EFFECTS OF PASSIVE SMOKING ON THROMBOCYTES IN D4 STUDENTS OF HEALTH ANALYST

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ABSTRACT

A passive smoker is someone who does not smoke but observes others smoking or is in the same room as the smoker. The influence of cigarettes on platelet count can lead to an increase in atherosclerosis. Inhaling cigarette smoke over a long period of time can lead to an increase in platelet counts as well as platelet aggregation. The purpose of this study was to determine the effect of passive smoking on platelet count in D4 students of Health Analyst. The design used in this study was descriptive analysis with a cross-sectional approach with a total sample of 30. The data analysis used in this study was in the form of the Chi-Square test. The result of this study obtained the number of passive smokers based on gender, age, and length of exposure which was abnormal for as many as 4 students and normal as many for as 26 students. Conclusions in this study there was a relationship between passive smoking based on sex to platelet count with p-value = 0.000, no relationship based on age to platelet count with p-value = 0.603, and no relationship between passive smokers based on length of exposure to platelet count with p-value = 0.475.

Keywords: passive smoker; platelets; rees ecker

INTRODUCTION

Smoking is a common practice in all ages, from youth to old age (Indra *et al*., 2015). A smoker is a person who inhales cigarette smoke either directly or indirectly. An active smoker is a person who smokes a cigarette every day on a regular basis, even if it is only one cigarette per day. A passive smoker is a person who does not smoke but inhales the smoke of another person or is in a closed room with the smoker (Ministry of Health, 2019). According to the Centers for Disease Control and Prevention (CDC), at least 30 people who die due to smoking have serious smoke-related diseases. According to the World Health Organization, smoking kills more than 7 million people each year. Of those deaths, about 6 million were from active smokers, while as many as 890,000 died from passive smoking (WHO, 2018).

Smoking has become one of the most popular lifestyle activities in Indonesia. In 2018, data from basic health research showed that 33.8% of smokers were over the age of 15. In total,

62.9% of the data came from male smokers, while 4.8% came from female smokers. Frequent smoking habits can lead to an increase in a variety of diseases that can be fatal, such as cancer, respiratory disorders, and cardiovascular diseases. Smoking is one of the dangers for stroke, deafness, osteoporosis (density in the bones becomes reduced), as well as diseases in peripheral blood vessels. According to the World Health Organization, the most common causes of death from smoking in Indonesia are heart disease and stroke (WHO, 2018).

Tobacco smoke contains 4,000 compounds that can have adverse effects on human health, including free radicals, nicotine, and CO. CO is one of the most dangerous gases because it can attack the human blood circulation system. The circulatory system of the human body consists of blood and the organs where blood is produced, namely bone marrow and lymph glands. Blood is one of the special organs of the body because of its fluid nature and because it is not like other organs in the human body (Handayani and Wiwik, 2008). For adults, the blood volume is about 70–75 ml per kg of body weight or 4-5 liters of blood, and blood pH is 7,35 – 7,45 (alkaline). Blood consists of two components: plasma and blood cells (Tarwoto, 2008). Thrombocytes, a fundamental component, and function in human blood circulation, play an important role in the coagulation process, as well as in systemic inflammation, immune regulation, angiogenesis, and wound healing. There is no core; it is 1-4 μm in diameter and has a volume of 7-8 fl. The normal human number of platelets is 150,000–350,000 per microliter of blood (Harjo and Resky, 2011).

Thrombocytes are megakaryocyte cytoplasmic fragments, without a nucleus, that are stacked inside the human bone marrow. Thrombocytes play a role in the blood clotting process, i.e., they can stop bleeding and damaged veins can be repaired. Thrombocytes play an important role in the pathophysiology of cardiovascular diseases mediated by pathological thrombosis. The activation of thrombocytes and thrombosis at the site of atherosclerotic plaque plays an important role in the pathophysiology of the occurrence of acute coronary artery disease. The role of the thrombocytes is to stop the bleeding by blocking the wound or by removing the thrombocyte. Thrombosis is an intravascular deposit consisting of fibrin and other blood-forming elements that occurs at various stages in the formation of thrombocytes, including adhesion, aggregation, and release reactions. The embolism of the thrombocytes may reduce the wound in order to stop the bleeding (Tarwoto, 2008).

Smoking is one of the risk factors for cardiovascular disease. The effects of smoking on thrombocytes can lead to an increase in atherosclerosis and risk factors caused by an increased MPV (mean platelet volume). The impact of smoking on the metabolic system is caused, among others, by increased blood sugar levels, levels of free fatty acids, and LDL

cholesterol. The hematological system, among other things, increases the aggregation of thrombocyte cells. In addition, contractions of the heart muscle such as increased oxygen intake and peripheral vasoconstriction (Sitepoe, 2000).

A study conducted by Habibah showed that passive smokers had an abnormally high number of thrombocytes compared to those who smoked, both in the normal thrombocyte category, although some active smoking categories had higher numbers and passive smokers had higher outcomes than normal.

