ORIGINAL ARTICLE

Associated Factors of Ever-vaping, from a Religious Perspective, among School-going Adolescents in Terengganu, Malaysia

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ABSTRACT

Introduction: Vaping is an emergent worrying trend among adolescents, which needs to be prevented. Previous studies have shown that religious-related factors have some influence on adolescent smoking but data on their effect on vaping is lacking. The objective of the study was to determine the significant factors associated with ever-vaping, including factors linked with religion, among school-going adolescents. **Methods:** The study was cross-sectional, involving 773 adolescents in Terengganu, Malaysia, aged from 13 to 18 years old, from 12 schools chosen using cluster random sampling. A validated questionnaire adapted from the Global School Health (GSHS) was used. Duke University Religion Scale (DUREL) Malay version was adopted to assess religiosity and a scale for perception on religious prohibition of substance use scale was added. SPSS version 23 was used to analyze the data, with ever-vaping as the dependent outcome via multiple logistic regression analysis. **Results:** Proportion of ever-vaping was 20%. The significant factors associated with ever vaping were being male (OR =10.10, p<0.001, CI =5.63, 18.12), ever-smoking (OR = 10.7, p<0.01, CI =5.66, 20.24) higher age (OR= 1.62, p<0.001, CI= 1.35, 1.93), family smoking (OR= 1.11, p=0.003, CI= 1.04,1.19) and perception of religious prohibition of substance use (OR = 0.92, p=0.009, CI =0.87, 0.98). An increase in one score of the perception scale reduced 8% odds for ever-vaping. **Conclusion:** Vaping has an increasing trend among adolescents. Perceptions of religious substance use prohibition was negatively associated with the trying of vape. Therefore, emphasizing on this perception may be an effective measure to counter this behaviour among adolescents.
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INTRODUCTION

The dangers of smoking have been well established in a breadth of documented data from over a century of research. The World Health Organization (WHO) has estimated smoking-related deaths to be more than eight million per year (1). E-cigarettes or vape has been introduced initially as a safer alternative to smoking. However, as the evidence mounts, it has been clear that vape is also associated with various health problems. Despite that, the prevalence of vaping has been increasing year by year. Ever-vaping among adolescents in Malaysia for example, has increased from 10.9% in 2011 to 19.1% in five years (2). Previous studies have shown that religion has an influence on substances and smoking.

A study on university students in Malaysia has shown that support on religious ruling statement (known as 'fatwa' in Islam) on smoking prohibition was significantly associated with non-smoking. (3). It has also been shown that uptake of smoking and alcohol were more likely in African American college students who had low spirituality (4). Meanwhile, a longitudinal study among a sample of 1,040 adolescents found that involvement in religious activities predicted a lower smoking level after 24 months (5). The period of adolescence is a vulnerable phase where an adolescent may be easily influenced to try new substances or be involved in high-risk behaviours. This is due to the immature development of the frontal lobe, where logical decisions are being processed whereas the curiosity during the period is increased (6). Therefore, any protective factors for the adolescents to try substances such as drug, alcohol or vaping is important to be investigated, including religion-related factors. These are some evidences that show the impact of religion towards smoking uptake. Vaping as a relatively new habit has not been adequately studied

with regards to any religious influence. The fatwa in Malaysia has dictated that vaping is not permissible among Muslims by extrapolating from the rabbinic literature regarding alcohol and drugs and data that established the harms related to vaping (7).

Therefore, the aim of this study was to determine the factors significantly contributing to ever-vaping, together with religion associated factors, among school-going adolescents in Terengganu, Malaysia.

MATERIALS AND METHODS

The study was a cross-sectional study from December 2018 until May 2019. The inclusion criteria for the study were students in the selected secondary schools who were literate and those who did not have parental consent were excluded.

