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Original Article

Educational Program about Electronic Hookah Smoking for Male University Students Based on Pender's Health Promotion Model

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ABSTRACT

Background: Electronic hookah smoking is one of the most avoidable risk factors for non-communicable diseases. It is also seen as a starting point for addiction. Pender's health promotion model is used to increase students' level of well-being and enhance preventive behaviors to prevent complications and subsequent effects of electronic hookah smoking. **Aim:** To evaluate the effect of educational program about electronic hookah smoking for male university students based on Pender's Health Promotion Model. **Research design**: A quasi-experimental design was used. **Setting**: This study was conducted at 6 faculties of Sohag University including faculty of Education, Social service, Arts, Law, Archaeology and Commerce. **Sample:** A convenience sample of 600 male university students was selected**. Tools:** Two tools were used in this study. **Tool one:** A structured interviewing questionnaire which consisted of the following parts: a) demographic characteristics of studied students. b) Knowledge of studied students about electronic hookah smoking. **Tool two:** Pender's health promotion model. **Results:** The current study showed that only 10 % of studied students had good knowledge at pre-educational program about electronic hookah smoking which improved to 86% at post program. Additionally, according to Pender's health promotion model, 25.7% of studied students had good beliefs at preprogram which increased to 87.8% of them had good beliefs at post-program. **Conclusion:** The study findings revealed to improvement in students' knowledge and beliefs after implementation of educational program about electronic hookah smoking **Recommendations**: Developing health educational program to increase awareness for male university students about prevention of electronic hookah smoking.

Key words: Educational program, Electronic hookah smoking, Pender's Health Promotion Model.

Introduction:

Electronic hookah (E-hookah) has quickly spread over the world to become a tobacco epidemic and is considered as a modern backbone of the traditional hookah that simulates tobacco smoking (**Cheng, 2022)**. It is used in the same manner as e-cigarettes, but differ in design and appearance in the form of pens containing a variety of flavors. Recently, electronic hookah is the new portable-travel friendly hookahs, as it is easy to operate and doesn't require any setup, depending on the brand, either comes with or

without nicotine. Texas Hookah carries many different flavors of e-hookahs (**Robert et al., 2023).**

Electronic hookah is battery powered devices that heat a liquid into an aerosol that the user inhales, the liquid typically incorporates flavoring and other additions. There is concern that students may take up vaping as a less harmful alternative to smoking. The act of inhaling and exhaling nicotine-containing vapor is known as vaping (**Cheng, 2022).** Two main factors contributed to the rise in popularity of E-hookah use: First, Students think that smoking a hookah is a safer option than smoking cigarettes. Secondly, a sweetened substance used in E-hookah, adds flavor to it as fruit flavor, apple, cappuccino, mint, chocolate, strawberry, vanilla and other flavors making it more enjoyable **(Babaie et al., 2021).**

Factors strongly linked to initiation E-hookah smoking among university students include having family members or peers who smoke, living in a higher socioeconomic status or residing in a neighborhood with high density of tobacco outlets, boredom eliminating, pleasure seeking, peer pressure, and intimacy between them by sharing e- hookah, put the group at a potential risk of taking up E- hookah **(Khan et al., 2022).**

Smoking of E-hookah has negative health effects that contribute significantly to cardiovascular morbidity and mortality. Inspite of heavily advertisement and aggressively promoted in the media for using E- hookah. Although hookah smoke is a healthier substitute for tobacco, its toxicological components-nicotine, carbon monoxide, particulates, oxidants, heavy metals, phenols, and flavorants-indicate the possibility to cause adverse heart disease. Other conditions are associated with the toxins and chemicals in E- hookah lead to lung cancer and respiratory diseases like emphysema, which causes difficulty breathing **(American Lung Association (ALA), 2021).**

University stage is a transitional period of growth and development that occurs between childhood and adulthood. It is a theoretical construct dynamically evolving informed through physiological, psychosocial, cultural and temporal aspects. The traditional definition of this critical developmental phase is the years between the onset of puberty and the establishment of social independence (**Alexa & Curtis, 2022).** A university student seems to fluctuate between a demand for independence and a desire for guidance and directions, as they engage in more interactions, many involving risk-taking behaviors and transference of loyalty to their peer group **(Usorol et al., 2021).**

The first E-hookah smoking experience usually occurs among university students in social settings, especially at campus or at friend's residence. During college, most students reside in a socially permissive environment with minimal parental supervision. The use of E-hookah smoking has grown considerably especially among university students. So, planning and education to prevent this health issue is considered a top and important priority **(Gathuru et al., 2022).**

