PharmacologyOnLine

Archives • 2021 • vol.2 • 607-617

E-CIGARETTES CULTURE AMONG UNIVERSITY STUDENTS IN JORDAN: A CROSS-SECTIONAL STUDY

Mohd Alaraj[1*], Khalil Altaif [1], Ammar M. Almaaytah [1, 2], Mohamed J. Saadh[1], Irena Kosinska[3], Ahmad A. S. Tabieh[1]

[1] Middle East University, Amman, Jordan
[2] Jordan University of Science and Technology, Irbid, Jordan
[3] Medical University of Warsaw, Warsaw, Poland.

* malaraj@meu.edu.jo

Abstract

This study aims at investigating the Jordanian students' knowledge, perceptions, and beliefs regarding e-cigarettes, as well as their motivation and triggers to try e-cigarettes in the future. A cross-sectional study design was utilized using a questionnaire that was constructed and validated by the study investigators before the start of the study. Undergraduate and postgraduate students attending the Middle East University (MEU), Amman, Jordan were asked to fill in a questionnaire from February to May 2019. Out of 787 students who successfully completed the study questionnaire 75% were males and 25% were females. Most of the study participants were aware of the concept of the e-cigarette; however, only 28.1% of them were active smokers, and 15.8 % of them use/have ever used the e-cigarettes. About 12% of the study participants were of medical background, and the majority of them were first- and second-year students. Most of the information acquired about e-cigarettes were from social media, followed by online advertising, and friends or family members. More than half of the participants rejected the idea of trying e-cigarettes in the future. Taken together; Jordanian students hold a good level of knowledge and perceptions regarding e-cigarettes. However, there is still a room for improvement and educational interventions. The good knowledge of students of medical background can help organizing social campaigns and public educational programs. Thus, the current study also highlights the pivotal role of social media nowadays, and enhances its consideration in any future interventions.

Keywords: *E-cigarettes, students, Jordan, Middle East University, cross-sectional study*

Introduction

Despite Jordan's small population size, around 10 million, the rate of smoking among its residents is high compared to other countries [1]. It has been estimated that 30% of Jordanian adult men (aged > 18) are smokers, in comparison with 26% acclaimed for the USA. Moreover, more than half of the Jordanian population is regular smokers and this addiction has been found as the leading reason of deaths in the country [2].

Therefore, Jordan created the National Tobacco Control Strategy for 2017–2019, which is based on the World Health Organization WHO's MPOWER strategy [3]. The approach aims at decreasing tobacco consumption by 30% in the 2025 [3].

An E-cigarette is a device that vaporizes nicotine, propylene glycol and/or glycerin, and flavoring substances of e-cigarettes bottles, which are then inhaled by the users [4,5]. E-smoking [electronic cigarettes] is gaining high popularity around the world, as it is promoted in the media as a healthier alternative to conventional cigarettes, and Jordan is not an exception [5,6].

Due to the short history of e-cigarette availability (around 10 years) [7], many of its related aspects are still not known or fully understood. The manufacturers/sellers of e-cigarette advocate it in the smoking market as a safer, and cheaper alternative to conventional smoking, and as an effective smoking cessation aid. The scientific evidence about the short- or long-term health hazards is somewhat controversial. A simulation study predicted that by replacing common cigarettes with e-cigarettes for the coming 10 years, 1.6 to 6.6 million smoking-related premature deaths in the United States (US) can be avoided [8]. However, the European Respiratory Society (ERS) stated that despite the fewer and less concentrated toxins that are in e-cigarettes compared to common ones, there is still no clear-cut evidence that e-cigarettes are a safe option in the long run [9]. Nevertheless, several recent studies demonstrated that E-smoking may induce severe respiratory damages and complications including chronic obstructive pulmonary disease (COPD), asthma and severe inflammation of the lungs [10-12].

