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# Comparative Analysis of Perceptions Regarding the Hazards of E-Cigarette use Among Sports Science and Health Science Students

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***Abstract.*** *E-cigarette use is a growing trend among students and has attracted attention due to its health impacts. This behavior is influenced not only by individual factors but also by social factors, particularly peer groups, including social interactions, peer habits, and group solidarity. This study aimed to determine the relationship between social interactions, peer habits, and group solidarity with e-cigarette use among students at the Faculty of Sport and Health Sciences, Universitas Negeri Makassar (FIKK UNM). A quantitative study with an observational-analytical design and a cross-sectional approach was employed. A total of 330 respondents were obtained using the Slovin formula. Data were collected using a questionnaire and analyzed using the chi-square test in SPSS. The results showed that 199 respondents (60.3%) did not use e-cigarettes, while 131 (39.7%) did. Bivariate analysis revealed a significant relationship between social interaction and e-cigarette use (p = 0.001), peer habits and e-cigarette use (p = 0.001), and group solidarity and e-cigarette use (p = 0.001). Peers play a significant role in e-cigarette use among students through social interaction, imitation of peers' habits, and the drive to maintain group solidarity. Prevention efforts should therefore target not only individuals but also the broader student social environment. These findings are relevant to SDG 3 (Good Health and Well-being), as addressing e-cigarette use among young people is essential to ensuring healthy lives and promoting well-being for all ages.*

***Keywords:*** *Perceived; E–cigarette; Peers; Behaviour; Students*

## 1. Introduction

According to the World Health Organization, approximately 1.2 billion people worldwide were active smokers throughout 2022, with the majority residing in developing countries, accounting for around 800 million individuals (WHO, 2025). A significant increase was recorded compared to 2020, when the global figure stood at 991 million people (WHO, 2021b). The number of smokers in Indonesia is projected to reach 90 million by 2025, with an estimated prevalence of 87.2% among males and 2.7% among females aged 15 years and above (Anggraeni & Piter, 2019). Data from the Global Adult Tobacco Survey (GATS) in 2021, reported by the Indonesian Ministry of Health, indicated a tenfold increase in the prevalence of electronic cigarette use compared with the previous survey conducted in 2011, rising from 0.3% to 3% (WHO, 2021a). This finding is consistent with a study published in the Journal of Indonesian Pharmacy (2024), which reported a prevalence of approximately 3% among the adult population in 2021, equivalent to 6.2 million individuals, with the highest proportion of users concentrated in the 18–29 age group (Indriyawati & Martha, 2024b).



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The growing popularity of electronic cigarettes has given rise to new public health challenges, including EVALI, which has been associated with a range of adverse health outcomes such as respiratory and gastrointestinal symptoms, and even death (Rebuli et al., 2023). The Centers for Disease Control and Prevention (CDC) documented a significant surge in EVALI (e-cigarette or vaping product use-associated lung injury) cases beginning in August 2019, reaching its peak in September 2019, with a total of 2,807 hospitalized cases reported across fifty states in the United States (Amjad et al., 2025). A study conducted by Dwi Titus Indriyawati and Evi Martha entitled "Perceptions of Male Electronic Cigarette Users Aged 15 Years and Above Regarding Pulmonary Disease" revealed that the perceived level of awareness regarding the hazards of electronic cigarettes to pulmonary health among males aged 15 years and above remained considerably low (Indriyawati & Martha, 2024b).

The current population of electronic cigarette users is predominantly composed of individuals within the productive age group, the majority of whom are university students, who exhibit a high propensity to experiment with electronic cigarettes under the assumption that such products are less addictive in nature (Conde et al., 2024). The ease of access to electronic cigarette products has further contributed to the escalating rate of use among adolescents and university students (Hartono et al., 2024).

This circumstance can be attributed to the absence of stringent governmental regulation, despite the Indonesian Food and Drug Authority (BPOM) issuing a formal statement declaring electronic cigarettes illegal and unsafe for consumption (WHO, 2026). As a consequence of the inadequate regulatory framework governing electronic cigarette use, individuals across various age groups can obtain these products with considerable ease through shopping centers, online retail platforms, and the proliferation of specialty vape stores widely distributed across major urban areas (Sunarti et al., 2020).

