The Relationship between Cholesterol Levels and Smoking Behavior among Active Smokers

by Farida Anwari ,

Submission date: 26-Sep-2022 10:03PM (UTC-0700)
Submission ID: 1910170202
File name: UAM-Farida_Anwari.docx (103.01K)
Word count: 3599
Character count: 19788

The Relationship between Cholesterol Levels and Smoking Behavior among Active Smokers

La Relación entre los Niveles de Colesterol y el Comportamiento de Fumar entre los Fumadores Activos

Farida Anwari[1a], Martina Kurnia Rohma[2a], Acivrida Mega Charisma[a], Iif Hanifa Nurrosyidah[3a], Arif Rahman Nurdianto[a], Galih Satrio Putra[b], Dimas Dimas[a]

ORCID ID: 0000-0002-3796-0932[1]
ORCID ID: 0000-0003-4883-9609[2]
ORCID ID: 0000-0003-4633-8181[3]

[a]Universitas Anwar Medika, Sidoarjo, East Java, Indonesia
[b]Universitas Negeri Malang, East Java, Indonesia

*Corresponding Author: Farida Anwari
E-mail: faridamph@gmail.com

SUMMARY

Introduction: Smoking behaviour is one of the factors that can cause serious and deadly diseases. Cigarette chemical content can reduce High-Density Lipoprotein (HDL) levels and increase Low-Density Lipoprotein (LDL) levels. It can cause fat metabolism disorders and are at risk for heart disease, cancer, and others. This study aimed to determine the relationship between cholesterol and smoking behaviour among active smokers.

Methods: This research is a cross-sectional research design. A sample of as many as 30 people was taken using a purposive sampling technique according to the inclusion and exclusion criteria that have been determined. The analytical method used is cross tabulation analysis and Spearman correlation analysis. The data used are total cholesterol level and smoking behaviour measured using the Brinkman index.

Results: The results of the analysis showed that there was an increase in cholesterol levels among active smokers with increasing age. This is due to an increase in the number of cigarettes consumed every day. Cholesterol levels have a positive correlation of 0,386 with smoking

behavior as measured by the Brinkman Index. This means that an increase in smoking behavior will be followed by an increase in cholesterol levels. The resulting significance value is 0,035 (P <0.05), which means that there is a significant relationship between cholesterol levels and smoking behavior.

Conclusion: Smoking is a bad habit that greatly affects total cholesterol levels in the blood. This habit should be avoided to reduce the factors that cause increased cholesterol levels in the blood that can trigger diseases such as cancer, heart disease, and the risk of death. Smokers with high smoking intensity tend to have higher total cholesterol levels.

Keywords: Active Smokers, Brinkman Index, Cholesterol, Smoking Behavior

RESUMEN

Introducción: El tabaquismo es uno de los factores que pueden causar enfermedades graves y mortales. El contenido químico del cigarrillo puede reducir los niveles de lipoproteína de alta densidad (HDL) y aumentar los niveles de lipoproteína de baja densidad (LDL). Puede causar trastornos del metabolismo de las grasas y corre el riesgo de sufrir enfermedades cardíacas, cáncer y otras. Este estudio tuvo como objetivo determinar la relación entre el colesterol y el hábito de fumar entre los fumadores activos.

Métodos: Esta investigación es un diseño de investigación transversal. Se tomó una muestra de hasta 30 personas mediante una técnica de muestreo intencional de acuerdo a los criterios de inclusión y exclusión que se hayan determinado. El método analítico utilizado es el análisis de tabulación cruzada y el análisis de correlación de Spearman. Los datos utilizados son el nivel de colesterol total y el tabaquismo medidos mediante el índice de Brinkman.

Resultados: Los resultados del análisis mostraron que hubo un aumento en los niveles de colesterol entre los fumadores activos con el aumento de la edad. Esto se debe a un aumento en la cantidad de cigarrillos consumidos todos los días. Los niveles de colesterol tienen una correlación positiva de 0,386 con el hábito de fumar medido por el índice de Brinkman. Esto significa que un aumento en el hábito de fumar será seguido por un aumento en los niveles de colesterol. El valor de significación resultante es de 0,035 (P <0,05), lo que significa que existe una relación significativa entre los niveles de colesterol y la conducta tabáquica.

