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RELATIONSHIP BETWEEN THE LEVEL OF CIGARETTE SMOKE EXPOSURE AND SERUM TRIGLYCERIDE LEVELS AMONG STUDENTS

HUBUNGAN TINGKAT PAPARAN ASAP ROKOK DENGAN KADAR TRIGLISERIDA SERUM PADA MAHASISWA

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Abstract

Cigarette smoke exposure is a significant health threat that may trigger lipid metabolism disorders, particularly by increasing serum triglyceride levels through nicotine-stimulated production of Very Low-Density Lipoprotein (VLDL). This study aimed to analyze the correlation between cigarette smoke exposure levels and serum triglyceride levels in students to identify cardiovascular risks among the productive age group. This study employed an analytical observational design with a cross-sectional approach. A total of 83 participants were selected using a purposive sampling technique. Participants' levels of exposure to cigarette smoke were assessed, and their serum triglyceride levels were analyzed using the GPO-PAP enzymatic method. Statistical analysis was performed to determine the significance of the association between smoke exposure levels and serum triglyceride levels. The findings indicate no statistically significant correlation between the level of cigarette smoke exposure and serum triglyceride levels among the study participants (Spearman's rho, $p = 0.882$). Most participants were classified as having mild cigarette smoke exposure and exhibited serum triglyceride levels within the normal reference range. Furthermore, the relatively homogeneous exposure levels and the young age of the participants may have contributed to the limited variability observed in the study. In conclusion, mild cigarette smoke exposure was not significantly associated with serum triglyceride levels among young adults.

Keywords : Young Adult, Serum Triglyceride Levels, Cigarette Smoke Exposure.

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Abstrak

Paparan asap rokok merupakan ancaman kesehatan yang signifikan yang dapat memicu gangguan metabolisme lipid, khususnya dengan meningkatkan kadar trigliserida serum melalui produksi Lipoprotein Densitas Sangat Rendah (VLDL) yang dirangsang oleh nikotin. Studi ini bertujuan untuk menganalisis korelasi antara tingkat paparan asap rokok dan kadar trigliserida serum pada mahasiswa untuk mengidentifikasi risiko kardiovaskular di antara kelompok usia produktif. Studi ini menggunakan desain observasional analitik dengan pendekatan cross-sectional. Sebanyak 83 partisipan dipilih menggunakan teknik purposive sampling. Tingkat paparan asap rokok partisipan dinilai, dan kadar trigliserida serum mereka dianalisis menggunakan metode enzimatik GPO-PAP. Analisis statistik dilakukan untuk menentukan signifikansi hubungan antara tingkat paparan asap rokok dan kadar trigliserida serum. Hasil penelitian menunjukkan tidak ada korelasi yang signifikan secara statistik antara tingkat paparan asap rokok dan kadar trigliserida serum di antara partisipan penelitian (rho Spearman, p = 0,882). Sebagian besar partisipan diklasifikasikan sebagai memiliki paparan asap rokok ringan dan menunjukkan kadar trigliserida serum dalam kisaran referensi normal. Selain itu, tingkat paparan yang relatif homogen dan usia muda para peserta mungkin berkontribusi pada variabilitas terbatas yang diamati dalam penelitian ini. Kesimpulannya, paparan asap rokok ringan tidak secara signifikan terkait dengan kadar trigliserida serum di kalangan dewasa muda.

Kata Kunci : Dewasa Muda, Kadar Trigliserida Serum, Paparan Asap Rokok.

1. INTRODUCTION

According to the Global Adult Tobacco Survey (GATS) 2021, approximately 34.5% of the Indonesian population aged 15 years and older, equivalent to 70.2 million individuals, were current users of tobacco products, including cigarettes, smokeless tobacco, and heated tobacco products. Among these users, the prevalence of tobacco use was substantially higher in males (65.5%) than in females (3.3%). *Kretek* cigarettes were the most commonly consumed tobacco product, with 28.6% of the Indonesian population (approximately 58.8 million individuals) identified as active *kretek* smokers (World Health Organization (WHO), 2022). Although tobacco is not considered a basic human necessity, cigarette consumption remains widespread and is often perceived as an essential part of daily life by many individuals. Various factors contribute to smoking behavior, including lifestyle, peer influence, habitual smoking, stress relief, and the desire to enhance self-confidence or social acceptance (Issalillah et al., 2021).