A study conducted by Dwi Titus Indriyawati and Evi Martha entitled "Perceptions of Male Electronic Cigarette Users Aged 15 Years and Above Regarding Pulmonary Disease," with a research focus on males aged 15 years and above, revealed that the level of perceived awareness regarding the hazards of electronic cigarettes to pulmonary health remained considerably (Indriyawati & Martha, 2024a). In another study conducted by Fakhreni and Putra Siregar entitled "The Relationship Between Knowledge and Perceptions of Electronic Cigarette (Vape) Use Among Female Adolescents in the City of Medan," which differed from the aforementioned study in that it focused exclusively on female adolescents in Medan, the findings indicated that there was no significant relationship between knowledge and perception toward electronic cigarette use. This implies that within the context of this study, within the context of this study, the behavior of electronic cigarette use among female adolescents in Medan was not influenced by their level of knowledge or perceptions thereof (Fakhreni & Siregar, 2023).

While previous studies have examined perceptions of e-cigarette use among adolescents and university students in general, few have specifically compared these perceptions across distinct academic disciplines. Given that Health Science students possess greater formal exposure to health knowledge and risk education, while Sports Science students maintain a strong orientation toward physical performance and bodily fitness, a disciplinary comparison offers a unique and underexplored perspective. Furthermore, this study employs the Health Belief Model (HBM) as its theoretical framework, enabling a structured examination of how perceived susceptibility, perceived severity, perceived

severity, perceived benefits, and perceived barriers shape students' perceptions of e-cigarette hazards across both groups.

To the best of the authors' knowledge, there has been little previous research comparing perceptions of the risks associated with e-cigarettes specifically among these two student populations. Therefore, this study makes a new contribution to the existing literature and provides evidence-based insights that can serve as a foundation for targeted health promotion strategies in higher education settings.

## 2. Methods

This study employed a quantitative approach using a descriptive-comparative design and a cross-sectional study framework. The quantitative approach was selected because the study aimed to systematically and objectively measure and compare students' perceptions. The research was conducted at the Faculty of Sport and Health Sciences, Universitas Negeri Makassar (FIKK UNM). The study population consisted of all male students enrolled in FIKK UNM. Male students were selected as the inclusion criterion because female students within the campus environment were generally reluctant to disclose or acknowledge their use of electronic cigarettes due to persistent social stigma toward women smokers, particularly in educational settings. The sample consisted of 126 respondents, equally distributed between the Sports Department and the Health Department, with 63 respondents from each department.

Data were collected using a structured questionnaire administered to both student groups. Data analysis included univariate and bivariate analyses. Univariate analysis was conducted to describe respondents' characteristics, including age, department, and e-cigarette use. Bivariate analysis was performed to examine the relationship between students' perceptions of the hazards of e-cigarette use and their academic discipline (sports and health sciences). Differences in perceptions between the two groups were analyzed using the Chi-Square test. This test is a nonparametric comparative statistical method for categorical variables. A p-value $< 0.05$ indicated rejection of H0 and acceptance of H1, signifying a statistically significant difference in perceptions between sports science and health science students regarding the hazards of e-cigarette use. Conversely, a p-value $> 0.05$ indicated that there was no statistically significant difference between the two groups.

## 3. Results and Discussion

The findings of this study were presented through univariate and bivariate analyses. The univariate analysis described respondents' characteristics, while the bivariate analysis explored differences in perceptions regarding the hazards of e-cigarette use between sports science and health science students:

**Table 1**. Characteristics of Students

| Variabel | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age** | | |
| 18 – 21 Years | 97 | 77 |
| 22 – 25 Years | 29 | 23 |
| **Departemen** | | |
| Sport | 63 | 50 |
| Health | 63 | 50 |
| **The Use of E-Cigarette in Sport Dept.** | | |
| Yes | 36 | 57.1 |
| No | 27 | 30.2 |
| **The Use of E-Cigarette in Health Dept.** | | |
| Yes | 19 | 42.9 |
| No | 44 | 69.8 |

The results in Table 1 show that the highest age group among respondents was 18–21 years, with 97 people (77%). The number of respondents per department was distributed equally, with 63 people (50%) from each department. The highest use of e-cigarettes in each department was shown in the sports department, with 36 people. Meanwhile, the health department reported the highest rate of non-use of e-cigarettes, with 19 people (42.9%).

