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Predictors of Transition in Different Stages of Smoking: A Longitudinal Study

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	<p>Abstract</p>
<p>Background:</p>	<p>We investigated longitudinally the prevalence of smoking according to three stages of smoking (never smoking, experimenting the smoking, and regular smoking), the rates of transition from one stage to another one, and determinant predictors of transition through these stages of smoking.</p>
<p>Methods:</p>	<p>Of all 10th grade students in Tabriz, 1785 students were randomly selected and assessed twice, with a 12-month interval, with respect to the changes of stage. The predictor variables were measured when the students were in the 10th grade. Logistic regression and principal component analysis were used to analysis data at grade 11.</p>
<p>Findings:</p>	<p>Of 1785 students, 14.3% (CI 95%: 12.3-16.4) and 2.8% (CI 95%: 2.0-4.0) of the never smokers became experimenters and regular smokers, respectively and 16.5% (CI 95%: 12.4-21.7) of the experimenters became regular smokers. Among never smokers, participating in smoker groups (OR = 1.24), having smoker friends (OR = 1.85) and a positive attitude towards smoking (OR = 1.22) predicted experimentation; and participating in smokers groups (OR = 1.35) and a lower socioeconomic class (OR = 0.36) predicted regular smoking. Among experimenters, students having general high risk behaviors (OR = 2.56) and participating in smoker groups (OR = 2.58) were distinguished as those who progressed to regular smoking in follow-up.</p>
<p>Conclusion:</p>	<p>Programs aimed at smoking prevention and intervention should incorporate plans which focus on predictors of transition through smoking stages, and targeting participation in smoker groups.</p>
<p>Key words:</p>	<p>Smoking, Students, Risk-Taking, Longitudinal studies, Peer group, Epidemiology, Prevalence, Risk factors</p>
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Introduction

In order to prevent adolescents from a serious health problem (tobacco smoking) it is necessary to identify the factors that lead to smoking in adolescents. Most of the adult smokers begin smoking in adolescence. Adolescence smoking is a strong predictor of smoking in adulthood.¹ As some studies showed, smoking before the age of eighteen increases the risk of being adulthood smokers.² Chassian et al concluded that smoking in adolescence increased the risk of adult smoking by 16 times. The earlier initiation of smoking causes more cigarettes consuming per day as an adult.¹

Considering the disadvantages of smoking, finding the prevalence of youth tobacco use in Iran is important. In a study performed on 11 to 18 year-old Iranian students in 2003-2004, the prevalence of smoking was 14.3% and it was higher in boys compared to girls. This study also showed that the average age of starting smoking was 13.2 (3.5) years.³ Early initiation of cigarette smoking was obvious in a way that 66.3% of the smokers (70.6% of the males and 34.9% of the females) were 15-24 years of age.⁴ In a study conducted in Tabriz (north-west of Iran) on 10th grade students (junior high school students), 77.4%, 18.2%, and 4.4% were never smokers, experimenters and regular smokers, respectively.⁵ According to previous reports, the overall prevalence of smoking among adult men in Iran has increased steadily from 12.6% in 1994 to 16.3% in 1998.⁶ It is clear that smoking is a complicated health problem with many interrelated components that affect the adolescents' smoking status.

There is no special and unique reason for smoking in adolescents as it is a complicated behavior influenced by psychosocial, biochemical and eco-political factors.⁷ Factors such as parental smoking, close friends' smoking, peer's smoking, low academic education^{3,8,9} and low educational interest are effective in starting smoking.¹⁰ Illicit drug abuse is also an important factor in conducting students towards smoking.¹¹⁻¹³ Regarding the individual predictors, research has suggested that specific cognitions (e.g., attitudes, normative beliefs, and anticipated expectations) may be important antecedents to adolescents' smoking.¹⁴⁻¹⁶ Some researchers have discussed that adolescent's substance abuse has a relationship with factors such as the age of student, self-injury, and peer's substance abuse.¹⁷

Because a transition through one level of smoking (e.g., monthly) must precede a transition to the next level of smoking (e.g., daily), and because these transitions often take months or years to occur, these smoking transitions are important to study.¹⁸

Although smoking is a continuous process, in hundreds of studies efforts have been done to break this process into stages for primary and secondary prevention.^{19,20} One limitation of many of these studies related to adolescence cigarette smoking is that smoking is considered as a binary variable. In this kind of classification, the process and the stages of smoking transition from non-smoking to experiment smoking and regular smoking are not perceived and therefore, designing preventive programs is difficult.