Based on the above background, passive smokers have an effect that can cause an increase in atherosclerosis, the number of thrombocytes, and the risk factors for atherosclerosis caused by increased MPV. (Mean Platelet Volume) There is an increase in the number of platelets, which can lead to the development of a systemic inflammatory response, i.e., increased production of thrombocytes and erythrocytes and a decrease in MCV. (Mean Corpuscular Volume). Therefore, the researchers wanted to know the impact of passive smokers on the number of platelets in D4 Health Analyst students based on age, gender, and length of exposure.

The study aims to evaluate or know the influence of smoking on the number of passive smokers' thrombocytes in D4 Health Analyst students.

METHOD

The design used in this study was descriptive analysis with a cross-sectional approach and a purposive sampling method. It was determined that 30 male and female students in D4 Health Analyst who is a passive smoker and meets the research criteria. The research was conducted at the Hematology Laboratory of Muhammadiyah University by Prof.Dr. Hamka in August - September 2022. Populations in this study were students in D4 Health Analysts UHAMKA semesters 5 and 7. The research variable consisted of an independent variable, i.e., passive smoking student D4 Health Analyst UHAMKA, while the dependent variable is the number of thrombocytes. The data used are from questionnaires in the form of places where smokers live, duration of exposure to cigarette smoke, health conditions, and medical history. Then, check the thrombocytes count manually. The study used a non-parametric comparative test analysis, namely a Chi-Square test with a 95% confidence rate.

RESULTS AND DISCUSSION

In this study, checking the number of platelets in passive smokers was done using the direct method. Rees Ecker's solution contains aquadest, sodium citrate, brilliant cresyl blue, and formaldehyde. The advantage of the Rees Ecker solution is that it is colorful because it contains Brilliant Cresyl Blue, which can produce a blue color, is easy to calculate because it glitters, and it looks clearer. The weakness of Rees Ecker's solution is that it is not able to dissolve the erythrocytes so that the thrombocytes are closed by erythrocytes.

The research was divided into several variables that were subsequently assembled and presented in the form of tables.

A validity test is a test used to determine the effectiveness and suitability of the questionnaire used by researchers to measure and obtain survey data from respondents. The validity test is calculated using the software SPSS 24 for Windows. The conclusion can be drawn if the r value counts more than the r table and then the questionnaire can be validated. At the validity test obtained results, all questionnaire questions are declared valid because the value r counts > r table. SPSS validity test results can be seen in Appendix 2.

A reliability test is a test that aims to measure the reliability or unreliability of a questionnaire. A question list or questionnaire is considered reliable when the Cronbach Alpha value is greater than 0.60. The reliability test that has been performed on six items of the question, is declared valid because the Cronbach's alpha value obtained is 0.694. A variable is reliable if the answer to the question is consistent. Based on the reliability test, the questionnaire is declared reliable. This is because the Cronbach Alpha value is >0.60. SPSS reliability test results can be seen in Appendix 3.

Univariate testing is a test that aims to explain the properties of each variable being studied. The type generally depends on the categorical data obtained using the frequency distribution ratio or percentage. This univariate test uses SPSS version 24.

Table 1. Univariate Analysis Based on Respondent Distribution

Variable	Frequency	Percentage
Type of		
Male	7	23,3%
Female	23	76,7%
Totally	30	100%
Age		
19 to 20 years	10	33,4%
21 to 22 years	20	66,6%
Totally	30	100%

In Table 1, the distribution of the frequency of passive smokers by gender was obtained from 23 women (76.7%) and 7 men (23.3%). This is demonstrated by the fact that women outnumber men in terms of respondents. Data from this study is consistent with data from GATS Indonesia 2011, which shows that passive smokers are more common among women.

The distribution of the frequency of passive smokers by age showed the majority of respondents were aged 21–22 years, which is 20 students (66.6%) and 10 students aged 19–20 years (33.4%). This study, by GATS data from 2011, showed that 99.9% of passive smokers in Indonesia are women aged between 15 and 24 years, and only 0.1% are active smokers, while in men, 48.3% are passive and 51.7% are active. The results are in line with data from the 2019 Global Youth Tobacco Survey, which showed that the percentage of teenagers exposed to cigarette smoke in the home was 57.8%. The results indicate that at the age of adolescence to adulthood many are exposed to cigarette smoke from the family environment, community environment, and friendship circles.

The bivariate test is a test used to find out the relationship between two variables, i.e., the free variable being studied and the bound variable. Then the next analysis is a bivariate analysis with statistical testing. The use of this statistical test depends on the data model or variable used.