Smoking among students remains a significant public health concern and is influenced by multiple factors, including social and family environments (Anwar et al., 2025). The harmful effects of tobacco smoking are not limited to active smokers but also extend to individuals who are involuntarily exposed to secondhand smoke. Although the health risks experienced by passive smokers are generally lower than those of active smokers, they still have a higher risk of developing cardiovascular diseases than individuals with no exposure to tobacco smoke. This increased risk is attributed to the absorption of toxic chemicals from cigarette smoke, which disrupt lipid metabolism, leading to elevated levels of low-density lipoprotein (LDL) cholesterol and triglycerides, along with reduced levels of high-density lipoprotein cholesterol (HDL-C) (Arief et al., 2023).

University students predominantly belong to the young adult population within the productive age group (Yuliana et al., 2023). According to the World Health Organization (WHO), the productive age population comprises individuals aged 15–59 years, whereas Statistics Indonesia (Badan Pusat Statistik, BPS) extends this classification to individuals aged 15–64 years. Despite being generally considered healthy, young adults often engage in behaviors that increase their risk of developing non-communicable diseases and tend to underestimate the importance of preventive health measures, resulting in delayed detection of potential health problems (Juliana et al., 2024).

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Under normal physiological conditions, triglycerides function as the body's major form of energy storage. Nevertheless, hypertriglyceridemia (TG ≥150 mg/dL) reflects an increased burden of triglyceride-rich lipoproteins, including very low-density lipoproteins (VLDL) and remnant lipoprotein particles. These lipoproteins are recognized as atherogenic because they can penetrate the arterial wall, promote lipid accumulation, and contribute to the development of atherosclerotic cardiovascular disease (Akivis et al., 2024).

Triglyceride metabolism occurs through two major pathways: the exogenous and endogenous pathways. In the exogenous pathway, dietary triglycerides are absorbed in the small intestine and incorporated into chylomicrons. These chylomicrons enter the circulation, where their triglyceride content is hydrolyzed by the enzyme lipoprotein lipase (LPL), producing free fatty acids and chylomicron remnants. The released free fatty acids are subsequently either re-esterified and stored as triglycerides in adipose tissue and skeletal muscle or utilized as an energy source through oxidation. In the endogenous pathway, triglycerides synthesized in the liver are packaged into very low-density lipoproteins (VLDL) and secreted into the bloodstream. Circulating VLDL particles are further hydrolyzed by lipoprotein lipase, generating progressively smaller lipoprotein particles, including intermediate-density lipoproteins (IDL) and low-density lipoproteins (LDL) (Salim et al., 2021).

Elevated triglyceride levels in individuals exposed to cigarette smoke are primarily attributed to nicotine, one of the major bioactive compounds in tobacco. Nicotine exerts profound effects on the cardiovascular system and plays a critical role in the initiation and progression of cardiovascular disease (Georgakopoulou et al., 2024). It stimulates the sympathetic nervous system, resulting in increased heart rate, elevated blood pressure, and peripheral vasoconstriction. In addition, nicotine promotes the release of catecholamines from the adrenal medulla through sympathetic activation. Elevated catecholamine levels enhance lipolysis in adipose tissue, leading to an increased release of free fatty acids into the circulation. (Riantika & Aliviameita, 2025).

Several studies have investigated the association between cigarette smoke exposure and serum triglyceride levels; however, the findings remain inconsistent. A meta-analysis conducted by Plas et al. (2023) reported that active smokers generally exhibited higher triglyceride levels than non-smokers. In contrast, studies by Nurpalah et al. (2021) and Athala et al. (2024) found that most participants had triglyceride levels within the normal range and reported no statistically significant differences in triglyceride concentrations according to smoking exposure status.

Although the association between cigarette smoke exposure and serum triglyceride levels has been extensively investigated, the available evidence remains inconsistent. Furthermore, most previous studies have categorized participants simply as active smokers, passive smokers, or non-smokers, whereas few have assessed the level of cigarette smoke exposure by integrating the duration, frequency, and intensity of exposure. Such an approach may provide a more comprehensive assessment of an individual's cumulative exposure to cigarette smoke. In addition, limited evidence is available regarding the association between the level of cigarette smoke exposure and serum triglyceride levels among students, a population that predominantly belongs to the productive-age group and is often characterized by suboptimal health awareness and engagement in preventive health behaviors. Consequently, this population can be at increased risk of developing health problems that could otherwise be identified at an earlier stage.

