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Underlying Predictors of Tobacco Smoking among Iranian Teenagers: Generalized Structural Equation Modeling

Fariba Khayyati[1], Parvaneh Taymoori[2], Asghar Mohammadpoorasl[3], Hamid Allahverdipour[4], *Mohammad Asghari Jafarabadi[5]

[1]PhD Candidate, Tabriz Health Service Management Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. [2]Assistant Professor of Health Education, Social Determinant of Health Research Center, Kurdistan University of Medical Science, Sanandaj, Iran. [3]Assistant Professor of Epidemiology**,** Department of Statistics and Epidemiology, Tabriz University of Medical Sciences, Tabriz, Iran. [4]Associate Professor of Health Education, Clinical Psychiatry Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. [5]Associate Professor of biostatistics, Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

Abstract

Background: To define underlying predictors of tobacco smoking among Iranian Teenagers in a generalized structural equation model.

Materials and Methods: In this cross-sectional study, a Generalized Structural Equation Model based on planned behavioral theory was used to explain the relationship among different factors such as demographic factors, subjective norms, and the intention to tobacco and, in turn, intention with tobacco use. The sample consisted of 4,422 high school students, based on census, in East Azerbaijan province, Iran. The questioner was designed adapting to the objectives of study. It was used global youth tobacco survey to design the queries of tobacco use.

Results: The model had a good fit on data. Adjusting for age and gender, there was a statistically significant relationship between the intention to consumption and the following factors: working while studying (P<0.05), consumption of hookah by family members (P<0.05), history of smoking among close friends (P<0.05), history of leaving school during the day without informing the officials (P<0.05), lack of commitment to academic tasks (P< 0.05), lack of acceptance by peers (P< 0.05), knowledge (P< 0.05), and attitude (P< 0.05). There was a significant relationship between the intentions to consumption to tobacco consumption in the past 30 days (P< 0.05) as well.

Conclusion: The intention to tobacco use may lead to its use, so the monitoring children's relationships are required by parents. Authorities should monitor teens' workplace environment, design and implement educational programs in the schools. As the final point, there was no significant correlation between the intention to and consumption of hookah, which can be investigated more in the future studies.

Key Words: Cigarette, Hookah, Smoking, Structural equation modeling, Teenager, Tobacco.

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Corresponding Author:

Mohammad Asghari Jafarabadi, Department of Statistics and Epidemiology, Tabriz University of Medical Sciences, Golgasht St. Attar e Neshabouri St., Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran. Postal Code: 5166614711, Fax: 0098411-3340634.

Email: m.asghari862@gmail.com

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1- INTRODUCTION

The harmful effect of cigarette use has been known for many years (1), and the Centers for Disease Control and prevention (CDC) website has declared that cigarettes harm almost every organ of human body (2). Hookah consumers, similar to cigarette consumers, are encountered with harmful substances such as nicotine, carbon monoxide, and large amounts of phenol and its derivatives. Hookah consumption as a habit might increase the risk of cancer and cardiovascular diseases (3, 4).

Despite the harmful effects of tobacco, its consumption is considerable in Iran and in the world (5-7), and the starting age of its use is decreasing (8-11). Several factors have been identified as associated with smoking, such as age (6, 7, 9, 10), gender (6, 7, 9, 12), place of residence (13), income and socioeconomic status (10), educational performance and achievements (12), stress (14, 15), a smoking peer group (6, 11, 12, 16), and having a smoker in the family (10, 16-18). In a study, low literacy of smokers, poor knowledge about the dangers of smoking, and being male were correlated with a positive attitude toward smoking (19). As such, normative beliefs are strong predictors of future tobacco use. Factors such as, the presence of a smoker in the family, and positive attitudes toward smoking were effective factors in the intention to tobacco use (20). A study by Stewart et al.(21) suggested that intention to smoke can predict the onset of smoking. Different studies have shown that a positive attitude toward smoking is associated with the intentions to it (17, 20, 22), and the study by Eckhart et al. demonstrated that the intention to tobacco consumption is the main predictor of smoking (23). Given the findings of the above mentioned studies, a conceptual model was considered in this study to investigate the factors influencing intention to smoke and, subsequently, smoking cigarettes and hookahs. The theoretical framework was the theory of planned behavior. According to this theory, people's intention to perform a desired behavior is a function of attitudes towards that behavior, their beliefs about what their families think they have to do, and their conception of ease or difficulty of that behavior (24). Therefore, we tested demographic factors, knowledge, attitude, and normative beliefs in terms of their relationship with behavioral intention and, in turn, intention associated with tobacco use. Demographic factors included age, gender, place of residence, and working while studying. Normative beliefs included hookah or cigarette smoking by family members; history of tobacco use by close friends; commitment to school tasks; leaving the school during the day without prior notice; feelings of acceptance in the peer group; and a history of drug and alcohol use. According to the results of a meta-analysis, the effect of subjective norms on the intention to cigarettes and the smoking behavior depends on whether people live in countries with individualistic or collectivist cultures. The authors have proposed that the design of tobacco prevention campaigns aimed at teenagers consider different national cultures (25).