Table 2. Passive Smoking Increases the number of Thrombocytes based on Gender

Sex	Number of Thrombocytes		Totally	p-value
	Abnormal	Normal		
Male	0	7	7	
Female	4	19	23	0,000
Totally	4	26	30	

In Table 2, the results of the number of thrombocytes in passive smokers based on gender obtained the result of 19 female students (63.3%) having a normal number of blood platelets that is in the range of 150-450 thousand cells/µl of blood and 4 students (13.3%) having an abnormal number of thrombocyte cells that is more than 450 thousand cells/µl of blood. In men, the results showed a normal number of platelets in 7 students (23.3%), and there were no students with abnormal thrombocytes. This result is due to the risk that 25% of the contaminants in cigarette smoke will enter the body of the smoker and 75% will circulate outdoors and enter the surrounding body. The results matched the questionnaire responses of four respondents who had been exposed to cigarette smoke for more than two years. This is in line with a study conducted by Biino *et al*., which showed that women who smoke had a higher number of platelets than men. This is due to the presence of differences in the hormonal profile

of women, which is known to allow megakaryocytes and thrombocytes to express steroid hormone receptors.

The data in this study were processed using the Chi-Square test shown in the table above. The result was the relationship between gender and the number of passive smoking thrombocytes obtained p-value = 0.000. This suggests that there is a relationship between gender and the number of platelets in passive smokers.

Table 3. The Relationship of Passive Smokers to the number of Thrombocytes based on Age

| Age | Number of Thrombocytes | | Totally | p-value |
	Abnormal	Normal		
19 to 22 years	1	10	11	
21 to 22 years	3	16	19	0,603
Totally	4	26	30	

In Table 3, the results of the number of thrombocytes passive smokers based on age obtained at the age of 19–20 years show that as many as 1 students (3.3%) had an abnormal number of platelets that was more than 450 thousand cells/μl of blood, while 10 students (33.4%) had a thrombocyte number that was in the range of 150–450 thousand cells/μl of blood. At age 21–22, as many as 3 students (10%) had an abnormal number of thrombocytes, and 16 students (53,3%) had a normal number of plaques. According to the survey results, passive smokers aged 21 and 22 have been exposed to cigarette smoke for more than 2 years in everyday life.

The data in this study were processed using the Chi-Square test shown in the table above. These results showed that there was no relationship between the age of passive smokers and the number of platelets, with a p-value of 0.603. The results of this study are consistent with the studies conducted by Misra and Venkates, which showed no significant relationship between age and the number of thrombocytes in passive smokers. Misra and Venkatesh submitted this because the age of the respondents in the study was still in the young category.

Table 4. The Relationship of Passive Smokers to the number of Thrombocytes based on Long Expose

| Long Expose | Number of Thrombocytes | | Totally | p-value |
	Abnormal	Normal		
> 2 years	4	1	5	
< 2 years	0	25	25	0,475
Totally	4	26	30	

In Table 4, the results of the number of passive smokers' thrombocytes based on the length of exposure obtained from respondents who were exposed to > 2 years showed abnormal outcomes of more than 450 thousand cells/μl of blood in 4 students (13.3%), and 1 student (3.3%) had a normal number of thrombocytes that is in the range of 150-450 thousand blood cells/μl. In passive smokers exposed for < 2 years, results showed that as many as 25 students had a normal number of platelets, and no students showed abnormal results. The results of this study are consistent with previous studies conducted by Habibah, which showed abnormal thrombocyte numbers in passive smokers. This suggests that passive smokers who have been exposed to cigarette smoke for too long will increase the number of platelets and have the potential for increased thrombocyte aggregation and excretion of thromboxane metabolites from the platelets. This can happen because the hazardous substances that enter the body of passive smokers are greater because the toxins inhaled by passively smoking people are not filtered, so the danger to be borne by passive smokers is three times greater than that of an active smoker.

This data is processed using the Chi-Square test shown in the table above. The results showed that there was no relationship between the length of exposure and the number of platelets, which is indicated by the p-value = 0.475. This is consistent with the research conducted by Suwansakri *et al*., which showed that there is no significant relationship between long exposure and the number of platelets in passive smokers.

In this study, the examination of platelets in passive smokers was carried out by the direct method using Rees Ecker's solution. Rees Ecker contains Aquadest, Sodium Citrate, Brilliant Cresyl Blue, and Formadehid. The advantage of Rees Ecker's solution is that it is colored because it contains Brilliant Cresyl Blue, which can produce a blue color; it is easy to do calculations because it is shiny and looks clearer; while the weakness is that it cannot lyse erythrocytes so that platelets are covered by erythrocytes.

CONCLUSION

Based on the results of this study, it can be concluded that the number of passive smoking students D4 Health Analysts at UHAMKA is as many as 23 women and 7 men. So, it can be concluded that there is a relationship between gender (p-value = 0,000) and the number of thrombocytes in passive smoking students D4 Health Analyst at UHAMKA. Besides that, there is no relationship between age (p-value = 0.603) and long exposure (p-value = 0.475) for the number of thrombocytes in passive smoking students D4 Health Analyst at UHAMKA.

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