Therefore, this study was conducted to investigate the association between the level of cigarette smoke exposure, assessed using a classification based on exposure duration, frequency, intensity, and serum triglyceride levels among students. Based on the background above, this study was aimed to determine “Relationship Between the Level of Cigarette Smoke Exposure and Serum Triglyceride Levels Among Students”

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2. RESEARCH METHOD

This study employed a quantitative approach using an analytical observational design with a cross-sectional framework. Data were collected by assessing the level of cigarette smoke exposure using a structured questionnaire and measuring serum triglyceride levels through laboratory analysis. The study population comprised undergraduate students, with a total of 132 students meeting the eligibility criteria for the study.

The sampling technique employed in this study was purposive sampling, a non-probability method, resulting in a total of 83 respondents who met the inclusion criteria participated in this study. The independent variable was the level of cigarette smoke exposure, while the dependent variable was serum triglyceride level. Potential confounding variables included age, sex, high-fat food consumption, physical activity, alcohol consumption, and medical history.

Data on cigarette smoke exposure were collected using a questionnaire distributed online through Google Forms. The questionnaire assessed three exposure components, namely exposure duration, exposure frequency, and exposure intensity. Each component was scored, and the total score was used to classify respondents into three categories of cigarette smoke exposure: mild, moderate, and severe based on class interval categorization. Prior to data collection, the questionnaire underwent validity testing to ensure the quality of the measurement instrument.

Serum triglyceride levels were determined using venous blood samples collected from each respondent. Laboratory examinations were performed at the Clinical Pathology Laboratory of the Bachelor of Applied Medical Laboratory Technology Program in Politeknik Indonusa Surakarta. Serum triglyceride concentrations were measured using the enzymatic Glycerol-3-Phosphate Oxidase–Phenol Aminophenazone (GPO-PAP) method with a semi-automatic photometer. Triglyceride levels below 150 mg/dL were classified as normal.

Descriptive analysis was performed to summarize respondent's characteristics on cigarette smoke exposure levels and serum triglyceride levels. The normality of numerical data was evaluated using the Kolmogorov–Smirnov test. Since the variables were not normally distributed and the cigarette smoke exposure variable was measured on an ordinal scale, the relationship between cigarette smoke exposure level and serum triglyceride level was analyzed using Spearman's rank correlation test. Statistical analyses were performed using IBM SPSS Statistics 25th version, and statistical significance was determined at a p-value of <0.05.

This study received ethical approval from the Health Research Ethics Committee of Universitas Muhammadiyah Purwokerto under approval number KEPK/UMP/272/V/2026 and written informed consent was obtained from all participants before data collection.

3. RESULT AND DISCCUSSION

1. Distribution of Respondents

The results of the study show the distribution of respondents by age and gender is displayed in the form of frequency and percentage, as shown in the following table:

Table 1. Distribution of Respondents by Age and Gender

Variable		Frequency (n)	Percentage (%)
Sex	Female	77	92.8
	Male	6	7.2
Total		**83**	**100.0**
Age	18	5	6.0
	19	34	41.2
	20	20	24.1
	21	15	18.1
	22	7	8.4
	23	1	1.2
	24	1	1.2

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Total	**83**	**100.0**

Source: Primary Data, 2026

The results of the study, which showed that the distribution of respondents by gender revealed that out of a total of 83 respondents, the majority were female, with 77 respondents (92.8%), and the lowest number were male, with 6 respondents (7.2%). This indicates that female respondents outnumbered male respondents. While the results of the study revealed that the highest age group was the 19-year-old respondents, with a total of 34 people (41.0%). Furthermore, there were 20 people aged 20 years (24.1%), 15 people aged 21 years (18.1%), 7 people aged 22 years (8.4%), and 5 people aged 18 years (6.0%). In addition, there was one person each aged 23 and 24 years (1.2%) respectively. So it can be said that most of the respondents in this study are between 19 and 21 years old.

