

Electronic Cigarette : Survey Of Middle School Students In Casablanca, Morocco

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Abstract

Electronic cigarette is a recent device. Initially designed as a substitute for smoking cessation, it's often presented to young adolescents as less harmful alternative to conventional cigarettes. The main objective of our study is to describe and analyze the perception of adolescents and their visions concerning e-cigarette. This is a descriptive cross-sectional study launched from September 2021 to March 2022. We targeted the age group ranging from 13 to 16 years old in two schools using an anonymous questionnaire distributed in classes. 450 questionnaires were collected and 422 were retained. The average age of adolescents was 14.07 years with a standard deviation of 0.734 years. The male gender represented 49.3%. The rate of tobacco smokers was 3.1% (IC 95%, 1.8–5.2). E-cigarette was known among the majority of middle school students in 78% (CI 95%, 73.8–81.7) and experienced by 14.45% of participants (CI 95%, 11.4–18.1). Circumstances for trying vaping were dominated by “the lure of novelty/curiosity” (48%) and the desire to “be part of the smoking group/feel adult” (25%). 31% of middle school students believed that the e-cigarette was less harmful. Concerning smoking cessation using e-cigarettes more than half of middle school students (54%) had no idea on this subject due to lack of available information and 20% felt that vaping was a good way to quit smoking. The perception of e-cigarettes among young adolescents seems to be linked to its use. Preventive measures should be implemented to make them aware of its danger especially and of tobacco products in general.

Keywords : Electronic cigarette, e-cigarette, middle school students, adolescents, smokers

Introduction

In 2003, the world has known the emergence of e-cigarettes (Vape, vaporetto ...). It is a device that produces vapors that users inhale and exhale [1]. Initially designed to replace the traditional cigarette and help smoking cessation, the e-cigarette has now become a real scourge that threatens particularly adolescents. The World Health Organization (WHO) states that "both tobacco products and e-cigarettes present health risks and the safest approach is not to use them" [2]. The rapid increase in the use of e-cigarettes among teenagers motivated the realization of this work whose objective was to estimate the

frequency of use of e-cigarettes among middle and high school students in the city of Casablanca and to describe their knowledge and attitudes towards it.

Material and method

This is a descriptive cross-sectional study realized in two schools in the city of Casablanca. The information was collected using a questionnaire whose items were inspired by the literature (Appendix 1). This questionnaire was distributed in some classes within the schools and explained during the meeting. In addition, a brief awareness-raising session on the subject of the harms of smoking was conducted with the students after the responses were collected. The study was conducted first between September 2021 and November 2021, then between February 2022 and April 2022 due to the constraints of the COVID-19 pandemic. Adolescents aged 13 to 16 years were included, regardless of smoking status.

The collected data were entered using Microsoft Office Excel 2013 and then analyzed using SPSS (Statistical Package for Social Sciences) software. The sample was described using averages and standard deviations for quantitative variables and counts and percentages for qualitative variables. Associations were tested using the Chi-squared test or Fisher's exact test, depending on the number of participants. The significance level was set at 5%.

Ethical considerations

The students were informed of the objectives of the survey and were asked for their written consent, which was included in the preamble (preceded by the objective of the survey) and had to be checked off before completing the questionnaire (Appendix 1). In addition, anonymity and confidentiality were insured.

Results

Of 450 questionnaires collected, 422 were retained.

Participant characteristics:

• Sociodemographic Characteristics

Table 1 summarizes socio-demographic characteristics of our sample; the mean age was 14.1 years with a standard deviation of 0.7 years and 51% of the participants were female.

• Parental smoking status

The proportion of adolescents who reported that their fathers were smokers or ex-smokers were 19.7% and 16.6% respectively. Almost all mothers were nonsmokers 99.1% (Table 1).

• Chronic diseases

At the time of the study, 24.1% of middle school students suffered from at least one chronic disease; 13.3% of them suffered from "Depression", 8.8% reported having asthma and 2.6% had diabetes (Table 1).

Middle school Students' Toxic Habits:

Within the study sample, 3.1% of middle school students were smokers (95% CI: 1.8-5.2) (Figure1). Approximately 7.3% of adolescents had used alcohol at least once in their lives (Figure 2) and 3.1 had experimented cannabis only once (Table 2).

E-Cigarettes Among Middle Schoolers:

• Knowledge of e-cigarette

The rate of middle school students who know, even by name, or have heard of e-cigarettes corresponds to

the majority of the sample 78% (95% CI, 73.8-81.7) (Figure 3).

- Main vectors of knowledge of e-cigarette

More than two-thirds of middle school students 69.3% aware of e-cigarette said they learned about the product through the Internet. (Figure 4)

- Experimentation with e-cigarette

14.45% of middle school students (95% CI, 11.4-18.1) reported having ever used e-cigarettes (Figure 5). Male gender accounted for 60.7% of these e-cigarette testers. Vaping/non-smoking testers represented 10.9% (n=46) of the total sample.

- Circumstances for trying e-cigarette

First, "Novelty appeal/curiosity" was the predominant element of trial circumstances, amounting to 47.5% of middle school students who had ever tried e-cigarettes. Next, 24.6% (n=15) of these reported a desire to be part of the smoking group and/or to feel like an adult. While 23% (n=14) reported that they were pushed by those around them. (Figure 6)

- Perception of e-cigarette by middle school students

- ✓ Harmfulness compared to conventional cigarettes:

We found that 39.3% (n=166) of middle school students in the sample had no idea about harmfulness compared to conventional cigarettes. While 30.8% (n=130) felt that e-cigarettes are less harmful (Figure 7).

- ✓ Smoking cessation using e-cigarettes:

More than half of middle school students or 53.8% (n=227) stated that they had no idea about it due to lack of informations. On the other hand, e-cigarette was considered a good means for smoking cessation by 20.1% (n=85) of the middle school students surveyed. (Figure 8)

- ✓ Social acceptance of e-cigarettes compared to traditional cigarettes:

Of middle school students in the sample, 53% (n=222) felt that e-cigarette was more socially acceptable than the conventional cigarette. While 47% (n=200) thought e-cigarette was less acceptable.

- ✓ Intention to try e-cigarettes:

Among the 361 middle school students who have never used e-cigarettes before, the intention to try it soon is reported in 9.1% (n=33).

- Use of e-cigarette among middle school students

- ✓ E-cigarette use in the past 30 days:

Of 61 middle school students who have ever experimented with e-cigarettes, more than half 55.7% (n=34) have used them in the last 30 days prior to the survey (excluding first-time use) (Figure 9). These users represent 8% of the total sample (95% CI, 5.8-11.0). Half of these e-cigarette users were represented by boys (n=17). We found that of the girls who had experimented with e-cigarettes at least once (n=24), 70.8% (n=17) were currently regular users. While in the group of boys who had tried this product at least once (n=37), only 45.95% subsequently became regular users.