There was a contrasting difference in e-cigarette use behavior between the sports department and the health department. The sports department recorded the highest number of e-cigarette users, namely 36 people. This reflects a paradox that deserves further examination, considering that students in this department should have a strong orientation toward fitness and physical performance. One possible explanation is the existence of a misconception among sports students that e-cigarettes are a safer alternative compared to conventional cigarettes, and therefore are considered not contradictory to their active lifestyle.

This perception is consistent with findings from several studies showing that e-cigarette users, particularly among young age groups, tend to underestimate the health risks posed by these products (Amrock et al., 2016). In addition, social environmental factors and the culture within sports communities, such as peer influence and the normalization of e-cigarette use within groups, may also contribute to the high prevalence of use in this department.

n contrast, the health department showed the highest proportion in the not using e-cigarettes category, namely 19 people (42.9% of the total respondents). This condition may be closely associated with the higher level of health literacy among health students. As individuals who are academically exposed to medical and health knowledge, health students

tend to have a more comprehensive understanding of the negative impacts of e-cigarettes on the respiratory system, cardiovascular system, and the long-term risk of nicotine addiction. This aligns with the study by Nalternatives et al. (2020), which found that individuals with good health literacy tend to make behavioral decisions that are more protective of their health. Therefore, the scientific background of health students appears to act as a protective factor, significantly influencing their decision not to use e-cigarettes.

The bivariate analysis is presented in Table 2 with the aim of exploring and identifying the differences between sports and health students regarding the dangers of e-cigarette use. This analysis describes the differences in the variables of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers among students from the sports and health departments, as shown below:

**Table 2**. Differences in Perceptions Between Sports and Health Department Students Regarding the Dangers of E-Cigarette Use

| Perceived | Departement | | | | P – Value |
|---|---|---|---|---|---|
| | Sport | | Health | | |
| | n | % | n | % | |
| **Susceptibility** | | | | | |
| Good | 33 | 52.4 | 58 | 92.1 | 0.000 |
| Poor | 30 | 47.6 | 5 | 7.9 | |
| **Severity** | | | | | |
| Good | 41 | 65.1 | 58 | 92.1 | 0.001 |
| Poor | 22 | 34.9 | 5 | 7.9 | |
| **Benefits** | | | | | |
| Good | 49 | 77.8 | 63 | 100 | 0.000 |
| Poor | 14 | 22.2 | 0 | 0 | |
| **Barriers** | | | | | |
| Good | 50 | 79.4 | 61 | 96.8 | 0.006 |
| Poor | 13 | 20.6 | 2 | 3.2 | |

As shown in Table 2, students from the Health Department had better perceptions than those from the Sports Department across all dimensions of the Health Belief Model. In perceived susceptibility, Health students with good perceptions accounted for 92.1%, which was much higher than Sports students at 52.4% (p=0.000). Likewise, in perceived severity, Health students reached 92.1%, higher than Sports students at 65.1% (p=0.001). In perceived benefits, all Health students (100%) had good perceptions, while 22.2% of Sports students still had poor perceptions (p=0.000). Meanwhile, in perceived barriers, Health students accounted for 96.8%, higher than Sports students at 79.4% (p=0.006). Since all p-values were < 0.05, there were statistically significant differences in all four perception dimensions between the two departments, which may be attributed to differences in exposure to health-related materials in each department's curriculum.

From the Health Belief Model (HBM), perceived susceptibility is an individual's subjective belief about the likelihood of developing a particular health condition, disease, or threat (Rutu & Nurmaladewi, 2025). Perceived susceptibility among students refers to

students' beliefs about their own vulnerability to health risks, which may encourage them to engage in healthier behaviors (Suharmanto, 2022).

The factor that most strongly supports this difference is the students' field of study (sports and health). Sports students tend to be more physically active due to academic demands that emphasize sports and fitness, leading them to feel they will remain fit and not vulnerable to the dangers posed by e-cigarette use. In contrast, health students are exposed to scientific knowledge that includes the study of various diseases and their causative factors, including diseases that may result from e-cigarette use. Therefore, more health students demonstrated greater perceived susceptibility than sports students.