Despite being marketed as a good smoking cessation aid tool; it is also suspected to provide a potential 'gateway" for step-forward in addicting illicit drugs [9,13]. The Eurobarometer survey that was conducted on the European Union population in 2012, reported that the use of e-cigarettes was more popular among students and individuals younger than 35 years old [14]. Hence, the current study aims at: exploring the Jordanian university students' [represented by MEU students] knowledge, perceptions, and beliefs associated with e-cigarette based on their variable sociodemographic factors, investigating their motivation to join the e-cigarettes club in the future and the reasons why they might do this.

Methods

Participants and Procedure

The study was conducted through a cross-sectional design in the period between February and May 2019 using a self-administered survey constructed before the start of the study. Undergraduate and postgraduate adult students (> 18 years old) attending MEU, Amman, Jordan who accepted to sign the informed consent and completed the questionnaire were included in the study. While students who were on leave and/or not attending classes for three months, suspended by the university, with cognitive disorders, refused to sign the informed consent, or did not complete the questionnaire were excluded.

Instrument validity and reliability

The questionnaire items were constructed by the investigators through a rigorous literature review based on former similar studies. After the design of the first version of the survey, it was finished through two steps: content validity and reliability assessment, and pilot testing. The reliability coefficient, Cronbach's alpha, was calculated and found to be 0.78 which is in the acceptable range (0.70 to 0.95).

Instrument content and scoring

The questionnaire contained three sections. The first section was the sociodemographic information

of the participants and the sources from which they got information about the study topic, followed by the second section which assessed their knowledge by 8 Multiple Choice Questions (MCQs), while the third and last section was to assess their perceptions, beliefs, and motivation towards e-cigarettes through 8 (five-point Likert scale) +2 MCQ questions.

Study ethics

Ethical approval for the study was granted by the administrative board of MEU. Information sheets and consent forms were distributed to all students, and active consent was received from the participants. The respondents were duly informed that participation in the study was voluntary, and that their identity will remain anonymous.

Statistical analysis

The overall score for correct answers and favourable responses for each of the two sections (knowledge, perceptions, and beliefs) was calculated and compared based on the sociodemographic characteristics of study participants. The collected data were analyzed using the Statistical Package for Social Sciences [SPSS] version 23.0. Frequencies (n), percentages (%), chi-square, and Kruskal-Wallis tests were used to interpret the descriptive and inferential information. The level of significance was set at $p<0.05$ with 95% Confidence Interval (CI).

Results

Table 1 shows the demographics of the study participants. Out of the 787 MEU students [mean age 21+2.1 years] who successfully completed the survey 590 (75%), and 197(25%) were females. The study included students from different specialties; the majority of which [88.2%] were from a non-medical background, while only 88 students (11.8%) were pharmacy students. Furthermore, the students were from different academic progress levels, where the highest contribution was from the first-year students (43.7%), followed by the second, third, fourth, and fifth years' students in descending order. More than 60% of participants never smoked before, while the rest (around 40%) were either active or former smokers. Although most of the participants (89.1%) were familiar with e-cigarettes, (84.2%) have never tried it. The monthly income/allowance of around two-thirds of the respondents was between 150 and 300 JDs and the rest of them were either less or more than this range.

As illustrated in fig. 1, most of the participants (42%) acquired their knowledge about e-cigarettes from social media, followed by online advertising (26%), and friends and family members (20%). Other informative tools like newspapers/magazines, TV/radio, and billboards/signs represented a minor role (3, 7, and 2% respectively).

Table 2 and fig. 2 demonstrate the knowledge level of the study participants in different aspects relevant to e-smoking and e-cigarettes. Knowledge of the participants fluctuated between acceptable knowledge level (> 60% correct answers) in some items like the Jordanian regulations of e-cigarettes, the lung cancer risk of e-cigarettes compared to conventional ones, addiction potential for nicotine in e-cigarettes cartridges, and complications of e-cigarettes use. On the other hand, other items showed weak knowledge level (<60% correct answers) as FDA approval status for e-cigarettes for smoking cessation, components of e-cigarettes, brands, terms and expressions related to e-smoking, and the average prices of e-cigarettes devices and refills.