Conclusión: Fumar es un mal hábito que afecta en gran medida los niveles de colesterol total en sangre. Este hábito debe evitarse para reducir los factores que provocan el aumento de los niveles de colesterol en la sangre que pueden desencadenar enfermedades como el cáncer, las

enfermedades del corazón y el riesgo de muerte. Los fumadores con una alta intensidad de tabaquismo tienden a tener niveles más altos de colesterol total.

Palabras Clave: Fumadores Activos, Índice De Brinkman, Colesterol, Conducta Tabáquica

INTRODUCTION

The fact that cigarettes are legalized in almost every country in the world cannot be denied even though it has a negative impact, it can encourage harmful habits that affect active smokers and those around them. According to the World Health Organization (WHO), about six million people die each year from smoking-related complications. Even more than 600,000 passive smokers are exposed to the same disease due to the dangers of cigarette smoke (1). Furthermore, the direct impact of smoking is indicated by an increased risk of death from diseases such as cancer, respiratory diseases (2–4), decreased mental health, and increased drug use (1,5–7). Meanwhile, the indirect impact can be seen in the harmful effects of cigarette smoke on passive smokers (8,9).

Indonesia's adult smokers have increased in the last ten years. The results of the ministry of health's 2021 survey through the Global Adult Tobacco Survey (GATS) showed that the number of smokers in 2021 reached 69.1 million, an increase of 8.8 million smokers compared to 2011 data. Another worrying finding also shows that socio-economically, household spending on cigarette products is even higher than the figure used for nutritious food, where the average spending on cigarettes reaches 382,091 thousand rupiahs per month. The results of the GATS survey in 2021 also show an increase in the prevalence of electronic smokers up to 10 times, from 0.3% in 2011 to 3% in 2021. In addition, the prevalence of passive smoking has also increased to 120 million people (10).

Smoking behaviour has been shown to change lipoprotein levels. For example, Komiya et al. in 2006 on male smokers in Japan found that smokers with a Brinkman index of about 554 will have a 1.657 times higher probability of having abnormal triglyceride levels (11). Kuzuya et al. in 2006 also found research results that smokers will have lower levels of High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL), lower total cholesterol levels, and higher triglyceride levels when compared to nonsmokers (12). In addition, nicotine and other particles in cigarettes are known to cause an increase in the secretion of catecholamines, cortisol, and growth hormone, resulting in the release of free fatty acids, which in turn can affect LDL concentrations and contribute to a decrease in HDL (13–15).

Smoking behaviour is also one of the factors that can increase cholesterol. The chemical content in cigarettes can reduce HDL levels and increase LDL levels. This causes fat from the liver to be carried back to the body's tissues (16). Smoking habits are also at high risk for atherosclerosis, coronary artery disease and peripheral vascular disease. The possibility of blood clots, impaired arterial wall integrity, and changes in blood lipids and protein concentrations are a consequence of smoking because smoking can increase the tendency of blood cells to clot and then stick to the inner lining of blood vessels.

Furthermore, this can increase the risk of platelet clumping, which usually occurs in areas affected by the presence of atherosclerosis (17). In addition, nicotine in cigarettes can cause narrowing of the end of the bronchioles in the lungs, thereby increasing the resistance to air entering the lungs. As a result of this resistance, it encourages an increase in haemoglobin levels to meet the oxygen needs in the body. According to Majid 2017, an increase in haemoglobin levels can ultimately spur viscosity in the blood, causing impaired blood flow, obstruction of oxygen supply and distribution of food essences, and disturbances in fat metabolism in the body (18).

The results of a survey conducted by researchers in Wates Tanjung Village, Gresik Regency, show that the development of the number of coffee shops is thought to be related to the increasing number of active smokers in the village. The researchers' observations also showed that more than 15 active smokers visited most coffee shops in one observation session. In addition, pre-analytical results conducted on 30 smokers showed that most of the samples had cholesterol in the high category. This phenomenon is interesting concerning the theoretical study of the relationship between cholesterol levels and smoking behaviour.

