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Analysis of Triglyceride Levels Among E-Cigarette Smokers in Adolescents from a Health Knowledge Perspective

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ABSTRACT

Objective: *This study aimed to analyze triglyceride levels among e-cigarette users at Universitas Muhammadiyah Sidoarjo.* ***Method:*** *A total of 32 male students who used e-cigarettes participated, and 3 cc of venous blood was drawn after at least 10 hours of fasting. Triglyceride levels were measured using a DIALAB Autolyzer with the enzymatic colorimetric method (GPO-PAP) and analyzed using the Independent t-test with SPSS 23.0.* ***Results:*** *The results showed an average triglyceride level of 86.75 mg/dl (range 63–125 mg/dl), which is within the normal category (<150 mg/dl). The hypothesis test showed p = 0.146 (p > 0.05), indicating no significant difference in triglyceride levels among e-cigarette users.* ***Novelty:*** *This study provides valuable insights into the triglyceride levels of e-cigarette users, contributing to the understanding of the potential impact of e-cigarette use on lipid profiles.*

INTRODUCTION

Smoking behavior in adolescents is still a global health problem that is concerning. World Health Organization (WHO) data shows that about 9% of adolescents in the world use tobacco products, including e-cigarettes, whose prevalence has increased in the last decade [1]. E-cigarettes or electronic cigarettes are often promoted as a safer alternative to conventional tobacco cigarettes. However, studies show that e-cigarette liquids contain nicotine, volatile compounds, and metal particles that can impact the body's metabolism, including lipid profiles [2]. One of the lipid components that is often used as an indicator of metabolic risk is triglycerides, whose levels can increase due to nicotine exposure [3].

Nicotine exposure from e-cigarettes is known to increase lipolysis activity, potentially raising triglyceride levels in the blood [4]. Some studies suggest that e-cigarette use can trigger changes in lipid profiles similar to conventional tobacco cigarettes, although research on its long-term effects on triglyceride levels is limited [5]. Increased triglycerides in adolescence may increase the risk of developing atherosclerosis and cardiovascular disease in the future [3]. Therefore, monitoring triglyceride levels in adolescent e-smokers is important as an early detection of metabolic disorders.

Health knowledge is an important factor in preventing risky behaviors in adolescents, including the use of e-cigarettes. Adolescents who have a low understanding of the dangers of e-cigarettes tend to be more susceptible to promotions and social pressures [6]. Research shows that low health knowledge is associated with high smoking behavior and low adherence to a healthy lifestyle [7]. Therefore, the analysis of triglyceride levels in adolescent e-cigarettes needs to be seen from the perspective of

health knowledge in order to provide a more comprehensive picture of risk factors and their prevention.

Based on this background, this study aims to analyze triglyceride levels in adolescent e-smokers from the perspective of health knowledge. The results of the study are expected to provide scientific data on the relationship between health knowledge and the metabolic condition of adolescents who use e-cigarettes. In addition, these findings can be the basis for the development of more effective health education strategies to reduce the number of e-cigarette use among adolescents.

METHOD

The research design used was quantitative with an experimental and cross-sectional approach. The research population consisted of male students of the University of Muhammadiyah Sidoarjo who were members of the student organization (Ormawa). The research sample amounted to 32 people who were e-smokers, determined through the non-probability quota sampling technique. The inclusion criteria were male students who consumed e-cigarette liquid <3 ml per day. Data collection was carried out by taking 3 cc venous blood samples after fasting for at least 10 hours. Triglyceride levels were checked using the DIALAB brand Autolyzer using the enzymatic colorimetry method (GPO-PAP). The data was analyzed using the Independent t-test with the help of SPSS software version 23.0.

RESULTS AND DISCUSSION

Table 1. Triglyceride levels of e-smokers.

Category	Triglyceride Levels		
	Average	**Min**	**Max**
Electric Smoker	86,75	63	125

Based on the results of a study conducted on 32 e-cigarette students who are members of a student organization (ORMAWA) at the University of Muhammadiyah Sidoarjo, an average triglyceride level of 86.75 mg/dl, with the lowest level being 63 mg/dl and the highest 125 mg/dl. The average value is still within the range of normal triglyceride levels (<150 mg/dl) according to the criteria of the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) [8].

Table 2. Triglyceride level normality test results.

	Triglycerides
Asymp. Sig (2-tailed)	0,146

The results of the normality test showed that the data was distributed normally ($p > 0.05$). Furthermore, a hypothesis test was carried out using the Independent t-test because the data was distributed normally. This test aims to find out the average difference of the two independent groups. The results of the hypothesis test showed a

significance value of p = 0.146 (p > 0.05), so it can be concluded that there is no significant difference in triglyceride levels of e-smokers.

These findings are in line with recent studies reporting that triglyceride levels in e-cigarette users tend to be within normal limits and show no significant difference compared to non-smokers in the younger age group [9].

Nicotine is known to increase the secretion of adrenaline in the adrenal cortex which promotes an increase in the concentration of Free Fatty Acids (FFA) in serum. This FFA will then stimulate the synthesis and secretion of liver cholesterol, including Very Low Density Lipoprotein (VLDL), which can ultimately increase triglyceride levels in the blood [10]. However, in this study, the average triglyceride levels of e-smokers were in the normal category.

This can be explained by several factors. First, the nicotine content in e-cigarette liquids is relatively lower than tobacco cigarettes. E-cigarette liquids generally only contain a mixture of nicotine, propylene glycol, glycerin, flavor enhancers, and do not contain tar or other toxic substances found in tobacco cigarettes [11]. Second, the characteristics of the respondents, the majority of whom are adolescents with high levels of physical activity, also contribute to normal triglyceride levels. Intense and regular physical activity can increase energy consumption and lower triglyceride levels through increased lipid breakdown [12]. Triglycerides themselves are the body's main energy reserves that will be mobilized when metabolism increases [8].

Thus, although nicotine has the potential to increase triglycerides, factors such as low nicotine levels in e-cigarettes, the absence of tar and other toxic substances, and high physical activity in adolescents are strongly suspected to be the cause of triglyceride levels remaining in the normal category. However, it is important to note that e-cigarette use still carries long-term health risks, including impaired cardiovascular function and lipid metabolism that can appear later in life [13], [14], [15].

CONCLUSION

Fundamental Finding : The study investigated triglyceride levels among 32 adolescent e-cigarette users at the University of Muhammadiyah Sidoarjo. Results showed an average triglyceride level of 86.75 mg/dl (range: 63–125 mg/dl), which remains within the normal range (<150 mg/dl) as per NCEP ATP III. Hypothesis testing using the Independent t-test indicated no significant difference in triglyceride levels (p = 0.146), aligning with studies showing e-cigarette users typically maintain normal lipid profiles at a young age. **Implication :** Although nicotine has the potential to increase triglycerides, factors such as low nicotine levels in e-cigarettes, the absence of tar and toxic substances, and high physical activity among adolescents likely explain the normal findings. The results of the study are expected to provide scientific data on the relationship between health knowledge and the metabolic condition of adolescents who use e-cigarettes. These findings can be the basis for more effective health education strategies to reduce e-cigarette use among adolescents. **Limitation :** Research on its long-term effects on triglyceride levels is limited. Characteristics such as high physical activity

and low nicotine exposure may have influenced the outcome. These variables might act as confounders and limit the generalizability to other adolescent populations with different behaviors or health profiles. **Future Research :** Further studies with larger and more diverse samples are needed. Longitudinal research should assess how vaping affects lipid metabolism over time and how health knowledge influences these outcomes as adolescents transition into adulthood.

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