This longitudinal study aimed to estimate the prevalence of the three stages of smoking, the rates of transitions through different stages and uncover the effects of factors such as family, attitude towards smoking, self-esteem, socioeconomic status (SES) on transition in different stages of smoking in Iranian adolescents in an effort to help develop effective primary and secondary prevention strategies.

Methods

Tabriz, one of the five principle cities of Iran, is the center of East Azerbaijan province. Schooling is compulsory and supported by the central government and applied by local education authorities. Out of about 13,000 students in the 10th grade in Tabriz, 1785 students were selected by random proportional cluster sampling. The reason for limiting the subjects to 10th grade students was the better possibility to follow-up subjects in the second phase of the study.

The respondents were classified into three stages of smoking continuum.¹³ Never smokers apply to adolescents, who have never tried cigarettes, not even a few puffs. Experimenters define adolescents who indicated having tried or experimented cigarette smoking, even a few puffs, but have smoked less than 100 cigarettes. Regular smokers are adolescents who indicated smoking 100 cigarettes or more in lifetime, irrespective of current smoking status. Three specific factors safeguarded the validity of student's self-reports in this study: 1. Participants were assured of strict confidentiality of their responses; 2. They were informed about the voluntary nature of their participations and their

rights to refuse or skip questions; and 3. Participants were assured that they couldn't be recognized by their answers.

In February and March 2005, a self-administrated questionnaire with 48 items was distributed among students during a one-hour session class. Almost all questions were multiple choice questions and the questionnaire could be completed in 15 minutes. Teachers were present in the classroom during the distribution but they stayed at their desks to protect the confidentiality of the responses. The questions aimed at obtaining information on smoking, parental smoking status, self-esteem, attitude towards smoking, friends' smoking status, high-risk behaviors, and self-injury as well as demographic information. After one year (February and March 2006), another questionnaire with 10 items was distributed among those students for determining transition in different smoking stages. University Ethics and Research Committee approved the questionnaire.

Evaluations

Self-esteem

Self-esteem was evaluated by the Persian version of Rosenberg self-esteem questionnaire. This test was a reversion of the original self-esteem scale, which was longer and harder to administer. The 10 questions were scored using a four-point scale, ranging from strongly agree¹ to strongly disagree.⁴ Examples of questions are as follows: "I feel that I have a number of good qualities" and "I have a positive attitude towards myself". The scores of this test ranged from 10 to 40, with lower scores indicating higher self-esteem. Five questions were reversely scored. Test-retest correlation of the Persian version for the 31 students in the 10th grade, with a 2-week interval, was obtained to be 0.82 (Cronbach's alpha: 0.89).

Attitude toward smoking

Students expressed their attitudes towards smoking through six pairs of adjectives forming semantic differential scales. Replies ranged from -2 to +2 for the following bipolar adjectives: disagreeable-agreeable, good-bad, annoying-interesting, unpleasant-pleasant, unhealthy-healthy, and disadvantageous-advantageous. Each of the six scales followed the statements "I think that for me, to smoke cigarette is Adding the replies for the six pairs of adjectives formed the attitude score. This produced a potential

range of -12 to +12. The internal consistency for attitude indicated a Cronbach's alpha of 0.85.

Exposure to smoking by friends and family

This was assessed by two measures: the smoking behavior of the best friends and the smoking behavior of any individual in the family (parents, siblings and other significant persons). Smoking behavior of friends was defined as a continuous variable assessing the total number of the best friends who smoke. Smokers in the family were dichotomized into whether any individual in the family smoked (coded as 1) or none smoked (coded as 0).

High risk behaviors

Three measures were used to assess individual's inclination to be engaged in high-risk behaviors. The first measure assessed whether the respondents had ever consumed alcoholic beverages (ever consumed coded as 1; never consumed coded as 0). The second combined respondent's lifetime abuse of illicit drugs; any abuse of substances was sufficient for that individual to be classified as having used drugs (coded as 1). No reported use was classified as never having abused drugs (coded as 0). The prevalence of alcohol and drugs abuse in Iranian adolescents is low, because the use of alcohol is both religiously and legally prohibited, and the use of drugs is legally prohibited. Thus, these variables were considered as dichotomized. Third, the respondents were asked whether they agreed, disagreed, or had no opinion regarding the statement: "I enjoy doing things that are a little dangerous or risky." Respondents who agreed with the statement were classified as reporting risky attitudes (coded as 1); all others were considered as reporting low-risk attitudes (coded as 0).