METHODS

This quantitative descriptive study is used to determine the relationship between cholesterol levels and smoking behaviour. The population used in this study is active smokers in Gresik Regency, Indonesia. The research sample used purposive sampling following the predetermined inclusion and exclusion criteria, totalling 30 respondents. The inclusion criteria used were male smokers aged over 20 years and willing to fill out informed consent. Meanwhile, the exclusion criteria in this study were respondents who were not willing to fill out informed consent. This research was carried out from March-June 2021. Laboratory testing was carried out at the integrated chemistry laboratory of Anwar Medika University. The data used in this study is the result of cholesterol examination in capillary blood samples. Other

primary data are the length of smoking and the number of cigarettes consumed in one day. The data is then used in calculating the Brinkman Index to determine the level of smoking behaviour of the subjects studied. The Brinkman Index is the product of the average number of cigarettes consumed daily and the length of smoking in one year. The level of smoking behaviour is based on the Brinkman Index, namely: (1) Light smokers, namely with an interval score of 0-199, (2) Moderate smokers, namely with an interval score of 200-599, (3) Heavy smokers, namely with a score above or equal to 600 (Yazdanpanah et al., 2015). The quantitative method used is descriptive analysis through cross-tabulation and Spearman correlation analysis to determine the close relationship between cholesterol levels and smoking behaviour as measured by the Brinkman Index.

RESULTS

Table 1

Cross Tabulation of Age Groups with Cholesterol Levels, Length of Smoking, Number of Cigarettes Consumed, and Brinkman Index (n=30)

Age Group	Cholesterol			Smoking Period (Years)				Many Cigarettes Consumed (Stems)			Brinkman Index (Smoker)		
	Normal n (%)	High n (%)	Total n (%)	1-10 n (%)	11-20 n (%)	>20 n (%)	Total n (%)	1-10 n (%)	11-20 n (%)	Total n (%)	Light n (%)	Moderate n (%)	Total n (%)
Late Teen	0 (0)	1 (100)	1 (100)	1 (100)	0 (0)	0 (0)	1 (100)	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)	1 (100)
Early Adult	4 (50)	4 (50)	8 (100)	5 (62,5)	3 (37,5)	0 (0)	8 (100)	8 (100)	0 (0)	8 (0)	8 (100)	0 (0)	8 (100)
Late Adult	6 (75)	2 (25)	8 (100)	1 (12,5)	6 (75)	1 (12,5)	8 (100)	8 (100)	0 (0)	8 (0)	8 (100)	0 (0)	8 (100)
Early Elderly	2 (40)	3 (60)	5 (100)	1 (20)	2 (40)	2 (40)	5 (100)	3 (60)	2 (40)	5 (100)	3 (60)	2 (40)	5 (100)
Late Elderly	0 (0)	4 (100)	4 (100)	0 (0)	1 (25)	3 (75)	4 (100)	1 (25)	3 (75)	4 (100)	1 (25)	3 (75)	4 (100)
Seniors	0 (0)	4 (100)	4 (100)	0 (0)	1 (25)	3 (75)	4 (100)	0 (0)	4 (100)	4 (100)	0 (0)	4 (100)	4 (100)
Total	12	18	30	8	13	9	30	21	9	30	21	9	30

	(40)	(60)	(100)	(26,7)	(43,3)	(30)	(100)	(70)	(30)	(100)	(70)	(30)	(100)

Table 1 shows that the age group of early and late adulthood dominates the research subjects, as many as 8 out of 30 active smokers studied. These results confirm that most active smokers in Wates Tanjung Village, Gresik Regency are between 32-45 years old, including adulthood. Data on the total number of subjects based on cholesterol levels showed that most of the smokers studied had high cholesterol, as many as 18 people (60%) of the total subjects. Smokers with high cholesterol are relatively dominated by early adulthood, late elderly, and seniors, each of which is 4 people. In general, the distribution of age groups based on cholesterol levels tends to show that the higher the age of smokers in Wates Tanjung Village, Gresik Regency, the higher their cholesterol level. Table 1 also shows that for most smokers studied, as many as 13 people (43.3%) out of 30 had smoked for 11-20 years. The distribution of age groups based on the length of smoking tends to show an increase in the length of smoking with increasing age.