- ✓ Frequency of e-cigarette use among these middle school students:

Among the 34 middle school students who reported using e-cigarettes in the past 30 days, 26% (n=9) had stated that they did not know how often they used e-cigarettes and 26% (n=9) had stated that they vaped several times a week. While 18% (n=6) used it 2-3 times a month, and 12% (n=4) used it every day. (Figure 10)

- ✓ Ownership of an e-cigarette:

Of the 34 middle school students who used e-cigarettes, only 32.35% (n=11) owned their own e-cigarette.

While 41.2% (n=14) shared the device with someone, and 26.5% (n=9) used the device with others (Figure 11).

✓ Place of purchase of e-cigarette and e-liquid:

An e-cigarette store was the preferred place of purchase for 61.8% of consumers (n=21). While 23.5% (n=8) purchased them at a tobacco shop and 14.7% (n=5) did so on the internet. (Figure 12)

✓ Dosage of nicotine used:

It had been found that 47.1% (n=16) did not know the dosage they were using. While 20.6% (n=7) were using a dosage of less than 4 mg/ml and 23.5% (n=8) were using a dosage of 5 to 8 mg/ml. (Figure 13)

✓ Adverse effects:

Among the 34 middle school students who used e-cigarettes, adverse effects following use were reported in 73.5% (n=25). These are summarized in Figure 14.

Level of information about e-cigarettes among middle school students:

Only 12% (n=51) of the middle school students in the sample felt sufficiently informed about e-cigarette. While 31% (n=132) felt they were not informed at all about it and 34% (n=142) felt they were not informed enough. (Figure 15)

Factors associated with e-cigarette experimentation

• E-cigarette experimentation by adolescent profile

Within the group, male gender represented 60.7% (Figure 16). The percentage of vaping testers (at least once before) among boys was 17.8% versus 11.2% among girls (p=0.055). The association between gender and experimentation approached significance (p=0.055). Depression in the female population significantly increased the risk of e-cigarette experimentation; the frequency of experimentation in girls reporting depression was 27% versus 7.9% in other girls (Table 2).

• Toxic habits

E-cigarettes were tested by 78.95% of smokers/ex-smokers versus 11.41% of non-smoking adolescents (p<0.001) (Table 2). Parental smoking had no significant impact.

Regarding other addictions, cannabis use was significantly associated with e-cigarette experimentation (p<0.001). As for alcohol, it was tried in 31.1% (n=19) of vaping testers, and 4.9% (n=3) used it occasionally (p<0.001). About 8% (n=5) of vaping testers have experimented with cocaine once before (p < 0.001). And finally, ecstasy has been tested before in 4.9% (n=3), and 4.9% (n=3) use it occasionally (p=0.001). There is therefore a significant link between the use of these illicit substances and experimentation with vaping.

• E-cigarette experimentation according to perceptions

✓ Perceived social acceptability of e-cigarettes:

78.7% of vaping testers felt that e-cigarettes are more socially acceptable than conventional cigarettes, versus 48.2% of teens who have never vaped. Thus, e-cigarette experimentation is significantly associated with the perception of its social acceptability (p<0.001). (Table 3)

✓ Perception of the harmfulness of e-cigarette compared to traditional cigarette:

In the group of e-cigarette testers, 39.3% had no idea about the harmfulness of this product compared to the conventional cigarette, while 37.7% believed that this product is less harmful than tobacco. There was no significant relationship between experimentation and perception of harm (p=0.126). (Table 3)

✓ Perception of the place of e-cigarette in smoking cessation:

23% of e-cigarette testers felt that vaping is a good way to quit smoking, compared to 9.7% of middle school students who had never vaped. There was no significant difference between the two groups in this regard ($p=0.457$). (Table 3)

Among the group that had never tried vaping ($n=361$), none of the adolescents who felt that e-cigarettes are more harmful than tobacco had the intention to vapourize afterwards, while among the middle school students who felt that e-cigarettes are less harmful, the intention to use them was reported in 16.8%. ($p=0.003$) (Table 4)

Discussion

In our study, the average age of participants was 14.07 years. The schoolchildren who have already experimented e-cigarettes ($n=61$), 60.66% ($n=37$) are male, and 39.34% ($n=24$) are female. While among middle school students using e-cigarettes ($n=34$) (middle school students who have used it in the last 30 days, excluding first use), 50% ($n=17$) are boys and 50% ($n=17$) are girls. In the study by Camenga et al. of adolescents in New York and Connecticut, boys represented 61.8% of the group of e-cigarette users [3]. Another US study done in 2015 on 15,264 adolescents suggests that boys are more likely to have tried e-cigarettes than girls [4].

The majority of middle school students knew e-cigarette 78% ($n = 329$). This result is relatively close to that found in a Finnish study conducted among 3,535 adolescents aged 12 to 18 years where 85.3% knew this product [5]. In Canada, the study conducted in Ontario in 2016 by Khoury et al [6] on a sample of 2,292 adolescents with an average age of 14.6 years, 69.8% had already heard of e-cigarette.

The predominant vector of information was the Internet (69.3%) while 47.7% of adolescents said they had known about e-cigarettes through their friends/family. Finally, advertising was a vector of information for 10% of our respondents.

In the National Tobacco Youth Survey, exposure to advertising was associated with current cigarette use among U.S. middle and high school students [7]. According to Duke et al [8] teen exposure to television ads for e-cigarettes increased 256% in 2013 compared to 2011. In 2020, Kong et al [9] published a study showing that friends were the number one source of information about e-cigarettes and their uses. [10].

We noted that 14.45% ($n=61$) of middle school students had tried e-cigarettes at least once. In an American study published in 2021 [11], Debchoudhury et al. compared data from two surveys conducted in 2014 and then in 2018 among middle school students, they had highlighted that the frequency of experimentation increased from 10.3% in 2014 to 14.8% in 2018.

In our study, among the 61 middle school students who had ever experimented e-cigarettes, 39.4% ($n=24$) had a father who was a smoker or ex-smoker. In our study, among middle school students who smoke ($n=13$), 69.2% ($n=9$) have already experimented e-cigarettes. In addition, middle school students who reported being ex-smokers ($n=6$) have all tried e-cigarette, which represents a percentage of experimentation of 100%. In contrast, within the population of non-smokers ($n = 403$), this percentage falls to 11.4% ($n = 46$) ($p < 0.001$). A survey conducted by the Parisian association "Paris sans tabac" had shown that non-smoking adolescents were significantly less experimenters with e-cigarettes (11.9%) than if they were smokers (64.9%) [12].

Circumstances of trial-Motives for use:

Of the middle school students in our sample who had already experimented with e-cigarettes ($n=61$), 47.5% ($n=29$) had stated that the attraction of novelty and curiosity were their main motives. The desire

to be part of the group of smokers or to feel like an adult came in second place for 24.6% (n=15), while being pushed by the environment was the case for 23% (n=14) of the adolescents in the sample. Finally, 4.9% (n=3) of the middle schoolers surveyed reported that it was a gift that was given to them.