Table 3 exhibits the responses of the study participants to the perception and beliefs section. Most of the respondents agreed that e-cigarettes draw a better social image for smokers (73%), encourages the continuation of smoking over than quitting [65%], contains harmful chemicals (77%), is a public health concern [88%], and that it should be regulated in public areas (93%). Most of them as well, disagreed that e-cigarettes are a better Nicotine Replacement Therapies (NRTs) alternative for smoking cessation and that it can lower cancer risk. Furthermore, the participants were quite unsure of the e-cigarettes' safety compared to conventional cigarettes and if it can represent a bridge for other forms of tobacco or addiction.

Table 3 exhibits the responses of the study participants to the perception and beliefs section. Most of the respondents agreed that e-cigarettes draw a better social image for smokers (73%),

encourages the continuation of smoking over than quitting (65%), contains harmful chemicals (77%), is a public health concern (88%), and that it should be regulated in public areas (93%). Most of them as well, disagreed that e-cigarettes are a better Nicotine Replacement Therapies (NRTs) alternative for smoking cessation and that it can lower cancer risk. Furthermore, the participants were quite unsure of the e-cigarettes' safety compared to conventional cigarettes and if it can represent a bridge for other forms of tobacco or addiction.

Table 4 shows how sociodemographic classifications of the study respondents affected their average mean knowledge, perceptions, and beliefs mean scores; gender, specialty, current smoking status, familiarity with e-cigarettes, and income/allowance were among demographic factors that showed significant differences between its members/groups. Additionally, other factors like academic years and e-cigarettes ever use did not significantly differentiate its groups. Overall, males, pharmacy students, fourth- and fifth-year students, current smokers, e-cigarettes familiar respondents, and highest-income participants score higher knowledge mean scores than their counterparts. Except for pharmacy students, most of the demographics subgroups who scored high knowledge scores, paradoxically, scored lower in perceptions and beliefs scores.

Fig. 3 and fig. 4 demonstrate the students' motivation regarding e-cigarettes use in the future where more than half of them (57%) made their decision of not giving it a try mostly because of its rare flavors or to quit conventional cigarettes, while around (28%) were motivated to try it, and around (15%) were not sure.

Discussion

The present study thoroughly investigated the MEU students' knowledge, perceptions, and beliefs regarding e-smoking and e-cigarettes consumption, as well as their motivations and the reasons why they might like to try it in the future. It was no wonder that most of the participants were familiar with e-cigarettes due to the rapidly growing popularity it is gaining around the world on daily basis. This finding was similar to that reported by Hart et al. [15], where most University of Louisville Students showed familiarity with the e-smoking concept [15].

The current study showed that the male gender was prevailing in their smoking practice and their knowledge regarding e-cigarettes. This comes in concordance with what Surís et al., Babineau et al., and Kochsiripong et al. who found in their former studies and this might be attributed to the Jordanian culture which does not tolerate female smokers [16,17]. Unlike some studies that reported a high percentage of university students who use e-cigarettes like Puteh et al., and Marion et al. [18,19], in our study around 16% of the participants were either naïve or expert e-cigarettes smokers, and this comes in congruence with Kochsiripong et al. who reported that only around 20% of the students were e-cigarette users [17].

Age did not significantly influence the e-cigarettes use fluctuation. Although some variability in age (18-27) occurred, the mean age of respondents in the present study was around 21, which is a normal standard college sample mean age. The remarkable impact of age may be easier to be detected in studies that look over a wider array of participants and age groups [15].

One of the major findings of this study is the almost inverse relationship between students' knowledge and perceptions/beliefs mean scores; as most of the students who scored high knowledge mean scores, paradoxically, scored lower in the perceptions and beliefs section. This dilemma can be explained by the fact that manufacturers tend to augment or overestimate the potential benefits of e-cigarettes and underestimates its hazards in the information or fact sheets that they provide to the public. Moreover, students reported that they acquired most of their information about e-cigarettes from social media pages and links which are mostly posted by manufacturers, and lack proper scientific evidence. Therefore, pharmacy students who are familiar with credible medical information resources represented an exception to this paradoxical phenomenon; by scoring high mean knowledge and perceptions/beliefs mean scores.

