

Prediction of hypertension risk as an occupational health disease in palm oil factory workers at Gandapura District, Bireuen Regency, Aceh, Indonesia



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ABSTRACT

Introduction: Hypertension is a condition where the pressure in the blood vessels increases continuously. Stress, a risk factor for hypertension, can be caused by a person's workload exceeding the normal time limit. A job that exceeds the normal time limit can trigger work fatigue so that can affect aspects of mental, physical and work time. There is a relationship between mass index (BMI), waist circumference and waist-to-height ratio measurements with blood pressure in working men and women. Workers in palm oil mills are at risk of developing hypertension because of their daily work activities. The prevalence of hypertension in palm oil factory workers is 18.4%, caused by the risk factors of smoking, obesity and waist circumference ratio. The research will be carried out at the palm oil factory, Bireuen Regency. Sampling was carried out by means of simple random sampling on selected subjects using a cross-sectional design. The end result of this study is a formula for predicting the risk of hypertension in palm oil factory workers. The study aims to make predictions of risk factors for hypertension as an occupational health disease in palm oil factory workers.

Patients and methods: Workers in palm oil mills are at risk of developing hypertension because of their daily work activities. The research will be carried out at the palm oil factory in Bireuen Regency, Aceh, Indonesia. Sampling was carried out by means of simple random sampling on selected subjects using a cross-sectional design.

Results: There is a relationship between BMI, waist circumference and waist-to-height ratio measurements with blood pressure in working men and women. Workers in palm oil mills are at risk of developing hypertension because of their daily work activities.

Conclusion: Most of the oil palm workers were male, had a university education, were married, the amount of income was according to the minimum wage and below the minimum wage, they did not smoke, were physically active, and all workers were not stressed. . Based on the risk of hypertension, the average age of the respondents was 34.4 years, blood pressure was above normal, Body Mass Index was in the overweight category and waist circumference was above normal limits.

Keywords: hypertension, worker, palm-oil factory, prediction formula.

Cite This Article: Yuziani., Sofia, R., Sawitri, H. 2023. Prediction of hypertension risk as an occupational health disease in palm oil factory workers at Gandapura District, Bireuen Regency, Aceh, Indonesia. *Bali Medical Journal* 12(1): 490-494. DOI: 10.15562/bmj.v12i1.4019

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Received: 2022-12-21

Accepted: 2023-01-10

Published: 2023-02-01

INTRODUCTION

Hypertension is a condition where the pressure in the blood vessels increases continuously. This is the main risk factor for coronary heart disease, kidney disease and stroke.¹ Hypertension is commonly called the silent killer because it often appears without complaints, making hypertension a major contributor to heart disease, kidney failure and stroke. The prevalence of hypertension in Indonesia is 34.1%. This has increased compared to the prevalence of hypertension in 2013 at 25.8%.² It is estimated that only 1/3 of cases of hypertension in Indonesia are

diagnosed, the rest are not diagnosed.² Therefore the target set out in the strategic plan and national medium-long-term plan for public health and nutrition 2015-2019 is to reduce the prevalence rate of hypertension from 25.8% in 2013 to 23.4% in 2019 One of the efforts in controlling hypertension is early detection which is done by visiting the target, because most people do not realize that they suffer from hypertension.³

The risk factors for hypertension are divided into two, namely: modifiable risks and irreversible risks. The risks that cannot be changed are age, gender and genetics.

While the risks that can be changed in the form of unhealthy lifestyles of people with hypertension include: smoking, low-fiber diet, dyslipidemia, excessive salt consumption, lack of physical activity, stress, excess body weight and the habit of consuming alcohol. Therefore it is important to control modifiable hypertension risk factors, by routinely carrying out early detection. Hypertension consists of 2 (two) degrees, namely grade 1 hypertension (systolic 140-159 mmHg and/or diastolic 90-99 mmHg) and grade 2 (systolic > 160 and/or diastolic > 100). Most hypertensive patients are included

in the first-degree hypertension group. 50% of sufferers are unaware that they are sufferers, so their disease is more severe because they do not change and avoid risk factors. There is a relationship between the lifestyle of male patients (smoking habits, sports activities and diet) to the incidence of hypertension.⁴ The age group of 25-34 years is the majority group with normal blood pressure. Respondents in the age group of 45-54 years are the largest group with blood pressure degree 1 hypertension and degree 2 hypertension.^{5,6}