Most of the smokers studied were 21 people (70%) consuming 1-10 cigarettes per day, while the remaining 9 (30%) consumed 11-20 cigarettes per day. Based on the percentage in each age group, it can be seen that the late teens dominate among smokers who consume 1-10 cigarettes per day to late adults with a total of 17 smokers. Furthermore, smokers who consume 11-20 cigarettes per day are dominated by the elderly, as many as 4 people. In general, the distribution of age groups based on the number of cigarettes consumed per day tends to show an increase in the number of cigarettes consumed along with the increasing age of smokers. Table 1 also shows that most of the smokers studied, namely 21 people (70%), belong to the category of light smokers, which are 1-10 cigarettes per day, while the remaining 9 people (30%) belong to the category of heavy smokers. Based on the percentage in each age group, it can be seen that the late teens dominate among light smokers to late adults, with a total of 17 smokers. Furthermore, heavy smokers are dominated by the elderly group, as many as 4 people. Therefore, the distribution of age groups based on the category of smokers according to the Brinkman Index tends to show an increase in smoking behaviour along with the age of smokers in Wates Tanjung Village, Gresik Regency.

Table 2

Correlation Between Cholesterol and Brinkman Index

Spearman's Correlation	Results
Correlation coefficient	0,386
Significance (P-Value)	0,035
n	30

The analysis results in Table 2 show that cholesterol has a positive correlation of 0.386 with smoking behaviour as measured by the Brinkman Index. This shows that there is a direct relationship between cholesterol and smoking behaviour, where an increase in smoking behaviour will be followed by an increase in cholesterol levels. The resulting significance value is 0.035 ($P < 0.05$), which means a significant relationship between cholesterol levels and smoking behaviour.

DISCUSSION

Smoking behaviour is one of the factors that can increase cholesterol. The chemical content in cigarettes can increase the risk of blood clots and can ultimately affect cholesterol levels. In addition, long-term nicotine consumption, including the number of cigarettes consumed, can increase LDL cholesterol and lower HDL cholesterol. Nicotine is also believed to increase free fatty acids, producing excessive LDL cholesterol. Cholesterol levels tend to increase with age. Therefore, steps are needed to maintain health levels at a young age to prevent excessive increases in cholesterol levels. This is important because uncontrolled cholesterol levels can be challenging to treat for years. In addition, fat accumulation in the blood with age and an unhealthy diet is at risk of increasing cholesterol levels in the blood.

The data processing results using Spearman correlation analysis showed that cholesterol significantly correlated with smoking behaviour. This shows that an increase will follow the higher smoking behaviour in cholesterol levels. Cigarettes contain chemicals that can lower HDL and increase LDL (16). This causes fat from the liver to be brought back to the body tissues so that it can increase cholesterol. In addition, according to Prasetyorini 2018, nicotine in cigarettes can also trigger an increase in cholesterol levels so that cholesterol disorders occur in the body (19). Nicotine can worsen blood lipid or cholesterol profile. Nicotine, as the main component of cigarettes, can increase the secretion of catecholamines so that lipolysis

increases. According to Alima et al. (2018), increased lipolysis will cause HDL to decrease while triglyceride, cholesterol, and VLDL levels increase (20). In addition, the release of catecholamines will activate adenyl cyclase in adipose tissue (21). This leads to increased lipolysis and the release of free fatty acids. In addition, increased levels of catecholamines can cause insulin release in the blood to increase, so that lipoprotein lipase activity decreases. This condition can further increase triglyceride and total cholesterol levels. The results of this study support previous research, which generally concludes that smoking behaviour is related to cholesterol levels in the blood (21–23).

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that there is a significant relationship between cholesterol and smoking behaviour. Smokers with higher smoking intensity tend to have higher total cholesterol levels. Smoking is a bad habit that greatly affects total cholesterol levels in the blood, so it is highly recommended to avoid and reduce cigarette consumption to reduce the factors that cause increased cholesterol levels that can trigger diseases such as cancer, heart disease, and the risk of death. However, this study has limitations on exclusion and inclusion criteria, so further exploration is needed, for example, by adding nutritional status to obtain research results that can be generalized to other research objects. In addition, this study is limited to the total cholesterol response, so further research should be carried out on the relationship between smoking behaviour and levels of each type of cholesterol in the blood.