2. Distribution of Cigarette Smoke Exposure Levels and Triglyceride Levels

The results of the study show the distribution of cigarette smoke exposure on students is displayed in the form of frequency and percentage, as shown in the following table:

Table 2. Distribution of Cigarette Smoke Exposure Levels

Variable	Frequency (n)	Percentage (%)
Cigarette Smoke Exposure		
Mild	61	73.5
Moderate	15	18.1
High	7	8.4
Total	**83**	**100.0**
Serum Triglyceride Levels		
<150 mg/dL	78	94.0
≥150 mg/dL	5	6.0
Total	**83**	**100.0**

Source: Primary Data, 2026

The results of the study show that the distribution of respondents by its cigarette smoke exposure divided into 3 different categories, dominated by 61 respondents (73.5%) had a mild exposure, followed by moderate exposure with 15 respondents (18.1%), and 7 (8.4%) respondents had a high level of exposure to cigarette smoke.

3. Distribution of Serum Triglyceride Levels

A descriptive analysis for serum triglyceride levels, including the mean, median, standard deviation (SD), minimum, and maximum values, are presented in Table 4.3 below:

Table 3. Distribution of Serum Triglyceride Levels

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Triglyceride	79.64	74.06	40.723	13	272

Source: Primary Data, 2026

The mean value of serum triglyceride level among the respondents was 79.64 mg/dL, with a median value of 74.06 mg/dL. The standard deviation (SD) of 40.723 mg/dL indicates substantial inter-individual variability in serum triglyceride levels. Serum triglyceride levels ranged from 13 mg/dL to 272 mg/dL. Despite this variability, the average serum triglyceride level was within the normal reference range, although several participants presented with elevated triglyceride concentrations.

4. Correlation Test Result

Table 4. Correlation Test Result

Spearman's rho		Serum Triglyceride	Cigarette Smoke Exposure Level
Serum Triglyceride	Correlation Coefficient	1.000	-.017
	Sig. (2-tailed)	.	.882
	N	83	83
Cigarette Smoke	Correlation Coefficient	-.017	1.000

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Exposure Level	Sig. (2-tailed)	.882	.
	N	83	83

Source: Primary Data, 2026

Spearman's rank correlation analysis demonstrated no statistically significant association between the level of cigarette smoke exposure and serum triglyceride levels ($\rho = -0.017$, $p = 0.882$). The correlation coefficient indicated a very weak negative relationship, while the non-significant *p*-value suggests that variations in cigarette smoke exposure were not associated with changes in serum triglyceride concentrations among the study participants.

Although cigarette smoke has been recognized as a major risk factor for lipid metabolism disorders, the findings of this study suggest that the level of smoke exposure appears to have been insufficient in serum triglyceride concentrations. This interpretation is supported by the distribution of the study population, in which most participants were classified as having mild cigarette smoke exposure (73.5%) and exhibited serum triglyceride levels within the normal reference range (94.0%). These findings indicate that, among young adults, relatively low levels of cigarette smoke exposure may not yet lead to measurable disturbances in triglyceride metabolism.

The absence of a significant association observed in this study can be explained by the underlying biological response to cigarette smoke exposure. Cigarette smoke contains thousands of toxic compounds, including nicotine and reactive oxygen species (ROS), which are known to induce oxidative stress and disrupt lipid metabolism. Nicotine stimulates the sympathetic nervous system, leading to increased catecholamine secretion that enhances lipolysis in adipose tissue and promotes the release of free fatty acids (FFAs) into the circulation. Excess FFAs are subsequently transported to the liver, where they serve as substrates for VLDL synthesis, thereby increasing circulating triglyceride concentrations.

However, these metabolic alterations are generally observed following prolonged or high-intensity cigarette smoke exposure, which induces persistent oxidative stress and sustained disruption of lipid metabolism. In the present study, the majority of participants were classified as having mild cigarette smoke exposure, suggesting that the cumulative exposure may have been insufficient to induce substantial oxidative stress or metabolic alterations capable of affecting serum triglyceride levels. Furthermore, as the study population consisted predominantly of young adults, endogenous antioxidant defense mechanisms likely remained effective in maintaining the balance between oxidant production and antioxidant defenses, thereby minimizing oxidative damage and preserving normal lipid metabolism.

The findings of this study are consistent with those reported by Nurpalah et al. (2021) and Athala et al. (2024), which also found that cigarette smoke exposure was not significantly associated with serum triglyceride levels and that most participants had triglyceride concentrations within the normal reference range. These similarities may be attributed to the comparable characteristics of the study populations, particularly the predominance of young and generally healthy individuals with relatively low levels of cigarette smoke exposure.