The major strategy to promote student's health is to motivate university students to adopt healthy behavior and avoid negative health effects. Because negative health behaviors lead to increased susceptibility to ill health. Conversely, adopting healthy habits can improve or sustain a person's well-being by reducing mortality and morbidity rates. Pender's Health Promotion Model (PHPM) is regarded as one of the most thorough and accurate models that can be used as method to encourage university students to adopt healthy habits **(Alzahrani et al., 2023).**

Pender's Health Promotion Model (PHPM) is focused on the promotion of health and individual empowerment for better health behavior and illness prevention through practicing changes. The PHPM is one of the broadly used models to map for and modify harmful behaviors and endorse health **(Khodaveisi et al., 2023).** According to the PHPM, cognitive perceptual factors such considerable benefits, challenges, and self-efficacy affect participation in wellness-promoting activities **(Sabooteh et al., 2021).**

The social cognitive theory, which includes cognitive-perceptual components (perceived advantages, impediments, and self-efficacy) and modifying factors (demographic characteristics, interpersonal influences, and behavioral factors), is the main focus of Pender's Health Promotion Model **(Aqtam, & Darawwad, 2023).**

Educational program is use communication activities to promote good health and prevent or diminish disease in individuals and groups through influencing knowledge, beliefs, behaviors and actions. Through educational program, it can provide essential knowledge about E-hookah, especially complications and preventive measures. Also, maintain wellbeing and optimal health of university students to enable them to prevent bad behaviors **(Durkin et al., 2021).**

Community health nurses play a critical role in controlling electronic hookah smoking through raising awareness among university students about the amount of nicotine in E- hookah, complications and hazards of E- hookah. Community health nurses offer education to university students about maintaining health. So, can decrease the occurrence of diseases, promote healthy lifestyle, prevent health problems, provide direct care, educate students about managing health conditions and help in prevent smoking of electronic hookah among university students through health promotion activities **(Barfi al., 2021).**

Significance of the study

Egypt is a developing country with the highest number of tobacco and E-hookah users in the Arab world, particularly among young students. The percent of Egyptian university students that report currently smoking between the ages of 18 and 25 years is 16.5%. According to the Global Youth Tobacco Survey (GYTS), 11.6 % of Egyptian youth reported current use of electronic hookah smoking **(Kabbasha et al., 2022).**

The number of E-hookah users in 2018 was 41 million worldwide and increasing 55 million currently. Two-thirds of young users' age was

between 15 to 21 years. Users are not simply experimenting with E-hookah but are instead using them habitually **(Hudson& Aprin,2021)**. There are many health consequences of E-hookah usage among university students such as heart diseases, lung diseases, containing addictive nicotine that can effect on cognitive development and are considered one of the most addictive substances **(Fevrier et al., 2021).**

Pender's health promotion model (HPM) is one of the widely used models to plan for and change unhealthy behaviors. Engaging in health-promoting activities is one of the best ways to stay healthy. Students who participate in activities that allow them to track their health are interacting in health-promoting habits **(Khodaveisi et al., 2023).**

Aim of the study

This study aimed to evaluate the effect of educational program about electronic hookah smoking for male university students based on Pender's Health Promotion Model

Research Hypotheses:

H1: Educational program based on Pender's health promotion model is expected to improve studied students' knowledge and beliefs in post program than preprogram.

H2: Significant correlation may be found between studied students' knowledge and Beliefs regarding electronic hookah smoking based on Pender's health promotion model.

Subjects and Method

Design: A quasi-experimental research design was utilized to accomplish the aim of the study

Setting: This study was conducted in 6 faculties of Sohag University including the following: Faculty of Education, Social service, Arts, Law, Archaeology and Commerce.

Subjects: A convenience sample of male university students was selected. The total number of the study subjects was 600 students from the previous mentioned setting of Sohag University, 100 students from each faculty. The following formula used to determine the sample size.

$$n = \frac{2(Z\alpha/2 + Z\beta)\text{^}2 \times p\,(1-p)}{(d)\text{^}2}$$ **(Alsanea et al., 2022)**

Where, p = pooled proportion obtained from previous study; d = expected difference in proportion of events; $Z_{\alpha/2}$ =1.96 (for 5% level of significance) and Z_{β} = 0.84 (for 80% power of study). Therefore,

$$n = \frac{2(1.96 + 0.84)^2 \times 0.414\,(1-0.414)}{(0.077)\text{^}2} = 600.1$$

Accordingly, 600 students are required for the sample size

Inclusion criteria

- Students aged 18 to 24 years
- From the first to fourth academic year
- Students who are willing to participate in this study.