The estimated sample size for the study was according to the largest sample size calculation for all the objectives, taken from the single proportion formula to calculate for prevalence of ever-vaping among adolescents. The prevalence of ever-vaping was 19.1% in Malaysia (2), hence minimum required sample size was 236. Considering the effect of cluster sampling, the sample size was doubled; and another 30% was added to cover the missing data and non-response rate making the total respondents needed n=755.

Cluster random sampling was used to randomly choose 11 public schools and one private school from the complete list of two groups of schools acting as clusters; private and public secondary schools in Terengganu, Malaysia, obtained from the Department of State Education of Terengganu. Permission of the Principles of schools were sought during a pre-visit briefing done to each school to explain regarding the study. At the pre-visit, 36 classes were selected using random sampling from a list of classes of Form One, Two and Four obtained from administration offices of all the schools, and research information were distributed to the students of the classes to be taken home to get consent from the parents. The data collection visits were subsequently done where the questionnaires were distributed to be answered in a session where the research assistants were present to clarify any query from the students regarding the questions. Permission to conduct the study was attained from the Ministry of Education Malaysia, and the State Department of Education before proceeding with the data collection. Ethical approval was acquired prior to conduct of the study from the Human Research Ethics Committee Universiti Sultan Zainal Abidin (UniSZA/UHREC/2019/104).

The study adapted the Global Student Health Survey (GSHS) questionnaire which was a self-administered questionnaire developed by the World Health Organization, in collaboration with other world organizations such as United Nations and U.S Centre for Disease prevention (CDC), designed to collect data on health behaviours of students from 13 to 17 years old. It contained validated questions in ten core modules, from nutrition to tobacco use, and was used worldwide since the year 2003 (8). The Malay version was used and only the module on smoking was utilized. The questions for smoking were replicated for vaping, which did not include any questions on source of tobacco or vape products. Previous usage of more than once of cigarettes and vape were categorized as 'ever-smoking' and 'ever-vaping', respectively.

The Malay version of Duke Religiosity Questionnaire (DUREL-M) was used to assess religiosity. The Duke University Religion Index (DUREL) is a measure of religiosity using five-items, evaluating three main religiosity dimensions, namely intrinsic religiosity, organizational and non-organizational religious activity (9). Therefore, the total DUREL-M and three subscales of DUREL-M were assessed in the study. The overall scale has good internal consistency with Cronbach's alpha between 0.78 to 0.91, high test-retest reliability (intra-class correlation of 0.91) and acceptable convergent validity (r's = 0.71–0.86) with other religiosity measures (9). Meanwhile DUREL -M had a satisfactory test-retest reliability (0.68), good parallel reliability (0.70) and fair internal consistency (Cronbach's alpha = 0.45) (10) and the validation was done among nursing students aged 18 to 23 years old. However, this version of DUREL-M have been used in studies among adolescents, where one study showed it to have good convergent correlation with the Malay version of Santa Clara Strength of Religious Faith (SCSORF) scale (11). Perception of religious prohibition for drugs was assessed using a religious prohibition perception for substance use belief scale, rated from 1 to 10, with 1 being strongly disagree and 10 being strongly agree. Data were entered into SPSS version 23, cleaned and analyzed. Simple and Multiple Logistic Regression were done with 'ever-vaping' as the dependent outcome, to determine the significant associated factors for ever-vaping. Dependent variable was ever-vaping. Independent variables were gender, age, race, parents' marital status, household income, presence of smoking in family members, total DUREL-M and subscales of DUREL-M.

RESULT

Response rate was 95%. The respondents were mostly female (53.7%) and Malays (92.9%). (Table I). The prevalence of ever-vaping among respondents was 20%, in which 85 out of 155 respondents who had vaped (54.8%) never smoked before. Table 1 shows the ssociodemographic, respondents' and family smoking status, DUREL-M and religious perception characteristics of respondents, together with the characteristics of the respondents according to their vaping status ('ever-vaped' and 'never vaped').