Stress, a risk factor for hypertension, can be caused by a person's workload exceeding the normal time limit. A job that exceeds the normal time limit can trigger work fatigue so that it can affect aspects of mental, physical and work time. Almost everyone in their life experiences stresses related to their job. This can be influenced by too many work demands (working too hard and often working overtime) and the type of work that must provide an assessment of the work performance of his subordinates or work that demands responsibility for humans. The workload includes limitations on working hours and the required working hours are 6-7 hours per day. The rest is used for family and society, sleep, and others.⁶

Research conducted on employees in 2021 shows a relationship between BMI, waist circumference and waist-to-height ratio measurements with blood pressure in working men and women.⁷ In line with research conducted at oil and gas companies, the proportion of hypertension was 18.9%. Workers over 40 years have a risk of hypertension by 4.2 times higher than workers under 40 years after controlling for body mass index and education level variables.⁸

One of the risk factors for hypertension is obesity. Several factors of worker behavior are also known to contribute to the emergence of metabolic syndrome. These factors include work factors that trigger workers to tend to be sedentary (not much physical activity), unhealthy eating patterns, smoking behavior, stress, and others. Associated with diet, many workers complain that they are getting fatter. However, they don't realize that their calorie intake is too high, caused by snacking or eating too often. Furthermore,

less physical activity in the office. Based on the results of research on company workers in Riau, it is known that the prevalence of metabolic syndrome cases in workers is 21.98%, with the most gender being male, the average age of workers is 49 years, many are aged > 50 years. Most workers suffer from metabolic syndrome with the most components being abdominal circumference and blood pressure. From the processing of physical activity data, it is known that most workers who experience metabolic syndrome have low to moderate physical activity averages and categories. Furthermore, food intake of workers with metabolic syndrome with a category not in accordance with the diet is dietary fiber, saturated fat and carbohydrates. It is also known that the abdominal circumference variable correlates or has a statistically significant relationship with systolic and diastolic blood pressure and high-density lipoprotein (HDL) cholesterol levels.⁹

Workers in palm oil mills are at risk of developing hypertension because of their daily work activities. The prevalence of hypertension in palm oil factory workers is 18.4%, caused by the risk factors of smoking, obesity and waist circumference ratio.¹

METHODS

The research will be carried out at the palm oil factory in Bireuen Regency, Aceh, Indonesia. Sampling was carried out by means of simple random sampling on selected subjects using a cross-sectional design. The end result of this study is a formula for predicting the risk of hypertension in palm oil factory workers.

The variables in this study were age, sex, blood pressure, education level, income level, marital status, body mass index, smoking behavior, stress level, history of diabetes mellitus and physical activity.

Study participant

The variables in this study were age, sex, blood pressure, education level, income level, marital status, body mass index, smoking behavior, stress level, history of diabetes mellitus and physical activity.

Procedure

The research implementation phase includes collecting data on the working

population at a palm oil factory in Bireuen and assessing blood pressure measurements. Assess the respondent's body mass index, conduct interviews on the variables of age, gender, physical activity and smoking behavior, re-check the data that has been collected and document research activities in the form of photos.

Locations

The research will be carried out at the palm oil factory in Bireuen Regency, Aceh, Indonesia. Sampling was done by simple random sampling on the selected subjects.

Data Analysis

Data analysis was performed using statistical analysis of multiple logistic regression models to produce a predictive model for a health risk factor. Logistic regression is a statistical model used to analyze the relationship between one or more independent variables that are continuous or binary and the dependent variable that is binomial or dichotomous. Besides that, it is also to be able to determine the direction of the relationship between the dependent and independent variables.

RESULTS

Characteristics of study participant

A total of 100 palm oil mill workers participated the study, baseline demographic characteristics were displayed in [table 1](#).

Based on [table 1](#), it can be concluded that most of the oil palm workers are male (92%), have high school education (49%) and university education (49%), is married (83%), total income according to minimum wage (75%), not smoking (58%), strenuous physical activity (52%), and most workers are not stressed (89%).

Risk of Hypertension

Based on the risk of hypertension, average-The average age of the respondents was 34.39 years (SD = 7.97), blood sugar levels were within normal limits, namely 112.04 (SD = 44.76), body mass index was in the category above normal, namely 24.91 (SD = 3.99) and waist circumference within normal limits, namely 88.32 (SD = 11.40) ([Table 2](#)).