Tools for Data Collection:

Tool 1: A structured interviewing questionnaire

It was developed by researchers, after reviewing the related recent literature. It was written in simple Arabic. It includes the following two parts:

Part 1: Demographic characteristics of studied students: Including age, academic years, marital status, their parents' education and parents' occupation

Part 2*:* Students' knowledge regarding electronic hookah smoking: include

Meaning of Electronic Hookah (**EH**), types of EH, chemical substance found in EH, risk factors for EH, health hazards of EH and strategies to prevent electronic hookah smoking.

Knowledge scoring system: it is composed of six questions scored as the following: "two" for complete correct answer, "one" for incomplete correct answer and "zero" for don't know or wrong answer. The total knowledge ranged from (0-12) divided into percentage and interpreted as follows.

- Poor knowledge < 50%
- Fair knowledge 50 - 75%
- Good knowledge >75%

Tool II: Pender's Health Promotion Model, this tool was developed by the researchers and based on **Pender et al., (2011), Sriyuktasu, (2018) and El-kest et al., (2022)** to asses health beliefs about electronic hookah smoking, it include perceived benefits (5 items), perceived barriers (10 items), perceived self-efficacy (10 items), and behavior-related affect (9 items), interpersonal influences (10 items), situational influences (5 items) and commitment to action (7 items). Total items were 56

Scoring system:

By using five-point Likert scale, the response was ranged from strongly disagree =1 to strongly agree =5, except for the perceived barriers, which the score of its items was reversed.

The total score was summed up and transformed into a percentage and categories as follows:

- Good beliefs ≥ 60 %
- Bad beliefs < 60 %

Data collection methods:

- Study Period: Data were collected during a period of eight months started from started from beginning of October 2023 to the end of May 2024.

- Approval: A formal letter was sent to the Dean of each Faculty from the previous mentioned setting. The researchers explained the purpose, benefits of this study, time and date of data collection.

-Ethical considerations: Ethical consideration was obtained from Scientific Ethical Committee of Faculty of Nursing, Helwan University. Before beginning data collection, each student was briefed on the study's goals and advantages, and their oral agreement was sought. Throughout the whole study, strict confidentiality

was maintained. Each student was advised of their ability to withdraw or refuse at any time without providing a reason, and they were reassured that all data would only be used for research purposes. Ethics, values, culture and beliefs were respected.

- **Pilot study:** A pilot study was carried out on 10% (60) students to assess the research tools' objectivity, clarity, viability, and applicability. As well as estimate the time needed for data collection. No modifications were done to the tools. So those who participated in pilot study were included in the study sample.

Tool development:

-Validity: Tools were examined and evaluated for validity by three experts in Community Health Nursing, minor modifications were applied in the form of rephrasing of some questions according to the experts' opinions.

- **Reliability:** reliability of the study tool was tested using Cronbach's Alpha test. Cronbach's Alpha was 0.887 for students' knowledge and 0.954 for Pender's Health Promotion Model.

Field work

- Data collection was completed by the researchers during the period of eight months, starting from beginning of October 2023 to end of May 2024.

- The researchers were present in the study areas for two days per week. The researchers introduced themselves to students before their enrollment in the study and gave them an explanation of the study's purpose.

- Informed consent from the students was acquired. Each interview lasted from 20-30 minutes to allow students to complete the questionnaire.

The Educational Program Based on Pender's Health Promotion Model was built in in four phases namely assessment, planning, implementation and evaluation

Assessment phase: Aimed to collect students' data about electronic hookah smoking, determine each student's unique learning needs to create the best educational program sessions to promote knowledge and beliefs regarding electronic hookah smoking for each university student recruited in the study sample. Each student was interviewed using demographic data, knowledge and Pender's Health Promotion Model about electronic hookah smoking.

Planning phase: Educational program was developed according to the finding of assessment to students' needs identified in the preprogram. knowledge of electronic hookah smoking included the following items: Meaning of Electronic Hookah (EH), types of EH, chemical substance found in EH, risk factors for EH, health hazards of EH and strategies to prevent electronic hookah smoking. In addition, health beliefs about electronic hookah smoking. Group discussions and lectures were used as teaching methods. While, teaching media included booklet and pictures.

Implementation phase: The researchers implemented an educational program followed by the immediate posttest. The total sample size of

studied students was 600 students and was divided into 24 groups (25 students) for each group and received four sessions (3 theoretical sessions and 1 practical). Duration of each session lasted from 30- 45 minutes. The researchers interviewed 2 groups/week.

Evaluation phase (Posttest): Was done immediately after implementation of educational program by using the same tools of preprogram to the same students to test the retained knowledge and health beliefs about electronic hookah smoking.

