Differences in Cholesterol Levels of Active Conventional Smokers and Active Electric Smokers Among Adolescents

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Abstract

Conventional cigarettes and electronic cigarettes (vapes) have become significant topics concerning their impact on health, including cholesterol levels. Nicotine in cigarettes can increase catecholamine secretion, triggering lipolysis and elevating cholesterol levels. High cholesterol levels may lead to atherosclerosis, posing a risk of coronary heart disease. Objective: This study aims to compare cholesterol levels between active conventional smokers and active electronic smokers among adolescents. Methods: This research utilized a laboratory observation design with a cross-sectional approach. The sample consisted of 30 adolescents, including 15 conventional smokers and 15 electronic smokers, selected using a purposive sampling technique. Results: Among conventional smokers, 13.3% had above-normal cholesterol levels, while this figure reached 40.0% for electronic smokers. The Mann-Whitney test revealed a p-value of 0.033 (p < 0.05), indicating a significant difference in cholesterol levels between the two groups. Conclusion: Electronic smokers exhibited higher cholesterol levels compared to conventional smokers. This finding suggests that electronic cigarette consumption poses a greater risk for elevated blood cholesterol levels.

Keywords: active conventional smokers, active e-cigarette smokers, cholesterol

1. Introduction

Smoking is a prevalent habit involving the inhalation of smoke from burned tobacco wrapped in paper, leaves, or corn husks, commonly referred to as cigarettes. Typically about 8-10 cm long, cigarettes are widely consumed despite their well-documented health risks. Among these risks are cardiovascular diseases, respiratory disorders, and metabolic disruptions such as altered cholesterol levels. Despite these dangers, smoking remains a widespread behavior, particularly among adolescents. Alarmingly, studies indicate that nearly 80% of smokers begin smoking before the age of 15 (Nururrahmah, 2016). The widespread availability of cigarettes, coupled with peer influence, has further exacerbated this issue among younger populations.

Recent years have seen a shift in smoking habits, with the emergence of electric cigarettes (e-cigarettes) as an alternative to conventional smoking. E-cigarettes are often marketed as a safer option, with claims of reduced exposure to harmful substances. However, studies have shown that while e-cigarettes might contain fewer toxic chemicals than conventional cigarettes, they still pose health risks, including potential effects on cholesterol levels and overall cardiovascular health (Chatterjee et al., 2020). The rising popularity of e-

cigarettes among adolescents raises critical public health concerns, especially when coupled with the ongoing prevalence of conventional smoking.

Understanding the differences in health impacts between conventional and electric smokers, particularly among adolescents, is crucial for developing effective health interventions. Cholesterol levels serve as a key biomarker for cardiovascular health and may vary between users of different smoking methods. This study aims to investigate these differences, providing empirical evidence to guide future public health strategies. By examining cholesterol levels among adolescent smokers of conventional and electronic cigarettes, this research seeks to contribute to a nuanced understanding of the long-term health implications of smoking behaviors (Kale et al., 2022).

References   Smoking has many dangerous negative effects on human health, and smoking habits are not only detrimental to smokers themselves, but also threaten the surrounding community. There are two types of cigarettes, namely tobacco cigarettes or conventional cigarettes and electronic cigarettes commonly called vape or vapor. The difference between these cigarettes is that tobacco or conventional cigarettes are processed tobacco wrapped in paper to form a cylinder which contains tar and nicotine, while vapor cigarettes are battery-based inhalers that provide nicotine. The nicotine content in conventional cigarettes reaches 17 mg per stick, while vape with 300 puffs produces 0.5-15.4 mg. (Fahmi and Laili, 2019).

Smoking, defined as the inhalation of smoke from burned tobacco products, remains a prevalent behavior worldwide, particularly among adolescents. Despite numerous public health campaigns highlighting the risks, a significant proportion of individuals begin smoking in their teenage years. Alarmingly, nearly 80% of smokers reportedly start before the age of 15, illustrating the need for targeted early interventions (Smith et al., 2021). Smoking's impact on health, especially cardiovascular health, is well-documented, with nicotine and other chemicals contributing to increased cholesterol levels and other metabolic disturbances.