These observations are consistent with the findings of other studies. In the Lille study, 82.95% of the adolescents surveyed considered that the attraction of novelty was their main reason for experimenting with vaping [13].

Intention to try e-cigarettes:

In our sample, 9.1% (n=33) of adolescents who had never tried e-cigarettes intended to try them soon. The Lille study [13] highlighted that in the subgroup that has not yet tried e-cigarette, the vast majority does not plan to test it (95.19%), only 0.54% want to try it soon and 4.28% has not yet made a decision. In the series by Debchoudhury et al, willingness to try e-cigarettes among non-users was twice as high (aOR = 2.19, 95% CI = 1.15-3.17) among high school students in New York City in 2018 compared to 2014 [11].

E-cigarette harmfulness:

In our study, middle school students who perceived e-cigarettes as less harmful than tobacco accounted for 30.8% of the total sample. Debchoudhury et al. showed that the belief that e-cigarettes are less harmful than combustible cigarettes has decreased (31.9% in 2014 vs. 20.2% in 2018)[11].

Regular vaping:

In our study, 34 middle school students (8.05% of the total sample) had used, at least once, the e-cigarette during the last 30 days preceding the survey (excluding first-time use). The frequency of regular use was quite variable. The study "Monitoring The Future" of the University of Michigan in the United States revealed in 2015 that 9.5% of 8th graders (13-14 years) as well as 14% of 10th graders (15-16 years) reported having used e-cigarettes in the last 30 days excluding the first use [14].

Depression and e-cigarettes:

In our series, among female respondents (n=214), 17.3% (n=37) had stated that they suffered from depression. Within this group (n=37), 27% had experimented with vaping (p=0.002), versus 11.2% of the total female population. In 2019, Chadi et al [31] had shown in a population of 26,821 adolescents, that exclusive use of e-cigarettes (versus no use) was associated with an increased likelihood of reporting suicidal ideation (aOR: 1.23, 95% CI 1.03-1.47) and depressive symptoms (aOR: 1.37, 95% CI 1.19-1.57).

Drugs and e-cigarette:

In our study, of the 61 adolescents who had tested e-cigarettes at least once before, 39.34% (n=24) had already experimented with at least one of these substances (alcohol, cannabis, ecstasy, cocaine). Dai and Hao raised the possibility that adolescents start using e-cigarettes at an earlier age and then progress to other substances [15].

E-cigarette purchase locations:

In our series, 61.8% of regular vapers obtain their e-cigarettes (cartridges, e-liquid ...) from specialized e-cigarette stores, and 14.7% do so on the internet.

Pepper et al [16] showed that 78.2% of the 1729 adolescents (15-17 years old) owned their own vaping device and that almost a third (31.1%) purchased their device from a store, vape store or online. Despite restrictions and regulations on the sale of tobacco and e-cigarettes to minors, many teens can still buy them online and in stores.

Nicotine concentrations of e-cigarettes:

We found that almost half (n=16; 47%) of regular vapers did not know the nicotine dosage. A study published in 2020 was conducted in 4 high schools in Connecticut, showed that nicotine strengths used among these high school students ranged from 0 mg to 24 mg. Most frequently cited responses regarding nicotine dosages used were "I don't know" (25.6%), 0 mg (17.6%) and 3 mg (13.6%) [9].

Adverse effects of e-cigarettes:

In our series, among adolescent vapers (n=34), 73.5% had ever experienced at least one adverse effect following vaping. The most reported side effects were throat pain in 50% and a cough in 26.47% of users. Headaches were experienced by 23.52% of vapers. King et al. had shown that among those who reported using e-cigarettes during the last 30 days before the survey, the most reported symptom was cough (42.3%), followed by dizziness (31.5%) and headache (25.4%) [17].

E-cigarettes and the gateway to smoking:

The spread of e-cigarette use raises concerns about the possible risks of long-term use and blocking smoking cessation through potential dual use. Another major and alarming concern is that use of the new device is increasing more among young adolescent nonsmokers than among adult smokers who use them to quit and expect a reduction in risk [18].

These concerns have been reinforced by the publication of a meta-analysis of longitudinal studies showing that e-cigarettes may serve as a gateway to later smoking among "nicotine-naive" youth [19]. There are several reasons for concern. First, e-cigarette use mimics smoking behaviors. Vaping involves hand-to-mouth movements, inhaling the mixture into the lungs and exhaling [20].

Conclusion

Epidemiological studies have shown an increase in the use of e-cigarettes among adolescents.

This increase could be due to the perception of the e-cigarette as less harmful compared to the traditional cigarette, or to the total lack of information on this subject among these young people. Thus, this can on the one hand normalize the act of smoking, and encourage to experiment with this new product. This is of great concern to the actors concerned (doctors, parents, civil society ...) given that the repercussions of smoking on student life and especially the health of this young population are serious.

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Tables :

Table 1: Socio-demographic characteristics of participants

Table 2: Factors associated with electronic cigarette experimentation

Table 3: Electronic cigarettes experimentation according to perceptions

Table 4: Intention to try the electronic cigarette according to the perception on its harmfulness

Table 1: Socio-demographic characteristics of participants

	Number	Percentage (%)
Average age in years (Standard deviation)	14,1 (0,734)	
Gender		
Male	208	49,3
Female	214	50,7
Education level		
Second year of middle school	136	32,2
Third year of middle school	286	67,7
Education level of parents		
Father		
Illiterate	13	3
Primary school	12	3
Middle school	80	19
High school	245	58
University	72	17
Mother		
Illiterate	38	9
Primary school	148	35,1
Middle school	126	29,8
High school	56	13,3
University	54	12,8

Table 2: Factors associated with electronic cigarette experimentation

Variables	Adolescents who have experimented e-cigarettes (n=61) Number (%)	p-value	
Gender		p=0,055	
Male (n=208)	37 (17,8)		
Female (n=214)	24 (11,2)		
Smoking status		p < 0,001	
Smoker/ex-smoker (n=19)	15 (78,95)		
Non-smoker (n=403)	46 (11,4)		
Cannabis use		p < 0,001	
Never (n=409)	48 (11,7)		
Only once (n=13)	13 (100)		
Depression			
Male	Yes (n=19)	2 (10,5)	p=0,537
	No (n=189)	35 (18,5)	
Female	Yes (n=37)	10 (27)	p=0,002
	No (n=177)	14 (7,9)	

Table 3: Electronic cigarettes experimentation according to perceptions

Variables	Adolescents who have experimented with e-cigarettes (n=61) Number (%)	p-value
Perception on the social acceptability of e-cigarettes		p<0,001
More acceptable than conventional cigarettes (n=222)	48 (21,6)	
Less acceptable than conventional cigarettes (n=200)	13 (6,5)	
Perception of the harmfulness of e-cigarettes compared to tobacco		p=0,126