Table I: Sociodemographic, self and family smoking status, DUREL-M and religious perception characteristics of participants according to vaping status (n=773)

	n=773			
	n	**%**	**Ever-vaped**	**Never Vaped**
Variable			n(%)	n(%)
Gender				
Male	358	46.3	133 (37.2)	225 (62.8)
Female	415	53.7	22 (5.3)	393 (94.7)
Age(years)				
Mean 14.7			15.3	14.5
Race				
Malay	718	92.9	152 (21.2)	566 (78.8)
Chinese	51	6.6	0 (0.0)	51 (100.0)
Indian	2	0.3	1 (50.0)	1(50.0)
Others	1	0.1	1 (100.0)	0 (0.0)
Missing	1	0.1		
Household Income				
<RM1000	194	25.1	52 (26.8)	142 (73.2)
RM1000-2999	263	34.0	47 (17.9)	216 (82.1)
RM3000-9999	165	21.3	46 (18.8)	119 (81.2)
RM10000 and above	57	7.4	10 (17.5)	47 (82.5)
Missing	94	12.2		
Marital status				
Married and living together	684	88.5	126 (18.4)	558 (81.6)
Married but not living together	21	2.7	5 (23.8)	16 (76.2)
Divorce	33	4.3	14 (42.4)	19 (57.6)
Widow or Widower	29	3.7	8 (27.6)	21 (72.4)
Others	6	0.8	3 (50.0)	3 (50.0)
Smoking status				
Never smoked	674	87.2	85 (12.6)	589 (87.3)
Ever-smoked	99	12.8	70 (70.7)	29 (29.3)
Family smoking				
No	456	59.0	68 (14.9)	388 (85.1)
Yes	316	40.9	87 (27.5)	229 (72.5)
Missing	1	0.1		
	Mean	SD	Mean (SD)	Mean (SD)
DUREL-M				
Total score	12.05	3.40	11.92 (3.22)	12.09 (3.45)
Organizational Religious Activities	3.58	1.51	3.87 (1.38)	3.51 (1.54)
Non-organizational Religious Activities	3.89	1.58	3.69 (1.54)	3.94 (1.59)
Intrinsic Religiosity	12.24	3.31	11.93 (3.24)	12.09 (3.45)
Perception on substance use prohibition	5.96	4.20	5.13 (4.17)	6.2 (4.19)

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Table II showed that there were five significant factors associated with increased odds for ever-vaping among respondents, which were older age, male gender, ever smoking, presence of family members smoking and lower religious prohibition perception for substance use belief. An increase in one score of the perception scale reduced 8% the odds for ever-vaping. Backward LR Multiple Logistic Regression model was chosen as it resulted the highest percentage in the classification table.

Table II: Simple and multiple logistic regression on the factors associated with ever-vaping among respondents

Variable	Simple logistic regression				Multiple logistic regression			
	Wald	B	OR (95% CI)	*p*-value	Wald	B	Adj OR (95% CI)	*p*-value
Age	31.95	0.37	1.44 (1.27, 1.65)	<0.001	28.88	0.43	1.62 (1.35, 1.93)	<0.001
Male gender	92.65	2.36	10.56 (6.53, 17.04)	<0.001	60.21	2.46	10.10 (5.63, 18.12)	<0.001
Ever smoking	127.51	2.82	16.72 (10.26, 27.27)	<0.001	50.82	2.22	10.7 (5.66, 20.24)	<0.001
Family members smoking	18.06	0.77	2.17 (1.52, 3.10)	<0.001	1.20	0.11	1.11 (1.04, 1.19)	0.003
Perception of religious prohibition	6.71	-0.06	0.94 (0.90, 0.98)	0.01	7.17	0.23	0.92 (0.87, 0.98)	0.009

Multiple logistic regression; Backward LR Multiple Logistic Regression model was applied. Multicollinearity and interaction term were checked and not found. Hosmer-Lemeshow test (p=0.986) and classification table (overall correctly classified percentage=86.5%) were applied to check the model fitness.

