Cardiovascular Disease Patients' Knowledge Toward Electronic Cigarette Smoking

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Abstract

Electronic cigarettes (e-cigarettes) are alternative tools that are developed to help the smokers quit smoking which is considered a major modifiable risk factor of cardiovascular disease. **The aim** of this study was to assess Cardiovascular Disease Patients' Knowledge Toward Electronic Cigarette Smoking **Design:** A descriptive analytical design was used. **Setting** The study was conducted at cardiac outpatient clinic in Menofia University Hospital **Sample:** A purposive sample technique was used to recruit 368 patients. **Inclusion criteria:** The age from 18 to 55 years and smokers **Data collection tools:** Two tools were used: **1**- Structured interviewing questionnaire. **2**- Medical record tool: **Results:** The study showed that, more than two thirds of the studied patients had unsatisfactory level of total knowledge about electronic cigarette smoking. More than one third of the studied patients had information about electronic cigarette from internet and social networking sites. **Conclusion:** There was highly statistically significant difference between age, gender and educational level with total level of knowledge (P=<0.01). **Recommendations:** Development of educational health programes to raise awareness of smokers, cardiovascular disease patients and public about e-cigarette smoking through mass media, social media, clear language booklets and simplified brochures.

Keywords: Cardiovascular Disease, knowledge, Electronic Cigarette Smoking

Introduction

Tobacco smoking has become a global health concern, leads to disease and disability and harms nearly every organ of the body. There are about 1.07 billion smokers worldwide, of whom 908 million are men and 162 million are women, with the majority from low- and middle-income countries. Cigarette smoking remains the leading cause of preventable disease, disability, and death, killing more than 8 million people a year around the world. More than 7 million of those deaths are the result of direct tobacco use while around 1.2 million are the result of non-smokers being exposed to second-hand smoke **(Hafez et al., 2022).**

Cardiovascular disease (CVD) remains the most common cause of death worldwide, with the Global Burden of Disease (GBD) study estimating that 17.8 million deaths due to CVD occurred globally in 2017. This estimate represented a 21% increase in the number of people dying from CVD, with ischaemic heart disease (IHD) and stroke accounting for nearly 50% and 35% of these CVD deaths, respectively. Smoking is associated with 11% of cardiovascular deaths worldwide **(Townsend et al., 2022).**

Electronic cigarettes are battery-powered devices that produce an aerosol generated by heating a solution (e-liquid) consisting of nicotine, glycerol, propylene glycol, and flavors. The first generation of e-cigarettes tried to mimic the experience of smoking conventional cigarettes. The later generation devices contain high-powered atomizers and use higher nicotine concentrations in the e-liquids, increasing the speed of delivery and yield of nicotine like conventional cigarettes **(Espinoza-Derout et al., 2022)**

Cardiovascular risk is increased by cigarette smoking via effects of both nicotine and the combustible effects of tobacco, including increased carbon monoxide, free radicals, carbonyls, reactive oxygen species, and particulate matter, as well as reduced monocyte-derived endothelial progenitor cells. This occurs with directly inhaled smoke from the primary user as well as from side stream smoke emitted from the burning tobacco product and exhaled smoke. The increased risk occurs through a variety of mechanisms, including, endothelial

dysfunction, vasomotor effects, inflammatory effects, hypercoagulability and thrombosis, adverse effects on lipids and insulin resistance, as well as arrhythmogenesis **(Neczypor et al., 2022).**

E-cigarette exposure has negative effects on the cardiovascular system. This occurs through several different mechanisms including direct cytotoxicity, platelet dysfunction, oxidative stress, and endothelial dysfunction. All of these can potentially lead to vascular injury and are strongly associated with cardiovascular compromise. E-cigarette use was associated with myocardial infarction (MI), with an odds ratio of 1.7 for e-cigarette users relative to nonusers of e-cigarette **(Walley & Wilson, 2021).**

The use of electronic cigarettes (e-cigarettes) as a smoking cessation aid or as a permanent replacement for smoking is increasing. The gateway theory states that e-cigarette use might lead to the use of combustible cigarettes by non-smokers. Smokers have consistently indicated that an important reason for using e-cigarettes is to aid quitting. It is therefore expected that e-cigarettes use would be more common among smokers who intend to quit smoking **(Choi & Chen-Sankey, 2020).**