Likewise, this study pointed to a higher knowledge level and more favourable perceptions

towards e-smoking when compared to their colleagues from other specialties like education, engineering, information technology, and media. This appropriateness of these results can be supported by former studies that involved students from medical backgrounds like nursing, medicine, and dentistry [13,20].

Similarly, the current study reported the potential reasons because of which participants might like to try e-cigarettes in the future; among which, trying to quit conventional smoking, unique and rare flavors of e-cigarettes products, were the highest reasons. These findings also come in concordance with prior studies by Notley et al. and Willett et al. [21-,22].

Finally, the main limitations of this study include its cross-sectional design, as well as being a single-centre study; as the data were only collected in one university in Jordan [MEU] which may limit its genera-ability. Likewise, the self-reporting mechanism used in data collection might have resulted in a biased response to some extent. Despite such limitations, the current study represents a stone in a still pond that triggers further waves of studies and interventions. It draws a clear image of the current situation of university students, represented by MEU students, regarding the emerging novel smoking technologies. It also informs about the reasons that might seduce our youth to the unfavourable e-smoking community in order to proactively control it. The present study provides a valuable piece of evidence to the Jordanian government and concerned institutions and bodies that can aid the national tobacco control strategies.

Conclusions

The study provides evidence-based information for triggering a behavior-change campaign on e-cigarette use among university students as both conventional cigarettes, as well as e-cigarette use among students, for whatever reason, need to be discouraged. National awareness movements need to be initiated to provide proper/reliable information about e-smoking and e-cigarettes including clarifying its improperly overestimated role in smoking cessation and inappropriately underestimated health short-term and long-term hazards to counteract the misleading, and evidence-lacking information provided and advertised by manufacturers. Different social media platforms have a remarkable role in shaping the young generation's knowledge and personalities and involving them in any anti-smoking activities is inevitable. Students with medical backgrounds possess good knowledge and perceptions regarding e-cigarettes and can be actively involved in e-smoking awareness activities.

Acknowledgments

The authors are thankful to the Middle East University, Amman, Jordan for the financial support granted to cover the publication fee of this research article.

References

1.https://www.globalbridges.org/news/blog/2015/12/22/jordan-launches-2016-18-tobacco controlroadmap/#.WrEovfluZhF

2. Kandela P. Jordan starts campaign to tackle high rates of smoking. Lancet. 2000;355(9217):1800

3. Marquez PVK, Konstantin K and Andreeva T /2019/ Jordan: Overview of Tobacco Use, Tobacco Control Legislation, and Taxation. Washington, D.C.: World Bank Group.

4. National Cancer Institute. NCI Dictionary of Cancer Terms [Online]. Available: https://www.cancer.gov/publications/dictionaries/cancer-terms/ def/electronic-cigarette. 2019

5. NIDA. Electronic Cigarettes (E-cigarettes) [Online]. Available: https:// www.drugabuse.gov/publications/drugfacts/electronic-cigarettes-e-cigarettes 2019.

6. Caponnetto P, Campagna D, Papale G, Russo C, Polosa R. The emerging phenomenon of electronic cigarettes. Expert review of respiratory medicine. 2012, 6(1), 63-74. doi:10.1586/ers.11.92

7. Brożek G, Jankowski M, Zejda J, Jarosińska A, Idzik A, Bańka P. E-smoking among students of medicine—frequency, pattern and motivations. Advances in Respiratory Medicine. 2017, 85(1), 8-14. doi:10.5603/ARM.2017.0003

8. Vos T, Barber R M, Bell B, Bertozzi-Villa A, Biryukov S, Bolliger I., et al. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013.

