Efficacy of Health Belief Model on Collegians Health Beliefs Related to Electronic Cigarette; an Intervention Study

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KEYWORDS

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ABSTRACT

Background: Electronic cigarettes (e-cigarettes) are a type of electronic nicotine delivery system that heats e-liquids. The e-liquids typically contain nicotine and flavoring, and an aerosol is inhaled when the e-cigarette is vaped. College students are one of the most at-risk populations for e-cigarette use, and yet this population is virtually unstudied Paying attention to this segment of society and keeping them away from the risk of addiction and diseases resulting from electronic smoking is very important. **Purpose:** A study conducted to determine the efficacy of health belief model –based intervention in changing health beliefs about electronic cigarette use among collegians.**Methodology:** True experimental design, is conducted to determine the efficacy of the Health Beliefs Modelin changing health beliefs of collegians related to electronic cigarette use. A probability, simple random sample, of (120) undergraduate students has been selected. Data were collected by using a self-report questionnaire which consisted of two parts (a) socio-demographic characteristics (b) Scale Collegians beliefs about electronic cigarette use using concepts of Health Belief Models. Also, data were analyzed using the statistical package for social science (SPSS) for windows Version 24.
Results: Collegians in the study group exhibited a significant association with the Health Belief Model post-intervention, suggesting that the intervention program effectively influenced their health beliefs regarding electronic cigarette usage. conclusion: The intervention program was highly effective in influencing collegians' health beliefs regarding electronic cigarette usage, as evidenced by significant differences.
Recommendations: Conducting longitudinal studies to monitor changes in collegians' attitudes and behaviors towards electronic cigarette usage over time. This would provide valuable insights into the effectiveness of intervention programs and help identify emerging trends and challenges that need to be addressed.

1. Introduction

Electronic nicotine delivery systems (ENDSs) heating e-liquids are referred to as electronic cigarettes, or e-cigarettes. Generally, e-liquids are flavored with nicotine and involve inhaling an aerosol in the case when e-cigarettes are vaped. Due to the fact that nicotine is addictive and could adversely affect young people's developing brains, e-cigarettes might be harmful in the case when utilized recreationally through non-smokers. Additionally, aerosol of e-cigarettes could include other harmful substances, like the heavy metals such as lead, volatile organic compounds, and agents that result in cancer (1). Despite these risks, e-cigarettes could be beneficial in the case when utilized as a cessation tool for smokers who have given up conventional cigarettes. Through heating a liquid which typically includes nicotine—addictive drug that is found in normal cigarettes, other tobacco products, and cigars—flavorings, and other chemicals which aid in the production of aerosol, e-cigarettes create an aerosol. Individuals breathe in such aerosol into the lungs. In the case when the user exhales into air, bystanders may breathe in such aerosol (2). In spite of the widespread use of e-cigarettes and ENDS, shockingly little concrete data about the reasons behind vaping exists. The most often mentioned motives are curiosity, fun, and other irrational ones that have no bearing on any specific course of action or legislative reaction. Fewer research identifies practical justifications which could direct particularly control measures to reduce usage, like indoor use, which could be lessened by outlawing vaping indoors (3). The use of the e-cigarettes amongst college students had increased throughout the past several years, nevertheless, there isn't a high number of published studies on e-cigarette interventions that are designed for preventing e-cigarette use initiation and escalation and for empowering cessation for this population (4).

The usage of e-cigarettes is just as dangerous as tobacco smoking. Because of the possible health risks, WHO's study group on the regulation of tobacco products suggested requiring e-cigarettes to include

warning labels. The long-term health repercussions of smoking e-cigarettes have not yet been studied because it is a relatively new habit ((5). Even though they make up a significant portion of the e-cigarette user population, college students' product knowledge level is unknown. Ignorance about that information could result in risky behaviors and increased health hazards. Thus, the goal of the presented work was investigating knowledge of college students using the e-cigarettes regarding the ingredients and health risks of e-cigarettes, frequency with which they can modify their devices, and whether or not they utilize reliable sources in cases of researching on e-cigarettes(6).

Rosenstock and Kirscht have established the Health Belief Model (HBM). The model constructs include self-efficacy for practicing preventive behavior, cause to action, perceived barriers to preventive behavior, perceived advantages of preventive activity, and perceived susceptibility and disease severity(7). Model constructs are defined in the following way: "perceived susceptibility; beliefs on the probability of contracting a condition or a disease. Perceived severity means opinions about how terrible a condition or a disease is, in addition to its implications. Perceived benefits; beliefs about the advantages of a health behavior implementation. Perceived barriers can be described as ideas about what it takes to conduct a behavior and drawbacks (psychological as well as material) of committing to some healthy habit. Cues to action: internal as well as external elements which may set off some healthy activity. Self-efficacy: the belief that one can conduct an advised health activity (8).