REFERENCES

1. Adames CP, Salamanca MV. Psychophysiological Bases of smokers' Classification System Based on the Amazing Reflection of Tobacco-Related Rates. Univ Psychol. 2020;19:2.
2. Roemer R, Taylor A, Lariviere J. Origins of the WHO framework convention on tobacco control. Am J Public Health. 2005;95(6):936–8.
3. Safitri W, Martini S, Artanti KD, Li C-Y. Smoking from a younger age is the dominant factor in the incidence of chronic obstructive pulmonary disease: Case-control study. Int J Environ Res Public Health. 2021;18(11):6047.
4. Artanti KD, Martini S, Widati S, Megatsari H. Influence of Passive Smoking on

Smoking-Attributable Disease. Stroke. 2021;103:37–8.

5. Sinaga BYM, Siregar Y, Amin M, Sarumpaet S. Effect of smoking and alcohol consumption on pulmonary tuberculosis among Batak ethnic population in Medan, Indonesia. In: L. W, D. W, W. M, J.K. B, P.C. E, M. de J, et al., editors. 1st International Conference on Tropical Medicine and Infectious Diseases, ICTROMI 2017, in conjunction with The 23rd National Congress of the Indonesian Society of Tropical and Infectious Diseases Consultant, ISTIC 2017 and the 18th Annual Meeting of Int [Internet]. Department of Pulmonology and Respiratory Medicine, Adam Malik General Hospital, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia: Institute of Physics Publishing; 2018. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85045614309&doi=10.1088%2F1755-1315%2F125%2F1%2F012139&partnerID=40&md5=852b832e9aab069aa6450792389df1da
6. Zairina E. Maternal passive smoking and the risk of developing wheeze in children: How should we deal with it? Eur Respir J [Internet]. 2016;48(1):3–5. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84977126684&doi=10.1183%2F13993003.01046-2016&partnerID=40&md5=070c7782eb9433d7a8f678c61e212c63
7. Kristianto YY, Bakar A, Yasmara D. Factors Affecting The Smoking Behavior Of 17–25 Year-Old Teenagers In Urban Areas'. Indian J Public Heal Res Dev Prof(Dr) Rk Sharma. 2019;10(8):1241–6.
8. American Addiction Centers. Addiction in Indonesia [Internet]. Addiction Centre. Addiction Center supports SAMHSA; 2021. Available from: https://www.addictioncenter.com/addiction/addiction-in-indonesia/
9. Amanda A, Hakim ATA, Febriyanti SE, Alwie EF, Rusyda H, Juliana N V, et al. Relationship between sleep disorders and passive smokers in adolescent ages. Int J Pharm Res [Internet]. 2020;12(2):2109–16. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85090224129&doi=10.31838%2Fijpr%2F2020.12.02.284&partnerID=40&md5=3f6c1d4f04098298e5ac2fb7f5077f76
10. Kemenkes RI. Temuan Survei GATS : Perokok Dewasa di Indonesia Naik 10 Tahun Terakhir [Internet]. Kementerian kesehatan Republik Indonesia; 2022. p. 9–11. Available from:

https://sehatnegeriku.kemkes.go.id/baca/umum/20220601/4440021/temuan-survei-gats-perokok-dewasa-di-indonesia-naik-10-tahun-terakhir/