The Lancet.2015, 386(9995), 743-800. doi:10.1016/S0140-6736[15]60692-4
9. Bals R, Boyd J, Esposito S, Foronjy R, Hiemstra P S, Jiménez-Ruiz C A, et al. Electronic cigarettes: a task force report from the European Respiratory Society. European Respiratory Journal. 2019, 53(2). doi:10.1183/13993003.01151-2018
10. Kaur G, Pinkston R, Mclemore B, Dorsey WC and Batra S. Immunological and toxicological risk assessment of e-cigarettes. European Respiratory Review. 2018, 27, 170119.
11. Chatterjee S, Tao J-Q, Johncola A, Guo W, Caporale A, Langham MC and Wehrli FW. Acute exposure to e-cigarettes causes inflammation and pulmonary endothelial oxidative stress in nonsmoking, healthy young subjects. American Journal of Physiology-Lung Cellular and Molecular Physiology. 2019, 317, L155–L166.
12. CDC. Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products[Online].2020,Available:https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html
13. Canzan F, Finocchio E, Moretti F, Vincenzi S, Tchepnou-Kouaya A, Marognolli O, et al. Knowledge and use of e-cigarettes among nursing students: results from a cross-sectional survey in north-eastern Italy. BMC public health. 2019, 19(1), 976. doi:10.1186/s12889-019-7250-y
14. Ooms G I, Bosdriesz J R, Portrait F R, Kunst A E. Sociodemographic differences in the use of electronic nicotine delivery systems in the European Union. Nicotine & Tobacco Research. 2016, 18(5), 724-729. doi:10.1093/ntr/ntv215
15. Hart E P, Sears C G, Hart J L, Walker K L. Electronic cigarettes and communication: an examination of college students' perceptions of safety and use. Kentucky journal of communication. 2017, 36(1), 35.
16. Suris J C, Berchtold A, Akre C. Reasons to use e-cigarettes and associations with other substances among adolescents in Switzerland. Drug and alcohol dependence.2015,153,140-144. doi:10.1016/j.drugalcdep.2015.05.034
17.KOCHSIRIPONG,Patchaya;PITIRATTANAWORRANAT, Prompiriya. Attitudes and perceptions toward electronic cigarettes among undergraduate health science students, Rangsit University, Thailand. Songklanakarin Journal of Science & Technology, 2021, 43.1.
18. Puteh S E W, Manap R A, Hassan T M, Ahmad I S, Idris I B, Sham F M, et al.The use of e-cigarettes among university students in Malaysia. Tobacco induced diseases. 2018, 16. doi:10.18332/tid/99539
19. MARION, Jason W.; STRAND, Alina; BALDRIDGE, Elliott. Changes in Student Behaviors and Policy Opinion regarding E-cigarettes at a Kentucky University from 2014 to 2018. Preventive Medicine Reports, 2021, 101364. doi: https://doi.org/10.1016/j.pmedr.2021.101364
20. Stepney M, Aveyard P, Begh, R. GPs' and nurses' perceptions of electronic cigarettes in England: a qualitative interview study. British Journal of General Practice. 2019, 69(678), e8-e14. doi:10.3399/bjgp18X699821
21. NOTLEY, Caitlin, et al. User pathways of e-cigarette use to support long term tobacco smoking relapse prevention: a qualitative analysis. Addiction, 2021, 116.3: 596-605.
22. WILLETT, Jeffrey G., Bennett, M., Hair, Elizabeth C., Xiao, H., Greenberg, Marisa S., Harvey, E., Cantrell, J., Vallone, D. Recognition, use and perceptions of JUUL among youth and young adults. Tobacco control, 2019, 28.1: 115-116. http://dx.doi.org/10.1136/tobaccocontrol-2018-054273

Table 1. Demographics of Study Participants [n = 787 student]