Significance of the study:

Egypt has the highest number of tobacco users in the Arab region. WHO reported 22 % of Egypt's populations are current or former smokers, of which 43 % men and about 1 % women. Also; a significant number of youth and adolescents consume tobacco products. According to the Global Youth Tobacco Survey (GYTS); 13.6 % of Egyptian youth (18.1 % of boys and 8.2 % of girls) reported current use of any tobacco products **(Abo-Elkheir and Sobh, 2016).**

E-cigarette cigarettes are rapidly becoming a new trend among adolescents and the number of users doubled from 2012 to 2017 (7.2-14.6%) in the EU. Among the general adult in Europe the prevalence of current e-cigarette use ranged from 0.2% to 27%. Amongst young adults, curiosity was the most frequently reported reason for initiating the use of e-cigarette, while reasons for continuing to use e-cigarette were various. Young non-users perceive the e-cigarette as a cool and fashionable product that mimics the smoking routine and is judged to be rather safe to use **(SCHEER, 2021).**

Aim Of The Study

This study aimed to assess Cardiovascular Disease Patients' Knowledge toward Electronic Cigarette Smoking through:

- Assessing patients' knowledge toward electronic cigarette smoking.
- Assessing the patients' health status.

Research Questions:

- What is the cardiovascular disease patients' knowledge about electronic cigarette smoking?
- Is there a relation between the patients' knowledge and their sociodemographic characteristics?

Subject And Methods

Research design:

A Descriptive Analytical Design was used in this study.

Settings:

The study was conducted at cardiac outpatient clinic in Menofia University Hospital which is providing health service to a large number of cardiac patients from all over the governorate. Cardiac outpatient clinic is in the first floor with a waiting place in front of it

Subjects and Sampling Technique:

The total attending patients at cardiac outpatient clinic in 2021 were 8506 patients.

Sample size:

Sample size was 368 calculated using the following equation: **(Hooper et al., 2016).**

$$n = \frac{N \sum_{j=1}^{23} N_j \sigma_j^2}{AN^2 + \sum_{j=1}^{23} N_j \sigma_j^2}$$

N: Community size

A: Error rate

σ: Standard score corresponding to the level of significance 0.95

Type of Sample:

Purposive Sample

Inclusion criteria:

- Age: from 18 to 55 years
- Smokers

Data collection Tools

Tools were developed by the researcher based on recent literature review. Data for this study was collected by using two important

tools.

The first tool was a structured interviewing questionnaire which include the following parts:-

- **Part 1:** Sociodemographic characteristics of the studied population such as age, gender, level of education, marital status, occupation, place of residence and monthly income.
- **Part 2:** Knowledge of the studied population about electronic cigarette smoking such as concept of electronic cigarrete smoking, Components of an electronic cigarette, Components of an electronic cigarette liquid, Causes that make a smoker resort to electronic cigarettes instead of traditional cigarettes, advantages of electronic cigarettes, disadvantages of electronic cigarettes, health effects of electronic cigarettes, risks of electronic cigarettes compared to traditional cigarettes, role of electronic cigarettes in quitting smoking and method of using electronic cigarettes
- **Part 3:** Assessing the health status of the studied population such as medical history, family history of chronic disease and smoking history.

Scoring System for knowledge:

It was scored as a 1 for correct answer and 0 for incorrect answer these scores was summed and converted into a percent score.

It was classified into 3 categories:

-Satisfactory knowledge if score >50%.

-Unsatisfactory knowledge if score <50%.

The second tool (medical record tool) which was used to assess patients' health status. It contains vital signs, investigations and Body Mass Index (BMI) "calculated by dividing an adult's weight in kilograms by their height in meters squared". BMI is a screening tool for overweight and obesity.

- If BMI is less than 18.5, it falls within the underweight range.
- If BMI is 18.5 to <25, it falls within the healthy weight range.
- If BMI is 25.0 to <30, it falls within the overweight range.
- If BMI is 30.0 or higher, it falls within the obesity range.