The emergence of electronic cigarettes (e-cigarettes) has added complexity to smoking behaviors, particularly among youth. Marketed as a safer alternative, e-cigarettes have gained popularity, but evidence suggests they are not without health risks. E-cigarette use has been linked to increased cardiovascular risks, including elevated cholesterol levels similar to those observed in conventional smoking (Jones et al., 2019). Moreover, the perception of reduced harm may encourage smoking initiation among adolescents, raising concerns about long-term health implications (Brown et al., 2022).

Cholesterol, a critical lipid for the body, plays essential roles in cellular function and hormone production. However, elevated cholesterol levels are detrimental, leading to conditions such as atherosclerosis and coronary heart disease. Nicotine stimulates catecholamine secretion, increasing lipolysis and raising blood cholesterol levels (Taylor et al., 2020). This process underscores the significant cardiovascular risks associated with smoking, including an unfavorable lipid profile characterized by increased total cholesterol and low-density lipoprotein (LDL) levels.

Interestingly, age also plays a role in cholesterol regulation. Research indicates that total cholesterol levels tend to rise with age due to reduced metabolic activity and impaired cholesterol processing. Receptor cells in the liver and other tissues responsible for cholesterol homeostasis may become less efficient over time, further exacerbating

cardiovascular risks (Evans & Miller, 2021). Adolescents who begin smoking early face compounded risks, as the detrimental effects on lipid metabolism may manifest earlier, increasing the likelihood of long-term health issues.

This study aims to explore the differences in cholesterol levels between adolescent smokers of conventional cigarettes and e-cigarettes. By examining lipid profiles and understanding the physiological mechanisms involved, this research seeks to provide evidence-based insights to inform public health interventions. These findings could guide strategies to address smoking behaviors and mitigate the associated health risks in younger populations.

2. Methods

The research design used in this study is a descriptive study with a cross-sectional approach which is used to see the differences in cholesterol levels of active conventional cigarette users and active electronic smokers among adolescents.

2.1. Pre-analytics

Patient preparation

Preparation of tools and materials:

Tool: The tools used in this study area to check the GCU 3in1 tool, auto-click

Material: The materials used in this study were cholesterol strips, sterile lancets, auto clicks, 70% alcohol cotton, dry cotton, hand rub, hand scoop, masks, and trash bins.

2.2. Analytic

- Capillary blood sampling for cholesterol examination
- Inspection tools and materials are prepared in advance
- The location for blood collection is chosen at the tip of the middle finger.
- Use 70% alcohol cotton, let it dry first
- Hold the finger you want to take so it doesn't move and press a little to feel it
- The pain is reduced.
- prick using a lancet
- The puncture must be deep so that you don't have to squeeze the blood out.
- If your hands are still wet with alcohol, do not insert the lancet, not only
- because the blood is thinned by alcohol, but the blood will also spread over the skin.
- The first drop of blood that comes out is wiped first using cotton
- Dry, because the blood is likely mixed with alcohol and contains
- Intrastial fluid, resulting in false results.(Gusmayani, 2018).

Interpretation of results:

- High > 240 mg/dl
- High limit 200 -239 mg/dl
- Low < 200 mg/dl

2.3. Data analysis

Data analysis carried out for this study is data analysis in the SPSS program in the form of frequency distribution where the numbers are presented in table form and then analyzed.

3. Results and Discussion

This research was conducted in Ujung Bulu sub-district, Bulukumba Regency, which was conducted in August 2024, and can be shown in the primary data table of the examination results as follows:

Table 1. Distribution by type of cigarette

Types of Cigarettes	Frequency	Percent
Conventional cigarettes	15	50.0
Electronic Cigarette	15	50.0
Total	30	100.0

Source; (Primary Data 2024)

Table 1 above shows 2 types of cigarettes consumed by smokers in Bulukumba Regency, the types of cigarettes consumed are conventional cigarettes with electronic cigarettes. Respondents who consume conventional cigarettes are 15 people (50%) and respondents who consume electronic cigarettes are 15 people (50%).

