



ESTIMATION OF HYPERTENSION RISK FROM LIFESTYLE FACTORS IN COASTAL POPULATIONS

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Abstract

The prevalence of hypertension in coastal areas was still high between 2007 and 2018 with the highest prevalence in 2007 at 53.3%. The purpose of this research was to analyze the prediction of hypertension based on the determinants of the lifestyle of the coastal population. The type of this research is using cross-sectional research design, with a total sample of 210 people in the coastal area of Medan Belawan. The data were collected using an instrument in the form of a questionnaire, body mass index measurement using a manual weight balance and a stature meter and blood pressure using an sphygmomanometer aneroid. The selection of candidates as predictive variables is carried out by chi-square test analysis, followed by multivariate analysis using binary logistic regression test and the formulation model to find predictions hypertension, namely age ≥ 45 years has a 3.040 times greater risk of suffering from hypertension than age < 45 years ($p = 0.001$; 95% CI = 1.549-5.966) and obesity nutritional status has a large 2.284 times greater risk of suffering from hypertension than nutritional status was not obese ($p = 0.028$; 95% CI = 1.091-4.780). The results of the calculation of the probability from the modeling, it is found that if a person is ≥ 45 years old and has a nutritional status of obesity, the probability of suffering hypertension is 99.99%.

Keywords: Hypertension; Lifestyle; Modeling; Coastal

1. Introduction

Indonesia has a large coastal area and has the most islands in the world and 60% of Indonesia's population lives in coastal areas (BPS, 2016). The prevalence of hypertension in coastal areas is quite high, such as in China at 21.5% (Chen et al., 2014), India at 46.6% (Muthukrishnan, Pillai Uma, & V., 2018), Brazil at 44% (Begossi, 2013). A literature study that the prevalence of hypertension specifically in coastal areas ranged from 6.45% to 51.1% (Yodang & Nuridah, 2019). This is not much different from coastal areas in Indonesia, based on Riskesdas data from 2007 to 2018 based on coastal areas, so coastal areas still have a high prevalence of hypertension. The highest prevalence of hypertension was in 2007 at 53.3% in the coastal areas of the Natuna Islands (Indonesian Health Ministry, 2007, 2013, 2018).

The problem of non-communicable hypertension is still a national priority. This is evidenced by the 2018 Riskesdas data with a prevalence of 34.1%, which increased from 2013. The results of previous research showed that hypertension was more prevalent in coastal areas compared to non-coastal areas due to lifestyle and the tendency to like to consume high amounts of salt (Ingrid, S. K. Krishnadath1, Vincent W. V. Jaddoe, 2016; Rahajeng, Ekowati, Dewi Kristanti, 2016). Previous studies have also shown that hypertension is more common in coastal areas than in mountainous areas (Rusliafa, Amiruddin, & Noor, 2014). Many of the coastal populations have low income levels and women in coastal areas work as housewives, so they have a passive lifestyle meaning that they do less physical activity because they are only housewives where household work is unstructured and usually not repetitive so it is less health benefits are not the same as structured

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exercise such as running (Julkrismi, 2018). This is supported by Dina's research (2014), where populations of coastal areas have a passive lifestyle caused by the low level of economy and education of coastal populations.

In epidemiology, there are several statistical analyzes in determining the causality of disease. Bivariate analysis is the most widely used analysis to see the relationship or influence between variables x to Y . However, this analysis is unable to see the interaction between variables and is less able to control confounding and is less able to show which variables have the most influence. Modeling in epidemiological analysis aims to find predictor variables that are relevant to forecasting the incidence of cases. Modeling also aims to predict and foretells the probability of disease occurrence from a combination of several influencing variables, so that effective and efficient intervention actions can be planned.

Although coastal residents have a passive lifestyle, this research and other similar researches have not been able to predict the incidence of hypertension in coastal areas, so it is not clear what the biggest risk factor is for coastal populations and how far it causes hypertension to these risk factors. Therefore, it is necessary to model the prediction of the incidence of hypertension based on the determinants of the lifestyle of the coastal population.

2. Method

Types of Research

The type of this research is observational analytic using a cross-sectional research design. The use of this design is used to determine the true magnitude of the problem of hypertension in coastal areas in the population, then the exposure and effects will be studied at the same time.

Location and Time of Research

This research was conducted in the coastal area of Medan Belawan District, Medan City, North Sumatra Province. All selected samples are scattered throughout the sub-district. This research was conducted from April to September 2019.

Population and Research Sample

The population in this study are population of the coastal area of Medan Belawan. Samples are people in the coastal area of Medan Belawan who have been selected and meet the inclusion and exclusion criteria. The sample size obtained

was 210 people. The inclusion criteria in this study are: 1. Permanent residents of the Medan Belawan area with an age of > 18 years; 2. The woman is not pregnant. 2. People diagnosed with hypertension and not suffering from hypertension based on blood pressure measurements in this study were also included. The exclusion criteria were: 1. Consuming food that does not come from one's own (family) cooking on a regular basis; 2. Have a history of adrenal disorder; 3. Consume hypertension drugs because to avoid bias in the blood pressure variable because they have received antihypertensives and their blood pressure is controlled considering that the sampling method in this study used random sampling so that respondents who did not have hypertension were also included in this study.