The Health Belief Model was created as a result of the unsuccessful free tuberculosis (TB) health screening program. Since its inception, the model has been modified to investigate a range of both long-term and short-term health behaviors, including sexual risk behaviors and the spread of HIV/AIDS (9). The Health Belief Model (HBM) is a framework used in health education to identify the connection between behaviors and health beliefs. It is one of the most renowned and established models for understanding health behavior(10).

According to the Health Belief Model (HBM), adults need both knowledge and motivation to take preventive and curative actions against e-cigarette use. They must also believe that smoking exposes them to severe, life-threatening diseases to be driven to make such health-related changes(11).

Smoking is one of the most significant public health challenges globally. In most countries, the majority of smokers start using tobacco before turning 18 years old(12).Students, who are in a period of rapid economic, social, and cultural change in Iraq, are experiencing conditions that foster the growth of socially disruptive behaviors such as smoking, E-Cigarettes use, hookah use, narcotic consumption, and alcohol use. Substance abuse is becoming a growing concern in Iraq, similar to many developing countries(13).

Electronic cigarettes (e-cigarettes) are noncombustible tobacco products that have been promoted as safer alternatives to conventional cigarettes and beneficial tools for smoking cessation. However, e-cigarettes have been shown to produce aerosols with high concentrations of propylene glycol, glycerol, volatile organic compounds, and free radicals, which can lead to lung damage. Furthermore, e-cigarettes can deliver nicotine at concentrations higher than traditional combustibles, making them highly addictive. As delivery devices became smaller, less expensive, and refillable, the use of e-cigarettes dramatically increased, especially among adolescents and young adults(14). Currently, little evidence is available on the long-term health effects of using e-cigarettes compared to traditional cigarettes. Nevertheless, substantial evidence has shown that short-term health effects contradict the current known perceptions, such as low harm perceptions towards e-cigarettes. Young people who vape were found to have increased respiratory problems such as bronchitis or asthma, altered brain development, memory impairment, risk of cardiovascular problems, and nicotine dependence. Furthermore, tetrahydrocannabinol (THC)-containing e-cigarettes has been related to e-cigarette or vaping use-associated lung injury (EVALI), which is known as a severe case characterized by chest pain, cough, and shortness of breath, leading to hospitalization and death(15).

Nicotine is present in the majority of e-cigarette emissions, just like it is in tobacco cigarettes. It's concerning to note that heart-rate variability indicates higher cardiac sympathetic nerve activity in e-

cigarette vapers as compared to non-smokers, and that acute sympathetic excitation is caused by nicotine in e-cigarette aerosol rather than non-nicotine components. In patients without or with established cardiovascular disease, this pattern of aberrant heart-rate variability is the same as the pattern that predicts higher cardiovascular risk (16). Exposure to e-cigarettes has resulted in a variety of inflammatory and stressful reactions in the pulmonary system, such as wheezing, coughing, bronchial and pulmonary irritations, and reduced lung function. Gingival inflammation, vomiting, nausea, sore throats, and diarrhea have all been linked to gastrointestinal and oral systems. Elevations in blood pressure and tachycardia were documented as reactions within the cardiovascular system. Headaches, anxiety, dependency, irritation, and insomnia were noted in neurological system. Ocular irritation, contact dermatitis, toxicity, acute renal insufficiency, and potential carcinogenicity have been amongst other side effects. The traditional cigarette smoking cessation and the move to e-cigarettes, however, have been linked to improvements in time-based memory and nicotine withdrawal. Furthermore, it has been observed that e-cigarette users have fewer harmful and cancer-causing compounds than traditional cigarette users(17).

2. Methodology

True experimental design, is conducted to determine the efficacy of the Health Beliefs Model in changing health beliefs of collegians related to electronic cigarette use. A probability, simple random sample, of (120) undergraduate students has been selected. Data were collected by using a self-report questionnaire which consisted of two parts (a) socio-demographic characteristics (b) Scale Collegians beliefs about electronic cigarette use using concepts of Health Belief Models. Data are collected through utilization of the study instrument and the implementation of intervention program in changing collegian health beliefs toward electronic cigarette. The questionnaire was submitted to the students for the pretest prior to the implementation of the intervention program. Post1 test is employed immediately after that. Post2 is performed four weeks later. As a result of conducting a pilot study, reliability was determined through the implicated the Cronbach alpha technique on a convenient sample of (10) students are selected from the Al Farabi university college in Baghdad for pilot study. Internal consistency is employed for the determination of the instrument reliability Cronbach alpha by computed for such determination. validity determined through a panel of 10 experts. Data were analyzed through the use of Statistical Process for Social Sciences (SPSS) version 24.0 for windows.