Perceived severity refers to an individual's perception of the seriousness or severity of a disease. Individuals who perceive a disease as serious are more likely to take preventive measures against it (Lois et al., 2022). Students' beliefs about the seriousness (threat) of a disease influence their actions; the more individuals feel at risk of a disease, the more likely they are to take preventive actions (Rutu & Nurmaladewi, 2025).

In the same theory (HBM), perceived benefits are defined as beliefs about usefulness, namely the extent to which individuals believe that a particular action or activity will benefit them (Paramitha et al., 2020). Health-related behaviors are also influenced by the perceived benefits of taking action. The perceived benefits of maintaining a healthy lifestyle refer to an individual's assessment of the value involved in health-promoting behaviors to reduce the risk of disease (Suharmanto, 2021).

Among health students, all respondents agreed on the benefits gained from quitting e-cigarette use. Health students did not compromise or hold alternative perspectives regarding quitting e-cigarettes, believing that cessation would be beneficial for health; therefore, no students demonstrated differing perceptions.

Meanwhile, perceived barriers in the Health Belief Model (HBM) refer to an individual's estimation of the challenges, obstacles, or negative aspects that hinder the adoption of healthy behaviors. This concept serves as a counterbalance to perceived benefits, as barriers such as cost, inconvenience, or time constraints may reduce the likelihood of preventive action. Perceived barriers are individual evaluations of the obstacles encountered in adopting a new behavior (Kurniawati et al., 2020).

The observational findings among students showed that the assumption that e-cigarettes are relatively safe became a barrier preventing students from avoiding or quitting e-cigarette use. Moreover, within society, there is a stigma that e-cigarettes represent one way to quit conventional smoking. Thus, the transition process from tobacco cigarettes to electronic cigarettes is perceived as the result of a rational assessment that weighs the benefits and risks of each behavioral option (Romijnders et al., 2019).

In several countries, e-cigarettes are used as a form of therapy in smoking cessation efforts. Previous analyses regarding the impact of e-cigarettes on smoking cessation success in real-world settings have largely been based on surveys conducted in the United States and the United Kingdom, where nicotine e-cigarettes are easily accessible. In addition, Australia has implemented strict regulations requiring e-cigarettes to be purchased only with a doctor's prescription (Chambers, 2022). Meanwhile, New Zealand has introduced an official "vape to quit" program as one of the strategies to reduce smoking prevalence in the country (Beckert et al., 2022).

However, the situation in Indonesia is different, as e-cigarettes still lack strict regulations. Many people can easily access e-cigarettes through both offline retail stores and

online platforms. Across Indonesia, the number of e-cigarette device retailers is estimated to reach 5,000 stores. This figure does not yet include the number of independent sellers operating online (Asnil Bambani Amri, 2017). In addition to unrestricted access to e-cigarettes, many users freely mix their e-cigarette refill liquids with hazardous substances, one of which is etomidate.

Investigators from the National Narcotics Agency received samples in the form of vape cartridges containing approximately ±1 ml of yellow liquid that tested positive for etomidate circulating within the community. Etomidate is a compound belonging to the anesthetic agent group administered intravenously, commonly used for induction and maintenance of anesthesia during surgical procedures and other medical interventions requiring sedation. This compound acts on the central nervous system and produces sedative, hypnotic, and relaxing effects, thereby carrying the potential for dependency. The use of vapes containing etomidate has also been identified in Singapore and Taiwan, where both countries have established their respective regulations—Singapore classifies etomidate as a regulated poison under The Poisons Act, while Taiwan categorizes it as a Class II Narcotic. However, to date, etomidate has not yet been included within Indonesia's regulatory framework, either under Law Number 35 of 2009 concerning Narcotics or Law Number 5 of 1997 concerning Psychotropics (BNN, 2025).