Therefore, although various factors related to tobacco have been reviewed, there are still numerous unknown factors. Lack of relevant studies in Iran and lack of studies in relation to the hookah use in the world justify our study. This study have addressed the following aims: investigating the effects of the abovementioned factors on the intention to tobacco, and investigating the effect of intention on tobacco use in the past 30 days.

2- MATERIALS AND METHODS

2-1. Procedure and participants

This was a cross-sectional study conducted on high school students in East Azerbaijan province, Iran. The population in the study consisted of all high school students from the cities of Ajabshir and Malekan (4,845). They were got involved in the study based on census. A total of 4,422 (91%) students (29 schools with 2,431 boys and 1,991 girls) were studying at the beginning of the academic year of 2013-2014, and all of them participated in the study. Students who were absent on data collection days were excluded from the study.

2-2. Measures

Data were collected using a self-administered questionnaire. Four items of the questionnaire were about demographic information, including age, gender, place of residence (urban or rural) and working while studying (yes or no). Four items were related to the tobacco consumption behavior, taken from the Global Youth Tobacco Survey standard questionnaire (26). The queries were as follows: "Have you ever tried smoking cigarettes or hookahs?" (yes or no); "Have you ever tried cigarette smoking in the past 30 days?"(every day, sometimes, or never); "Have you ever tried smoked hookah in the past 30 days?" (every day, every other day, twice a week, once a week, or no).

Other factors in the present study were: history of leaving the school during the day without the permission of school officials (yes or no); history of smoking and hookah use in the family (yes or no) and history of smoking among close friends (yes or no). There were two items about the history of drug and alcohol use (yes or no), and two questions on the commitment to school tasks and a feeling of acceptance among peer groups and the neighborhood (with a 5-point Likert scale from very low to very high). 13 items were used to assess knowledge; for example, “Cigarette smoking increases the risk of heart attack.”, or "Hookah smoking can lead to lung cancer.” Responses were yes, no, or I don’t know ($\alpha = 0.77$). Knowledge ranged from -13 to 13. Higher score showed higher knowledge. 16 items were used to assess attitude; for instance, “Cigarette use gives me self-confidence”, or " Hookah use with friends is wonderful” (with a 5-point Likert scale from strongly agree to strongly disagree) ($\alpha = 0.87$). Attitude ranged from 16 to 80, and higher scores showed more negative attitudes. 6 items were used to measure behavioral intention; for example, “I will not try cigarettes in the next 6 months even if my friends insist on it”, or “I intend not to use hookah in the upcoming year” (with a 5-point Likert scale from strongly agree to strongly disagree) ($\alpha = 0.95$). Behavioral intention ranged from 6 to 30, and higher scores showed further positive intentions. The internal consistency of the study was approved. The main outcome of the study was “cigarette or hookah smoking in the past 30 days”.