Characteristics	n [%]
Age mean ± SD	21 ±2.1
Gender	
Male	590 [75.0]
Female	197 [25.0]
School/specialty	
Medical [pharmacy]	88 [11.8]
Others [non-medical]	699 [88.2]
Law, Education & Philosophy and theology	266 [34.0]
Engineering & Agriculture and design	192 [24.4]
Information technology & media	241 [29.8]
Academic Year of study	
First	344 [43.7]
Second	219 [27.8]
Third	111 [14.1]
Fourth	60 [7.6]
Fifth	53 [6.8]
Smoking current status	
Never smoker	489 [62.1]
Former smoker	77 [9.8]
Current smoker	221 [28.1]
E-cigarettes ever use	
Never	662 [84.2]
Naïve user	82 [10.4]
Expert user	43 [5.4]
E-cigarettes familiarity	
Yes	701 [89.1]
No	86 [10.9]
Income/allowance	
< 150 JD	126 [16.0]
150 - 300 JD	488 [62.0]
300 -450 JD	118 [15.0]
> 450 JD	55 [7.0]

Table 2. Respondents Knowledge About E-Cigarettes

Item	% of correct answer
E-cigarettes approval status by FDA as an aid for smoking cessation	32.7
E-cigarettes product law regulations in Jordan	77.8
E-cigarettes relative lung cancer risk compared with conventional ones	82.2
Components of e-cigarettes [especially Ethylene Glycol -EG]	39.1
E-cigarettes addiction/dependence potential of nicotine refill bottles	88.6
Long and short-term Health hazards/complications/toxicities after exposure to e-cigarettes	74.5
E-cigarettes products/brands/terms [ex: all-day-vape, PVs, MOD, and analogue]	20.3
Average price/expenditure of e-cigarettes	16.5

Table 3. Participants' Perceptions, and Beliefs

Item	Agree n [%]	Disagree n [%]
E-cigarettes are safer to use than regular cigarette	52.3	47.7
E-cigarettes are better than other Nicotine Replacement Therapies [NRTs] like adhesive patches and chewing gums for smoking cessation	32.4	67.6
E-cigarettes could be a "gateway" to other tobacco/addiction	55.3	44.7
E-cigarettes draw a better social image and acceptance for smokers	72.8	27.2
E-cigarettes encourage smoking continuation among smokers who might have quit otherwise	65.1	34.9
E-cigarettes contain some chemicals that may cause long-term health effects	77.2	22.8
E-cigarettes use is a public health concern	88.4	11.6
E-cigarettes should be regulated in public areas	92.9	7.1
E-cigarettes can lower cancer risk	33.3	66.7

Table 4. The impact of participant's demographics on the participants' knowledge, perceptions, beliefs, and motivation to use e-cigarettes.

Characteristics	Knowledge Mean [SD][a]	P-value	Perceptions, beliefs & motivation Mean [SD][b]	P-value
Gender				
Male	6.2 [1.30]	0.112	7.2 [2.1]	0.023
Female	5.6 [0.88]		8.3 [1.6]	
School/specialty				
Medical [pharmacy]	7.1 [1.2]	0.021	7.6 [1.8]	0.033
Others [non-medical]				
Law, Education & Philosophy and theology	6.3 [2.1]		6.8 [1.2]	
Engineering & Agriculture and design	5.2 [1.8]		6.1 [2.1]	
Information technology & media	6.8 [1.3]		7.2 [1.6]	
Academic Year of study				
First	4.2 [1.30]	0.062	7.8 [1.2]	0.052
Second	5.5 [0.88]		7.3 [2.1]	
Third	6.4 [1.30]		6.8 [1.6]	
Fourth	7.1 [0.88]		6.2 [1.2]	
Fifth	6.9 [1.30]		6.7 [2.1]	
Smoking current status				
Never smoker	5.2 [1.20]	0.014	7.8 [2.1]	0.021
Former smoker	6.5 [0.90]		6.2 [2.0]	
Current smoker	7.4 [2.30]		5.8 [1.6]	
E-cigarettes ever use				
Never	6.1 [2.30]	0.092	7.4 [1.7]	0.063
Naïve user	6.9 [1.80]		6.8 [1.9]	
Expert user	7.6 [1.55]		6.2 [2.3]	
E-cigarettes familiarity				
Yes	7.4 [1.20]	0.015	5.9 [1.4]	0.022
No	5.6 [1.75]		7.1 [1.9]	
Income/allowance				
< 200 JD	5.2 [1.20]	0.001	7.8 [1.1]	0.031
200 - 400 JD	6.6 [1.75]		6.5 [1.6]	
> 400 JD	7.4 [1.20]		5.8 [2.5]	