Statistical Analysis:

Data was analyzed using the Statistical Package for Social Sciences (SPSS), version 29. The first part of the data was descriptive data, which were coded, revised, tabulated and statistically analyzed using numbers, percentages, mean, and standard deviations. The second part of data dealt with correlations between different variables, Spearman's correlation analysis was used for the assessment of the interrelationships among scored and ranked variables. The comparisons were determined using Student's t-test for variables with continuous data and chi-square test for variables with categorical data. P-values of 0.05 or less were considered statistically significant.

Results

Table (1): Shows that, 61.5% of the studied students aged from 18 - < 20 years with a Mean age of 20.9 ±2.7 years and 33.5% of them were in second academic year. Regarding marital status, 96.5% of them were single. Concerning educational level 37.3% of their mothers had secondary education and 33.8% of their fathers had university education respectively While, 77.8% of their mothers were housewives and 82.5% of their fathers were employed.

Table (2): Indicates that, highly statistically significant differences between studied students at pre⁄ post educational program about electronic hookah smoking in all knowledge items at $P < 0.001$.

Figure (1): Illustrates that, there was a highly statistically significant increase in their overall level of knowledge among the studied students at pre/post educational program about electronic hookah smoking in total knowledge level, where only 10.0 % of them had good knowledge at pre educational program compared to 86% of them had good knowledge in the post educational program. The difference between pre/post program was a highly statistically significant difference ($X^2 = 717.359$ at $P < 0.001$).

Table (3): Demonstrates that, comparison between mean scores of Pender's Health Promotion Model among studied students about electronic hookah smoking in pre and post educational program, it was found highly statistically significant difference regarding all Pender's Health Promotion Model domains at pre and post educational program ($P<0.001$).

Figure (2): Clarifies that, 74.3% of the studied students had total bad beliefs according to

Pender's model at pre-educational program while, 25.7% of them had good beliefs, which improved to 87.8% of them had good beliefs at the post educational program. The difference between pre/post program was a highly statistically significant difference (X^2 = 517.594 at P < 0.001).

Table (4): Reveals that, there is positive correlation between total knowledge and total Pender's promotion model regarding electronic hookah smoking among the studied students at post educational program (r = 0.095 at P< 0.001). While, at preprogram there is no correlation.

Table (5): Shows that, highly significant relations between the total knowledge level and the total Pender's promotion model level of studied students about electronic hookah smoking at post educational program with their demographic characteristics as age, academic year and educational level of mothers. Also, with fathers' occupation.

Table (1): Distribution of the Studied Students according to their Demographic Characteristics (n = 600)

Demographic characteristics	No.	%
Age (years)		
18 – < 21	369	**61.5**
21 – 24	231	38.5
Range	18 – 24	
Mean ±SD	**20.9 ±2.7**	
Academic year		
First	120	20.0
Second	201	**33.5**
Third	117	19.5
Fourth	162	27.0
Marital status		
Single	579	**96.5**
Married	21	3.5
Mothers' education		
Cannot read and write	50	8.3
Read / write	85	14.2
Basic	90	15.0
Secondary	224	**37.3**
University and more	151	25.2
Fathers' education		
Cannot read and write	62	10.3
Read / write	92	15.3
Basic	100	16.7
Secondary	143	23.9
University and more	203	**33.8**
Mothers' occupation		
Unemployed / housewife	467	**77.8**
Employed	133	22.2
Fathers' occupation		
Unemployed / professionals	105	17.5
Employed	495	**82.5**

Table (2): Distribution of the Studied students according to their Knowledge about Electronic Hookah Smoking at Pre and Post educational program (n = 600)

Items of knowledge	Pre- educational program						Post- educational program						X^2	P
	Complete correct		Incomplete correct		Incorrect / don know		Complete correct		Incomplete correct		Incorrect / don know			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Meaning of Electronic Hookah (EH)	74	12.3	208	34.7	318	53.0	516	86.0	71	11.8	13	2.2	679.44	**<0.001****
Types of EH	60	10.0	218	36.3	322	53.7	511	85.2	71	11.8	18	3.0	702.80	**<0.001****
Chemical substance found in EH	43	7.2	231	38.5	326	54.3	514	85.7	67	11.2	19	3.1	761.71	**<0.001****
Risk factors for EH smoking	48	8.0	218	36.3	334	55.7	515	85.8	69	11.5	16	2.7	753.65	**<0.001****
Health hazards of EH	53	8.8	211	35.2	336	56.0	519	86.5	68	11.3	13	2.2	751.87	**<0.001****
Strategies to prevent electronic hookah smoking	50	8.3	215	35.8	335	55.8	517	86.2	62	10.3	21	3.5	746.10	**<0.001****