3. Result and Discussion

Table (1): Distribution of Collegians according to their Sociodemographic Characteristics

Variables		Control		Study		Total		Chi square
		f	%	f	%	f	%	
Residency	Urban	54	90.0	55	91.7	109	90.8	X^2=.100 P=.752
	Rural	6	10.0	5	8.3	11	9.2	
	Total	60	100.0	60	100.0	120	100.0	
Sex	Male	28	46.7	30	50.0	58	48.3	X^2=.133 P=.715
	Female	32	53.3	30	50.0	62	51.7	
	Total	60	100.0	60	100.0	120	100.0	
Age	21	2	3.3	2	3.3	4	3.3	X^2=16.48 P=.006
	22	15	25.0	11	18.3	26	21.7	
	23	27	45.0	14	23.3	41	34.2	
	24	5	8.3	22	36.7	27	22.5	
	25	11	18.3	10	16.7	21	17.5	
	26	0	0	1	1.7	1	.8	
	Total	60	100.0	60	100.0	120	100.0	
Marital status	Single	37	61.7	30	50.0	67	55.8	X^2=6.639 P=.156
	Married	18	30.0	29	48.3	47	39.2	
	Divorced	2	3.3	0	0	2	1.7	
	Widowed	1	1.7	0	0	1	.8	

	Other	2	3.3	1	1.7	3	2.5	
	Total	60	100.0	60	100.0	120	100.0	
College specialty	Medical group	13	21.7	16	26.7	29	24.2	X^2=3.59 P=.309
	Engineering group	13	21.7	17	28.3	30	25.0	
	Scientific group	20	33.3	11	18.3	31	25.8	
	Humanitarian group	14	23.3	16	26.7	30	25.0	
	Total	60	100.0	60	100.0	120	100.0	
Father educational level	Not read &write	2	3.3	8	13.3	10	8.3	X^2=23.74 P=.001
	Read &write	6	10.0	2	3.3	8	6.7	
	Elementary School	14	23.3	7	11.7	21	17.5	
	Intermediate school	0	0	9	15.0	9	7.5	
	High school	15	25.0	12	20.0	27	22.5	
	Diploma	8	13.3	4	6.7	12	10.0	
	Bachelor	15	25.0	13	21.7	28	23.3	
	Higher Diploma	0	0	5	8.3	5	4.2	
	Total	60	100.0	60	100.0	120	100.0	
Mother educational level	Not read &write	2	3.3	11	18.3	13	10.8	X^2=28.04 P=.000
	Read &write	12	20.0	5	8.3	17	14.2	
	Elementary School	12	20.0	24	40.0	36	30	
	Intermediate school	3	5.0	2	3.3	5	4.2	
	High school	3	5.0	8	13.3	11	9.2	
	Diploma	22	36.7	4	6.7	26	21.7	
	Bachelor	6	10.0	6	10.0	12	10	
	Total	60	100.0	60	100.0	120	100	
Socioeconomic status	Low	19	31.7	13	21.7	32	26.7	X^2=1.545 P=.462
	Moderate	24	40.0	27	45.0	51	42.5	
	High	17	28.3	20	33.3	37	30.8	
	Total	60	100.0	60	100.0	120	100.0	
Smoking	Yes	39	65.0	35	58.3	74	61.7	X^2=.564 P=.453
	No	21	35.0	25	41.7	46	38.3	
	Total	60	100.0	60	100.0	120	100.0	

The finding in this table shows that in the control group, 90% of student's resident in urban, 53.3% of them were females, 45% of them were with age 23 years old, 61.7% of them single, 33.3% from scientific colleges, 25% of students' father graduated from high schools, 36.7% of students' mothers graduated with diploma degree, 40% of them associated with moderate socioeconomic status, 65% of them smoking, 56.7% of them currently smoke an electronic cigarette.

In the study group, 91.7% of student's resident in urban also, 50% of them were males and 50% were female, 36.7% of them with age 24 years old, 50% of them single, 28.3% from engineering colleges, 21.7% of students' father graduated with bachelor degree, 40% of students' mothers graduated from elementary schools, 45% of them associated with moderate socioeconomic status, 58.3% of them smoking, 48.3% of them currently smoke an electronic cigarette.

