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The Relationship Of Smoking Behavior With Carboxyhemoglobin Levels In Active Smokers

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ABSTRACT

Smoking behavior is still entrenched in Indonesian cause a variety of diseases and even death. Cigarettes have become necessities of life that can not be abandoned in everyday life. The smoking problem in essence has become a national problem, even international level. But most connoisseurs of cigarettes assume that smoking is a personal responsibility for the consequences caused. Scientific researchers revealed that smoking is the leading cause of premature death. Statistical data shows that 90% of deaths due to respiratory problems, 25% of deaths caused by coronary heart disease that is triggered by smoking. In cigarette smoke contains 4000 chemicals, one of which is carbonmonoksida (CO), which can disturb binding of oxygen with hemoglobin (Hb), which transformed into bonds HbCO. This research used a correlational analysis with a quantitative approach and cross-sectional study design. Samples used as many 100 respondents used purposive sampling technique. Samples fill out the questionnaire and measured HbCO levels in the blood HbCO qualitatively. Data were analyzed with univariate, bivariate with Product Moment correlation techniques, multivariate correlation analysis. The results showed that there is a correlation of smoking behavior (number of cigarettes smoked by the respondent, the respondent smoking duration and type of cigarettes consumed by the respondents) against HbCO levels. Smoking behavior (knowledge, attitudes, and actions on how cigarette smoking cigarettes made by respondents) have no correlation with HbCO levels.

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1. Introduction

At this time cigarettes are not a foreign object anymore. For those who live in the city or in the village, generally they are familiar with the thing called cigarettes. Even by some people, cigarettes have become a necessity of life that cannot be abandoned in everyday life [1]. Smoking behavior of the population 10 years and over still has not experienced a significant decline from 2013 to 2018, the national prevalence of smoking in 2013 was 29.3%, and in 2018 28.8% [2].

A person's behavior, including smoking behavior, is influenced by predisposing factors which include knowledge, attitudes, beliefs, traditions, the value of enabling factors which include the availability of sources/facilities and reinforcing factors which include attitudes and the behavior of the people around them [3].

A scientific researcher revealed that smoking is the main cause that undermines human health and causes premature death. Statistical data illustrates that 90% of deaths are caused by respiratory disorders, 25% of deaths are caused by coronary heart disease and 75% of deaths are caused by emphysema, this is driven by smoking habits [4]. The risk of these various diseases is caused by every cigarette that contains more than 4,000 toxic chemicals and 43 cancer-causing substances [5]. Of the 4,000 known chemicals contained in cigarette smoke, one of them is Carbon monoxide (CO) [6]. Symptoms of toxicity or mild poisoning due to CO gas include headaches and nausea at concentrations less than 100 ppm. The lowest concentration of 667 ppm can cause 50% of the body's hemoglobin to turn into carboxyhemoglobin (HbCO). Carboxyhemoglobin is quite stable but this change can be reversible or can return to the initial state. Carboxyhemoglobin is not effective in delivering oxygen in the circulatory or blood transport system. Therefore some parts of the body do not get enough oxygen. As a result, exposure to this level can be life-threatening [7].

The impact of Carbon monoxide (CO) on humans in general can result in the reaction of CO with blood hemoglobin (Hb) so that it can inhibit the function of Hb to bind oxygen. CO is also produced from cigarette smoke which can cause indoor air pollution. Smoking can also cause an increase in blood pressure in active smokers. Indoor air pollution is very dangerous because the source is directly adjacent to humans [8].

Langkat Regency is one of the regencies in North Sumatra Province which, based on an initial survey in the EMP Hamlet of Adi Mulyo Sei Bingai, it is known that the majority are of the Karo

Batak ethnicity. One of the Batak Karo culture is giving cigarettes during traditional events and smoking has also become a tradition, namely by the head of the family. The heads of families and even teenage boys when they gather at the stall offer each other cigarettes to enjoy. Even at home or at work, cigarettes have become a necessity. Based on this, researchers are interested in examining the relationship between smoking behavior and levels of carboxyhemoglobin (HbCO) in active smokers in Dusun EMP Adi Mulyo Sei Bingai.

2. Method

The method used in this study is a correlational analysis method using a quantitative approach and a cross-sectional study design, namely to determine the relationship between smoking behavior and levels of carboxyhaemoglobin (HbCO) in active smokers in Dusun EMP Adi Mulyo Langkat.