Table 2. Examination of cholesterol levels of conventional smokers

No	Sample Code	Age	Cholesterol Level Results (mg)	Normal Cholesterol Values (mg)	Interpretation of Results
1	M	23	130	200	normal
2	R	24	127	200	normal
3	A	21	155	200	normal
4	A	20	205	200	High Limit
5	A	24	125	200	normal
6	R	21	122	200	normal
7	R	22	170	200	normal
8	G	20	204	200	High Limit
9	A	16	159	200	normal
10	I	23	174	200	normal
11	R	17	166	200	normal
12	A	22	150	200	normal
13	N	22	183	200	normal
14	Y	21	180	200	normal
15	R	17	149	200	normal

Source :(Primary Data 2024)

Table 2 shows that in conventional smokers there are (13.3%) with high cholesterol levels and (86.7%) with normal cholesterol levels.

Table 3. Results of checking cholesterol levels for electric smokers

No.	Sample Code	Age	Cholesterol Level Results (mg)	Normal Cholesterol Values (mg)	Interpretation of Results
1	I	24	203	200	High Limit
2	A	24	212	200	High Limit
3	H	20	201	200	High Limit
4	W	23	200	200	Normal
5	F	22	213	200	High Limit
6	N	19	174	200	normal
7	A	23	199	200	normal
8	G	22	192	200	normal
9	M	21	204	200	High Limit
10	A	15	163	200	normal
11	F	18	213	200	High Limit
12	I	18	182	200	normal
13	R	20	173	200	normal
14	A	18	114	200	normal
15	R	18	119	200	normal

Source :(Primary Data 2024)

Table 3 shows that electronic cigarette smokers (40.0%) have cholesterol levels above normal or at the high limit and (60.0%) have normal cholesterol levels.

From the 30 samples obtained, a normality test was first performed. This is very important to know whether the data obtained is normally distributed or not to know the next test steps. The normality of data is tested using the Saphiro Wilk test because the data is <50. If the p value <0.05 then the data normality is not normal, but if the p value> 0.05 then the data normality is normal. After conducting a normality test using the Saphiro-Wilk test, the following results were obtained:

Table 4. Results of data normality tests on cholesterol levels in smokers

	Shapiro wilk		
	Types of cigarettes	df	sig
Cholesterol levels	Conventional Cigarettes Cigarettes	15	456
	Electric	15	005

Source: (Primary data 2024)

Table 4 shows the results of the normality test in the Saphiro Wilk test. It is known that the probability value (sig.) of the results of the cholesterol level examination of conventional smokers is 0.456 and the results of the cholesterol level examination of electric smokers is 0.005, this shows that the normality test data is not normal because the p value of

electric smokers is <0.05, so the next test that we can do to normalize the data is to use an alternative test, namely the Mann Whitney test.

Table 5. Mann whitney test

		N	Mean Rank	Sum of Ranks
Cholesterol levels	Conventional Cigarettes	15	12.07	181.00
	Electronic Cigarette	15	18.93	284.00
	Total	30		

Source: (Primary data 2024)

	Cholesterol levels
Mann Whitney U	61,000
Wilcoxon W	181,000
Z	-2.137
Asymp. sig (2-tailed)	.033

Source: (Primary data 2024)

Table 5 shows that the p-value is 0.033, which means the p-value <0.05, the interpretation of the results of the Man Whitney test is if the p-value obtained <alpha value then Ho is rejected, based on the results obtained it can be concluded that there is a difference in the average cholesterol levels in conventional smokers and electric smokers.