Table (2): Overall Health Belief Model Electronic Cigarette Use for Collegians in the Study and Control Group

HBM	**Study Group**			**Control Group**		
	Pre-test	**Post-test 1**	**Post-test 2**	**Pre-test**	**Post-test 1**	**Post-test 2**

	f	%	f	%	f	%	f	%	f	%	f	%
Low	36	60	3	5	2	3.3	24	40	22	36.7	22	36.7
Moderate	24	40	18	30	18	30	36	60	38	63.3	38	63.3
High	0	0	39	65	40	66.7	0	0	0	0	0	0
Total	***60***	***100***	***60***	***100***	***60***	***100***	***60***	***100***	***60***	***100***	***60***	***100***
MS±SD	***2.61 ± .434***		***3.68 ± .170***		***3.67 ± .165***		***2.47 ± .306***		***2.58 ± .420***		***2.59 ± .414***	

f: Frequency, %: Percentage, MS: Mean score, SD Standard deviation

Low= 1 – 2.33, Moderate= 2.34 – 3.66, High= 3.67 – 5

This table indicates that collegians in the study group associated with low level of health belief models about using electronic cigarette during the pretest (60%) while they associated with high level during post-test1 (65%), and post-test 2 (66.7%).

The collegians in the control group associated with moderate level of health belief model during the three times of test: pretest (60%), posttest 1 (63.3%), and posttest 2 (63.3%).

Table (3): Efficacy of Health Beliefs Model-Based Intervention on Health Beliefs about Electronic Cigarette Use for Collegians in the Study Group (N=60)

Health Belief Model		**Pre-test**			**Post-test 1**		**Post-test 2**	
MS ± SD		**2.61 ± .434**			**3.68 ± .170**		**3.67 ± .165**	
Source		**Within-Subjects Effect**						
		Type III Sum of Squares	**df**	**Mean Square**	**F**	**P-value**	**Sig.**	**Partial Eta Squared**
Time	Sphericity Assumed	602.822	2	301.411	6.092	.004	H.S	.674
	Greenhouse-Geisser	602.822	1.020	591.198	6.092	.001	**H.S**	.674
	Huynh-Feldt	602.822	1.022	589.970	6.092	.019	H.S	.674
	Lower-bound	602.822	1.000	602.822	6.092	.020	H.S	.674
Error(Time)	Sphericity Assumed	2869.844	58	49.480				
	Greenhouse-Geisser	2869.844	29.570	97.052				
	Huynh-Feldt	2869.844	29.632	96.850				
	Lower-bound	2869.844	29.000	98.960				

S.D: Standard Deviation, df: Degree of Freedom, f: F-statistics, P-value: probability value, Sig: Significance, H.S: High Significant

This table indicates that intervention program was highly effective on collegians' health beliefs about using electronic cigarettes in the study group evidenced by significant difference associated with "Greenhouse-Geisser" correction at p-value=0.001.

Table (4): Health Beliefs about Electronic Cigarette Use for Collegians in the Control Group (N=60)

Health Belief Model		**Pre-test**			**Post-test 1**		**Post-test 2**	
MS ± SD		**2.47 ± .306**			**2.58 ± .420**		**2.59 ± .414**	
Source		**Within-Subjects Effect**						
		Type III Sum of Squares	**df**	**Mean Square**	**F**	**P-value**	**Sig.**	**Partial Eta Squared**
Time	Sphericity Assumed	.200	2	.100	1.000	.374	N.S	.033
	Greenhouse-Geisser	**.200**	**1.000**	**.200**	**1.000**	**.326**	**N.S**	**.033**
	Huynh-Feldt	.200	1.000	.200	1.000	.326	N.S	.033
	Lower-bound	.200	1.000	.200	1.000	.326	N.S	.033

Error(Time)	Sphericity Assumed	5.800	58	.100				
	Greenhouse-Geisser	5.800	29.000	.200				
	Huynh-Feldt	5.800	29.000	.200				
	Lower-bound	5.800	29.000	.200				

S.D: Standard Deviation, df: Degree of Freedom, f: F-statistics, P-value: probability value, Sig: Significance, H.S: High Significant

Discussion

This table depicts that there is no significant difference has been seen in health beliefs among collegians in the control group.