More harmful (n=32)	1 (3,1)	
Less harmful (n=130)	23 (17,7)	
Same effect (n=94)	13 (13,8)	
No idea (n=166)	24 (14,5)	
"Is the e-cigarette a good way to quit smoking?"		p=0,457
Yes (n=85)	14 (16,5)	
No (n=110)	12 (10,9)	
Don't know (n=227)	35 (15,4)	

Table 4: Intention to try the electronic cigarette according to the perception on its harmfulness

			Intention to test the e-cigarette in the near future		
			Yes	No	Total
Harmfulness compared to tobacco	More harmful than tobacco	Number	0	31	31
		% in harmfulness compared to tobacco	0.0%	100.0%	100.0%
	Less harmful than tobacco	Number	18	89	107
		% in harmfulness compared to tobacco	16.8%	83.2%	100.0%
	Same effect	Number	5	76	81
		% in harmfulness compared to tobacco	6.2%	93.0%	100.0%
	No idea	Number	10	132	142
		% in harmfulness compared to tobacco	7.0%	93.0%	100.0%
Total		Number	33	328	361

		% in harmfulness compared to tobacco	9.1%	90.9%	100.0%
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Figures :

Figure 1: Distribution of middle school students in the sample by smoking status

Figure 2: Other toxic habits of middle school students

Figure 3: Percentage of middle school students with knowledge of e-cigarettes

Figure 4: Main vectors of knowledge of the e-cigarette among middle school students in the sample

Figure 5: Percentage of electronic cigarette experimentation among middle school students in the sample

Figure 6: Circumstances of trying the electronic cigarette among the middle school students in the sample

Figure 7: perception of the harmfulness of the electronic cigarette among middle students in the sample

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Figure 9: Use of electronic cigarettes in the last 30 days among middle school students in the sample who have already tried them

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Figure 12: Distribution of middle school students in the sample who use electronic cigarettes according to the place of purchase of cartridges

Figure 13: Dosage of nicotine used by middle school students in the sample using electronic cigarettes

Figure 14: Adverse effects experienced by the sample of middle school students using electronic cigarettes

Figure 15: Perception of middle school students in the sample on their level of information about the electronic cigarette