The population in this study was the entire population in Dusun EMP Adi Mulyo Sei Bingai as many as 2568 people who were carried out from April to June 2020. Based on the calculations obtained, the number of samples was 96 respondents which was fulfilled into 100 respondents in this study using a purporsive sampling technique based on inclusion and exclusion criteria.

a. Inclusion criteria
   - Active smoker
   - Willing to be a respondent
   - Located in Dusun EMP Adi Mulyo Sei Bingai.
   - Not taking drugs

b. Exclusion criteria
   - Not an active smoker
   - Not willing to be a respondent
   - Not in Dusun EMP Adi Mulyo Sei Bingai
   - Taking drugs

In this study, the method of measuring variables is as follows:

1. Knowledge Measurement
2. Attitude Measurement
3. Action
4. Measurement of Carboxyhemoglobin (HbCO) levels was qualitatively carried out with the formalin test

   1cc of blood was taken using a syringe. Then put in a plaque that has been given EDTA. The way it works is that the blood to be examined is added with an equal amount of 40% formalin solution. If the blood contains 25% HbCO saturation, a red coagulant will be formed which settles at the bottom of the test tube. The higher the HbCO level, the redder the color of the coagulants. Whereas in normal blood, brown coagulants are formed [9].

Data processing is carried out in two stages as follows Editing, namely data editing is carried out to avoid errors or the possibility of an unfilled questionnaire. Coding is to facilitate the data entry process, each answer is coded and scored. Entry, after the data code is entered into the computer. Cleaning, prior to data analysis, checks and repairs are carried out.

Univariate Analysis

Univariate analysis was conducted to obtain an overview of the frequency distribution of respondents. This analysis was conducted to obtain an overview of each independent variable. The data that has been collected through questionnaires were analyzed using descriptive methods so that a true picture of the research variables can be obtained based on the data.

Bivariate Analysis

Bivariate Correlational Analysis Technique is a simple correlation technique (bivariate correlation) which is used to determine the close relationship between two variables and to determine the direction of the relationship that occurs. There are several methods of bivariate correlation analysis and in this study, Product Moment Correlation was used to find the relationship and prove the hypothesis of the relationship between two variables. The high or low or the strength of a correlation can be known by looking at the size of a number (coefficient) called the correlation index number which is symbolized by r (for the population) or r (for the sample).

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TABLE 1.
DATA LEVEL OF RELATIONSHIP BETWEEN TWO VARIABLES

Coefficient Interval	Relationship Level
0,00 - 0,19	Very week
0,20 – 0,34	Week
0,35 – 0,64	Medium
0,65 – 0,84	Fairly High
0,85 – 1	High

Source: [10]

Multivariate Correlation Analysis

Multiple correlation is a tool to measure the relationship or level of association between independent variables (X1,2,3,4,...n) to the dependent variable (Y) simultaneously [10].

3. Results and Analysis

Characteristics of Respondents

Respondents in this study were 100 people. Characteristics of respondents in this study include age, education and occupation. Data on the characteristics of respondents in the study can be seen in table 2.

TABLE 2.
CHARACTERISTICS OF RESPONDENTS IN DUSUN EMP ADI MULYO SEI BINGAI

No	Characteristics of Respondents	Frequency	Percentage (%)
1	Old		
	21 – 30	18	18
	31 – 40	48	48
	41 – 50	34	34
	Total	100	100
2	Education		
	S1	29	29
	SMA	53	53
	SMP	13	13
	SD	5	5
	Total	100	100
3	Occupation		
	PNS/Teacher	28	28
	self-employed	72	72
	Total	100	100

Smoking Behavior

Knowledge, attitude and action variables were measured based on 10 indicators. Distribution of respondents based on knowledge, attitudes and actions about HbCO among active smokers in Dusun EMP Adi Mulyo Sei Bingai can be seen in table 3

TABLE 3.
DISTRIBUTION OF RESPONDENTS BASED ON KNOWLEDGE, ATTITUDES AND ACTIONS ABOUT HBCO IN DUSUN EMP ADI MULYO SEI BINGAI

No	Smoking Behavior	Frequency	Percentage (%)
1	Knowledge		
	Good	84	84
	Enough	12	12
	Less	4	4
	Total	100	100
2	Attitudes		

	Good	53	53
	Enough	47	47
	Less	0	0
	Total	100	100
3	Action		
	Good	5	5
	Enough	86	86
	Less	9	9
	Total	100	100

Smoking Frequency

The smoking variable was assessed based on the explanations of the respondents which can be seen in table 4.