[a] The highest knowledge mean score: 8/8, [b] The highest mean score for perceptions, and beliefs is

Figure 1. Sources of e-cigarettes information

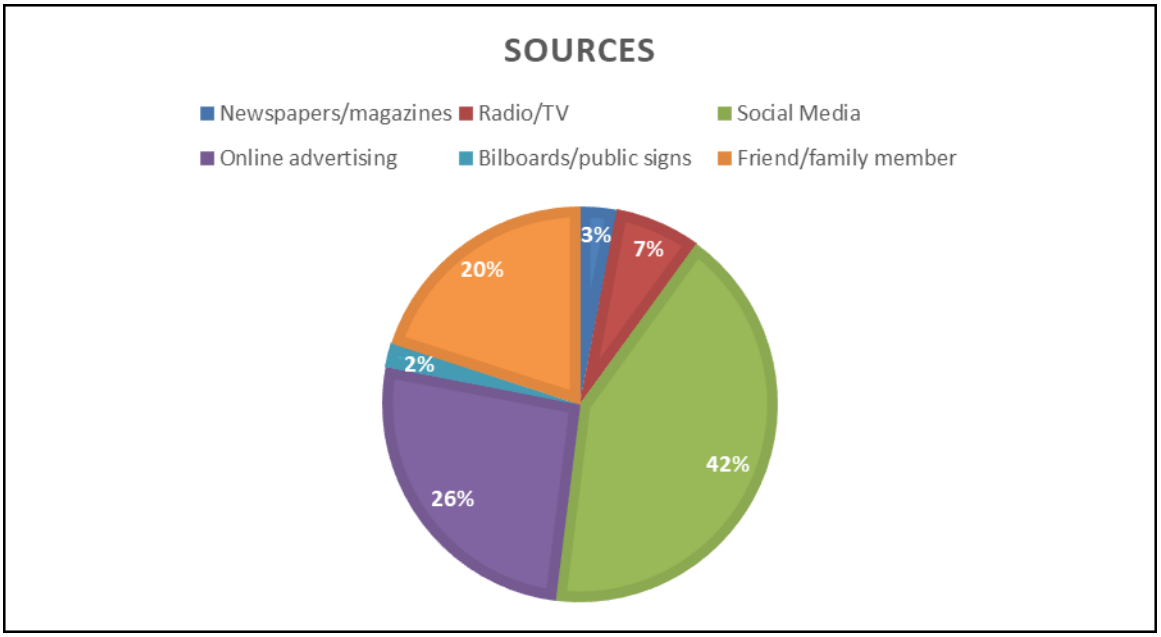

Figure 2. Knowledge level of the respondents in different aspects regarding e-smoking