DISCUSSION

The trend of vaping in Malaysia has been increasing due to the belief that vaping has lower health risk than cigarette smoking (10). The proportion of adolescents who had tried vape in our study was 20%. This figure showed over a one-fold increase of ever-vaping among adolescents in Terengganu compared to 9.6% in 2011 (2). The majority of adolescents who had taken vape were among those who had never smoked. This refutes the claim that vape was taken as an alternative for smoking. The prevalence is worrying as the trend is still increasing despite many evidences of the dangers of vaping emerged. This trend is not only happening in Malaysia, but is also present

in many developed countries. In the West, a survey on adolescents in Canada, The Unites States and England also showed similar pattern where there was increase in the prevalence of vaping among adolescents between 2017 and 2018 (13). A study in New Jersey reported the prevalence of vaping among adolescents was 24% in 2018, increased from 10% in 2016 (14). A study done in another state in Malaysia showed that the prevalence of ever-vaping is 52.9%, which higher as compared from our findings (15). This could be due to the difference in the study participants as it only included public schools and excluded a few types of schools such as private schools, vernacular schools and boarding schools. This shows that the exposure towards vape might be more in public non-boarding schools, leading to the higher rate of vaping.

A study on school-going adolescents in Kuala Lumpur showed that vaping is the more prevalent than cigarette smoking (16). This study indicated that vaping practice is slowly replacing cigarette smoking among adolescents in Malaysia especially in the urban setting. Other than the direct effect of vaping to the person, vaping also leads to second hand smoke. exposure to others. A local study in Terengganu revealed that vaping contributed to second-hand smoke exposure to other households (17). Associated factors of ever-vaping in this study, other than the religious perception of prohibition of drugs were male gender, higher age and presence of smoking among immediate family members were similar to other studies (15, 18). The Malaysia National e-cigarette survey (2016) also revealed that male was the common consumer of e-cigarette (19). A previous study in a district in Malaysia showed that being male was a predictor as well as a moderator for the intention to vape among secondary school adolescents (20). The reasons for these students to vape were wanting to try and believe that vaping was safer than cigarette smoking. Another study among over 13,000 Malaysian adolescents also showed similar findings where male was more likely to use vape and experimentation was its pulling factor (21). Religiosity aspects from DUREL-M measurements and subscales were not significantly associated with ever-vaping in our study, although in general, all the scores were lower in those who had tried vape (Table I). There were not many studies which focused on religion-related factors for vaping among adolescents. However, many previous studies have shown that the occurrence of smoking habit tend to be less among those actively involved in activities associated with religion across many religious traditions such as Jews (22) and Christians (4). These activity participations also appear to confer some protection against escalation to heavy smoking in those adolescents who had tried cigarettes before (5). Some studies have found that there were different effects between individual religiosity such as regularity of prayers and public religiosity such as occurrences of religious services attendance (23). The studies pointed that although there appears to be a protective effect by both domains, individual religiosity effect was more protective against initiation of smoking and public religiosity had more influence on the escalation of smoking. This may be due to the effect of bonding to traditional social institutions and conventional norms, as involvement in religious activities may make it less likely for adolescents to affiliate with peers who are more likely to smoke. Furthermore, the close monitoring of the adolescents is more likely in religion observant families may be relatively more likely to be monitored closely by their parents. These adolescents often have better adult role models and are more likely to participate in the traditional activities in the community (24). The negative results in our study may be due to the unique aspects of vaping compared to smoking, or difference in the tools used in the other studies to assess religiosity. Using a different tool may yield different results as religiosity is a difficult aspect to quantify. As adolescents, they may have changing views regarding the belief or vary their religious practice with time. Therefore, a different tool or a prospective study may elicit a different result. However, the DUREL questionnaire is used worldwide with good reliability and validity with the advantage of ease of administration due to relatively few items and therefore the results of this study cannot be dismissed.