Instrument

To obtain hypertension status data, blood pressure screening was performed using an sphygmomanometer aneroid with the help of a nurse. To obtain data on salt and vegetable consumption patterns, interviews were conducted (asked directly by researchers) using a qualitative Food Frequency Questionnaire (FFQ). To obtain data on the nutritional status of respondents, the body mass index was measured using a manual weight balance and a stature meter. Then the other variables were collected by interview using a questionnaire.

Data analysis

Data analysis that will be carried out is univariate, bivariate to multivariate data analysis. The univariate analysis in this study aims to see the frequency distribution and central distribution. Bivariate analysis using this type of statistical test used the chi-square test with error on an alpha of 5%. Multivariate statistical analysis was used to create a regression model for the incidence of hypertension using binary logistic statistical tests.

3. Result and Discussion

Based on table 1, it is found that the prevalence of hypertension in the coastal population of Medan Belawan is still high (31%). Thus, from 10 coastal residents, there are 3 to 4 people who suffer from hypertension. Based on table 2, it is obtained that the average blood pressure in all samples in the coastal area of Medan Belawan is in the pre-hypertension category. However, the average blood pressure in

patients with hypertension is included in the category of level 2 hypertension.

Table 1. Prevalence of Hypertension in the Coastal Population of Medan Belawan (n = 210)

Variable	Frequency	Percentage	95% CI
Hypertension	65	31	23.5-38.3
Not Hypertension	145	69	61.7-76.5

Table 2. Systolic and Diastolic Blood Pressure in the Coastal Population of Medan Belawan

Blood Pressure	Mean	SD	Min	Max	95% CI
Sample (n = 210)					
Systolic (mmHg)	133.32	30.265	90	266	129.20 – 137.44
Diastolic (mmHg)	80.55	9.425	60	150	79.29 – 81.81
Hypertension (n = 65)					
Systolic (mmHg)	170.43	29.018	140	266	163.24 – 177.62
Diastolic (mmHg)	86.39	12.412	80	150	83.31 – 89.47

Based on table 3, the characteristics of respondents with hypertension have a high level of salt consumption, the majority have obesity nutritional status, do not have routine exercise habits, the majority have low work status, low vegetable consumption, the population is more at risk of hypertension. Based on table 4, the results of multivariate analysis using logistic regression, it is known that the most dominant risk factors

for the incidence of hypertension are age with an OR of 3.040 ($p = 0.001$; 95% CI = 1.549-5.966) and obesity nutritional status with an OR of 2.284. ($p = 0.028$; 95% CI = 1.091-4.780). Based on table 5, the probability of the incidence of hypertension in the coastal area of Medan Belawan will be smaller if a person does not have one or all of the risk factors above.

Based on the multivariate analysis that was carried out using binary logistic regression, it was found that the age variable was the dominant variable for the occurrence of hypertension in the coastal areas of Medan Belawan. Age ≥ 45 years had a 3.040 times greater risk of suffering from hypertension than those aged < 45 years ($p = 0.001$). This is in line with the results of research conducted by Widjaya (2018), Tamamilang (2018), and Adam (2019) namely that there was a relationship between age and the incidence of hypertension with a consecutive p value of $p < 0.000$; $p = 0.003$; and $p = 0.003$. Based on Aidha's research (2019), age is one of the factors that are a risk or cause of hypertension that cannot be changed. Increasing age will cause a decrease in the body's functional system, one of which is a decrease in the elasticity of blood vessels and the work of the heart. The age at risk for hypertension is ≥ 45 years. This is because at the age of ≥ 45 years, the artery walls will experience thickening as a result of collagen buildup in the muscle layer and cause narrowing and stiffness (Kozier, 2010).

Table 3. Analysis of Population Characteristics with Hypertension Status

Variable	Hypertension Status				OR	Sig
	Hypertension		Normal			
	n	%	n	%		
Salt Consumption						
High (≥ 0.4 Teaspoon)	61	32.1	129	67.9	1.891 (0.607-5.898)	0.390
Enough (< 0.4 Teaspoon)	4	20	16	80		
Nutritional Status						
Obesity (> 27 kg/m ²)	34	42	47	58	2.532 (1.303-4.921)	0.038
Overweight (25.1 – 27 kg/m ²)	8	32	17	68	1.647 (0.620-4.372)	
Normal (18.5 – 25 kg/m ²)	20	22.2	70	77.8	References	
Thin (< 18.5 kg/m ²)	3	21.4	11	78.6	0.955 (0.243-3.756)	
Exercise						
Not a routine	59	32.8	121	67.2	1.950	0.235