**** = highly significant**

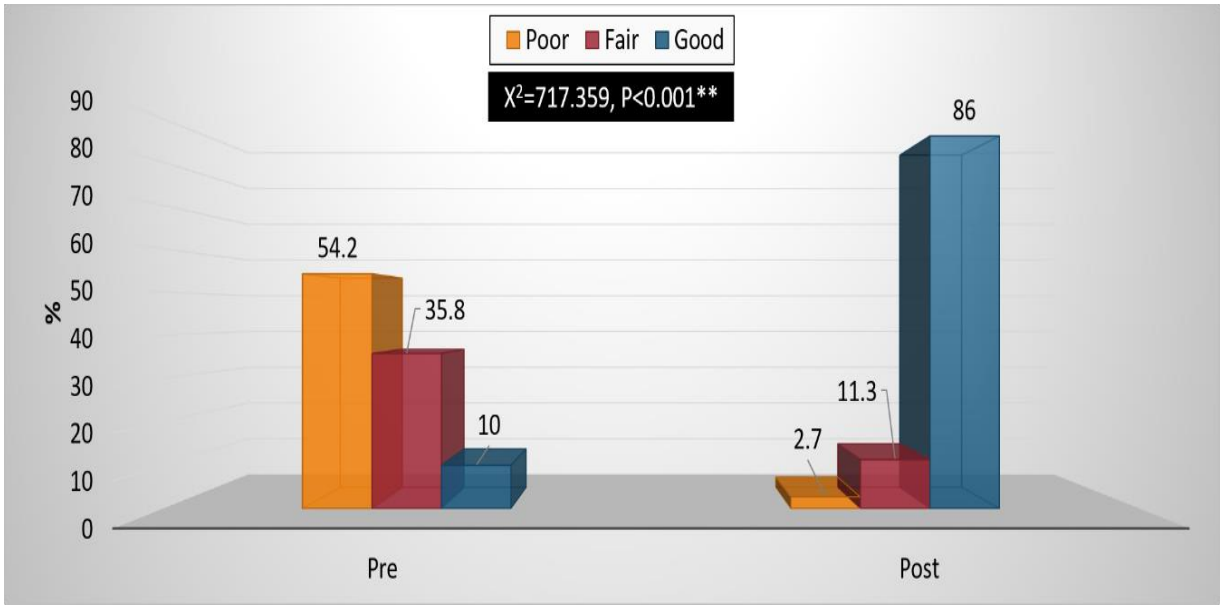

Figure (1): Total knowledge level of Studied Students at Pre and Post educational Program about Electronic Hookah Smoking (n=600)

Table (3): Comparison between Mean Scores of Pender's Health Promotion Model of the Studied Students at Pre and Post Educational Program about Electronic Hookah Smoking (n=600)

Items	Pre - Program Mean ±SD	Post – Program Mean ±SD	Mean Difference	T– Test	P
Perceived benefits of action	8.9 ±2.5	18.1 ±4.9	9.20	40.966	**<0.001****
Perceived barriers of action	20.7 ±5.9	32.2 ±4.2	11.50	38.895	**<0.001****
Perceived self-efficacy of action	19.8 ±8.1	32.1 ±3.3	12.30	34.446	**<0.001****
Activity related affect	15.1 ±2.8	36.3±7.4	21.20	65.633	**<0.001****
Interpersonal influences of preventive behaviors	22.6±4.2	29.4±6.2	6.80	22.242	**<0.001****
Situational influences of preventive behaviors	9.2 ±2.1	18.2 ±3.1	9.00	58.876	**<0.001****
Commitment to a plan of action	15.1 ±3.2	23.6 ±5.5	8.50	32.720	**<0.001****
Total Pender Score	111.4 ±4.1	189.9 ±5.9	78.50	267.630	**<0.001****