Therefore, education is needed to instill the understanding that although e-cigarettes were created as an alternative to reduce addiction caused by conventional cigarettes, the dangers of e-cigarettes still cannot be disregarded. This study is consistent with the findings of Nuraini et al. (2025), which examined the relationship between perceptions of e-cigarettes and e-cigarette smoking behavior among students at Universitas Gadjah Mada. The study found that the majority of students had positive perceptions, while only a small proportion had negative perceptions. Some students perceived e-cigarettes as relatively safe, for example, because they are considered free from tar and produce less disturbing odors (Nuraini et al., 2025).

Health science students are regularly exposed to clinical literature, epidemiological studies, and evidence-based health education that explicitly address the dangers of e-cigarettes. In contrast, exercise science students are primarily exposed to information about athletic performance, so their understanding of the specific risks associated with e-cigarettes is relatively limited. In addition, physically active students tend to exhibit an optimism bias, the belief that they are more immune to disease than others because of their active lifestyle. This condition causes them to underestimate their perceived susceptibility to the negative effects of e-cigarettes, even though scientifically, these risks still exist regardless of an individual's level of physical fitness (Riva et al., 2018; Rocha-Ávila et al., 2025).

Differential curriculum exposure between Sports Science and Health Science students directly influences the first two HBM dimensions, namely perceived susceptibility and perceived severity. Students in non-health disciplines are twice as likely to perceive e-cigarettes as less harmful than conventional cigarettes, a difference that most likely stems from a lack of exposure to health-related information and education regarding the risks associated with e-cigarette use. The low perceived susceptibility among Sports Science students reflects their limited exposure to clinical and epidemiological literature that explicitly describes individual vulnerability to the harmful effects of e-cigarettes. Similarly, with regard to perceived severity, 74% of students who use e-cigarettes believed they were at risk of lung injury, and 68% believed they had a chance of dying from lung injury caused by e-cigarette

use, reflecting the role of health knowledge in shaping the perception of harm severity. Without curricular exposure that comprehensively addresses the pathophysiology and clinical consequences of e-cigarette use, Sports Science students tend to evaluate health risks solely through the lens of physical performance, resulting in persistently low perceived severity (Katz et al., 2022; Wen et al., 2026)

The influence of differential curriculum exposure is equally evident in the dimensions of perceived benefits and perceived barriers. Perceived benefits, such as enjoyment and social acceptance, combined with lower barriers such as the ease of concealing use and product availability, can outweigh perceived risks — particularly among male students. Sports Science students who do not receive critical education regarding tobacco industry claims are more likely to accept the perceived benefits of e-cigarettes as a means of relaxation or stress relief following physical training, without considering the long-term health consequences. The absence of e-cigarette-specific health education in the Sports Science curriculum leaves students in this program lacking the knowledge-based motivation to overcome such social barriers. This underscores the critical need for tailored, evidence-based health promotion interventions specifically designed for students in non-health disciplines (Kelsh et al., 2023; Milicic et al., 2017)

Further research is recommended to compare two groups: healthcare and medical personnel, and athletes who heavily rely on lung function, such as runners and swimmers. This comparison may provide deeper insights into differences in perceptions, behaviors, and health risks associated with e-cigarette use across populations with varying levels of health knowledge and respiratory performance demands.

## Conclusions

This study concludes that there are statistically significant differences between students from the Sports Department and the Health Department at the Faculty of Sports and Health Sciences, Universitas Negeri Makassar (FIKK UNM), regarding perceptions of the dangers of e-cigarette use across all dimensions of the Health Belief Model, including perceived susceptibility (p=0.000), perceived severity (p=0.001), perceived benefits (p=0.000), and perceived barriers (p=0.006). Students from the Health Department consistently demonstrated better perceptions than students from the Sports Department, which is presumed to be influenced by differences in scientific exposure within each department's curriculum—health students receive more extensive education on diseases and their risk factors, including the negative impacts of e-cigarettes. On the other hand, the high prevalence of e-cigarette use among sports students reflects the existence of misconceptions that e-cigarettes are a safer alternative. This study also highlights the weak regulation of e-cigarettes in Indonesia, including the absence of regulations concerning hazardous substances such as etomidate within the national legal framework on narcotics and psychotropics. Therefore, educational efforts and stronger regulatory measures are urgently needed to reduce e-cigarette use among university students.

## Conflicts of Interest

The authors declare no conflict of interest.

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