

The Association between the Intensity of Cigarette Smoking and Haematological Parameters on Sam Ratulangi University Students

Sylvia R. Marunduh*, Damajanti H.C. Pangemanan, Hedison Polii

Faculty of Medicine, Sam Ratulangi University Jl Kampus Unsrat, Bahu Manado 95115, Indonesia

Original Research Article

***Corresponding author**

Sylvia R. Marunduh

Article History

Received: 01.12.2018

Accepted: 08.12.2018

Published: 30.12.2018

DOI:

10.36347/sjams.2018.v06i12.002



Abstract: According to World Health Organization (WHO) nearly 5 million people worldwide died every year due to diseases caused by cigarette smoking. If the trends continue, there will be 8 million deaths on 2030. Around 80% of the world's 1.1 billion smokers live in low and middle income countries. The national prevalence of smoking in Indonesia based on Research Report on Basic Health (RISKESDAS) 2018 is 28.8% and North Sulawesi is at the 10th of 35 provinces. In order to find solutions on this critical situation along with the raising people awareness about the dangerous of cigarette smoking, the damages related to smoking (i.e. haematological parameters) need to be assessed more to obtain better knowledge, treatment and better health policy on smoking related problems. Cigarette smoking based on previous studies has acute and chronic effects on various haematological parameters with some inconsistent results. Many studies shows cigarette smoking increases blood leucocyte levels but its effect on other haematological parameters is largely unexplored and inconsistent. This study aims to determine the relationships between the degrees of smoking and some haematological parameters. This study was a cross-sectional design study on 51 healthy male students of Faculty of Engineering Sam Ratulangi University badge 2015 and 2016, aged 18 – 24 years old. The subjects are active smokers of at least 2 cigarettes daily in duration of minimally 2 years. Blood sample were obtained from the subjects and measured for various hematology parameters. There is a strong significant association between the intensity of cigarette smoking with total leucocyte levels ($p < 0.000$), neutrophil, basophil and lymphocyte count ($p < 0.05$).

Keywords: Cigarette smoking, haematological parameters.

INTRODUCTION

Tobacco cigarette contains about 7000 chemical compounds and 250 of them are very dangerous to the smokers and also to non-smokers (passive smokers). There are 69 from 250 chemical contents in cigarettes are carcinogenic [1, 2]. Several studies show some evidences that smoking tobacco cigarettes is responsible in alteration of the lipid profile and some haematological parameters and moreover smoking causes diseases in every organ of the body such as coronary heart disease, chronic obstructive pulmonary disease, rheumatoid arthritis and cancer [3,4]. According to World Health Organization (WHO) nearly 5 million people worldwide died every year due to diseases caused by cigarette smoking. If the trends continue, there will be 8 million deaths on 2030. Around 80% of the world's 1.1 billion smokers live in low and middle income countries [5,6]. The national prevalence of smoking in Indonesia based on Research Report on Basic Health (RISKESDAS) 2018 is 28.8% and North Sulawesi is at the 10th rank of 35 provinces [7].

WHO (2013) classified smokers into three categories which are light smokers (1-10 cigarettes daily), moderate smokers (11-19 cigarettes daily) dan heavy smokers (20 or more cigarettes daily). Data from Basic Health Research (Risksedas 2013) shows nearly one third of people of North Sulawesi aged ≥ 10 years old are active smokers with average 10 cigarettes of daily smoking [8].

In order to find solutions on this critical situation along with the raising people awareness about the dangerous of cigarette smoking, the damages related to smoking (i.e. haematological parameters) need to be assessed more to obtain better knowledge, treatment and better health policy on smoking related problems [9-12] Cigarette smoking based on previous studies has acute and chronic effects on various haematological parameters with some inconsistent results. Many studies shows cigarette smoking increases blood leucocyte levels but its effect on other haematological parameters is largely unexplored and inconsistent[13-16].

The objective of this study is to determine the relationships between the degrees of smoking and some haematological parameters.

MATERIALS AND METHODS

The study was conducted for 10 months, from February to December 2018. The research locations were in Faculty of Engineering Sam Ratulangi University in Manado City of North Sulawesi Province. The target population of this study was late teenagers aged 18 - 24 years old. The subjects were affordable populations that met the inclusion criteria as follows: university students aged between 18 -24 years old smoke at least 2 cigarettes per day for a minimum 2 years of smoking.

The stages of research are carried out as follows

- Request permission for research as well as requests for Ethical Clearance to the Research Ethical Committee of the Faculty of Medicine, Sam Ratulangi University, and Manado.
- Request permission from the Dean and Vice Dean of Faculty of Engineering.
- Explanations to students regarding the purpose of this study and questionnaire.

- Interviews to prospective subjects to get willingness to be the subject of this study by reading and signing informed consent.
- Perform physical examinations such as body weight using electric scale, measurement of height using microtoise, and blood pressure measured using Nova@mercury sphygromanometer.
- Perform blood sampling for further analysis in the clinical laboratory.