2-3. Statistical analysis

Data were presented using mean $\pm$ standard deviation (SD) and number (%) for numeric and categorical variables respectively. Chi-squared test was used to test the relations between qualitative variables. To determine the relationship between different factors and smoking in the conceptual model, a Generalized Structural Equation Model (GSEM) with maximum likelihood estimation was used. Our model fit indices included the χ^2 estimate with given degrees of freedom and the root mean squared error of approximation (RMSEA) as absolute fit indices. SPSS-16 and MPLUS6.8 statistical software were used for data analysis and 0.05 was considered as the significance level.

2-4. Ethical considerations

This project was carried out after receiving approval from the Ethics Committee of

Tabriz University of Medical Sciences and obtaining consent from education system authorities and the students' parents. Students were reassured that their information would remain confidential.

3- RESULTS

A total of 4,422 students, 91% of all of them, (54.9% male and 45.1% female) participated in this study. Their age ranged between 13 and 19 years, and all of them were studying in high schools. Students who were absent on data collection days were excluded from the study. The demographic information of smokers and non-smokers and the modification indices are showed in **Table.1** and **Table.2** respectively.

According to the relevant indicators, **Figure.1**, the conceptual models fitness was approved for cigarette smoking. For cigarette smoking, the results showed that a history of alcohol consumption (B=-0.128, P < 0.001), and the scores of knowledge (B=0.289, P < 0.001), and attitude (B= -0.156, P = 0.002) were positively related to the intention to cigarette smoking. Also, alcohol use, lack of knowledge and positive attitude toward tobacco lead to more behavioral intention.

While other variables did not show any significant correlation with behavioral intention. Behavioral intention was strongly and positively associated with cigarette smoking in the past 30 days (B=0.272, P < 0.001).

According to the relevant indicators, **Figure.2**, the conceptual models fitness was approved for hookah smoking, and it was statistically significant.

For hookah smoking, similar to cigarette smoking, the results showed that a history of alcohol consumption (B=-0.130, P < 0.001), and the scores of knowledge (B=0.283, P < 0.001) and attitude (B=-0.169, P < 0.001) were related to the intention to smoking, Alcohol use, lack of knowledge and positive attitude toward tobacco lead to more behavioral intention. while other variables did not show any significant correlation with behavioral intention. It is noteworthy that behavioral intention was not significantly associated with smoking hookah in the past 30 days. The overall results of cigarette and hookah smoking (tobacco use) showed that according to the relevant parameters, **Figure.3**, the conceptual models fitness was approved, and it was statistically significant.

Adjusting for age and gender, there was a statistically significant and positive relationship between working while studying (B=0.457, P = 0.030), hookah smoking by family members (B=0.810, P = 0.003), history of smoking among close friends (B=0.487, P < 0.001), history of leaving school without informing the officials (B=0.956, P < 0.003), lack of commitment to academic tasks (B=0.299, P < 0.001), lack of acceptance by peers (B=0.329, P < 0.001), lack of knowledge (B=-0.171, P < 0.001,), positive attitude toward tobacco (B=-0.305, P < 0.001), and with the intention to tobacco consumption . Moreover, there was a significant and positive relationship between intention toward tobacco smoking and tobacco consumption in the past 30 days (B=0.037, P < 0.001).

Table-1: Demographic information of the participants

Variables	Tobacco Consumer	Tobacco Non-Consumer
	N (%)	N (%)
Age (yrs)		
13-14	7 (3.3)	517 (13.2)
15-16	113 (52.8)	2318 (59.3)
17-18	91 (42.5)	1057 (27.0)
19	3 (1.4)	17 (0.5)