TABLE 4.
DISTRIBUTION OF RESPONDENTS BASED ON ANSWERS TO CIGARETTE QUESTIONS IN DUSUN EMP ADI MULYO SEI BINGAI

No	Cigarette	Frequency	Percentage (%)
1	Types of Cigarettes		
	Non Filter	47	47
	Filter	53	53
	Total	100	100
2	Long smoking		
	< 10 years	20	20
	> 10 years	80	80
	Total	100	100
3	Number of cigarettes smoked		
	< 10 stems per day	8	8
	10 - 20 stems per day	53	42
	> 20 stems per day	39	50
	Total	100	100
4	How to smoke cigarettes		
	suck in mouth	44	44
	shallow suction	9	9
	deep suction	47	47
	Total	100	100

Carboxyhemoglobin (HbCO) levels

Table 5.
Hbco Levels In Active Smokers In Dusun Emp Adi Mulyo Sei Bingai

HbCO Levels	Frequency	Percentage (%)
Low (< 25%)	39	39
High (> 25%)	61	61
Total	100	100

Bivariate Analysis

Bivariate correlation analysis in this study to see the relationship between the independent variables, namely smoking behavior with the dependent variable Carboxihemoglobin (HbCO) using the moment product correlation technique with a significance level of 95%.

TABLE 6.
THE RELATIONSHIP OF SMOKING BEHAVIOR WITH CARBOXIHEMOGLOBIN (HBCO) ON ACTIVE SMOKERS IN DUSUN EMP ADI MULYO SEI BINGAI

Smoking Behavior	*Carboxihemoglobin* (HbCO)	Total	*P Value*	*r*

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	Low		High					
	N	%	n	%	N	%		
Knowledge								
Good	35	35	49	49	84	84		
Enough	3	3	9	9	12	12	0,246	0,117
Less	1	1	3	3	4	4		
Total	39	39	61	61	100	100		
Attitude								
Good	18	18	35	35	53	53	0,277	-0,110
Enough	21	21	26	26	47	47		
Total	39	39	61	61	100	100		
Action								
Good	1	1	4	4	5	5		
Enough	35	35	51	51	86	86	0,811	-0,024
Less	3	3	6	6	9	9		
Total	39	39	61	61	100	100		
Types of Cigarettes	15	15	38	38	53	53	0,020	0,233*
Filter	24	24	23	23	47	47		
Non Filter								
Total	39	39	61	61	100	100		
Long Smoking								
< 10 years	15	15	5	5	20	20	0,000	0,369*
> 10 years	24	24	56	56	80	80		
Total	39	39	61	61	100	100		
Number of cigarettes smoked								
< 10 stems per	6	6	2	2	8	8	0,000	0,405*
day	27	27	16	16	53	53		
10-20 stems per	6	6	33	33	39	39		
day								
> 20 stems per								
hari								
Total	39	39	61	61	100	100		
How to smoke cigarettes								
	20	20	24	24	44	44	0,188	0,133
suck in mouth	4	4	5	5	9	9		
shallow suction	15	15	32	32	47	47		
deep suction								
Total	39	39	61	61	100	100		

Information:
P value < 0.05 indicates that there is a relationship between these variables on HbCO levels in the blood.
P value > 0.05 indicates that there is no relationship between these variables on HbCO levels in the blood.
* Significant correlation at 0.05 . level

From table 6. it can be seen that smoking behavior that has a relationship with respondents' HbCO levels in Dusun EMP Adi Mulyo Sei Bingai is the type of cigarette, the duration of the respondent's smoking and the number of cigarettes smoked. Meanwhile, respondents' knowledge, attitudes, actions and ways of smoking cigarettes have no relationship to HbCO levels and the correlation coefficient is very low.

Multivariate Analysis

The test used in the multivariate analysis is the Linear Regression Test to find variables that have an effect on carboxihemoglobin (HbCO). The variables that will be included in the multiple correlation analysis are the variables in the bivariate analysis which have a p value <0.05, namely the type of cigarette, the length of the respondent smoked and the number of cigarettes smoked.