**** = Highly Significant**

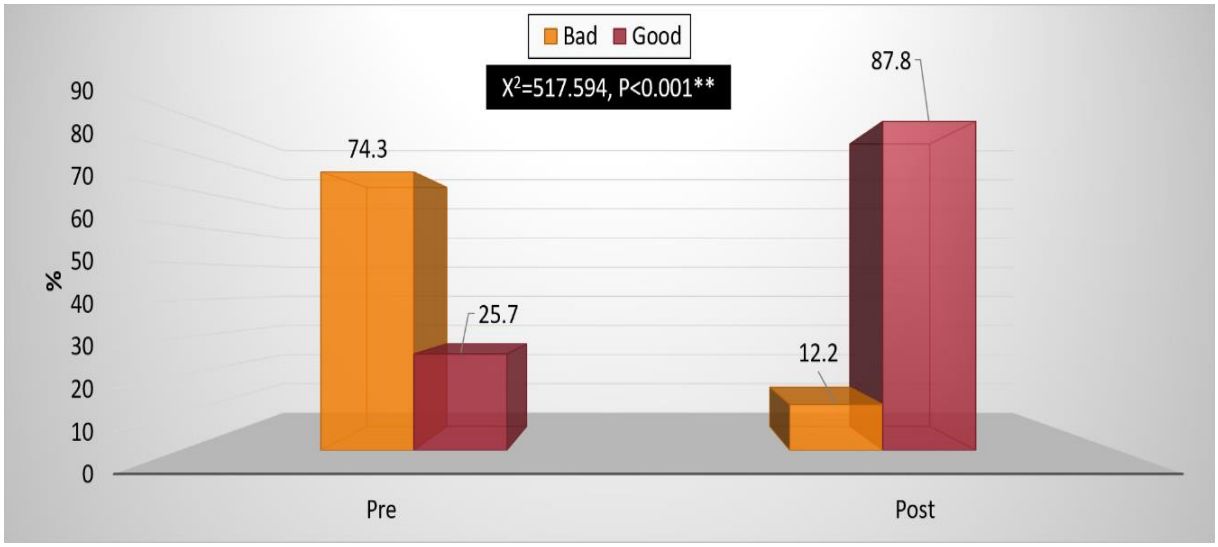

Figure (2): Total Pender's Health Promotion Model level of Studied Students at Pre and Post Educational Program about Electronic Hookah Smoking (n=600)

Table (4): Correlation between Total Pender's Health Promotion Model and Total Knowledge of Studied Students Pre and Post Educational Program about Electronic Hookah Smoking (n=600).

Total Knowledge	Total Pender's Health Promotion Model			
	Pre – Educational Program		Post – Educational Program	
	r	p	r	p
Pre – Educational Program	**0.018**	**0.654**	----------	----------
Post – Educational Program	----------	----------	**0.095**	**<0.001****

**** = Highly Significant Non-significant p < 0.05**

Table (5): Relation between Demographic Characteristics of Studied Students and their Total Knowledge Level and Total Pender's Health Promotion Model Level at Post Educational Program about Electronic Hookah Smoking (n=600).

Variables	Total Knowledge Level						Total Pender's Health Promotion Model Level			
	Good (n=516)		Fair (n=68)		Poor (n=16))		Good beliefs (n=527)		Bad beliefs (n=73)	
Age (years)	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
18 – < 21	317	61.4	40	58.8	12	75.0	322	61.1	47	64.4
21 – 24	199	38.6	28	41.2	4	25.0	205	38.9	26	35.6
	X^2=16.06		**P <0.001****				**X^2=18.958**		**P<0.001****	
Academic year										
First	88	17.1	21	30.9	11	68.7	75	15.4	35	55.6
Second	167	32.3	29	42.6	5	31.3	181	37.2	20	31.7
Third	104	20.2	13	19.1	0	0.0	111	22.8	6	9.5
Fourth	157	30.4	5	7.4	0	0.0	120	24.6	2	3.2
	X^2=46.723		**P <0.001****				**X^2=61.627**		**P<0.001****	
Marital status										
Single	9	1.7	4	5.9	8	50.0	14	2.7	7	9.6
Married	507	98.3	64	94.1	8	50.0	513	97.3	66	90.4
	X2=0.252		P= 0. 0.882				X2=2.393		P= 0.122	
Mothers' education										
Cannot read and write	41	7.9	6	8.8	3	18.8	42	8.0	8	11.0
Read / write	79	15.3	6	8.8	0	0.0	70	13.3	15	20.5
Basic	78	15.1	9	13.2	3	18.8	79	15.0	11	15.1
Secondary	200	38.8	20	29.4	4	25.0	149	28.3	12	16.4
University and more	118	22.9	27	39.7	6	37.5	187	35.5	27	37.0
	X^2=55.724		**P <0.001****				**X^2=19.965**		**P<0.001****	
Fathers' education										
Cannot read and write	51	9.9	10	14.7	1	6.3	56	10.6	6	8.2
Read / write	78	15.1	10	14.7	4	25.0	84	15.9	8	11.0
Basic	89	17.2	9	13.2	2	12.5	89	16.9	11	15.1
Secondary	122	23.6	17	25.0	4	25.0	127	24.1	16	21.9
University and more	176	34.1	22	32.4	5	31.3	171	32.4	32	43.8
	X^2=3.520		P= 0.898				X^2=4.110		P= 0.391	
Mothers' occupation										
Unemployed / housewife	394	76.4	58	85.3	15	93.8	409	77.6	58	79.5
Employed	122	23.6	10	14.7	1	6.3	118	22.4	15	20.5
	X^2=69.801		P <0.001**				X^2=0.126		P= 0.722	
Fathers' occupation										
Unemployed / professionals	90	17.4	14	20.6	1	6.3	89	16.9	16	21.9
Employed	426	82.6	54	79.4	15	93.8	438	83.1	57	78.1
	X^2=1.853		P= 0.396				**X^2=58.426**		**P<0.001****	