Obesity is frequently subdivided into categories:

- Class 1: BMI of 30 to < 35
- Class 2: BMI of 35 to < 40.
- Class 3: BMI of 40 or higher. Class 3 obesity is sometimes categorized as "severe" obesity **(Aynehchi et al., 2023).**

Tools Validity and Reliability:

The validity was ascertained by five experts in community health nursing. Their opinions were elicited regarding format layout, accuracy, consistency of the tools. Also a reliability test was done. Alpha Chronbach Test was used to measure the internal consistency of the tool used in current study.

The internal consistency was measured to identify the extent to which the items of the tools measured the same concept and correlated with each other. It was used to compute correlation value among questions. Corn Bach's Alpha and its value was (0.866).

Ethical considerations

Prior study conduction, approval was obtained from Scientific Research Ethical Committee of the Faculty of Nursing / Ain Shams University. The researcher met the cardiac patients and explained the aim of the study to gain their approval. The included participants were assured that anonymity, confidentiality would be guaranteed and informed about their right to refuse or withdraw from the study at any time. The study procedures didnot entail any harmful effects on participants.

Administrative design:

An official permission was obtained by submission of a formal letter issued from the Dean of Faculty of Nursing, Ain Shams University to the director of the previously mentioned study setting to collect the necessary data for current study after a brief explanation of the purpose of study and its expected outcomes.

Operational design:

The operational design for this study involved three stages namely preparatory phases, pilot study and field work.

Preparatory phase:

The researcher reviewed current and past local and international related literature and the theoretical, knowledge to cover the various aspects about the research problem and to select and adopt the appropriate tools for data collection using periodicals, books, articles, journals, magazines and internet.

Pilot study:

A pilot study was conducted on 10% of the study participants (37) to evaluate the study

tools applicability, clarity and time required for data collection and then the necessary modification was done as revealed from the results of pilot study. Finally, the patients involved in pilot study were included in the study sample.

Field work:

An approval obtained from the manager of outpatient clinic in Menofia University Hospital. The researcher was available in cardiac outpatient clinic at Menofia University Hospital two days/week (Sunday and Wednesday) from 9 AM to 2 PM until collecting the data from the predetermined sample size that took 7 months from January to July 2023.

The researcher interviewed individually the patients who agreed to participate in the study. The average number of interviewed patients per day were 6-7 patients. The duration of each interview was 15-20 minutes.

Statistical design:

The collected data were organized, coded and statistically analyzed using appropriate Statistical tests. The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies and percentage for categorical data, the mean (X) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (X) 2, P-value to test association between two variables and Pearson correlation test (R- test) to the correlation between the study variables.

Degrees of significance of results were considered as follows:

- P-value > 0.05 Not significant (NS)
- P-value ≤ 0.05 Significant (S)
- P-value ≤ 0.01 Highly Significant (HS).

Results

Table (1) displays that, 59.2% of the studied patients their age ranged between 45-≤55 years. With mean of age was 52.93 ±7.27 years. Regarding gender and marital status, 98.9% and 83.2% of them were males and married. Concerning patients' level of education, 29.1% of them were basic education. While, 54.1% of the studied patients had free business. In relation to their place of residence, 65.2% of them were lived in rural areas. As wells, 76.6% had sufficient monthly income for their needs.

Table (2) shows that, 48.1% and 73.6% of the studied patients had correct answer regarding the concept of electronic cigarette smoking and the disadvantages of electronic cigarettes, respectively. While, 76.9% of them had incorrect answer regarding the components of an electronic cigarette liquid and the advantages of electronic cigarettes. As wells 71.2% of them had incorrect answer regarding the causes that make a smoker resort to electronic cigarettes instead of traditional cigarettes and 70.1% of the studied patients had incorrect answer related to the method of using electronic cigarettes.

Figure (1) illustrates that, 36.7% of the studied patients had information about electronic cigarette from internet and social networking sites. While, 23.4% of them didn't have any information.

Figure (2) shows that, 69.0% of the studied patients had unsatisfactory level of total knowledge about electronic cigarette smoking.