TABLE 7.
MULTIVARIATE ANALYSIS ASSOCIATED WITH CARBOXYHEMOGLOBIN (HBCO) LEVELS IN ACTIVE SMOKERS IN DUSUN EMP ADI MULYO SEI BINGAI

No	Variabel	B	P *Value*	Exp (B)	Koefisien Korelasi (R)
1.	Types of Cigarettes *	0,139	0,103	0,143	
	Long smoking	0,396	0,000	0,325	0,553
	Number of cigarettes smoked	0,301	0,000	0,377	
	Constanta	-0,012	0,964		
2.	Long smoking	0,427	0,000	0,350	
	Number of cigarettes smoked	0,310	0,000	0,388	0,535
	Constanta	0,127	0,605		

* Variables issued in each selection stage

In this study, almost all respondents had good knowledge and after statistical tests, it turned out that knowledge did not have a significant relationship with HbCO levels in the blood of active smokers in the Dusun EMP Adi Mulyo Sei Bingai (p = 0.246). Respondents who have good knowledge about the dangers of smoking have high HbCO levels as much as 49% and low HbCO levels in the blood as much as 35%. The number of respondents who have good knowledge has almost the same number of respondents for low and high HbCO levels.

This shows that consuming cigarettes is not related to good knowledge because many people know that cigarettes are harmful to health, but still consume cigarettes. So that there is no difference between people who have good knowledge and those who are not well informed about cigarettes with cigarette consumption and HbCO levels. Many factors influence a person's behavior in smoking, such as belief, race, and public trust in the environment.

Based on the results of statistical tests obtained p value = 0.277 (p> 0.05), which means that there is no relationship between respondents' attitudes towards HbCO levels. Someone who has a good attitude may not necessarily be able to reduce cigarette consumption because many things can affect a person's attitude in smoking.

The results of the statistical tests carried out obtained p value = 0.811 (p > 0.05), which means that there is no relationship between action and blood HbCO levels in active smokers in Dusun EMP Adi Mulyo Sei Bingai. Actions can be related to individual health, larger social, economic and environmental factors, such as social support networks, employment, income and change [11].

According to Silvan and Tomkins in Mu'tadin [12] there are four types of smoking behavior based on Management of affect theory, namely:

a. Smoker's behavior is influenced by positive feelings
   Pleasure relaxation is smoking behavior only to increase or increase the enjoyment that has been obtained, for example smoking after drinking coffee or eating. Simulation to pick them up is smoking behavior is only done just to please feelings. Pleasure of handling the cigerette is smoking behavior based on the pleasure obtained from holding cigarettes.
b. Smoker's behavior is influenced by negative feelings
   Many people smoke to reduce negative feelings in themselves. For example, smoking when angry, anxious, restless, smoking is considered a savior. They use cigarettes when bad feelings occur, thus avoiding more unpleasant feelings.
c. Addictive smoking behavior
   Smokers who are addicted will increase the dose of cigarettes used at any time after the effects of the cigarettes they smoke are reduced.
d. Smoking behavior that has become a habit
   They use cigarettes not at all to control their feelings, but because it has become a habit. The factors that influence smoking behavior are divided into several reasons, namely [13]:

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- Habit
  The habit of smoking is the activity of smoking cigarettes that is carried out repeatedly, regularly and is difficult to release. It's commonplace means it doesn't need anything more to do it. Habit is something that is ingrained. They use cigarettes not at all to control their feelings, but because it has really become routine.
- Emotional Reaction
  Smoking is used to produce positive emotions, such as pleasure, relaxation and pleasure. Smoking can also show masculinity (self-pride) and show maturity. Smoking is intended to reduce tension, ordinary anxiety or anxiety that arises due to interactions with other people.
- Social environment
  Most teenagers start smoking because their friends follow them, but also because they are influenced by the image created by cigarette manufacturers (for example by using teenage idols as advertisement stars). Another social factor that influences adolescent smoking behavior is family factors. In relation to adolescent smoking behavior, family becomes the second determinant after peers. Families can be a source of support and fulfillment for adolescents, but also a source for adolescents to learn norms and behaviors including smoking behavior.
- Biological
  This factor emphasizes the nicotine content in cigarettes which can affect a person's dependence on cigarettes biologically. Nicotine is an alkaloid that is a stimulant and at high doses is toxic. This substance exists only in tobacco, is highly addictive and affects the brain/nervous system. In the long term, nicotine will suppress the brain's ability to experience pleasure, so smokers will always need higher levels of nicotine to achieve satisfaction and addiction levels.