The haematological parameters measured in this study are total leucocyte count, differential leucocyte count (neutrophil, eosinophil, basophil, monocyte, and lymphocyte), haemoglobin levels, platelet count, and hematocrit level and erythrocyte sedimentation rate.

RESULTS AND DISCUSSION

Table 1 show that the age of subjects ranges from 17-23 years old with the range of smoking duration of 2 to 8 years and the 6 – 16 cigarettes a day. As shown in table 2, the subjects are in the category of light smokers and moderate smokers, there are no heavy smokers among them.

Table-1: General description

Variabel	Descriptive Analysis			
	n	Minimum	Maximum	Average
Age (year)	51	17	23	20.24
Duration of smoking (year)	51	2	8	4.65
Amount of cigarette daily	51	6	16	9.76

Table-2: Subjet distribution based on smoker categories (WHO 2013)

Smoker type	n	%
Light smokers (1-10 cigarettes per day)	29	56.9
Moderate smokers (11-20 cigarettes per day)	22	43.1
Heavy smokers (>20 cigarettes per day)	0	0
Total	51	100.0

Table-3: The correlation of smoking duration and daily amount of cigarettes smoking with total leucocyte count, differential leucocyte count, haemoglobin concentration, erythrocyte count, hematocrit, platelet count and erythrocyte sedimentation rate

Variable	Smoking duration		Number of cigarettes/day	
	Correlation coefficient (R)	ρ	Correlation coefficient(R)	ρ
Categories of smoking status (WHO 2013)	0,119	0,406	0,875**	0,000
Haemoglobin (Hb)	0,148	0,300	0,158	0,269
Erythrocyte	0,168	0,239	0,105	0,462
Hematocrit (HCT)	0,144	0,313	0,118	0,410
Redblood Distribution Width (RDW)	0,039	0,785	-0,025	0,863
Leucocyte	0,078	0,588	0,793**	0,000
Eosinophil	0,105	0,463	-0,042	0,771
Neutrophil	-0,189	0,183	0,305*	0,029
Basophil	0,028	0,848	-0,290*	0,039
Lymphocyte	0,164	0,250	-0,286*	0,042
Monocyte	0,274	0,052	-0,170	0,232
Platelet	0,013	0,927	0,185	0,194
Erythrocyte sedimentation rate	-0,198	0,163	-0,081	0,572

This study (table 3) indicates there is a strong positive correlation between the amount of cigarettes per day and total leucocyte count and neutrophil count. This means the increasing of daily amount of cigarettes will increase leucocyte and neutrophil levels. The negative correlation between the daily amount of cigarettes and basophil and lymphocyte counts means the more cigarettes smoked per day the lower the basophil and lymphocyte levels. This study did not find significant association between the intensity of smoking (number of cigarettes per day) and the other haematological parameters.

The results of this study are consistent with other published studies in this case the positive correlation between smoking intensity and total leucocyte count [17-21]. Total leucocyte count is perhaps the most simple, useful and inexpensive biomarker to detect endothelial damage. The high count of leucocyte can promote cardiovascular diseases through multiple mechanisms that mediate inflammation, plug the microvasculature, induce hypercoagulability and promote infarct expansion [4, 22]. The exact mechanism responsible for smoking association to elevated leucocytes count is unclear. It is suggested that nicotine may produce smoking induced leukocytosis by circulating catecholamine, as an increase in certain endogenous hormones such as epinephrine and cortisol have been reported. Both of the hormones are known to increase total leucocytes count [23]. Another possible mechanism is an acute or chronic inflammatory response induced by particulates of cigarettes smoke [4, 22, 23].

The present study indicates the negative correlation between smoking intensity with basophils and lymphocytes. Previous studies reported inconsistent results on the relation of smoking and differential leucocyte count. Some studies reveal only the increase of neutrophils, some report only elevation in lymphocyte count while others indicate an elevation of the granulocytes count or several other combination of differential leucocyte count [13-21, 24]. A further study to clarify these inconsistent relationships may help to explain the underlying mechanism.

Some substances released by leucocytes could be pathogenic in cardiovascular and pulmonary diseases and also cancer. A decrease in leucocyte count has been associated to decreasing risk of cardiovascular disease related deaths while the increase of total leucocytes has been related to the increase in chronic cough and chronic bronchitis [23]. Therefore in the present study increased total leucocytes among smokers might predict the possible risk of developing fatal diseases related to smoking.

CONCLUSION

There is a significant association between the intensity of cigarette smoking and total leucocyte

levels ($p < 0.000$), neutrophil, basophil and lymphocyte counts ($p < 0.05$).

ACKNOWLEDGEMENT

We gratefully acknowledge Sam Ratulangi University assistance for funding through the Sam Ratulangi University DIPA fund, Ministry of Research, Technology and Higher Education and the students of Faculty of Engineering.