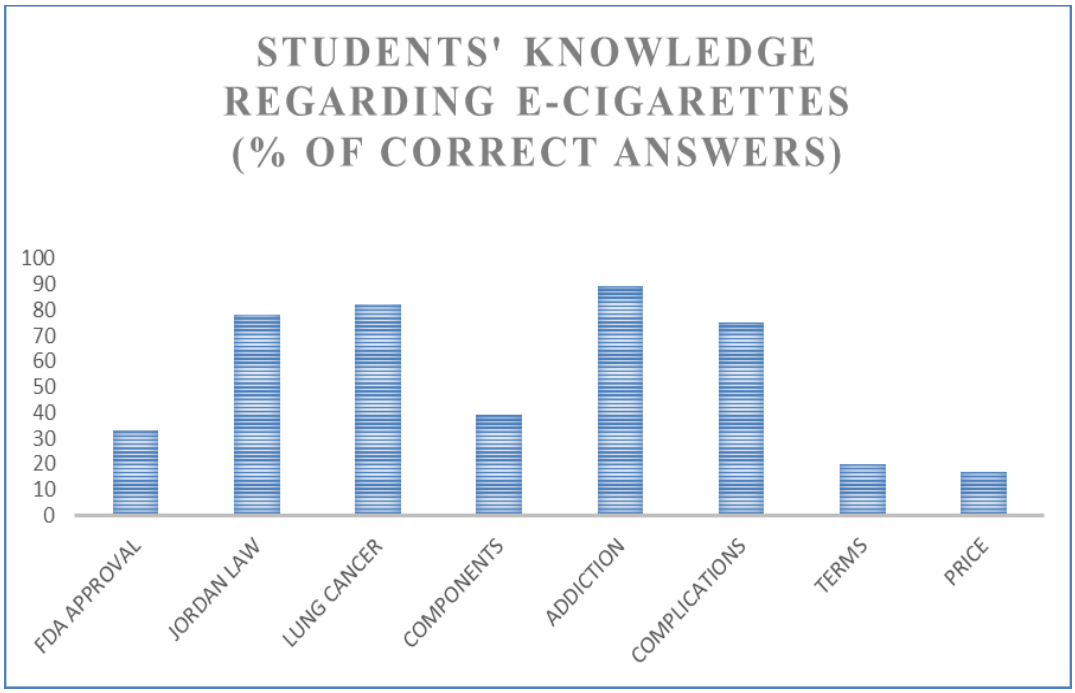

Figure 3. Willingness to use/try in the future

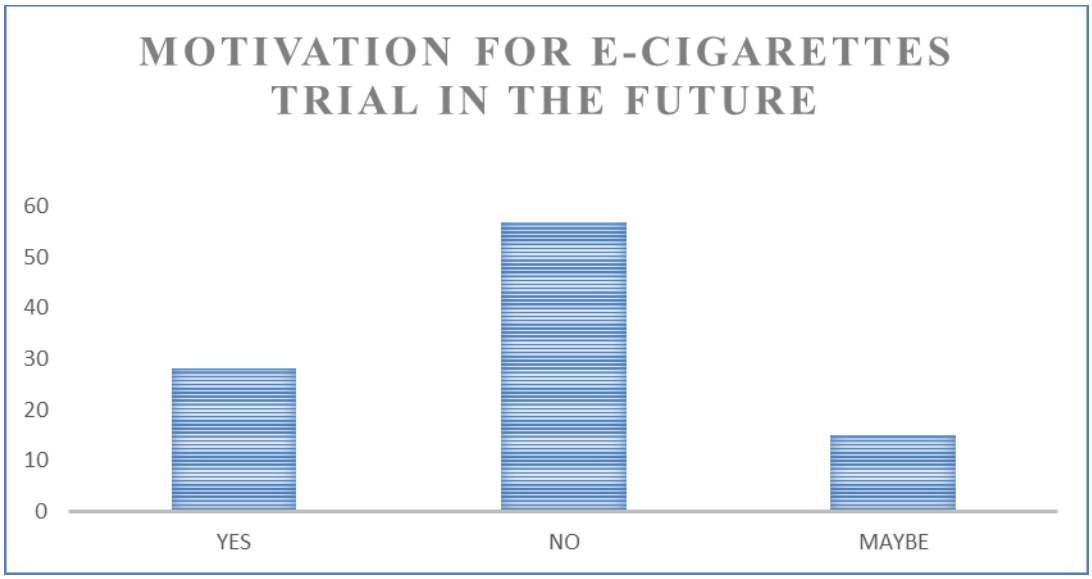

Figure 4. Triggers for Motivation to try E-cigarettes in The Future