In contrast, the findings differ from those reported by Plas et al. (2023), whose meta-analysis demonstrated significantly higher triglyceride levels among active smokers than non-smokers. This discrepancy can be explained by differences in participant characteristics, smoking status, cumulative exposure, and smoking intensity. Unlike the populations included in the meta-analysis, most participants in the present study experienced only mild cigarette smoke exposure, which may have been insufficient to induce persistent oxidative stress and lipid metabolic disturbances.

The present findings suggest that mild cigarette smoke exposure among young adults may not be sufficient to produce measurable alterations in serum triglyceride levels. However, this should not be interpreted as evidence that cigarette smoke exposure is harmless, as prolonged exposure has been shown to contribute to oxidative stress, endothelial dysfunction, and an increased risk of cardiovascular disease. Therefore, reducing exposure to cigarette smoke remains an important preventive strategy, particularly among students.

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This study has several limitations that should be considered when interpreting the findings. The cross-sectional design does not allow causal relationships to be established, and most participants were classified as having mild cigarette smoke exposure, resulting in limited variability of exposure levels. In addition, cigarette smoke exposure was assessed using a researcher-developed scoring system based on exposure duration, frequency, and intensity, while other factors that may influence serum triglyceride levels were not comprehensively evaluated. Future studies should employ validated exposure assessment tools and longitudinal designs to better investigate the long-term effects of cigarette smoke exposure on lipid metabolism.

4. CONCLUSION

Although cigarette smoke is widely recognized as a risk factor for dyslipidemia and cardiovascular disease, its effect on serum triglyceride levels appears to depend on the cumulative level of exposure, including its duration, frequency, and intensity. The findings of this study indicate that mild cigarette smoke exposure may not immediately result in disturbances of triglyceride metabolism among young adults. Nevertheless, reducing exposure to cigarette smoke remains important to minimize the long-term risk of oxidative stress, metabolic disorders, and cardiovascular disease.

In conclusion, this study shows that there was no statistically significant association between the level of cigarette smoke exposure and serum triglyceride levels among students (Spearman's rho = −0.017, p = 0.882). Most participants were classified as having mild cigarette smoke exposure and exhibited serum triglyceride levels within the normal reference range. These findings suggest that, in this population of young adults, the level of cigarette smoke exposure may not have been sufficient to induce measurable alterations in serum triglyceride concentrations.

5. REFERENCES

Akivis, Y., Alkaissi, H., Mcfarlane, S. I., & Bukharovich, I. (2024). The Role of Triglycerides in Atherosclerosis: Recent Pathophysiologic Insights and Therapeutic Implications. *Current Cardiology Reviews*, *20*(2), 39–49. https://doi.org/10.2174/011573403X272750240109052319

Anwar, C. A., Nursabita, G. A., Dalimunthe, M., & Andini. (2025). Dampak Rokok Terhadap Kesehatan Mahasiswa/i UINSU. *Cemara Journal*, *3*(3), 1–8.

Arief, R. Q., W, L. P., & Arief, M. J. (2023). Risiko Tinggi Dislipidemia pada Remaja Obesitas: Menggali Faktor dan Implikasinya terhadap Kesehatan Kardiovaskular. *Al GIZZAI: Public Health Nutrition Journal*, *3*(2), 77–89. http://dx.doi.org/10.24252/algizzai.v%vi%i.38932

Azab, G. El, Elkhouly, E., Abouyoussef, R., & Nagdy, H. (2026). Smoking and Liver Diseases: An Updated Review of Pathogenesis, Progression, and Therapeutic Implications. *Clinical and Experimental Medicine, 26*(1), 51. https://doi.org/10.1007/s10238-025-01922-6

Athala, S. A. A., Sulistiyowati, R., Sudarsono, T. A., & Dhanti, K. R. (2024). Perbedaan Kadar Trigliserida pada Perokok Aktif dan Pasif di Terminal Bulupitu Purwokerto. *Journal of Medical Laboratory and Science*, *4*(2), 1–8. https://doi.org/10.36086/medlabscience.v4i2

Emma, R., Caruso, M., Campagna, D., Pulvirenti, R., & Volti, G. L. (2022). The Impact of Tobacco Cigarettes , Vaping Products and Tobacco Heating Products on Oxidative Stress. *Antioxidants, 11*(9), 1–28. https://doi.org/10.3390/antiox11091829

Georgakopoulou, V. E., Sklapani, P., Trakas, N., Reitter, R. J., & Spandidos, D. A. (2024). Exploring the Association Between Melatonin and Nicotine Dependence (Review). *International Journal of Molecular Medicine*, *54*(82), 1–13. https://doi.org/10.3892/ijmm.2024.5406

Issalillah, F., Khayru, R. K., Darmawan, D., Amri, M. W., & Purwanti, S. (2021). Analisis Perilaku Konsumen Rokok Mild Berdasarkan Persepsi dan Sikap. *Journal of Trends Economics and Accounting Research*, *2*(2), 49–53.

