

RISK ANALYSIS OF CARDIOVASCULAR DISEASES IN LIGHT, MODERATE AND HEAVY SMOKERS BY FRAMINGHAM SCORE

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Background: The prevalence of smokers in Indonesia is still quite high. Indonesia ranks second highest number of smokers. Smoking can cause several degenerative diseases including cardiovascular disease. This study aims to describe the risk of cardiovascular disease in light smokers, moderate smokers and heavy smokers.

Methods This is a descriptive analytic with *cross sectional* study design. Sixty subjects included in this study were active smokers male aged 20-55 years old who did not have a history of degenerative disease. Smokers criteria determined by the number of cigarettes smoked per day. Blood pressure was measured by using a mercury sphygmomanometer. Blood cholesterol levels checked by using a spectrophotometer. The risk of cardiovascular disease is determined by using the Framingham score. Framingham score and a long relationship of smoking with smokers criteria tested by Pearson correlation ($p > 0.05$)

Results: The average age of smokers was 36.6 years with an average smoking duration is 16.6 years. Total cholesterol level is normal in 90% of subjects, and 97% of subjects had normal HDL cholesterol. Mean systolic and diastolic blood pressure in light smokers was 110/73.21 mmHg, 118.94/78.48 mmHg in moderate smokers and 118.461/77.69 mmHg in heavy smokers. Subjects are located mainly on the criterion of moderate smokers (55%). Based on the calculation of the Framingham score, the majority of subjects (95%) have a low risk, moderate risk of only 5% and 0% high risk. Not found an association between smokers with a score of Framingham criteria ($p = 0.389$), but found the existence of a relationship between duration of smoking with framingham scores ($p = 0.020$)

Conclusion: In this study, the risk of cardiovascular disease in light, moderate and heavy smokers are the same
Keywords: cardiovascular disease risk, light smokers, moderate smokers, heavy smokers

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Introduction

The prevalence of smokers in Indonesia is still high. It is estimated that around 52 million people in Indonesia has the habit of smoking by the number of active smokers as many as 5.7 million people¹. Smoking is an important risk factor for cardiovascular disease. Increased risk is associated with the number of cigarettes smoked and the duration of smoking history. Smoking lowers levels of nitric oxide (NO) indirectly. Nitric oxide is an important substance that is secreted by the endothelium of blood vessels. Nitric oxide that released into the lumen of the blood vessel are inhibitors that are potent to inhibit the aggregation and adhesion of platelets in the blood vessel walls³.

In the previous studies, it is known that smoking gives a greater risk of heart disease than non-smokers 2.4 times⁸. The Framingham Score is

Smoking increases triglycerides and LDL cholesterol, and also lowers HDL. One function of HDL is a major means of transport of excess cholesterol from extrahepatic tissues and cell cleanser⁴. The presence of interference or a decrease in plasma HDL levels will interrupt the transport of cholesterol from extrahepatic tissues to the liver and will accumulate cholesterol in intracellular. Intracellular cholesterol build up will stimulate the formation of atherogenesis. The formation of atherosclerosis in the coronary blood vessels lead to coronary heart disease. If the blockage happens quite large, there will be ischemic of heart muscle^{5,6}.

used to determine whether a person has a risk of mild, moderate or severe for developing cardiovascular disease This study aims to describe

the risk of cardiovascular disease in light smokers, moderate smokers and heavy smokers.

Method

This research was conducted to 60 subjects. Subjects selected by *consecutive sampling* which are male, aged 20-55 years, active smokers and willing to follow the research. Whereas subjects who had a history of hypertension, type 2 diabetes mellitus, history of stroke, kidney failure, was exclude from the research. The identity of the patient such as age, height, weight, duration of smoking, cigarette type and number of cigarettes smoked per day is tabulated. The patient's blood pressure is measured in a sitting position using a mercury sphygmomanometer. Blood taken from the cubital vein. Total cholesterol and HDL cholesterol is checked by using a spectrophotometer. Smokers criteria determined by the number of cigarettes smoked per day. Then the risk of cardiovascular disease is calculated using the Framingham Risk Score assesment Tools. To determine the

relationship between the criteria of smokers with cardiovascular disease risk by Risk Score Framingham, Pearson correlation statistical tests is used with significance level of $p < 0.05$

Ethical Approval

This study has approved by ethical committee of Medical Faculty of Universitas Sumatera Utara.

Result

In this study, the average age of subjects was 36.6 years with the largest distribution in the range 32 - 37 years of age (17%). Duration of smoking on average is 15.7 years with the number of cigarettes smoked per day was 16.6 cigarettes. A total of 33 subjects (55 %) had smoked for more than 10 years and 27 subjects (45%) smoked less than 10 years. Light smokers is as many as 14 subjects (23.3%), moderate smokers were 33 subjects (50%) and heavy smokers is 13 subjects (21.7%). Characteristics of the subject can be seen in Table 1.

Table. 1 Characteristics subjects according to age, nutritional status, duration of smoking, number of cigarettes per day, smokers criteria

	Total (%)	Average (\pm SD)
Age (years)		
20-25	6 (10)	36.9 (\pm 9872)
26-31	13 (21.7)	
32-37	17 (28.3)	
38-43	9 (15)	
44-49	4 (6.7)	
50-55	11 (18.3)	
Nutritional status (kg / mm ²)		
Underweight	4 (6.6)	24.1 (\pm 4.121)
Normoweight	22 (36.7)	
Overweight	13 (21.7)	
Obese I	14 (23.3)	
Obese II	7 (11.7)	
Smokers Criteria (cigarettes / day)		
Light	14 (23.3)	16.6 (\pm 9.631)
Moderate	33 (55.0)	
Heavy	13 (21.7)	

Duration of smoking		
<10 years	27 (45)	15.7 (\pm 10. 665)
> 10 years	33 (55)	
Total cholesterol (mg / dl)		151.53 (\pm 33.419)
HDL cholesterol (mg / dl)		69.808 (\pm 18.637)
Systolic blood pressure (mmHg)		116.75 (\pm 11.711)
Diastolic blood pressure (mmHg)		77.08 (\pm 7.028)

By using Pearson correlation test, it is found that there is an association between the number of cigarettes smoked and the total cholesterol ($p = 0.000$). As for HDL cholesterol, the whole subject is at normal category. On a statistical test, it is found that there is no relationship between the number of cigarettes smoked by the levels of HDL cholesterol ($p = 0.226$).