**** = Highly Significant**

Discussion

Electronic hookah is an electronic device and a modern backbone of the traditional hookah that simulates tobacco smoking (**Cheng, 2022)**. It is used in the same manner as e-cigarettes but differ in design and appearance; most e-hookah is shaped as pens and come in a variety of flavors. It is considered an entirely new class of vaping devices in which electronic vessels are integrated and placed on traditional water pipes, which allow aerosols to pass through a base filled with water before and then inhaled, due to the lack of combustion, as hookah is marketed electronic hookah as a safe alternative to hookah smoking **(Mary et al., 2022)**.

University students are the vulnerable group & higher risk to develop smoking habits because they start showing independency, peer influence & personality factors on their behaviors. Also, they are seeking attraction and popularity as well as they are exposed to great social and emotional stresses **(Atwa et al., 2021)**. Electronic Hookah smoking is a harmful practice which has become increasingly popular among university students **(Joveini et al., 2020)**.

Concerning demographic characteristics of the studied sample. The results of the current study showed that more than three fifths of the studied sample aged from 18 -< 21year-old with the mean ±SD were 20.9 ±2.7 years and most of them were single. In relation to mothers' and fathers' education, the present study showed that more than one third had secondary and university education and more respectively. Regarding occupation, more than three quarters of mothers were housewives, while more than four fifths of fathers were employed **(Table1)**. This result is in the same line with the study of **Al-Sawalha et al. (2021)** and entitled "E-cigarettes use among university students in Jordan: Perception and related knowledge" (n=1059) they found that 61.2% of studied students were in age group 18-20 years with the mean ±SD were 20.4 ±2. 9 years and most of them were single. Also, these results agreed with **Wang et al. (2020)** who studied "Awareness and use of e-cigarettes among university students in Shanghai, China" stated that 60% of students were in age group 18-21, 37% of their mothers had secondary education, 33.1% of their fathers had university education and majority of their fathers were employed.

Regarding knowledge of studied students about electronic hookah smoking, the present study results showed that highly statistically significant improvements in all items of knowledge in post educational program. As well, this study showed increase among the studied students concerning total knowledge level, the results revealed that more than half of them had poor knowledge level at pre-educational program, while at post, the majority of them had good knowledge level about electronic hookah smoking **(Table 2 & Figure 1).** The findings are consistent with **Bashirian et al. (2022)** in Iran (n=83), whose study entitled "The effect of an educational program for hookah use prevention among high school male students: Application of the prototype

willingness model", and mentioned that a statistically significant improvement was detected between pre and post of an educational program in all items of knowledge about hookah and also, found improvement in total knowledge level at post. This result was also in the same line with those of a study done by **Barati et al. (2020)** in USA, who studied "Water Pipe Smoking Reduction in the Male Adolescent Students: An Educational Intervention Using Multi-Theory Model", and reported that there were significant improvements in knowledge between the mean score of knowledge in comparison between the control group and the intervention group (P<0.001).

Additionally, the findings of this study are consistent with those of the study of **Hamid et al. (2020)** in Iran (n=150)**,** whose study entitled "The effects of an education program on hookah smoking cessation in university students: an application of the Health Action Process Approach", and stated that significantly higher knowledge about hookah smoking in post program than preprogram and Health Action Process Approach (HAPA) is a useful model that can be applied in education programs to increase the rate of hookah smoking cessation in university students. These improvements in knowledge of studied students could be attributed to the positive effects of educational program based on Pender's health promotion model which is considered an effective method for acquiring the study students with satisfactory knowledge about electronic hookah smoking