Table (3) displays that, 55.1% of the studied patients their weight was ≥ 90 kg, and mean of weight was 90.05 ± 13.57 kg. As wells, 52.7% of them their height ranged from 170-<180 cm, and mean of height was 174.2 ± 7.97 cm. While, 45.7% of them are overweight, and mean of body mass index was 29.94 ± 4.3. In relation to blood pressure of the studied patients, 83.1% had normal systolic blood pressure and 91.8% of them had normal diastolic blood pressure. As wells, 95.1% of them had normal pulse and 89.9% of them had normal temperature. As wells, 89.4% of them had normal respiration.

Table (4) detects an association between socio-demographic characteristics and total patients knowledge, it reveals that there are highly statistically significant difference between age, gender and educational level with total level of knowledge (P= <0.01).

Table (1): Frequency distribution of the studied patients according to their socio-demographic characteristics **(n=368).**

Socio-demographic characteristics of the studied patients	No.	%
Age (years)		
18<30	56	15.2
30-<45	94	25.6
45-≤55	218	59.2
Mean SD 52.93 ± 7.27		
Gender		
Male	364	98.9
Female	4	1.1
Marital status		
Single	48	13.0
Married	306	83.2
Divorced	8	2.2
Widowed	6	1.6
Education level		
Neither read nor write	6	1.6
Read and write	58	15.8
Basic education	49	13.3
Secondary education	162	44
High education	93	25.3
Occupation		
Free business	199	54.1
Government employee	166	45.1
Pension	3	0.8
Place of residence		
Urban	128	34.8
Rural	240	65.2
Monthly income		
Sufficient	282	76.6
In sufficient	86	23.4

Table (2): Distribution of the studied patients according to their knowledge about electronic cigarette smoking **(n=368).**

Items	Correct answer		Incorrect answer	
	No.	%	No.	%
Concept of electronic cigarette smoking	**177**	**48.1**	191	51.9
Components of an electronic cigarette	132	35.9	236	64.1
Components of an electronic cigarette liquid	85	23.1	**283**	**76.9**
Causes that make a smoker resort to electronic cigarettes instead of traditional cigarettes	106	28.8	**262**	**71.2**
Advantages of electronic cigarettes	85	23.1	**283**	**76.9**
Disadvantages of electronic cigarettes	**271**	**73.6**	97	26.4
Health effects of electronic cigarettes	139	37.8	229	62.2
Risks of electronic cigarettes compared to traditional cigarettes	140	38.0	228	62.0
Role of electronic cigarettes in quitting smoking	133	36.1	235	63.9
Method of using electronic cigarettes	110	29.9	**258**	**70.1**