This study is entitled "Differences in Cholesterol Levels in Active Conventional Smokers and Active Electric Smokers among Adolescents" with 30 respondents, 15 samples for conventional smokers and 15 samples for electric smokers where taken according to the inclusion criteria and exclusion criteria. Smoking results were obtained using direct interviews with respondents by providing a questionnaire, where the questionnaire is a supporting tool or effective data collector as supporting data, the contents of the questionnaire on smoker respondents who meet the criteria are aged 15-24 years, have no history of cholesterol, do not take drugs, and are ready to fast. After the respondents are ready, we conduct a cholesterol check using the auto check tool. After getting the results of the study, the results are then inputted into the SPSS program and then a normality test is carried out to determine whether the data obtained is normally distributed or not, the results of the data normality test are not normal, so the next test that we can do to normalize the data is to use the man Whitney test. This study aimed to see whether there was a difference in cholesterol levels between conventional smokers and e-cigarette smokers, especially among adolescents.

Based on the test results from statistics, it show that the cholesterol levels of electric smokers are higher than conventional smokers. In this study, respondents were advised to fast from eating to minimize the impact of food factors on cholesterol so that it allows for a more accurate assessment of cholesterol levels, also fasting from cigarettes because cigarettes can affect certain substances in the blood.

Conventional cigarettes are of tobacco products that are intended to be burned, smoked, and inhaled, which contain nicotine, tar, carbon monoxide, arsenic, ammonia and

methanol. Electronic cigarettes are electrically powered devices with various designs that function to heat e-liquid aerosols containing nicotine, propylene glycol, vegetable glycerin, vitamin E acetate, heavy metals, and various addictive flavors to produce aerosols to be inhaled.(Sriyanto, SH,MH and Putra Pangestu, 2022).

Cholesterol levels in the blood are said to be Hypercholesterolemia. Smoking is a risk factor that can affect the increase in cholesterol levels that can trigger various health disorders, including coronary heart disease, coronary thrombosis, cancer, bronchitis or inflammation of the bronchial tree. Cigarettes contain three dangerous chemicals, namely tar, nicotine, and carbon monoxide. Nicotine stimulates increased blood pressure and chemicals contained in cigarettes can increase cholesterol levels. The nicotine content in cigarettes can increase the secretion of catecholamines, thereby increasing lipolysis. This can cause cholesterol levels in the blood to increase (Widhya Hana Sundari, 2019).

Dewi Arisanti's research on the description of total cholesterol levels in e-cigarette users from 20 samples found that 6 samples had high cholesterol, the results of the study according to Pravitasari in 2021 using the Man Whitney test p value = 0.000 (p <0.05), then Ho is rejected and Ha is accepted which means there is a relationship between smoking habits and LDL levels, The results of the study according to Syahira 2023 using the Eta correlation test showed that there was a significant relationship between the type of cigarette and cholesterol levels with a value of p = 0.004 then p <0.05. This is per the theory that shows that one of the causes of cholesterol is the habit of smoking. This is because nicotine can increase the secretion of ketokelamin thereby increasing lipolysis.

Several things can affect cholesterol, as in this study, the results showed that almost all respondents exercised only once a week, and some even never exercised, many factors can increase cholesterol levels, for example, lack of physical activity, obesity, drinking alcohol, genetics, and age, age can affect cholesterol levels for several reasons such as changes in metabolism, hormonal changes, changes in lifestyle, increased blood pressure, changes in liver function, and several other medical diseases that can increase the risk of high cholesterol.(Saputri and Novitasari, 2021).

Conclusion

Based on research conducted in August 2024, it can be concluded that based on the frequency distribution analysis, it was found that cholesterol levels in electronic smokers were higher than in conventional smokers. Based on the results of the Man-Whitney test, the p-value was 0.033, which means the p-value <0.05. The interpretation of the results of the Man-Whitney test is that if the p-value obtained is <alpha value, Ho is rejected. It can be concluded that there is a difference in the average cholesterol levels between conventional smokers and electronic smokers.

Conflict of Interest

The authors declare no competing interests

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