REFERENCES

1. Green CR, Rodgman A. The tobacco chemists' research conference: a half century forum for advances in analytical methodology of tobacco and its products. *Recent Adv Tobacco Sci.* 1996; 22:131–304.
2. Elyse Phillips, Teresa W Wang, Corinne G. Husten, Catherine G. Corey, Benjamin J. Apelberg, Ahmed Jamal, et al. Tobacco Product Use Among Adults in United States. Centers for Disease Control and Prevention (CDC). 2015; 66(44):1209–1215.
3. U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. 2014 [accessed 2018 Feb 22].
4. Naik P, Cucullo L. Pathobiology of tobacco smoking and neurovascular disorders: untied strings and alternative products. *Fluids and Barriers of the CNS.* 2015 Dec;12(1):25.
5. World Health Organization. WHO global report on trends in prevalence of tobacco smoking 2000-2025. 2nd ed. Geneva: WHO. 2018.
6. World Health Organization. Guidelines for controlling and monitoring the tobacco epidemic. Geneva; World Health Organization. 2001: 2-7.
7. Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia Research Report on Basic Health (Riskesdas) Indonesia. Jakarta. 2018.
8. Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia Research Report on Basic Health (Riskesdas) Indonesia. Jakarta. 2013.
9. Jha P, Peto R. Global effects of smoking, of quitting, and of taxing tobacco. *N Engl J Med.* 2014;370:60–8
10. U S. Department of Health and Human Services. Health policy 2010 (Conference ed., 2 vols) Washington DC: URL: <http://www.cdc.gov/nchs>. Dated 25.5.2014
11. Islami F, Stoklosa M, Drope J, Jemal A. Global and regional patterns of tobacco smoking and tobacco control policies. *European urology focus.* 2015 Aug 1;1(1):3-16.

12. Centers for Disease Control and Prevention. Current Cigarette Smoking Among Adults—United States, 2016. *Morbidity and Mortality Weekly Report*. 2018;67(2):53-9.
13. Khand F, Shaikh SS, Ata MA, Shaikh SS. Evaluation of the effect of smoking on complete blood counts, serum C-reactive protein and magnesium levels in healthy adult male smokers. *J Pak Med Assoc*. 2015 Jan 1;65:59-61.
14. Shipa SA, Rana MM, Miah MF, Alam MJ, Mahmud MG. Effect of Intensity of Cigarette Smoking on Leukocytes among Adult Men and Women Smokers in Bangladesh. *Asia Pacific Journal of Medical Toxicology*. 2017;6(1):12-7.
15. Lakshmi A, Anandhi Lakshmanan GK, Saravanan A. Effect of intensity of cigarette smoking on haematological and lipid parameters. *Journal of clinical and diagnostic research: JCDR*. 2014 Jul;8(7):BC11.
16. Malenica M, Prnjavorac B, Bego T, Dujic T, Semiz S, Skrbo S, Gusic A, Hadzic A, Causevic A. Effect of Cigarette Smoking on Haematological Parameters in Healthy Population. *Medical Archives*. 2017 Apr;71(2):132.
17. Higuchi T, Omata F, Tsuchihashi K, Higashioka K, Koyamada R, Okada S. Current cigarette smoking is a reversible cause of elevated white blood cell count: Cross-sectional and longitudinal studies. *Preventive medicine reports*. 2016 Dec 1;4:417-22.
18. Smith MR, Kinmonth AL, Luben RN, Bingham S, Day NE, Wareham NJ, Welch A, Khaw KT. Smoking status and differential white cell count in men and women in the EPIC-Norfolk population. *Atherosclerosis*. 2003 Aug 1;169(2):331-7.
19. Fröhlich M, Sund M, Löwel H, Imhof A, Hoffmeister A, Koenig W. Independent association of various smoking characteristics with markers of systemic inflammation in men: results from a representative sample of the general population (MONICA Augsburg Survey 1994/95). *European heart journal*. 2003 Jul 1;24(14):1365-72.
20. Haider MJ, Rauf A. Smoking habits and their association with total leukocytes count among healthy men in Karachi, Pakistan. *World Appl. Sci. J*. 2010;11(6):669-73.
21. Rozi S, Butt ZA, Akhtar S. Correlates of cigarette smoking among male college students in Karachi, Pakistan. *BMC public Health*. 2007 Dec;7(1):312.
22. Kapoor D, Jones TH. Smoking and hormones in health and endocrine disorders. *European journal of endocrinology*. 2005 Apr 1;152(4):491-9.
23. Grimm RH, Neaton JD, Ludwig W. Prognostic importance of the white blood cell count for coronary, cancer, and all-cause mortality. *Jama*. 1985 Oct 11;254(14):1932-7.
24. Gitte RN. Effect of cigarette smoking on plasma fibrinogen and platelet count. *Asian Journal of Medical Sciences*. 2011; 2:181- 184.