Regarding mean scores of Pender's health promotion model for the studied students pre and post educational program about electronic hookah smoking, the current study denoted that; highly statistically significant difference was found regarding all Pander's health promotion model determinants healthy beliefs between pre and post educational program. As table shows, mean ± SD of perceived benefits of action was 8.9 ±2.5 preprogram that improved to 18.1 ±4.9 post program. Also, mean ± SD of self-efficacy was 19.8 ±8.1 preprogram that improved to 32.1 ±3.3 post program (P <0.001) **(table 3)**. This result was in agreement with **Panahi et al. (2022)** who conducted a study entitled "Measuring the Structures of the Health Belief Model Integrated with Health Literacy in Predicting University Students' Adoption of Smoking Preventive Behaviors" in Tehran, Iran (n=355), and reported that; perceived benefits was 20.2 ± 4.8 preprogram that improved to 29.1 ±3.9 at post and mean ± SD of self-efficacy was 23.11±5.1 preprogram that improved to 29.1 ±6.7 at post program. Also, this results were parallel to **Youssef et al. (2022)** who conducted a study about "Effectiveness of Health Belief Model-Based Educational Intervention In Improving Knowledge, Beliefs, Smoking Behaviors, And Nicotine Dependence Among Electronic Cigarette Smoking Medical Students During COVID-19 Pandemic" in Egypt and found that; perceived benefits increased from 9.1 ± 3.2 pre educational intervention to 17.8 ± 2.5 and self-efficacy increased from 17.1 ± 8.9 pre intervention to 31.8 ± 7.4 at post educational intervention. These may be due to Pander's health promotion

model had a good effect on healthy beliefs of students about electronic hookah smoking

Pertaining to total Pander's health promotion model, the current results demonstrated that, more than one quarter of the studied students had good beliefs at pre-educational program, which improved to the majority of them had good beliefs at post program. While, less than three quarters of the studied students had bad beliefs at pre-program compared to slightly more than one tenth at post program **(figure 2)**. These findings agreed with **Ahmed et al. (2023)** who conducted a study to examine "Effect of a trans theoretical model in improving behaviors of health care workers related to electronic hookah in Mosul, Iraq" (n=58) and found that improvement in total Trans theoretical model level at posttest than pretest.

Regarding the correlation between total knowledge level and total Pander's health promotion model of the studied students, this study indicated that; there were highly statistical positive correlations between studied students' total knowledge scores and total Pender's health promotion model at post program (P<0.001) **(table 4)**. These results agreed with **Emen and Edrada, (2022),** who did a study on "Effectiveness of Health Promotion Audiovisual Materials in Reducing Electronic Hookah Dependence Among Young Adults" in España (n=50) and found that; a significant positive correlation was found between the post intervention total electronic hookah knowledge score and total health promotion of the experimental group than the control group ($p < 0.001$). From the perspective of the researcher, the implementation of an educational program based on Pender's health promotion model helps students to acquire knowledge and promote their beliefs about electronic hookah smoking.

Concerning the relation between demographic characteristics of studied students and their total knowledge level at post-program, this study revealed that significant relations between the total knowledge of studied students about electronic hookah smoking at post program with their age, academic year and educational level of mothers **(table 5)**. These findings were consistent with **Bashirian et al. (2022)** and found that; significant relations between the total knowledge of studied students about hookah smoking at post educational program with their age, academic year and educational level of their mothers. Also, these results were agreed with **Sadeghi et al. (2021)** who conducted a study in Iran about "A Systematic Review about Educational Intervention aimed to prevent Hookah Smoking", (n= 109) and found that, significant relations between the total knowledge of studied students about hookah smoking at post educational intervention with their age and educational level of mothers in intervention group than control group.

Regarding the relation between demographic characteristics of studied students and their total Pander's health promotion model at post educational program, this study revealed that a highly significant relation between total Pender's beliefs of studied students regarding electronic hookah smoking at post program with their age, academic year, educational level of their mothers

and occupation of their fathers. This result is aligns with the study of **Niknami et al. (2020),** who conducted a study in Iran entitled "Adding Health Literacy to the Health Belief Model: Effectiveness of an Educational Intervention on hookah Smoking Preventive Behaviors among University Students" and found significant relation between total Health Belief Model of studied university Students regarding hookah smoking at post educational intervention with their age and mothers educational level and fathers occupation

Conclusion:

Considering the findings and hypothesis of the current study, the present study revealed improvements in students' knowledge and beliefs after implementation of an educational program about electronic hookah smoking. Additionally, there was a highly statistically significant positive correlation between total knowledge and beliefs regarding electronic hookah smoking among male university students at post educational program.

Recommendations:

- Developing health education program to increase awareness for male university students about prevention of electronic hookah smoking.
- Dissemination of brochure and booklets about hazards of electronic hookah smoking for male university students.
- Further research on a large sample and others setting are required.

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