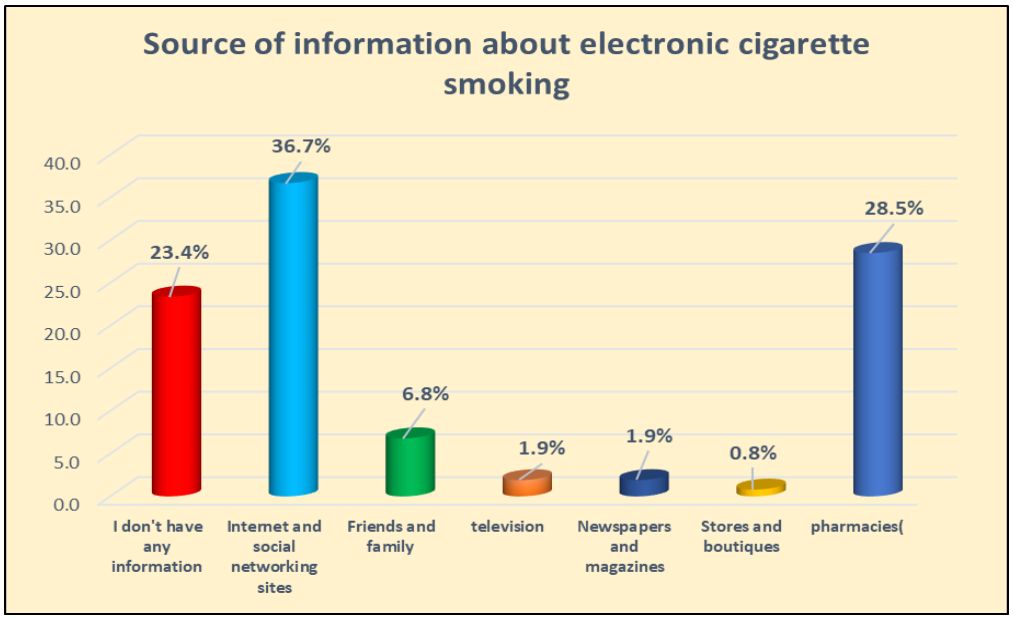

Figure (1): Percentage distribution of the studied patients according to source of information about electronic cigarette **(n=368).**

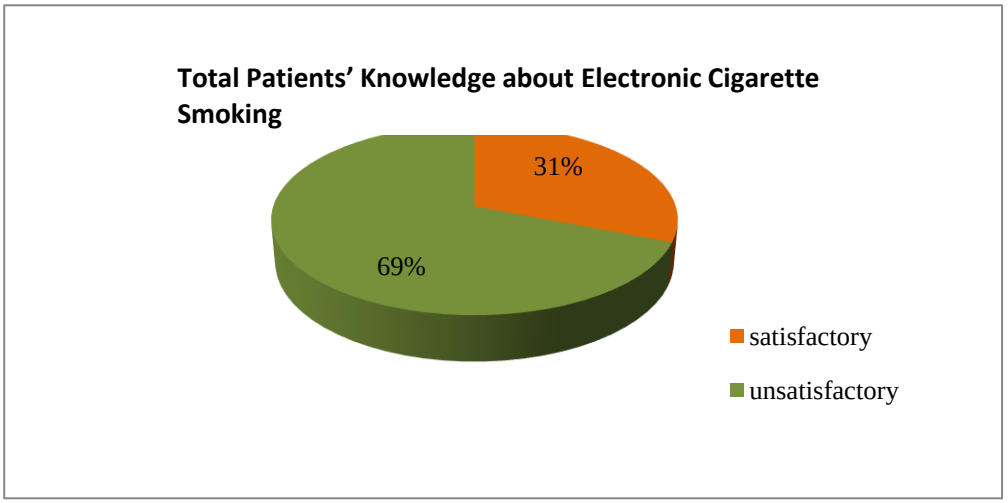

Figure (2): Percentage distribution of the studied patients according to their total knowledge about electronic cigarette smoking **(n=368).**

Table (3): Distribution of the studied patients according to their physical examination (n=368).

Anthropometric measurements of the studied patients	No.	%
Weight (Kg)		
60-<70	4	1.1
70-<80	54	14.7
80-<90	107	29.1
≥ 90	203	55.1
Mean SD 90.05 ± 13.57		
Height (Cm)		
150-<160	11	3.0
160-<170	68	18.5
170-<180	194	52.7
≥ 180	95	25.8
Mean SD 174.2 ± 7.97		
Body mass index		
Under weight (<18.5)	**4**	**1.1**
Normal weight(18.5 to <25)	**31**	**8.4**
Over weight (25.0 to <30)	**168**	**45.7**
Obese (30.0 or higher)	**165**	**44.8**
Mean SD 29.94 ± 4.31		
Blood pressure		
Systolic blood pressure		
High	**58**	**15.8**
Normal	**306**	**83.1**
Low	**4**	**1.1**
Mean SD 127.6 ± 12.8		
Diastolic blood pressure		
High	**19**	**5.2**
Normal	**338**	**91.8**
Low	**11**	**3.0**
Mean SD 79.83 ± 8.79		
Pulse		
Tachycardia	**10**	**2.7**
Normal	**350**	**95.1**
Bradycardia	**8**	**2.2**
Mean SD 79.14 ± 8.47		
Temperature		
Hyperthermia	26	7.1
Normal	331	89.9
Hypothermia	11	3.0
Mean SD 36.9 ± 1.08		
Respiration		
Tachypnea	31	8.4
Normal	329	89.4
Bradypnea	8	2.2
Mean SD 19.23 ± 2.42		