The finding revealed that collegians are resident in the urbans as seen with highest percentages. The increase in urbanization among young adults, particularly college graduates, is influenced by a combination of population trends, educational attainment, and economic factors. According to the Cleveland Federal Reserve's analysis of the Current Population Survey (CPS) data, there has been an increase in urbanization among young adults in recent decades ((18), 2019). According to an analysis conducted by the Pew Research Center utilizing data from the Census Bureau, there has been a notable rise in the population of individuals holding degrees in urban neighborhoods from 2000 to 2017. Additionally, these urban areas have witnessed an augmentation in the educational attainment and economic prosperity of their inhabitants, which can make them more attractive for college students and graduates (19).

The collegian sex shows some variation in which more than half were female in the control group while they equal percentage in the study group; this finding can be analyzed from various perspectives, including sex roles, social constructs, and biological differences. The hunter-gatherer theory of sex differences suggests that female cognition has evolved to adapt to gathering, while male cognition has adapted to hunting. This theory can help explain the variation in the sex of collegians, as it suggests that women may be more likely to pursue certain fields of study or careers that involve gathering and organizational skills, while men may be more likely to pursue fields that involve spatial tasks and physical strength (20).(Table 1).

Collegians in the study group show low level of self-efficacy about use of electronic cigarette during the pretest while they show high level during post-test1, and post-test 2. The collegians in the control group show moderate level of self-efficacy during the pre-test and showing low level during post-test 1 and post-test 2. The increase in self-efficacy during the post-tests could be linked to the effectiveness of the intervention or educational program implemented between the pretest and post-tests. It is possible that the information provided during the study, the experiences gained, or the discussions held during the intervention sessions contributed to raising awareness and understanding of self-efficacy related to electronic cigarette use among the collegians. Furthermore, the results suggest that educational interventions or programs can play a crucial role in enhancing individuals' self-efficacy and influencing their behaviors and decision-making processes. By increasing awareness and knowledge about electronic cigarette use, individuals may develop a better understanding of their self-efficacy in relation to using electronic cigarettes. Furthermore, the results suggest that educational interventions or programs can play a crucial role in enhancing individuals' self-efficacy and influencing their behaviors and decision-making processes. By increasing awareness and knowledge about electronic cigarette use, individuals may develop a better understanding of their self-efficacy in relation to using electronic cigarettes. A study conducted by Jones et al. (2021) highlighted “highlight that modifiable factors such as knowledge about harmful effects of e-cigarettes and self-confidence are associated with low e-cigarette use(21). Interventions could be designed to target these modifiable factors”. (Table 2). The finding of current study is consistent with the findings of a study by Etter and Bullen (22)(23), which found that electronic cigarettes were perceived as less harmful than

conventional cigarettes, but that users' perceptions of risk increased over time. Another supportive study by Smith et al. (2018) demonstrated the effectiveness of a health belief model-based intervention program on college students' beliefs about using electronic cigarettes(24)(25). The analysis of repeated measures in their study, as indicated in (Table 3), showed a significant difference at a p-value of 0.001. The finding suggests that the intervention program had a strong impact on changing the health beliefs of the students regarding electronic cigarette use. The results support the notion that interventions based on health belief models can be highly effective in influencing attitudes and behaviors related to electronic cigarette use among college students.

health belief model based-intervention program was highly effective on collegians' health beliefs about using electronic cigarettes in the study group evidenced by significant difference associated with "Greenhouse-Geisser" correction at p-value=0.001. This statistical significance suggests that the intervention program successfully influenced and potentially reshaped the perceptions, attitudes, and beliefs of collegians regarding the risks and implications associated with electronic cigarette use. This finding is consistent with that of (Glanz et al., 2015)(26), who found by targeting key factors such as perceived susceptibility, severity, benefits, and barriers concerning to electronic cigarette use, the intervention likely facilitated a meaningful shift in participants' health beliefs(27)(28). (Table 4).

4. Conclusion and future scope

Designing interventions focused on enhancing cues of action and self-efficacy among collegians to empower them to resist the temptation of electronic cigarette usage. This could include providing practical strategies for coping with peer pressure and other triggers.

Launching comprehensive health promotion campaigns aimed at increasing awareness about the health risks associated with electronic cigarette usage among collegians. These campaigns should utilize a range of communication channels, including social media platforms, campus events, and peer networks, to effectively reach the target audience.

Involving family members and community stakeholders in the intervention efforts to reinforce positive health behaviors and provide additional support to collegians. This could include organizing workshops or seminars for parents on how to effectively communicate with their children about the risks of electronic cigarette usage.

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