Juliana, I., Hengky, H. K., Umar, F., & Usman, U. (2024). Analysis of Factors Related to The Incidence of Hypertension In Productive Age (15 – 59 Years). *Jurnal Gizi Kerja Dan*

Multidisciplinary Indonesian Center Journal (MICJO)
Journal page is available to
https://e-jurnal.jurnalcenter.com/index.php/micjo
Email: admin@jurnalcenter.com

Produktivitas, *5*(1), 138–148.

Normala, A., Sari, T., Santoso, A. H., Wijaya, C., & Satyanegara, G. (2025). Pengaruh Usia dan Biomarker Lipid terhadap Distribusi Lemak dan Massa Otot Wanita Dewasa : Studi Observasional di 6 Kelurahan DKI Jakarta The Effect of Age and Lipid Biomarkers on Fat Distribution and Muscle Mass in Adult Women : An Observational Study in. *Jurnal Keperawatan Bunda Delima*, *7*(2), 196–209.

Nurpalah, R., Rosdiana, R., Putri, A. A., & Barat, J. (2021). Gambaran Kadar Trigliserida pada Perokok Aktif Usia Remaja. *Journal of BTH Medical Laboratory Technology, 1*(1), 29–33.

Paitei, N. (2025). *Gambaran Kadar Trigliserida pada Wanita Menopause*. ITSKes Insan Cendekia Medika Jombang.

Plas, A. Van Der, Antunes, M., Pouly, S., Bourdonnaye, G. D. La, Hankins, M., & Heremans, A. (2023). Meta-analysis of the Effects of Smoking and Smoking Cessation on Triglyceride Levels. *Toxicology Report*s, 10(January), 367–375. https://doi.org/10.1016/j.toxrep.2023.03.001

Rafsanjani, A. (2024). Peran SGLT2 Inhibitor dalam Terapi Kardiovaskular: Tinjauan Literatur. *Jurnal Penelitian Keperawatan Kontemporer*, 1–9.

Ruswati, H. M., & Apriani. (2021). Kadar Kolesterol dan Trigliserida pada Perokok Aktif di Lingkungan Villa Mas Garden Bekasi. Journal of Safety and Health, 01(November), 41–46.

Riantika, M., & Aliviameita, A. (2025). Triglyceride and Blood Glucose Levels in Diabetic Smokers and Non-Smokers: Tingkat Trigliserida dan Gula Darah pada Penderita Diabetes yang Merokok dan yang Tidak Merokok. *Indonesian Journal on Health Science and Medicine*, *2*(2), 1–7.

Salim, B. R. K., Wihandani, D. M., & Dewi, N. N. A. (2021). Obesitas Sebagai Faktor Risiko Terjadinya Peningkatan Kadar Trigliserida Dalam Darah: Tinjauan Pustaka. *Intisari Sains Medis*, *12*(2), 519–523. https://doi.org/10.15562/ism.v12i2.1031

Saputra, B. D., Suratno, Rahmaniati, R., & Purbayanti, D. (2022). Perbedaan Kadar Trigliserida pada Millenial Vapers dan Non-Perokok di Kota Palangka Raya: Differences in Triglyceride Levels in Millenial Vapers and Non-Smokers in Palangka Raya City. *Jurnal Surya Medika (JSM), 8*(3), 235 – 242.

World Health Organization (WHO). (2022). *GATS (Global Adult Tobacco Survey) Fact Sheet: Indonesia 2021*.

Yuliana, A. I., Faizah, M., Azimah, F. N., Rofendi, H. A., & Ummah, R. (2023). Edukasi Kesehatan : Bahaya Konsumsi Fast Food pada Mahasiswa Fakultas Pertanian Universitas KH. A. Wahab Hasbullah. *Pertanian: Jurnal Pengabdian Masyarakat*, *4*(2), 64 – 67.