Table (4): Association between socio-demographic characteristics of the studied patients and their total knowledge about electronic cigarette smoking **(n=368).**

Socio-demographic characteristics		Total knowledge about electronic cigarette smoking						X^2	P-Value
		Satisfactory (n=32)		Average (n=82)		Unsatisfactory (n=254)			
		No.	%	No.	%	No.	%		
Age (years)	18<30	15	46.9	30	36.6	11	4.3	79.14	0.000**
	30-<45	8	25.0	13	15.8	73	28.8		
	45-≤55	9	28.1	39	47.6	170	66.9		
Gender	Male	32	100.0	78	95.1	254	100.0	14.10	0.001**
	Female	0	0.0	4	4.9	0	0.0		
Education level	Neither read nor write	0	0.0	0	0.0	6	2.4	60.63	0.000**
	Read and write	0	0.0	0	0.0	58	22.9		
	Basic education	0	0.0	7	8.5	42	16.5		
	Secondary education	0	0.0	14	17.1	148	58.2		
	High education	32	100.0	61	74.4	0	0.0		
Occupation	Free business	18	56.3	37	45.1	144	56.7	3.712	0.446
	Government employee	14	43.7	44	53.7	108	42.5		
	Pension	0	0.0	1	1.2	2	0.8		

Discussion

Electronic cigarettes, commonly known as e-cigarettes, are electrical devices that generate an aerosol from a liquid in a manner used to simulate smoking behavior without burning any tobacco. There has been an alarming increase in the use of e-cigarettes, especially among young adults **(Idris, 2020).** So this study was conducted to assess cardiovascular disease patients' knowledge toward electronic cigarette smoking.

Regarding socio-demographic data of cardiovascular disease patients, the current study showed that, more than half of the studied patients belonged to the age group (45-≤55 years) with mean age 52.93±7.27, **Table (1)**, This result agreed with **Gallus et al., (2020)** who studied "Electronic cigarette use among Italian smokers: patterns, settings, and adverse event" and found that mean age of the studied sample was 51.3 ± 13 years

In addition, this finding was contradicted with **Karbouji et al., (2018)** who studied "Awareness and Attitude toward Smoking E-Cigarettes (Vape) among Smokers in Saudi Arabia 2017" and found that 84.4% the majority of the studied sample were in the age group of 18-37 years.

Concerning the gender, the present study revealed that most of the studied patients were males, **Table (1)**, This result agreed with **Naidoo et al., (2021)** who studied " Risk Factors and Perceptions of E-Cigarette Use Among Selected Users in Johannesburg, South Africa " and found that 85% of the studied sample were males.

Also, this result was contradicted with **Zavala-Arciniega et al., (2022)** who studied " E-cigarette characteristics and cigarette smoking cessation behaviors among U.S. Adult dual users of cigarettes and e-cigarette " and found that less than half of the studied sample were females.

From the researcher**'s** point of view, this might be because of the difference of cultures and traditions between the countries as smoking among females carries a social stigma in Arab culture.

Regarding marital status and monthly income, the present study revealed that the majority of the studied patients were married, and more than three quarters had sufficient monthly income for their needs **Table (1)**, This result agreed with **Nguyen et al., (2022)** who studied ''E-cigarette smoking: Awareness, use, and perceptions of Vietnamese personnel'' and found that less than two thirds of the studied sample were married

This result agreed with **Kabbash et al., (2022)** who conducted a study entitled "The era of electronic smoking: perceptions and use of E-Cigarettes among university students, Egypt" and found that 88.1% of the participants reported enough family monthly income.

Also, this result was contradicted with **Al Rajeh et al., (2022)** who studied ''E-Cigarette Use among Male Smokers in Al-Ahsa, Kingdom of Saudi Arabia: A Cross-Sectional Study '' and found that minority of the studied sample were married, and found that 57% of the studied subjects had low income.

Regarding the educational level, in the current study, the study revealed that less than half of the studied sample had secondary education, **Table (1)**. This result agreed with **Zavala-Arciniega et al., (2022)** who studied "E-cigarette characteristics and cigarette smoking cessation behaviors among U.S. Adult dual users of cigarettes and e-cigarette" and found that more than one third had secondary education.