Based on this, it can be seen that knowledge, attitudes and actions that are quite good from a person have no relationship with HbCO levels in the blood. This is because there are many factors that influence a person to consume cigarettes and increase the number of cigarettes consumed.

From the statistical test results obtained $p = 0.020$ ($p < 0.05$), $r = 0.233$ which indicates that there is a weak positive and significant relationship between the type of cigarette and the level of HbCO in the blood of active smokers in Dusun EMP Adi Mulyo Sei Bingai. This means that the type of cigarette has a weak relationship with HbCO levels and in a positive direction which indicates that if the value of the cigarette type variable increases, the HbCO variable value will also be high. Filter cigarettes are different from non-filtered cigarettes, even though filter cigarettes have a carcinogenic effect, they can still enter the lungs when you inhale deeply, inhale many times and the number of cigarettes used increases because CO gas is not caught by the filter. so that respondents who smoke with filter cigarettes still have respondents with high HbCO levels (38%).

And after statistical tests, the value of $p = 0.000$ ($p <0.05$) $r = 0.369$, which indicates that there is a positive and significant relationship between smoking duration and HbCO levels. This means that the length of smoking has a stronger relationship than the type of cigarette to the HbCO level and the variable value of the length of smoking with HbCO levels influences each other in the same direction. This shows that the longer a person smokes and is exposed to cigarettes, the higher the risk for disease, one of which is high HbCO levels in the blood.

The results of the statistical test also showed a significant value ($p = 0.000$) and had a moderately positive relationship ($r = 0.405$), meaning that the number of cigarettes smoked had an almost as strong relationship with the length of smoking and if the value of the variable number of smoking increased, then the HbCO level also increases (positive direction). Smokers can be categorized into 3, namely light smokers (1-4 cigarettes per day), moderate smokers (5-14 cigarettes per day) and heavy smokers (more than 15 cigarettes per day). From the data obtained, smokers who are in the category of heavy smokers have high HbCO levels. The more a person consumes cigarettes, the higher the risk of disease.

This study is different from the research by Adelina [9] which shows that there is no relationship between the number of cigarettes and HbCO levels. Research by Killinc [14] shows that smokers have more erythrocyte counts than non-smokers. This increase is an adaptation of carbon monoxide contained in cigarette smoke.

Based on the research conducted, the results of statistical tests were not significant ($p = 0.188$),

which means that there was no relationship between how to smoke cigarettes and HbCO levels. Based on this it is known that smoking does not affect HbCO levels in the blood, however smoking can affect HbCO levels because the smoke produced from cigarettes contains CO which can bind to Hb. The CO bond with Hb is reversible, so the CO bond with Hb can be released if it is not exposed to continuously.

From the results of multivariate analysis, it is known that the most dominant variable that has a relationship with HbCO levels is the number of cigarettes consumed by the respondent and the length of time the respondent smokes with a multiple correlation coefficient value, namely 0.535. The results of the linear regression equation show that the number of cigarettes consumed by the respondent and the length of time the respondent smokes have a fairly strong relationship with HbCO levels. This can be seen from the R value (multiple correlation coefficient) and the significance value <0.05.

4. Conclusion

Based on the results of research that has been carried out at EMP Adi Mulyo Hamlet regarding the Relationship of Smoking Behavior with Carboxyhaemoglobin (HbCO) Levels in Active Smokers in EMP Hamlet Adi Mulyo Sei Bingai it can be concluded that:

1. There is a relationship between smoking behavior and HbCO levels in the blood, namely the number of cigarettes smoked by the respondent, the length of time the respondent smokes and the type of cigarette consumed by the respondent.
2. There is no relationship between smoking behavior and HbCO levels in the blood, namely the respondents' knowledge, attitudes, actions about smoking and how to smoke cigarettes.
3. The number of cigarettes smoked by the respondent and the length of time the respondent smoked are variables that together have a significant and strong enough relationship to the level of HbCO in the blood of active smokers. HbCO in the blood also increases.

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