The variables included in the multivariate modeling are those with a p-value ≤ 0.25 , namely age, BMI, waist circumference and education. Then these variables will be included in the multivariate modeling to see which variables influence the risk of hypertension (Table 3).

In step first, two variables have $p > 0.05$, namely waist circumference (0.83) and education (0.98). However, education has a larger p, so education is excluded from the model. Step 2's waist circumference

variable still has a $p > 0.05$. So that the waist circumference will also be removed from the model. Step 3, the age and BMI variables have a $p < 0.05$. Each age (0.007) and BMI (0.001). So the final model of the risk factors that influence hypertension is age and body mass index. The variable that has the most influence on the incidence of hypertension is BMI. This can be seen from the OR (Odds Ratio) of 31.38. This means that workers who have an overweight BMI have a risk of developing hypertension 31.38 times greater than those who have

a normal BMI. The formulation on the hypertension risk model in this study was: Hypertension risk = $-9.73 + 1.61(\text{age}) + 3.45(\text{BMI})$.

DISCUSSION

Based on the results of the analysis, for gender characteristics there was no difference in risk factors between men and women, in the study. Most of the respondents have male gender. The prevalence of hypertension is almost the same between men and women, but women are protected from cardiovascular disease before menopause, women who have not experienced menopause are protected by the hormone estrogen which plays a role in increasing levels of high-density lipoprotein.¹⁰ However, men are at risk for developing hypertension because of their smoking habits and lifestyle and drinking alcoholic beverages.¹¹ Besides gender, smoking behavior is also a risk factor for hypertension. Smoking is a risk factor for hypertension. The nicotine in cigarettes is what causes blood pressure to rise immediately after the first puff. Like the other chemicals in cigarette smoke, nicotine is absorbed by tiny blood vessels in the lungs and circulated into the bloodstream. In just a few seconds nicotine has reached the brain. The brain reacts to nicotine by signaling the adrenal glands to release epinephrine (adrenaline). This strong hormone will constrict blood vessels and force the heart to work harder due to higher pressure and the role of carbon monoxide which can replace oxygen in the blood and force the heart to meet the body's oxygen needs. Smoking a cigarette will have a big effect on increasing blood pressure. This is because cigarette smoke contains approximately 4000 chemicals, 200 of which are toxic and 43 other types can cause cancer in the body.¹²

The average waist circumference of palm oil factory workers is also normal. Waist circumference can be the parameter of choice for predicting metabolic syndrome compared to BMI and waist-to-hip ratio. Waist circumference is an anthropometric measure that can be used to determine central obesity. The criteria for waist circumference for Asia Pacific are 90 cm for men and 80 cm for women. Waist circumference measurements

Table 1. Characteristics of Palm Oil Mill Workers in 2022.

No	Variable	Frequency (n=100)	Percentage (%)
1	Gender		
	Man	92	92
	Woman	8	8
2	Education		
	No school	0	0
	Elementary school	2	2
	Junior high school	0	0
	Senior high school	49	49
	Higher education	49	49
3	Marital status		
	Not Married	83	83
	Marry	17	17
4	Income		
	Below Government Base Salary	28	28
	Above Government Base Salary	72	72
5	Smoking Behavior		
	Do not smoke	58	58
	Light	12	12
	Moderate	27	27
	Heavy	3	3
6	Physical Activity		
	Light	13	13
	Moderate	35	35
	Heavy	52	52
7	Stress		
	No Stress	89	89
	Light Stress	11	11
	Moderate Stress	0	0
	Heavy Stress	0	0
	Extremely Stressful	0	0
8	Hypertension		
	No	80	80
	Yes	20	20

Table 2. Risk of Hypertension in Palm Oil Factory Workers in 2022 (n=100).

No	Variable	Means	SD	Min	Max
1	Age	34.39	7.97	21	59
2	Blood Sugar Levels	112.04	44.76	55	377
3	Body mass index	24.91	3.99	16.53	35.38
4	Waist size	88.32	11.40	36	112

can describe the presence of dangerous fat in the abdominal wall three times greater than BMI. Waist circumference measurement can be used as an index of

body fat distribution and can be used to identify individuals who are overweight and obese, which is a risk factor for hypertension.⁵

The average age of workers is 34 years. Age has a significant relationship with hypertension. The research subjects were in the age range that was prone to suffering

Table 3. Bivariate Analysis Selection of Hypertension Risk Factors in Palm Oil Mill Workers.