Figure 16: Association between e-cigarettes and gender in the study population

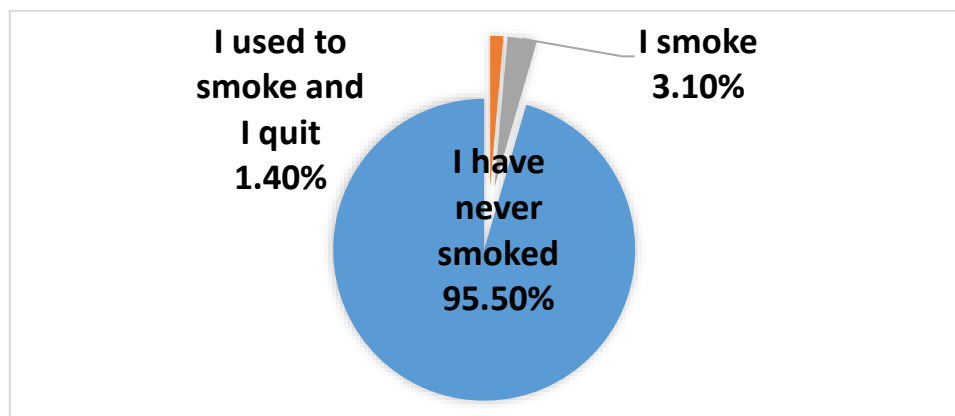


Figure 1: Distribution of middle school students in the sample by smoking status

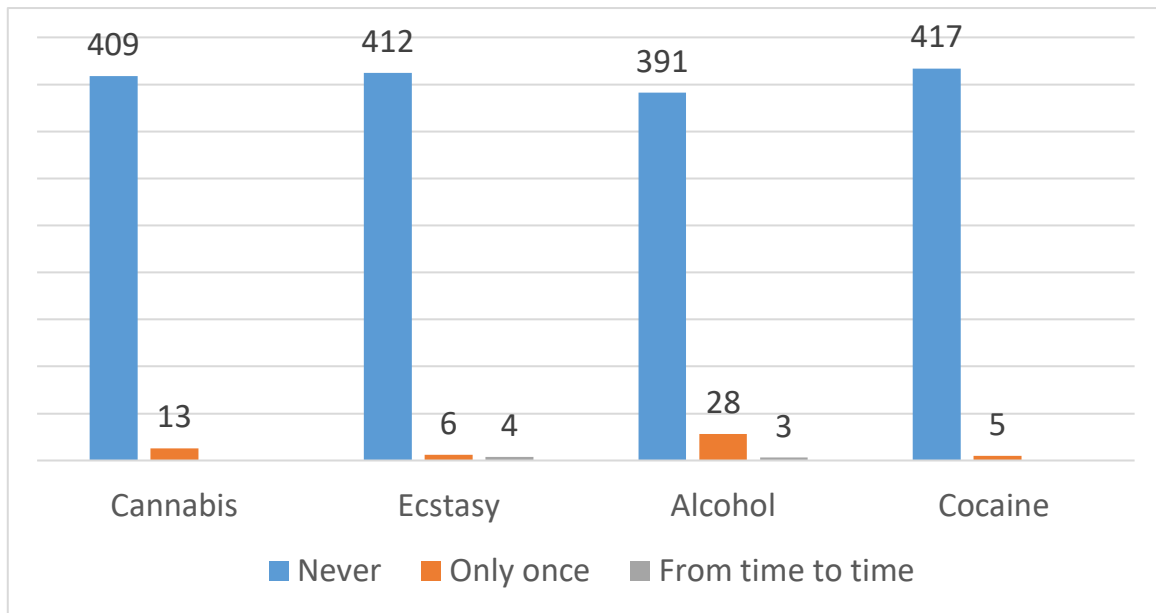


Figure 2: Other toxic habits of middle school students

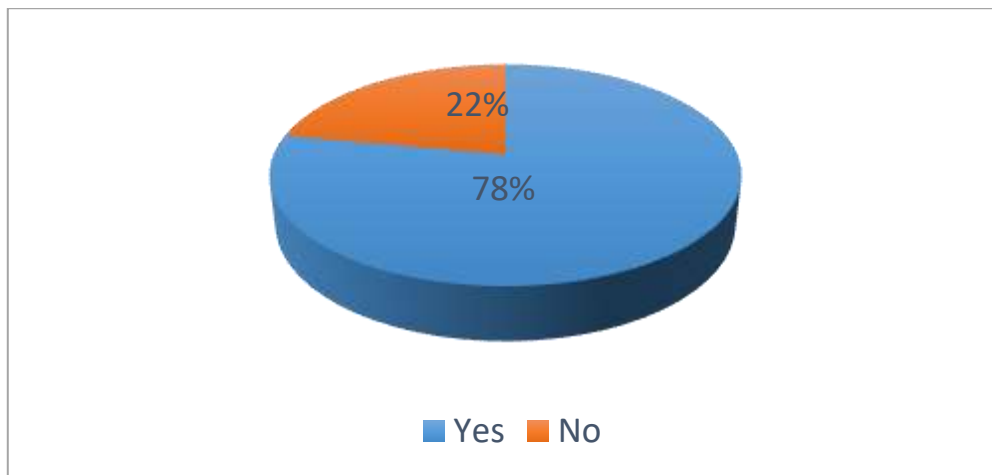


Figure 3: Percentage of middle school students with knowledge of e-cigarettes

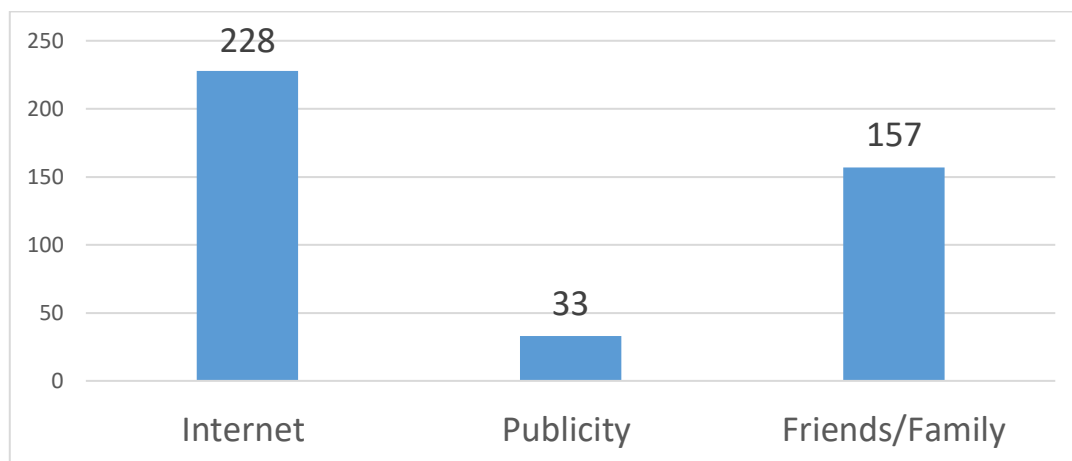


Figure 4: Main vectors of knowledge of the e-cigarette among middle school students in the sample

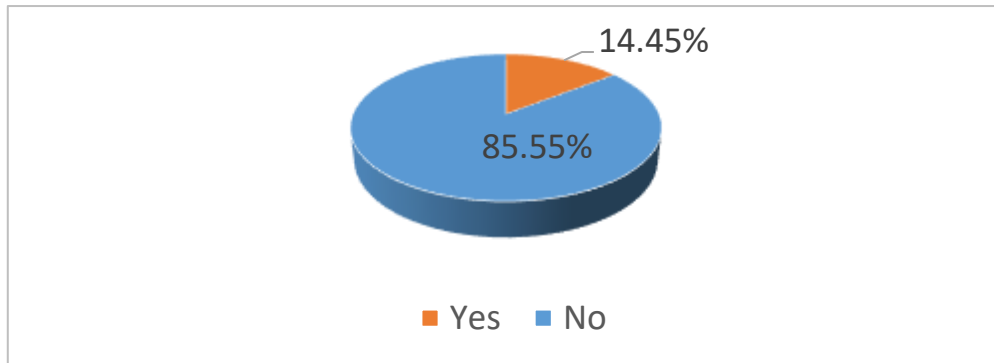


Figure 5: Percentage of electronic cigarette experimentation among middle school students in the sample

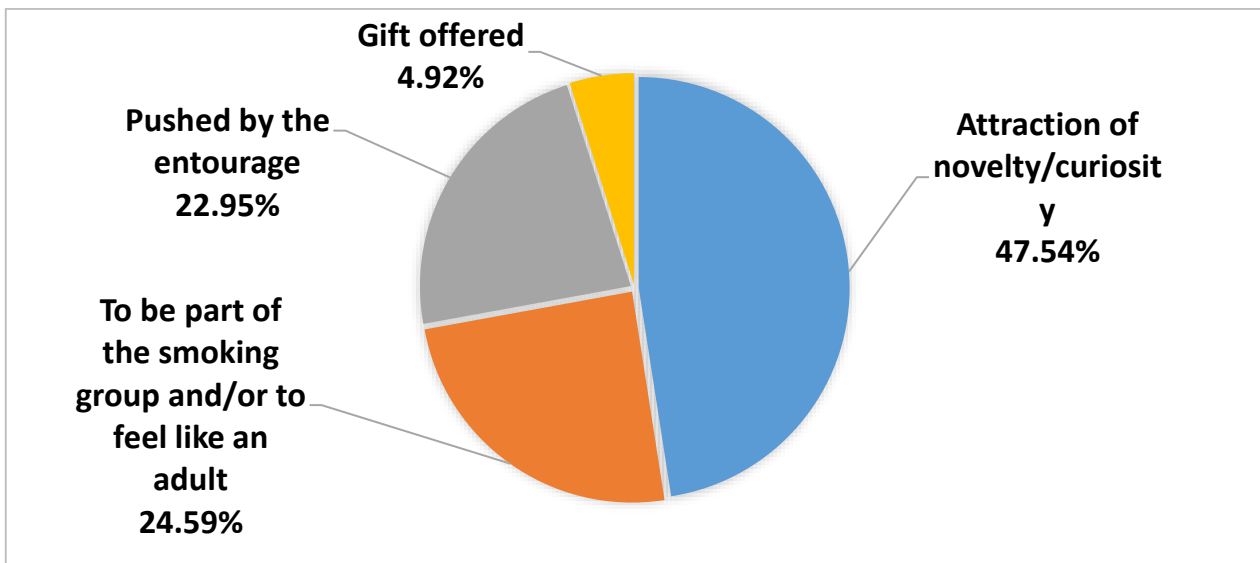


Figure 6: Circumstances of trying the electronic cigarette among the middle school students in the sample