Gender		
Male	194 (89.0)	2081(52.4)
Female	24 (11.0)	1888 (47.5)
Place of residence		
Urban	102 (48.1)	1875 (47.6)
Rural	110 (51.9)	2063 (52.4)
Working while studying		
Working	92 (42.4)	587 (14.8)
Not working	125 (57.6)	3370 (85.2)
Leaving school without informing school officials		
Yes	58 (27.0)	207 (5.2)
No	157 (73)	3787 (94.8)
Cigarette smoking by family members		
Yes	97 (45.1)	1080 (27.6)
No	118 (55.9)	2826 (72.4)
Hookah smoking by family members		
Yes	81 (37.5)	365 (9.3)
No	135 (62.5)	3550 (90.7)
Close friends' history of smoking		
Yes	111 (50.9)	550 (14.0)
No	30 (13.8)	1301 (33.1)
I don't know	77 (35.3)	2079 (52.9)
Commitment to school tasks		
Very High	68 (32.1)	2058 (53.2)
High	57 (26.9)	1068 (27.6)
Moderate	54 (25.5)	575 (14.9)
Low	11 (5.2)	70 (1.8)
Very low	22 (10.4)	100 (2.6)
Feeling of acceptance by peer groups		
Very High	55 (26.3)	828 (21.8)
High	59 (28.2)	1223 (32.1)
Moderate	60 (28.7)	1365 (35.9)
Low	17 (8.1)	222 (5.8)
Very low	18 (8.6)	167 (4.4)
History of alcohol use		
Yes	87 (40.7)	131 (3.3)
No	127 (59.3)	3782 (96.6)
History of drug use		
Yes	39 (18.1)	25 (0.6)
No	176 (81.9)	3889 (99.4)

Table-2: Modification indices

Models	$\chi 2$	df	P-value	$\chi 2$/df	RMSEA (95% CI)	TLI	CFI
Model 1	67.492	42	0.0076	1.60	0.036 (0.019, 0.051)	0.92	0.95
Model 2	101.918	42	<0.001	2.42	0.055 (0.041, 0.068)	0.94	0.96
Model 3	69.534	63	<0.001	1.10	o.o51 (0.041, 0.054)	0.91	0.94

$\chi 2$, chi-square; df, degrees of freedom; $\chi 2$/df, normed Chi-square; RMSEA, root mean square error of approximation; TLI: Tucker Lewis Index; CFI, comparative fit index.