11. Komiya H, Mori Y, Yokose T, Tajima N. Smoking as a risk factor for visceral fat accumulation in Japanese men. Tohoku J Exp Med. 2006;208(2):123–32.
12. Kuzuya M, Ando F, Iguchi A, Shimokata H. Effect of smoking habit on age-related changes in serum lipids: a cross-sectional and longitudinal analysis in a large Japanese cohort. Atherosclerosis. 2006;185(1):183–90.
13. Nakamura M, Yamamoto Y, Imaoka W, Kuroshima T, Toragai R, Ito Y, et al. Relationships between smoking status, cardiovascular risk factors, and lipoproteins in a large Japanese population. J Atheroscler Thromb. 2021;28(9):942–53.
14. Febrina K, Fayasari A. Fiber and Fat Intake, Smoking Habits, Body Mass Index and Central Obesity and Its Association with Lipid Profile of Man in Gatot Subroto Hospital Heart Polyclinic. Media Gizi Indones. 2020;15(3):205–13.
15. As' ari H. Decrease of LDL Cholesterol Through The Increase of HDL Cholesterol by Administering Garcinia mangostana L. Peel Extract in White Mice. Folia Medica Indones. 2021;57(4):298–302.
16. Sanhia AM, Pangemanan DHC, Engka JNA. Gambaran kadar kolesterol low density lipoprotein (ldl) pada masyarakat perokok di pesisir pantai. e-Biomedik. 2015;3(1).
17. Devaranavadagi BB, Aski BS, Kashinath RT, Hundekari IA. Effect of cigarette smoking on blood lipids–A study in Belgaum, northern Karnataka, India. Glob J Med Res. 2012;12((6)):1–3.
18. Majid YA. Perbedaan Kadar Hemoglobin dan Kolesterol pada Masyarakat Perokok dan Tidak Merokok di RW 07 Kelurahan Tangga Takat Wilayah Kerja Puskesmas Taman Bacaan Palembang Tahun 2017. Masker Med. 2017;5(2):326–35.
19. Prasetyorini T, Permata PPK. Smoking Habit Effect on Total Cholesterol Levels. Asian J Appl Sci. 2018;6(5).
20. Alima S, Kusdinar G, Rokim MA. Hubungan Antara Kadar Kolesterol Total Dengan High Sensitivity C-Reactive Protein (hsCRP) Pada Perokok Aktif Di Dusun Gambirejo RW 03 Desa Warujayeng. In: Prosiding SINTESIS (Seminar Nasional Sains, Teknologi dan Analisis). 2018.
21. Minarti NS, Ketaren I, Hadi DP. Hubungan Antara Perilaku Merokok Terhadap Kadar Kolesterol Low Density Lipoprotein (LDL) Serum Pada Pekerja CV. Julian Pratama Pontianak UNTAN. 2014;1(1):1–17.
22. Anggraini DI, Nabillah LF. Activity Test of Suji Leaf Extract (Dracaena angustifolia

Roxb.) on in vitro cholesterol lowering. J Kim Sains dan Apl. 2018;21(2):54.

23. Fahmawati D. Perbedaan Tingkat Konsumsi dan Kadar Kolesterol Darah antara Perokok dan Non Perokok. Indones J Public Heal. 2019;14(2):243–51.

The Relationship between Cholesterol Levels and Smoking Behavior among Active Smokers

ORIGINALITY REPORT

9%	5%	7%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Tri Prasetyorini, Putu Puja Kasih Permata. "Smoking Habit Effect on Total Cholesterol Levels", Asian Journal of Applied Sciences, 2018 Publication	3%
2	dokumen.pub Internet Source	1%
3	S A Santosa, A Susanto, N Hindratiningrum. "The Effect of Non Genetic Factors on Milk Production in BBPTU HPT Baturraden Central Java", IOP Conference Series: Earth and Environmental Science, 2019 Publication	1%
4	amrsjournals.com Internet Source	1%
5	Ram B Jain, Alan Ducatman. "Associations between smoking and lipid/lipoprotein concentrations among US adults aged ≥20 years", Journal of Circulating Biomarkers, 2018 Publication	1%

6	www.aclr.com.es Internet Source	1 %
7	Ratna Wilis, Dea Maulizani. "RELATIONSHIP OF SNACKING PATTERNS WITH DENTAL CARIES IN SDN 1 JEUMPET STUDENTS, ACEH BESAR REGENCY IN 2022", DHeJA: Dental Health Journal of Aceh, 2022 Publication	1 %
8	media.neliti.com Internet Source	1 %
9	repositorio.unal.edu.co Internet Source	1 %

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	On		