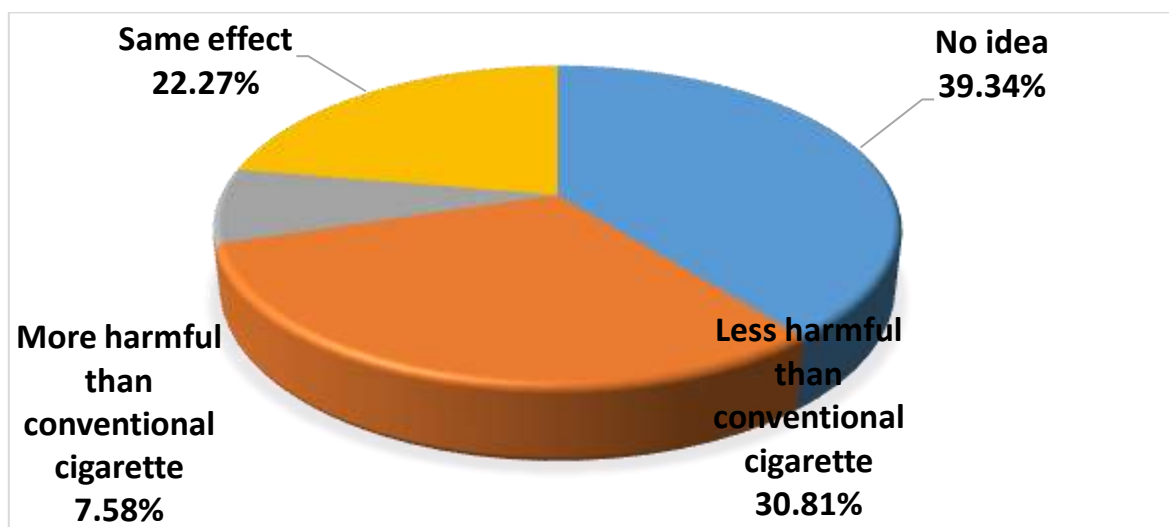


Figure 7: perception of the harmfulness of the electronic cigarette among middle students in the Sample

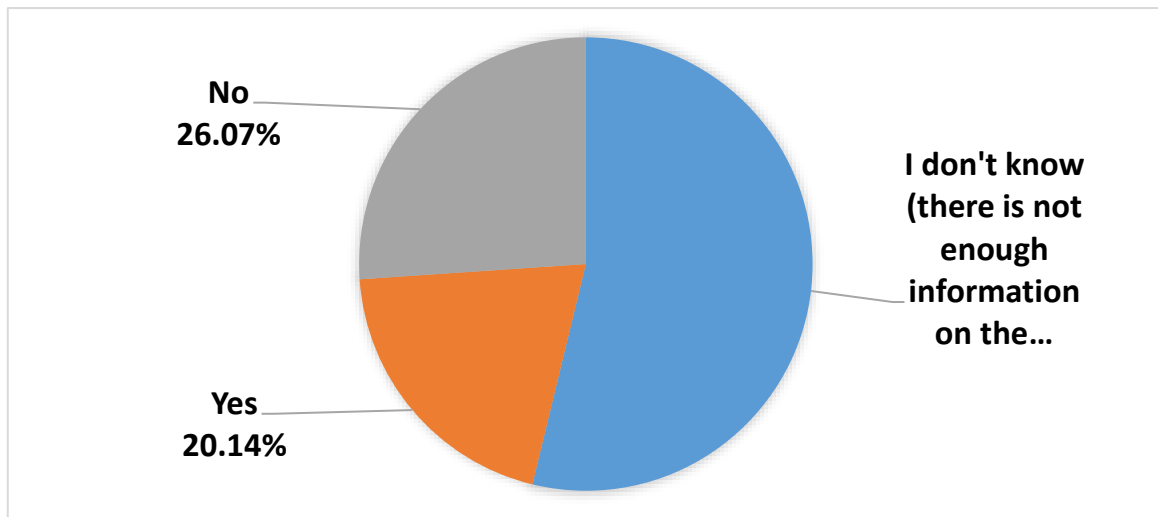


Figure 8: Answers of middle school students in the sample to the question: "Is the electronic cigarette is a good way to stop smoking conventional cigarettes? "

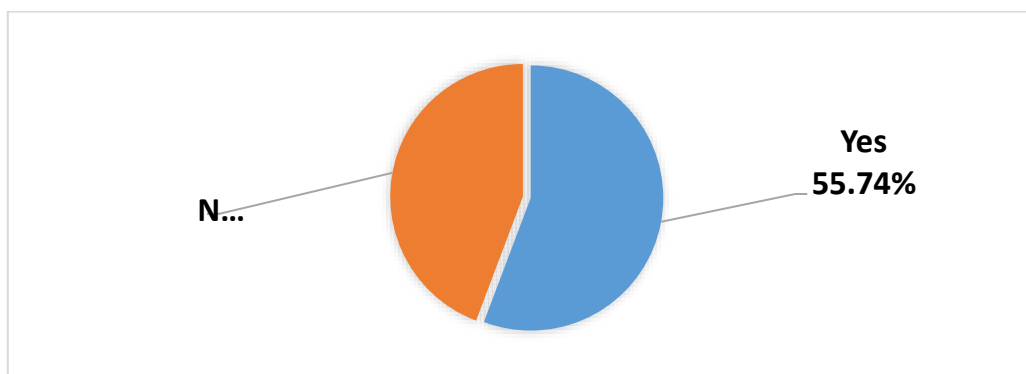


Figure 9: Use of electronic cigarettes in the last 30 days among middle school students in the sample who have already tried them

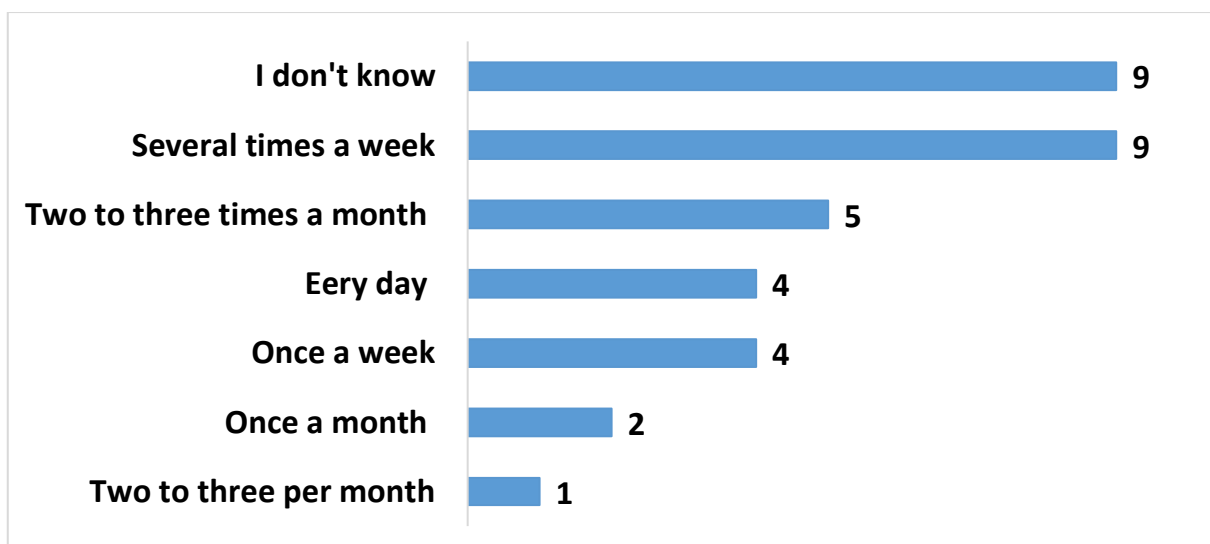


Figure 10: Frequency of use of electronic cigarettes among middle school students who have used them in the past 30 days