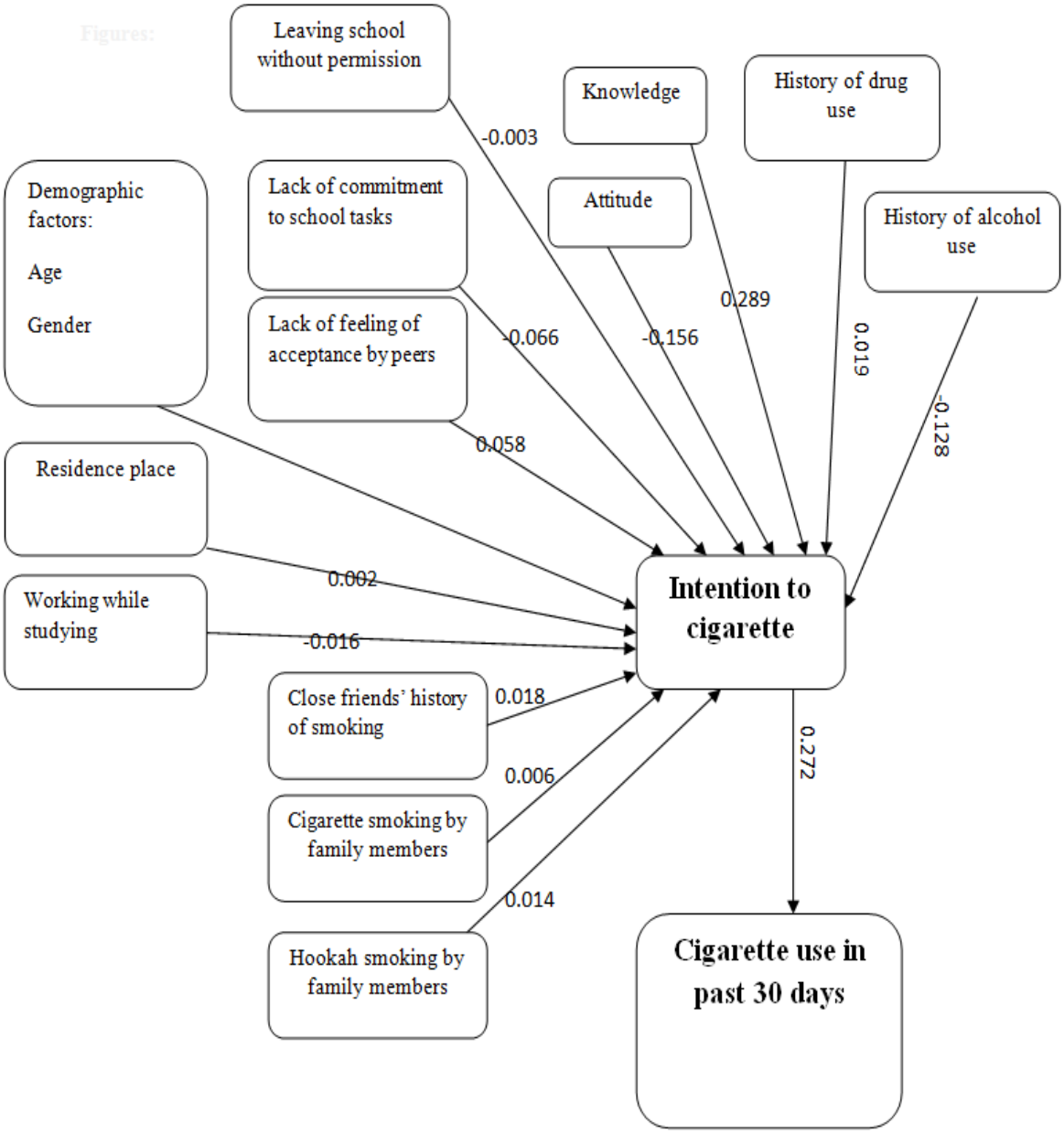

Fig.1: Path Diagram of relations between Demographic factors, normative beliefs and intention/cigarette use model