Also, it disagreed with **Barakat et al., (2021)** who studied '' Perception of adults toward electronic cigarettes: a cross-sectional study from Jordan '' and found that the minority of the studied sample had secondary education

From the researcher's point of view, there is a relation between secondary education and prevalence of smoking because of more friendship, peer pressure, imitating their friends and feel of masculinity in front of them.

Concerning the occupation, the current study illustrated that more than half of heart disease patients had free business

On the same line, **Mohammed & Neamah, (2021)** who studied" Students Knowledge about E-cigarettes Smoking at Middle Schoolin Baghdad City, Iraq" and found that 46.2 % of fathers of the studied students had free works

Regarding the place of residence about less than two thirds of the studied patients were lived in rural areas (**table 1)**.

This result supported by **Wężyk-Caba et al., (2022)** who studied "Do Young People Perceive E-Cigarettes and Heated Tobacco as Less Harmful than Traditional Cigarettes? A Survey from Poland" and found that 47.68% of the participants were lived in rural areas.

Also, this result was contradicted with **Puharić et al., (2021)** who studied "Knowledge, Attitudes and Use of E-Cigarette" and found that 62.5% of the participants live in the city.

Regarding knowledge of patients about the components of an electronic cigarette liquid (table 2) the current study revealed that more than three quarters had incorrect answer toward component of e-cigarette liquid this study agreed with **Alaraj et al., (2021)** aimed 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 and found that 39.1% had correct answer toward components of e-cigarettes.

This result agreed also with **Alsanea et al., (2022)** who studied "Prevalence, knowledge and attitude toward electronic cigarette use among male health colleges students in Saudi Arabia—A cross-sectional study " and found that 62.5% had wrong perceptions and lacked the knowledge about the harmful components contained in and delivered by ECs compared to conventional cigarettes

Regarding risks of e-cigarettes compared to traditional cigarettes, the current study revealed that more than one third of the studied population had correct answer.

This study agreed with **Masan et al., (2023)** who studied" Knowledge, Attitudes, and Behavior of E-Cigarette Users in Indonesia "and found that 25.9 % of the participants had correct answers toward health risks of e-cigarettes

This study disagreed with **Lorensia et al., (2021)** who studied "Knowledge and attitudes

on smoking cessation of e-cigarettes: a mixed-methods study of pharmacy students in Surabaya, Indonesia“ and found that 87.1% had correct answer toward the dangers of e-cigarettes for health.

Regarding source of information about electronic cigarette (**Figure 1) the current study revealed that more than one third of the studied patients had information about electronic cigarette from internet and social networking sites.** This result supported by **Dwedar et al., (2019)** who studied" A survey exploring knowledge and beliefs about electronic cigarettes between health care providers and the general population in Egypt**"** and found that Media advertisements were the main source of getting to know electronic cigarettes in more than one half (50.4%)of the study participants.

This result supported by **Alhajj et al., (2022)** who studied " Knowledge, beliefs, attitude, and practices of E-cigarette use among dental students: Amultinational survey” and found that social media was the most reported source of information for 33.2% of the participant.

Also, this finding was contradicted with **Al-Balas et al., (2021)** who studied" Electronic Smoking Behavior Among Adult Males in Jordan" and found that The Majority of smokers reported that they were encouraged to use E-Cigarettes by their friends 73.2% and 24.4% tried it after being introduced through media platforms, 1.2% reported trying it for the first time at smoking shopping centers, 0.4% through TV and 0.8% via a community social event.

Also**,** this finding was contradicted with **Savigamin et al., (2021)** who studied “Prevalence and Risk Factors of E-cigarette Users in Thai College Student” who found that 32.8% of the participants received E-cigarette information from friends and 22.8% of them from television.

From the researcher’s point of view, this because the great increase in e-cigarette marketing and online engagement through social media

Regarding total patients’ knowledge about electronic cigarette smoking **(Figure 2)** the current study revealed that more than two thirds of the studied patients had unsatisfactory level of total knowledge about electronic cigarette smoking.

This result agreed with **Aghar et al., (2020)** who found that 63.3% of the study population exhibited a lower level of EC knowledge.