In our study, the perception of religious ruling regarding prohibition of drugs was associated with non-trying of vape. Religious dogmas can form social norms restrictive of smoking behaviour and vaping. Most of the world's major religions had texts which were written before the worldwide prevalence of tobacco use and vaping. Despite this, religious scholars in many religions have interpreted the texts and official statements were issued on whether the use of tobacco and nicotine-containing products were consistent with the doctrines and beliefs of the religion, emanated from the religious texts (25). In Islam, the 'fatwa' or religious ruling in Malaysia regarding vaping is that it is not permissible (7). Similarly, Jewish law has extrapolated the rulings from Rabbanic literatures regarding combustible cigarettes and e-cigarettes and came to the conclusion that the use of these were prohibited. Other religions such as Christianity, Judaism, Buddhism and Hinduism for example, despite not specifically forbidding smoking, indicated that the practice is inconsistent with the teaching and writings of the varied religions. The reasons include deliberate harming of the body, and the fact that many intoxicating and addictive substances can lead to impairment of judgment (26). On the other hand, tobacco was commonly used for healing and ceremonies among people with American Indian religions and they in general do not condone smoking and tobacco use outside of spiritual contexts (27). Therefore, this has become a challenge for tobacco control and preventing recreational use and nicotine dependence in the communities of American Indian, as there is a need to acknowledge the cultural use of tobacco. This impact would be similarly applied to vaping as well.

In general, however, many religious beliefs and practices can form opportunities for reduction of substance use or smoking. This has been proved by the association of increased smoking cessation and other specific occasions the increased smoking cessation such as Ramadan or Lent (28). In Malaysia, the ruling of prohibition of smoking in Islam has influenced Muslims to avoid smoking as well as encouraged them to quit smoking (29). Religiosity has been shown to improve cessation rates (30). For instance, the awareness of this prohibition is further enhanced during the month of Ramadhan when smokers usually abstain from smoking (31). A study among Malaysian Muslims and Thai Buddhist showed that encouragement from religious leaders had motivated them to quit smoking (32). The study further indicated that, compared to Thai Buddhists, religious believe by the Malaysian Muslims was a factor for a success to quit. In a study in Egypt, the knowledge of the religious prohibitionon smoking was higher among non-smokers and further increased with the help of religious leaders (33). Quit attempt was also higher among those with knowledge on the religious ruling. Despite the religious ruling awareness, only imposing the ruling, without further enhancement by law, has the tendency to fail (34). Our study has shown that the perception of religious ruling of substance use does influence uptake of vape. Therefore, there should be an increased effort to hold more awareness campaigns informing religious rulings about using substances such as drugs, vaping and smoking to reduce the likelihood of the trying of these substances especially among adolescents, as well as further enhancement of the law regarding underaged vaping. This could prevent them from engaging with these substances and the development of addiction to the substances during adulthood, thus reducing the morbidity and mortality resulting from them.

CONCLUSION

Vaping is an emerging worrying trend among adolescents. Religious prohibition of substance use was shown to be negatively associated with ever-vaping. Therefore, emphasizing on this prohibition may be effective in ensuring less adolescents take-up this hazardous act.

The study has several limitations which include the cross-sectional design which limits the causality assignment for the studied factors. Future studies should focus on intervention and longitudinal studies to establish the causality effect of this factor and the effect of enhancement of this factor towards vaping. Other limitations include the respondents were only from one state in Malaysia. Thus, the study finding may not be able to be extendable to adolescent population in other states in Malaysia. Self-reporting in data collection also may lead to a biased response. However, the findings showed evidence of association of religious perception of substances with ever-vaping among adolescents which later can be a guide in future guidelines regarding prevention of vaping. Huge studies in diverse locations might be needed to address the limitations of this study. Emphasizing of the religious prohibition of substance use may be effective in curbing this hazardous act among adolescents. The limitation of this study is the cross-sectional nature which limits the causality assessment of the studied factors. Future studies should focus on intervention and longitudinal studies to establish the causality effect of this factor and the effect of enhancement of this factor towards vaping.

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