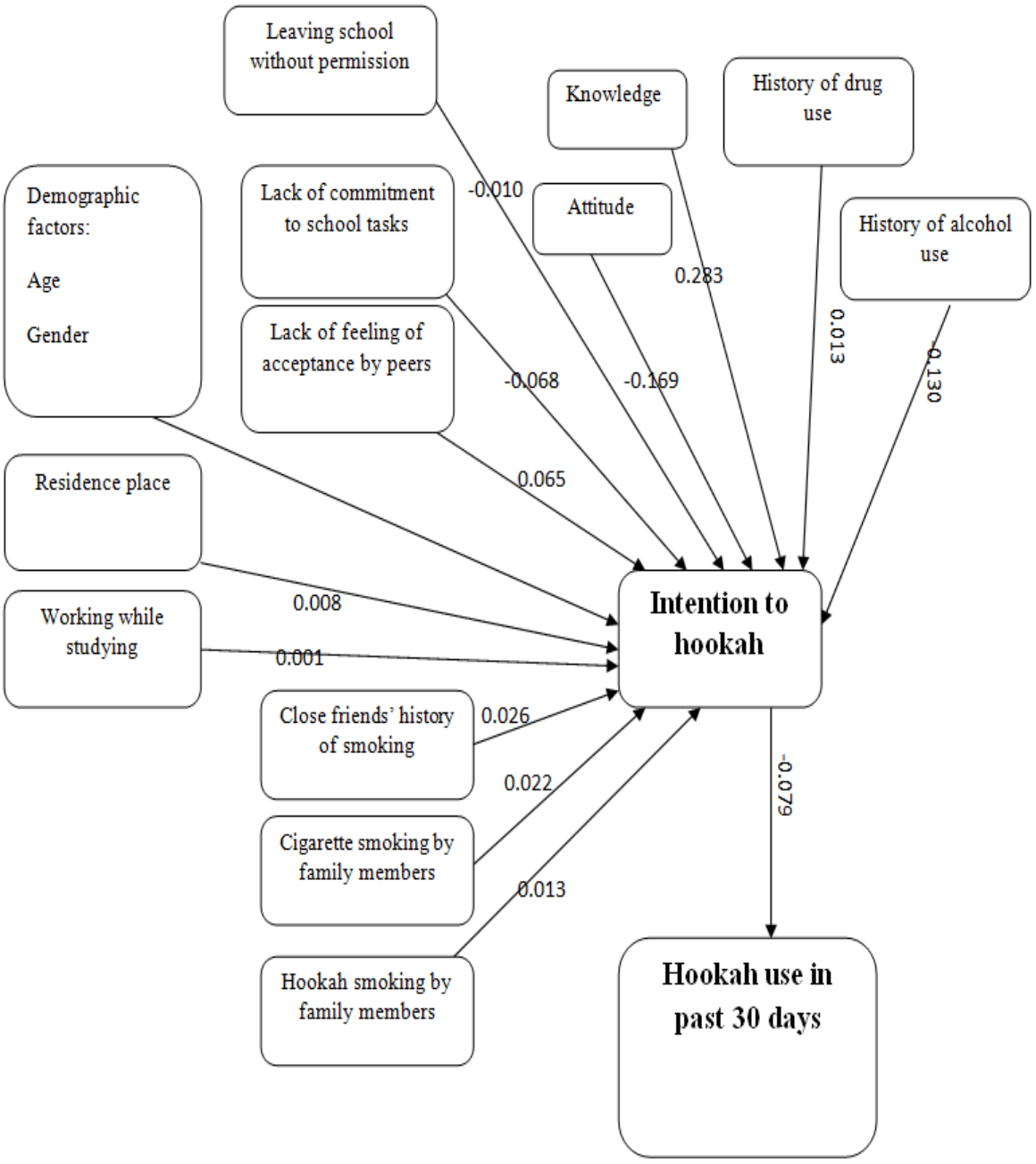

Fig.2: Path Diagram of relations between Demographic factors, normative beliefs and intention/Hookah use model