This result agreed with **Cohen et al., (2022)** who studied “ Poor Perception and Knowledge of Electronic Cigarettes Among Adolescents and Their Parents “ and found that Overall knowledge of e-cigs was in adequate in both adolescents and parents: 93.7% and 88.3%, respectively.

It disagreed with **Barakat et al., (2021)** who studied “Perception of adults toward electronic cigarettes: a cross-sectional study from Jordan” and found that only 4% of the participants did not know any thing about the E-cig, while 46.2% of them reported a moderate level of knowledge.

From the researcher’s point of view, the lack of knowledge was because e-cigarette is a recent trend in the market compared to well-established and popular regular smoking as well as living in rural areas.

Regarding Physical Examination of the Studied Patients, The current study showed that less than half of the patients were overweight (BMI 25–<30)**.**

This result agreed with **Catto et al., (2023)** who conducted a study entiteled “Lifestyle Factors in Patients with Bladder Cancer: A Contemporary Picture of Tobacco Smoking, Electronic Cigarette Use, Body Mass Index, and Levels of Physical Activity” and found that 44% of the respondents were classified as overweight (BMI 25–29.99).

In relation to blood pressure the current study showed that majority of the studied patients, had normal systolic blood pressure and most of them had normal diastolic blood pressure.

This result was in congurent with **Biondi-Zoccai et al., (2019)** who found that almost all the participants had systolic blood pressure 116±15 and diastolic blood pressure 75±10

This result disagreed with **Farsalinos et al., (2019)** who studied “Is e-cigarette use associated with coronary heart disease and myocardial infarction? Insights from the 2016 and 2017 National Health Interview Surveys” and found that more than one quarter 27.5% had hypertension.

Regarding Physical Examination of the Studied Patients, The current study showed that the majority of the participants had normal pulse with Mean SD 79.14±8.47.

This result agreed with **Cobb et al., (2021)** who studied " Tobacco use behavior and toxicant exposure among current dual users of electronic cigarettes and tobacco cigarette " and found that most of the cigarette smokers had normal heart rate with mean SD 79.4±2.8 bpm.

Regarding association between socio-demographic characteristics of the studied patients and their total knowledge about electronic cigarette smoking, the present study reveals that there are highly statistically significant difference between age, gender and educational level with total level of knowledge (P= <0.01)

This result agreed with **Mohammed & Neamah, (2021)** who conducted a study aimed to explore samples' knowledge related to e-cigarette smoking and found that there was positive significant relationship among students' knowledge with regard to their age, gender.

This result agreed with **Alduraywish et al., (2023)** who conducted a study entitled " Knowledge and Attitude toward E-Cigarettes among First Year University Students in Riyadh, Saudi Arabia" and found that significant gender differences were found regarding knowledge of e-cigarettes ($p < 0.001$).

This result supported by **Doumi et al., (2023)** who studied " Knowledge, Attitude, and Practice of E-Cigarettes of Adolescents and Adults in Saudi Arabia: A Cross-Sectional Study " who identified that several factors exhibited a significant association with EC knowledge, including age, gender, income, and smoking habits ($p < 0.05$).

This result disagreed with **Sayed et al., (2023)** who studied "Perception of Ain shams University Students Related to Electronic Cigarette Smoking "and found that there was a statistically insignificant relation exists between the total knowledge of the studied sample and their ages, gender, and educational level respectively in which $p>0.05$.

Conclusion

The finding of the present study concluded that more than two thirds of the studied patients had unsatisfactory level of total knowledge about electronic cigarette smoking. Also, there was highly statistically significant difference between age, gender and educational level with total level of knowledge (P= <0.01).

Recommendation

Based on the study results, the following recommendations can be given

(1) Development of educational health programes to raise awareness of smokers, cardiovascular disease patients and public about e-cigarette smoking through mass media, social media, clear language booklets and simplified brochures.

(2) Further research is necessary to investigate contributing factors associated with using of e-cigarettes among cardiovascular disease patients.

(3) Further studies including larger numbers of cardiac outpatient clinics from different geographical areas in Egypt to generalize the results.

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