Variable	Hypertension				p	OR	CI 95%	
	Not		Yes				min	max
	n	%	n	%				
Gender								
Woman	7	87.5	1	12.5	0.58	1.82	0.21	15.72
Man	73	79.3	19	20.7				
Age								
< 35 years	57	87.7	8	23.3	0.02	3.71	1.34	10.28
> 35 Years	23	65.7	12	34.3				
BMI								
Normal	46	97.9	1	2.1	0.01			
Overweight	34	64.2	19	35.8		25.7	3.27	201.5
Waist size								
Normal	48	88.9	6	11.1	0.03	3.50	1.21	10.06
Above normal	32	69.9	14	30.4				
Education								
Low	0	0	2	100	0.04	5.44	3.58	8.26
Tall	80	81.6	18	18.4				
Marital status								
Marry	65	78.3	18	21.7	0.51	0.48	0.10	2.30
Not Married	15	88.2	2	11.8				
Income								
>UMR	59	81.9	7	18.1	0.61	1.51	0.53	4.30
<UMR	21	75	13	25				
Physical Activity								
Tall	40	76.9	12	23.1	0.46	0.66	0.24	1.80
Low-Medium	40	83.3	8	16.7				
Smoking Behavior								
Not	44	75.9	14	24.1	0.33	0.52	0.18	1.50
Yes	36	85.7	6	14.3				
stress								
Not	71	79.8	18	20.2	0.61	0.87	0.17	4,41
Yes	9	81.8	2	18.8				
Diabetes mellitus								
Not	77	80,2	19	19.8	0.59	1.35	0.13	13.72
Yes	3	75	1	25				

Table 4. Results of Logistic Regression Multivariate Analysis with the Prediction Model Method.

Logistic step	Variable	Coefficient	p	OR	CI (95%)	
					min	max
Step 1	Age	1.44	0.02	4.24	1.26	14.22
	BMI	3.39	0.00	29.60	3.24	270.64
	Waist size	-0.14	0.83	0.87	0.24	3.18
	Education	-2.04	0.98	0.00	0.00	14.22
Step 2	Age	1.61	0.01	5.03	1.53	16.49
	BMI	3.47	0.02	32.30	3.51	296.59
	Waist size	-0.05	0.93	0.94	0.25	3.45
Step 3	Age	1.61	0.007	4.99	1.54	16.12
	BMI	3.45	0.001	31.38	3.81	258.34

from hypertension, starting at the age of 20 with the percentage of hypertension incidents increasing every year which stated that there was a relationship between age and the incidence of hypertension. The older the age, the more at risk of developing hypertension. Blood pressure increases with age, and people with high baseline blood pressure have a more rapid rise than normal or below-average pressure.¹³ The increase in blood pressure with age is largely related to changes in the stiffness of the arteries and arterioles. Other pathophysiological factors that predispose to increased blood pressure with aging include decreased baroreceptor sensitivity, increased responsiveness to nervous system stimuli, changes in renal and sodium metabolism, and altered renin-aldosterone relationships.¹

The average body mass index for palm oil factory workers is in the normal category, but some workers are in the overweight category. Hypertension cannot be caused by just one factor. However, many factors influence each other in a complex way to cause hypertension, one of these factors is consumption patterns. The results of a study conducted by Rismadi et al.¹⁴ showed that diet was significantly related to the incidence of hypertension in fishermen in Medan City, where a person who has a poor diet is at risk of up to 15 times to experience hypertension compared to someone who has a good diet, where the results of the interview conducted on respondents showed that most of the respondents ate salted foods such as salted fish, salted squid and soy sauce.¹⁴

CONCLUSION

The study results concluded that most of the oil palm workers were male, had

a higher education, were married, did not smoke, were physically active, and were not stressed. Based on the risk of hypertension, the average age of the respondents was 34.4 years, blood pressure was above normal, Body Mass Index was in the overweight category and waist circumference was above normal limits. Age

DISCLOSURE

The author reports no conflicts of interest in this work.

ETHICAL CONSIDERATION

This study has been approved by committee of ethics Universitas Malikussaleh, with ethical clearance reference number 001/KEPK/FKUNIMAL-RSUCM/2022.

FUNDING

None.

AUTHOR CONTRIBUTION

All author has been contributed to manuscript writing and agreed for the final version for publication.

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