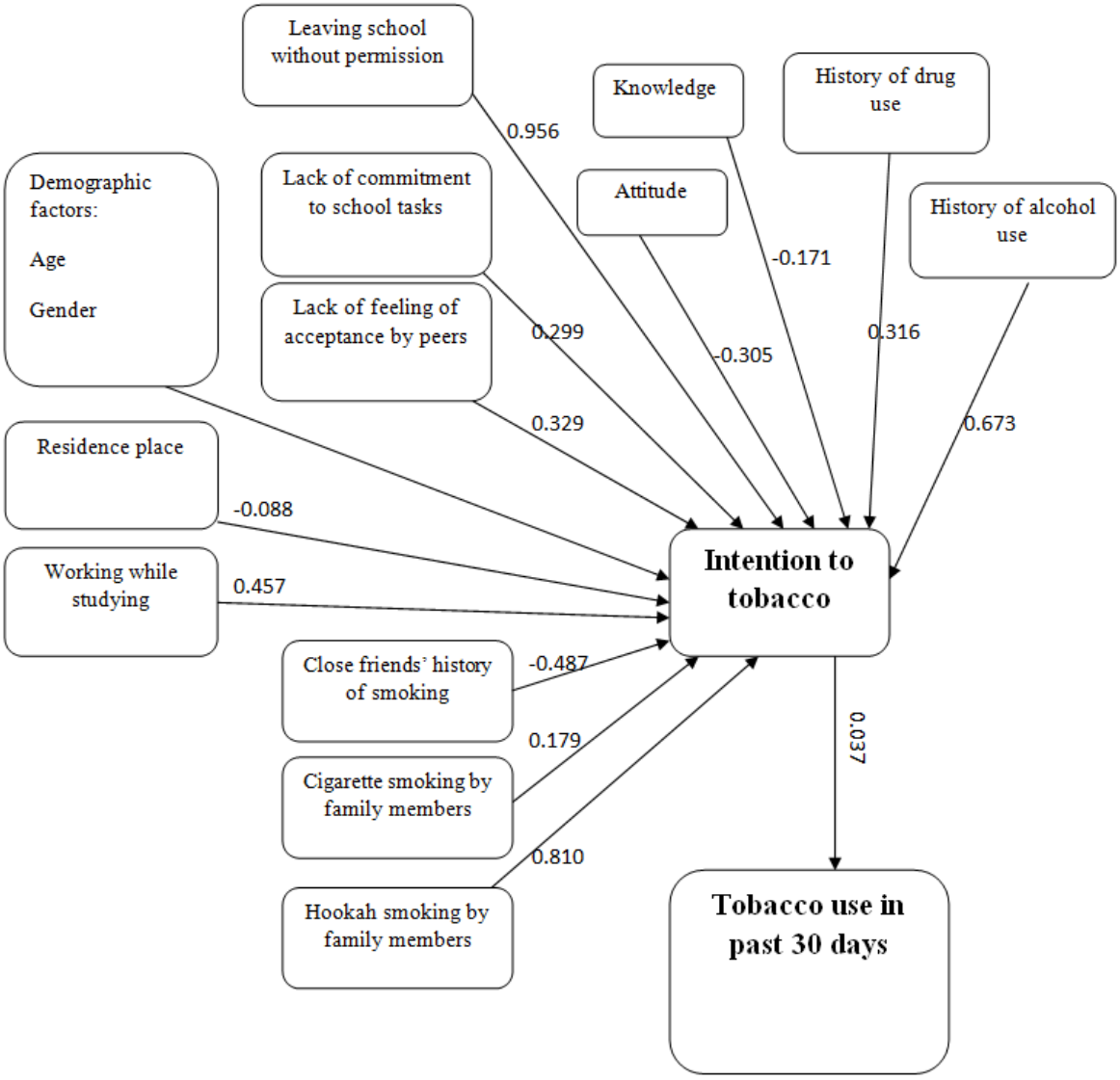

Fig.3: Path Diagram of relations between Demographic factors, normative beliefs and intention/Tobacco use model

4- DISCUSSION

In this study, a conceptual model was considered to investigate the relationship between demographic factors, knowledge, attitude, normative beliefs, and intention to and consumption of tobacco (including cigarette and hookah). Afterwards, the relationship between intention to and consumption of cigarette and hookah was separately investigated. Results showed that the intention to tobacco use acts as a mediator predictor for tobacco use behavior. This prediction is also true for cigarettes smoking. As reported previously, it is quite clear that the intention can lead to tobacco use (21, 23, 27, 28), but the results are not consistent about hookah. This difference could be attributed to the fact that smoking cigarettes happened out of sight of the parents. In addition, unlike cigarette smoking, hookah use was not easy and needed additional supplies. Therefore, the intention to hookah consumption cannot lead to its immediate use. Results of the whole model (**Figure.3**) indicated that the

intention to tobacco use was associated with several demographic characteristics in the study group, such as age, gender, and studying while working. Even though the onset age of tobacco use has decreased, this use has increased with age among both Iranian and non-Iranian adolescents (5, 9, 10). This might be linked to the independence that is achieved with growing up, and to their greater interaction with the community. Moreover, the role of nicotine as an addictive substance may be effective. In other word, trying smoking at an early age of adolescence may lead to continued use in later years.

Gender differences in many countries have confirmed that smoking rate is higher among boys (5-7, 12, 29), while reviewing gender differences in tobacco use in countries such as New Zealand (10) shows that the prevalence of smoking is higher among girls. In some European countries the difference in the rate of cigarette smoking between girls and boys is declining, and this is due to the decrease of cigarette smoking among boys and the alarming increase of cigarette smoking among girls(30, 31). The dominant prevalence of smoking among boys in Iran may be associated with their freedom and the higher obscenity of this behavior for girls. In the present study, there was a positive relationship between employment during education and tobacco use. This result is consistent with findings of previous studies(32, 33). The effect of employment on tobacco use can be attributed to the fact that employed people afford spending their money and have more purchasing power; thus, they are able to purchase and use tobacco products more easily. In this regard, Rudatsikira et al. (29) reported that purchasing power is one of the effective factors for tobacco use among adolescents. Presence in the workplace and work-related stress can be a factor in students' tendency to use tobacco products (14) and it is said that decrease in stress level is a reason why people use tobacco (34). Most employed students have poor grades in school or fail to graduate from high school on time (35). Among American students, there was a negative relationship between working hard and grade point, and a positive relationship was observed between working hard and tobacco use (36). Moreover, the effects of the social space of the working environment should not be ignored. Our study showed that there was a significant relationship between the intention to tobacco use and lack of commitment to academic tasks, as well as leaving school without permission. Previous studies also reported that there was a significant relationship between the intention to tobacco use, low scores, and poor performance in school (12, 37-39).