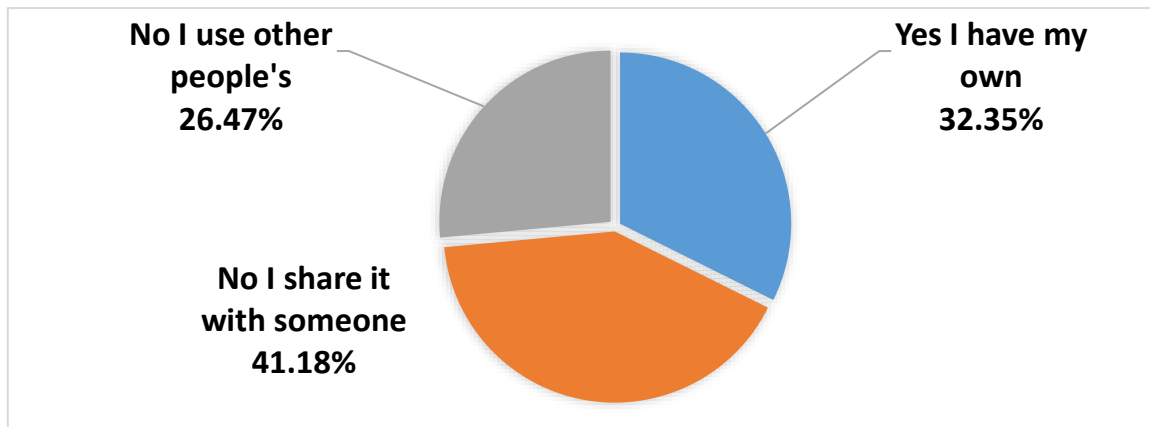


Figure 11: Distribution of middle school students in the sample who use electronic cigarettes according to ownership of a device

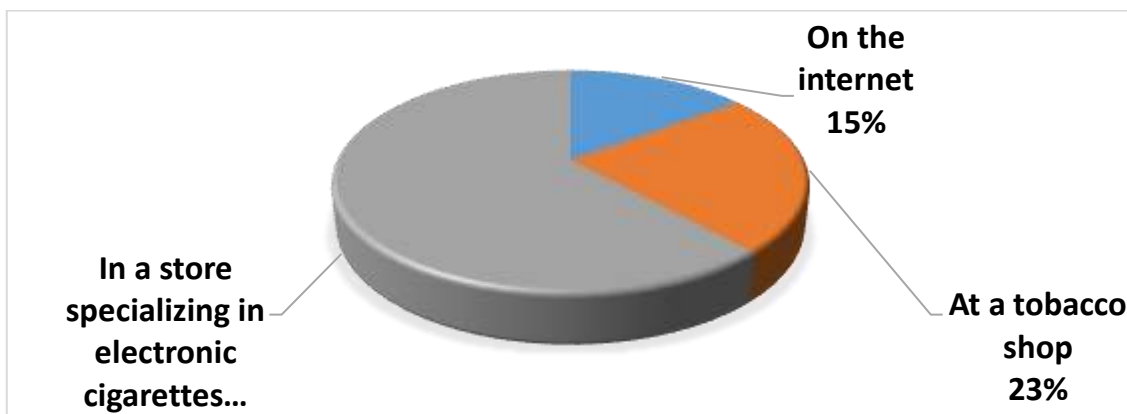


Figure 12: Distribution of middle school students in the sample who use electronic cigarettes according to the place of purchase of cartridges

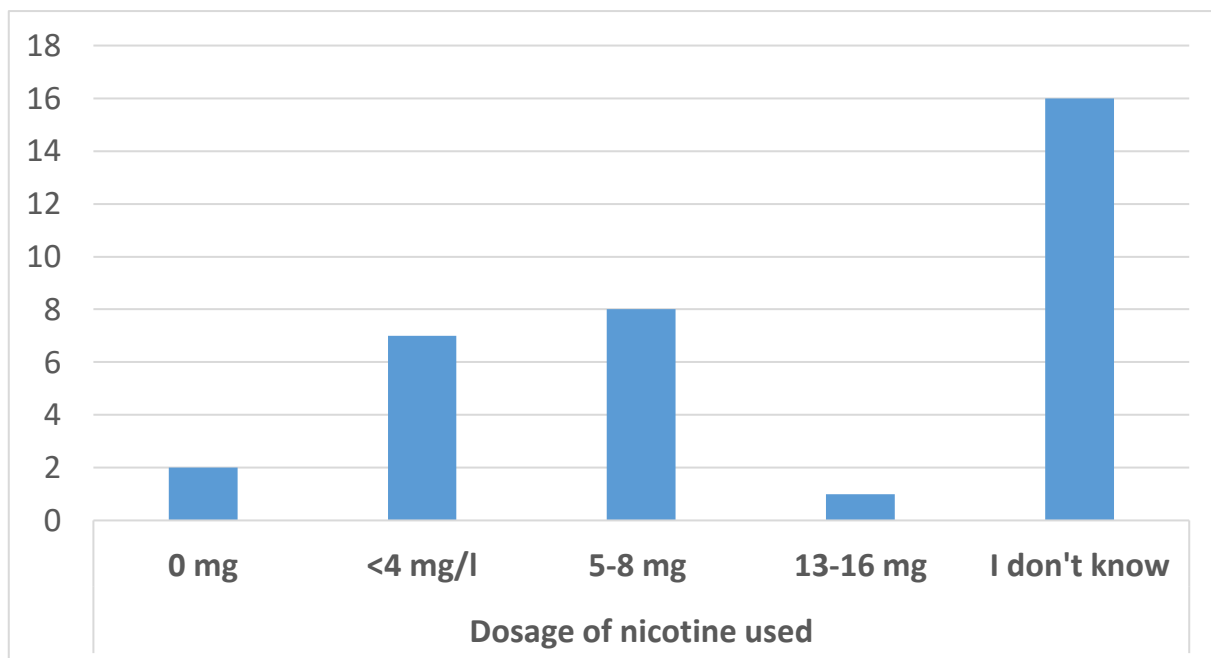


Figure 13: Dosage of nicotine used by middle school students in the sample using electronic cigarettes