Variable	Hypertension Status				OR	Sig
	Hypertension		Normal			
	n	%	n	%		
(< 3 times/week)					(0.756-5.092)	
Routine	6	20	24	80		
(> 3 times/week)						
Job status						
Low	42	30.4	96	69.6	1.458	0.728
					(0.382-5.570)	
Moderate	20	33.9	39	66.1	1.709	
					(0.422-6.920)	
High	3	23.1	10	76.9		
Vegetable Consumption						
Low	59	33	120	67	2.049	0.193
(< 3 Portion)					(0.797-5.265)	
Enough	6	19.4	25	80.6		
(> 3 Portion)						
Age						
At Risk	43	43.9	55	56.1	3.198	<0.000
(≥45 Years Old)					(1.732-5.907)	
Not At Risk	22	19.6	90	80.4		
(< 45 Years Old)						

The results of the multivariate analysis that was carried out using binary logistic regression showed that the nutritional status variable of obesity was the dominant variable after age for the occurrence of hypertension in the coastal area of Medan Belawan. Obesity nutritional status has a large risk 2.284 times bigger risk of suffering

from hypertension than non-obese nutritional status ($p = 0.028$). This is in line with the research of Darmawan (2018), Adam (2019), and Suranti (2019), namely that there was a relationship between nutritional status of obesity and the incidence of hypertension with a consecutive p value, namely $p = 0.001$; $p = 0.007$; and $p = 0.001$.

Table 4. Final Model of Risk Factors for Hypertension

Variable	B	S,E	P	OR	95% CI
Age	1.112	0.344	0.001	3.040	1.549-5.966
Obesity Nutritional Status	0.826	0.377	0.028	2.284	1.091-4.780
Constant	18.547	40193.582	1.000	113504919.176	

Information: R2 = 25.8%

Based on the research of Jean (2017) with a systematic review method, it is found that the nutritional status of obesity is associated with an increase in blood pressure. In the condition of obesity nutritional status, the occurrence of insulin resistance and impaired endothelial function of blood vessels, causing vasoconstriction and sodium reabsorption in the kidneys and causing an increase in blood

pressure (Angesti, Triyanti, n.d.). An increase in BMI associated with an increase in norepinephrine in the kidneys suggests a relationship between sympathetic nervous system activation with obesity and renin release. The activation of the sympathetic nervous system causes an increase in blood pressure by increasing the activity of the renin angiotensin aldosterone system (RAA) (Brady, 2017).

Table 5. Probability Value of Hypertension Based on Risk Factors for Age and Nutritional Status of Obesity

Age At Risk	Obesity Nutritional Status	Probability Formula	Probability Value (%)
Yes	Yes	$P(x) = 1 / (1 + 2.718^{-20,485})$ = 0.999999987	99.9999987
Yes	No	$P(x) = 1 / (1 + 2.718^{-19,659})$ = 0.999999971	99.9999971
No	Yes	$P(x) = 1 / (1 + 2.718^{-19,373})$ = 0.999999961	99.9999961
Yes	Yes	$P(x) = 1 / (1 + 2.718^{-18,547})$ = 0.999999912	99.9999912

To control hypertension in patients who are ≥ 45 years old and have a nutritional status of obesity, it is necessary to hold exercise and promote the selection of appropriate food for people aged ≥ 45 years regularly once a week in coastal areas so that the nutritional status remains within normal limits. If within 4 to 6 months of implementing a healthy lifestyle you cannot lower the expected blood pressure (Indonesian Association of Cardiovascular Specialists, 2015).

4. Conclusion and Suggestion

The hypertension status in the coastal area of Medan Belawan is still high with a percentage of 31% (95% CI = 23.5% -38.3%). Their average blood pressure is in the pre-hypertensive category (systolic = 133.32 mmHg, and diastolic = 80.55 mmHg) and their blood pressure is included in the category of hypertension level 2 (systolic = 133.32 mmHg, and diastolic = 80.55 mmHg). Hypertension sufferers have a high level of salt consumption, the majority have obesity nutritional status, do not have routine exercise habits, low work status, low vegetable consumption. The final model of probability binary logistic regression based on the risk factors for hypertension in the coastal population of Medan Belawan, namely $(y) = 1 / (1 + e^{-x})$ with a value of $y = 18,547 + (1,112) (\text{Age}) + (0.826) (\text{Obesity nutritional status})$. If a person is ≥ 45 years old and has a nutritional status of obesity, the probability of developing hypertension is 99.99%. Suggestions that can be given to the Health Office are the need to hold exercise and promote the selection of appropriate food for people aged ≥ 45 years regularly once a week in coastal

areas so that their nutritional status remains within normal limits. In further research, the research questionnaire needs to be sharpened because the research variables under researched tend to be homogeneous.

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