It should be noted that the relationship between academic achievement and tobacco smoking is a two-way communication: a decline in the academic performance and lack of a good relationship with school can cause a tendency to tobacco use; on the other hand, tobacco use can cause poor educational performance in school. Therefore, there is no causal link between them. These findings suggest that schools should pay special attention to these students and hold various programs such as private consultations for them. The residence of the participants was not related to tobacco use. Previous studies showed different patterns in this issue. Results of a review study showed that tobacco use was higher among urban students than rural students (40). Results of another study on the prevalence of numerous drugs used among high school students showed that the use of these substances decreased in urban and rural areas from 1976 to 1992. In 1976, the most drugs were highly prevalent among urban students. In 1992, urban and rural students were similar, while the

consumption of alcohol and cigarette was excessive among rural students (41).

In our study, tobacco use was associated with a history of tobacco use among their close friends, which is due to the fact that adolescents are influenced by their close friends. This result is consistent with findings of several previous studies (10, 12, 29, 42). Moreover, the lack of feeling of acceptance among peers was associated with tobacco use, indicating the important role of peers on adolescents. This result highlights the role of parents in taking care of their children by choosing their close friends. Our results showed that hookah use (but not cigarette smoking) by other family members was related to the intention to tobacco use. Many studies reported that tobacco use was associated with its use by family members (10, 20, 29); but why hookah consumption by family members was related to the intent to tobacco use among adolescences, while cigarette smoking by family members was not related to the intention to tobacco use among them, may be due to the fact that, historically and culturally, hookah use is accepted more than cigarette smoking among Iranians.

Moreover, hookah use in Iran is more prevalent among family members and in parties. Results of a new qualitative study in Iran, conducted using in-depth interviews, highlights the role of families in hookah use by women and girls (43). In the present study, the knowledge of participants was associated with the intention to tobacco use, which is consistent with findings of Hoch et al. (44). Other studies have shown that the lack of awareness was associated with high tobacco use, and increasing awareness was related to the high rate of non-adherence to tobacco use (45). In this study, as expected, attitude was effective on the intention and behaviors of tobacco use, consistent with other studies (17, 20, 22, 46). Negative attitude affects rates of quitting smoking (45). Given that attitude is formed by belief about the consequences of behaviors and their evaluations (24), implementation of strategies that increase information about the consequences of tobacco use and highlight the value of outcomes may influence attitude.

In this conceptual model, there was no significant relationship between the history of alcohol and drug use with tobacco use; however, data analysis using the other two models for cigarette and hookah use separately showed that there was a significant relationship between alcohol use and the intention to use both cigarette and hookah. Generally, other studies have confirmed simultaneous use of different drugs (47-50).

4-1. Limitations of the study

Our study was a cross-sectional study. However, since the adolescents' attitudes are not stable, longitudinal studies are perhaps needed for investigating attitude in teens. Moreover, a self-reported questionnaire was used to collect data, which is a drawback on its own. We tried to justify participants, and assured them that their information would remain confidential. As such there may be other variables that have not been considered in our model.

5. CONCLUSION

In adolescents, intention to tobacco use acts as a mediator predictor for tobacco use behavior. This prediction is also true for cigarettes smoking. On the other hand, according to the results, some demographic factors and subjective norms associated with behavioral intention. It seems to prevent of tobacco the policy makers have to considering and planning to overcome those factors. Also, the intention to tobacco use may lead to its use. Monitoring children's relationships and involvement in choosing their close friends are required by parents. Authorities

should monitor teens' workplace environment, design educational programs and include them in the curriculum of schools. Screening the students who are not strongly linked with school or sometimes leave school without permission, and holding special programs and consultations to help them could be effective as well. As the final important point, there is no significant correlation between the intention to and consumption of hookah; it can be investigated more in the future studies.

6- CONFLICT OF INTEREST: None.

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