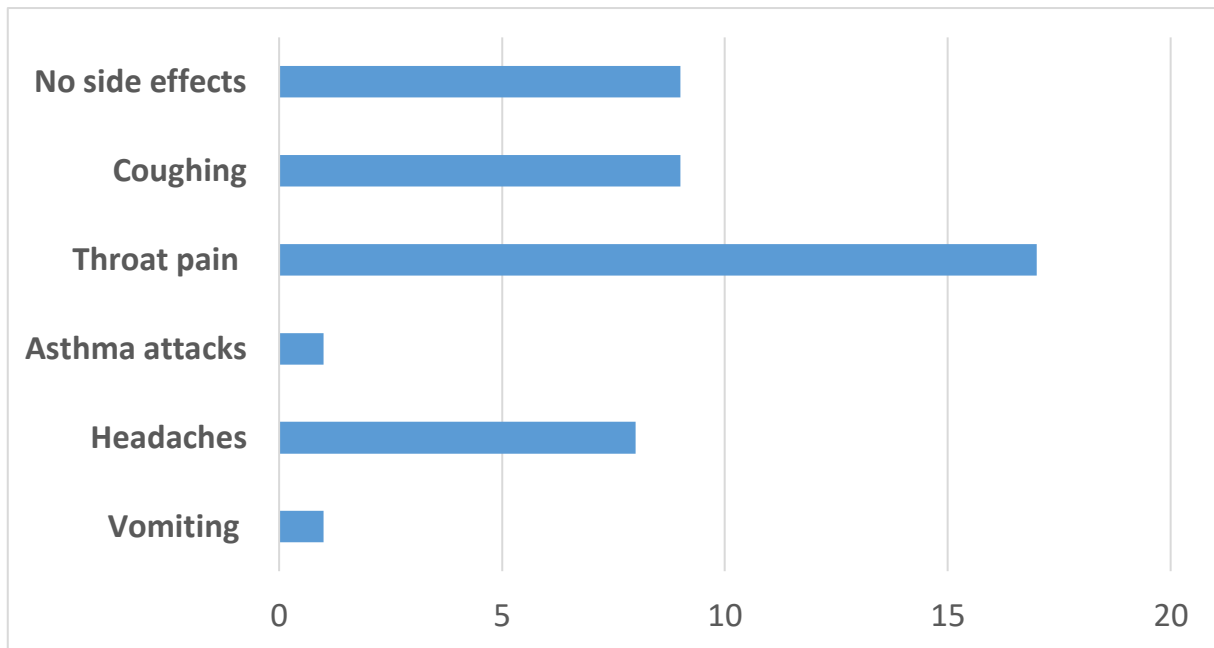


Figure 14: Adverse effects experienced by the sample of middle school students using electronic cigarettes

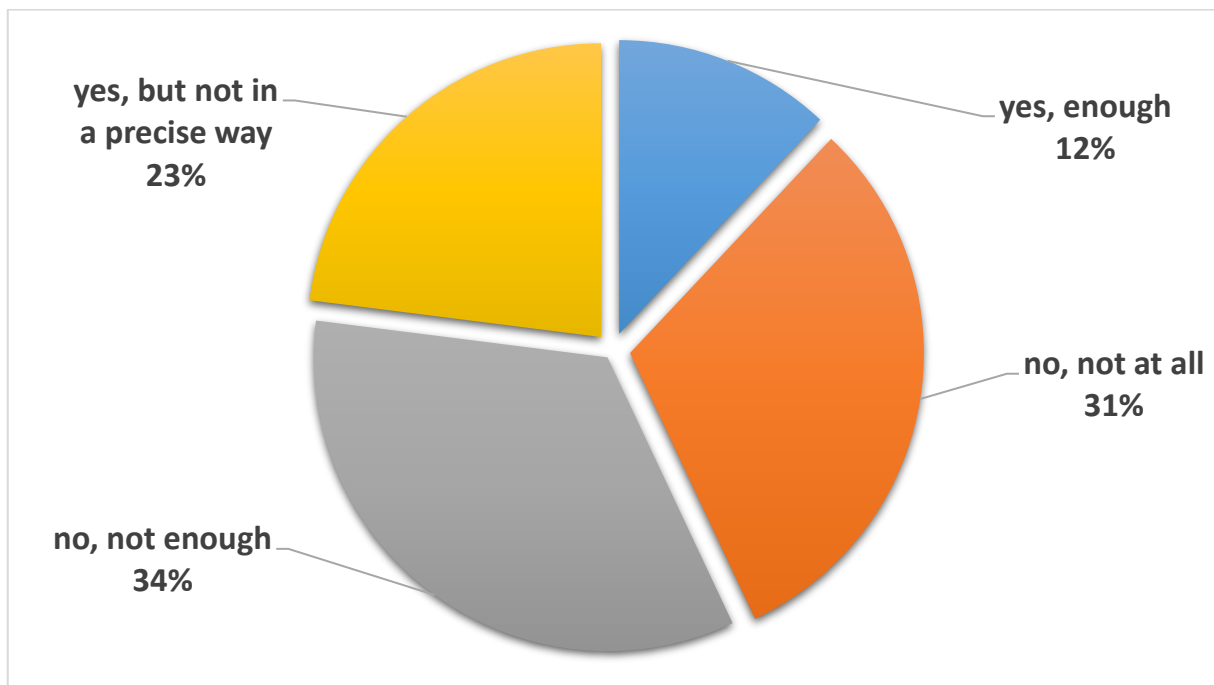


Figure 15: Perception of middle school students in the sample on their level of information about the electronic cigarette

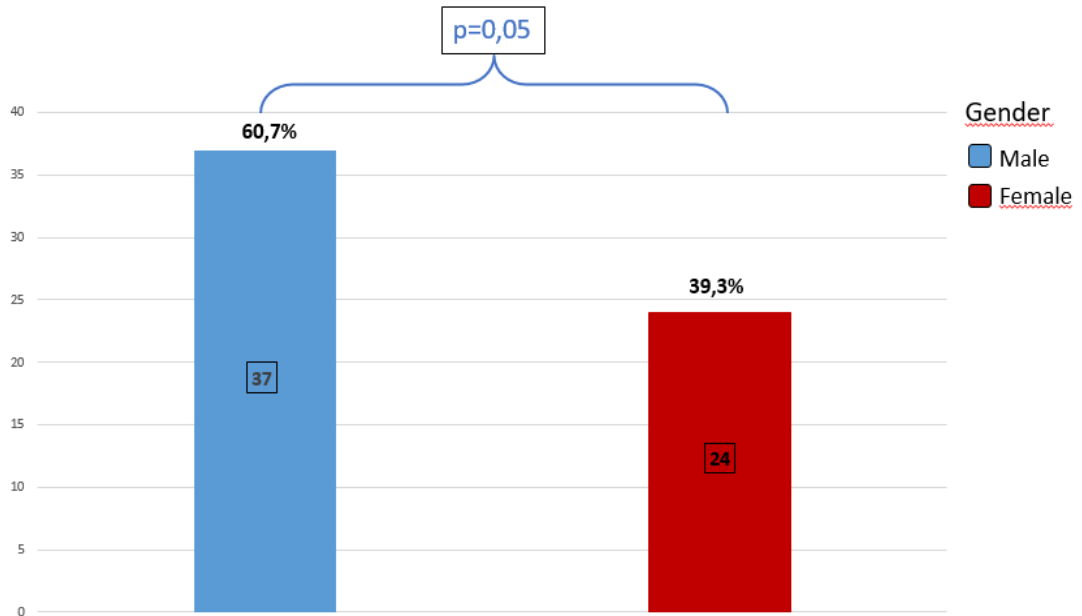


Figure 16: Association between e-cigarettes and gender in the study population