Table. 2. Levels of total cholesterol, HDL cholesterol, systolic blood pressure, diastolic blood pressure, and the Framingham score in light, moderate and heavy smokers

	Smokers category			P =
	Light Total (%)	Moderate Total (%)	Heavy Total (%)	
Total cholesterol				
Normal (<200 mg / dl)	13 (93)	31 (94)	10 (77)	0.000
Borderline (200-239 mg / dl)	1 (7)	1 (3)	3 (23)	
High (> 239 mg / dl)	0 (0)	1 (3)	0 (0)	
HDL Cholesterol				
Normal (> 45 mg / dl)	14 (100)	32 (97)	13 (100)	0.226
Low (<45 mg / dl)	0 (0)	1 (3)	0 (0)	
Systolic blood pressure				
Normal (<120 mmHg)	13 (97)	23 (70)	11 (85)	0.007
Pre hypertension (120-139 mm Hg)	1 (3)	9 (27)	0 (0)	
Stage I hypertension (140-159 mm Hg)	0 (0)	1 (3)	2 (15)	
Hypertension stage II \geq 160 mmHg)	0 (0)	0 (0)	0 (0)	
Diastolic blood pressure				
Normal (<70 mmHg)	12 (86)	30 (91)	12 (92.3)	0.016
Pre hypertension (70-89 mmHg)	1 (7)	0 (0)	0 (0)	
Hypertension stage I (90-99 mmHg)	1 (7)	3 (9)	1 (7.7)	
Hypertension stage II \geq 100 mmHg)	0 (0)	0 (0)	0 (0)	
Framingham Risk Score				
Low (<i>low risk</i>)	13 (93)	32 (97)	12 (92.3)	P =

Medium (<i>intermediate risk</i>)	1 (7)	1 (3)	1 (7.7)	0.389
High (<i>high risk</i>)	0 (0)	0 (0)	0 (0)	

Systolic and diastolic blood pressure in average was 116.75 / 77.08 mmHg (Table.1). The increase in blood pressure in smokers statistically correlated between the number of cigarettes smoked with systolic blood pressure ($p = 0.007$) and diastolic blood pressure ($p = 0.016$)

Discussion

Smoking is difficult to change and this behavior is found at all ages. The results show that smokers are most common at the age of 32-36 years. Factors that affect a person to smoke coming from the individual (personality factors) and external factors such as the influence of parents, peers and cigarette advertising⁹.

Smoking gives the risk of coronary heart disease⁸. Supriyono's research results show that men aged under 45 years had 2.4 times the risk of coronary heart disease compare to nonsmokers⁸. The longer a person smokes, he will be increasingly exposed to the active substance that can damage the vascular endothelium. In this study, there is a relationship between the criteria smokers with systolic and diastolic blood pressure. Increased blood pressure is associated with a rise in peripheral resistance due to decreased *nitric oxide* by cigarettes⁴. Peripheral resistance affects ventricles contraction at the systolic phase. Furthermore, increase in diastolic blood pressure can be affected by plasma viscosity that increases cardiac filling pressures. Solute concentration in the plasma such as erythrocytes, blood glucose and high cholesterol increase the viscosity of plasma¹⁰. In this study there is a significant correlation between total cholesterol levels by of cigarettes smoked per day.

Atherosclerosis formation is initiated with the occurrence of dyslipidemia. The accumulation of fat in the blood vessel walls due to lower HDL causing endothelial damage thus forming atheroma. Lumen of the blood vessels become narrow, blood circulation becomes disrupted⁶. When this process occurs in the coronary arteries will certainly be fatal

to the heart. Severe blockage do not replace the possibility of patients having a heart attack.

In this study, the risk of a smoker to get a heart attack was measured by calculating a score of Framingham. Ninety five percent (95%) of subjects had low risk, only 5% had moderate risk. In contrast with previous research that smokers are more at risk of getting coronary heart disease than nonsmokers^{2, 8}. This is probably because 97% of subjects had normal cholesterol HDL level, only one person had low HDL cholesterol and subject are under 45 years of age.

According to the Framingham study, HDL cholesterol had a negative correlation with total cholesterol that give risk of heart attack, but in this study eventhough there are differences in total cholesterol in smokers with number of cigarettes smoked per day, there were no differences in levels of HDL cholesterol.

In this study there was no relationship between the number of cigarettes smoked per day by the risk of heart attack^{1 1}. But there is a relationship between duration of smoking with risk of heart attack. Thus in this study, the risk of a heart attack is unrelated to the number of cigarettes smoked per day but with the consistency of a person in the smoking.

Conclusions and suggestions

Risk of cardiovascular disease in smokers do not depend on the number of cigarettes smoked each day, but on the duration of smoking. Light smokers have the same risk as the moderate and heavy smokers when they are constantly smoking in the long term. It needs further research to measure directly how many levels of nitric oxide in the blood plasma of light, moderate and heavy smokers to get closer correlation to the occurrence of damage to the blood vessels of the heart.

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