBP levels and related with age causing blood pressure. Studies in Chinese population showed correlation of highest sodium consumption with increasing of blood pressure (Rose et al., 1988). However in meta analysis reported that salt intake didn't show association with increasing of stroke and CVD (Strazzullo, D'Elia, Kandala, & Cappuccio, 2009). Improving lifestyle actually needed as an easier prevention for reducing blood pressure and other chronical disease such as diabetes melitus because of lipid metabolism would be improved (Egan, 2017). In this study there was no participant that consume

alcohol, whereas frequently alcohol intake would increase high risk of hypertension. Ethnicity plays an important role for increasing high risk of hypertension, this shows by study from (Taylor et al., 2009; Zheng et al., 2010) that Asian men tend to be have hugh risk hypertension compared with non-Asian men although have similarity of alcohol consumption. Salt consumption have been discussed globally and guideline in "Creating and Enabling Environment for Population based Salt Reduction Strategies" that become first goals of WHO meeting (World Health Organization, 2010). Some countries already published national actions for antihypertensive dietary strategies, including salt consumption reduction. Thus countries are Brazil, Canada, China, Czech Republic, Finland, South Korea, UK, and USA. Other than that, the aforementioned countries also tribute to the arrengement of national nutrition guideliness—including nutrition status of national populations, especially for increasing the accessibility, availability, and affordability of healthy foods by updating national standards (Wong, Lim, Ma, Chua, & Heng, 2015).

Research Limitations

This study have some limitations especially in duration of study and the number of participants that joined were limited. The majority of participants were above 35 years old, study were conduct only in one public health center so it's cannot be figuring condition in another public health center.

CONCLUSION

Hypertension screening urgently needed in order to minimize complication and decreasing economic burden during health coverage era. Unspesifically clinical manifestation and variation of risk factor like family history with hypertension, smoking, physical activity, dietary habit (fruit, vegetable, and salt consumption)

must be known by citizen, so that healthy lifestyle can be citizen's habituation.

Hypertension is a combination of genetic and environmental factors. Burden of hypertension tribute to burden of economic country. In case, health promotive and preventive strategy must be integrated in many stakeholders—including health policy maker, health officer, public health center, health worker, and also nutritionist. Better prevention could reduce severity complication. National guidelines of nutritional status must be arranged sisthematically in each country due to the difference of ethnicity, cultural, and lifestyle. Awareness of health screening must be a habituation in every age especially in adult and ederly.

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