Socioeconomic status

Principal component analysis was applied to calculate socioeconomic status by using mother's education, father's education, and father's occupation. This measure placed the students in one of the high, middle, and low socioeconomic levels.

A logistic model was used to evaluate the relationship between independent variables and transition in different smoking stages. Chi-Square test and independent t-test were also used in statistical analysis using CIA, Epi info and SPSS statistical package programs.

Results

The prevalence of the three stages of smoking

The mean (SD) age of the subjects was 16.3 (0.87) (minimum 15, maximum 19). Four hundred and three adolescents (22.6%) had smoked cigarettes but 1382 (77.4%) were never smokers. Of 403 adolescents who had smoked, 324 (18.2%) were experimenters (tried cigarettes but smoked less than 100 cigarettes in their lifetime), and 79 (4.4%) were regular smokers. The mean (SD) age of starting smoking was 12.7 (2.7) years (minimum 5, maximum 18).

Totally, 355 (19.9%) students dropped out of

study during the follow-up period. Comparison of some of the key variables (such as attitude towards smoking, having smoker friends, having smoker persons in the family, positive history of alcohol and drug abuse) -that strongly associated with cigarette smoking- of these students with other students, showed no significant differences between the two groups (lack of bias). At the end of the follow-up period, 29.5 percent of the students were either regular smokers or experimenters (23.1% were experimenters and 6.4% were regular smokers) and 70.5% were never smokers.

Table 1. Rate of transition in different stages of smoking by key variable of the students

Characteristics	Never to experimenter Smoker	Never to regular smoker	Experimenter to regular smoker
Self-injury			
Yes	33.3	0	9.1
No	14.2	3.4	17.3
P	0.022	0.998	0.564
Ever use alcohol			
Yes	22.2	5.8	24.5
No	14.2	3.2	14.3
P	0.079	0.309	0.079
Being any smoker in the family			
Yes	16.9	2.3	17.7
No	13.5	3.9	15.2
P	0.121	0.185	0.603
Number of smoker friend			
0	24.8	5.7	21.8
≥ 1	12.5	2.8	10.9
P	< 0.001	0.054	0.035
Participate in friendship smoker groups			
Usually	24.5	7.0	22.2
Sometime	17.7	4.6	18.0
Never	8.4	1.2	2.4
P	< 0.001	0.001	0.019
General risk taking behavior			
Yes	12.7	2.4	11.0
No	10.7	6.1	24.7
P	< 0.001	0.007	0.005
Ever use of illicit drugs			
Yes	33.3	33.3	0
No	14.8	3.3	17.4
P	0.384	0.097	0.219
Socioeconomics status			
Low	17.5	1.0	17.5
Middle	13.6	3.7	17.9
High	13.3	6.6	10.0
P	0.314	0.01	0.421
Age			
15 years	13.8	3.0	18.4
16 years	14.3	2.0	13.3
17 years	18.0	7.1	21.4
18-19 years	10.9	1.5	14.3
P	0.319	0.003	0.534

Table 2. Mean (standard deviation) of self-esteem and attitude toward smoking scores in student with and without transition in smoking stages

Variable	Never to experimenter Smoker			Never to regular smoker			Experimenter to regular smoker		
	Yes	No	P	Yes	No	P	Yes	No	P
Attitude toward smoking	-10.3(2.6)	-11.0(2.2)	<0.001	10.3(3.8)	11.0(2.2)	0.301	-6.6(4.3)	-8.4(3.9)	<0.001
Self-esteem	17.5(4.3)	17.6(4.4)	0.803	18.5(5.2)	17.6(4.4)	0.268	19.3(3.9)	19.0(4.6)	0.656

Table 3. Analysis of the relationship between transition in different smoking stages and risk variables (Logistic regression)

Variable	Never to experimenter Smoker		Never to regular smoker		Experimenter to regular smoker	
	OR (CI95%)	P	OR (CI95%)	P	OR (CI95%)	P
Positive attitude toward smoking	1.22 (1.02-1.46)	0.048	1.08 (0.95-1.22)	0.254	1.02 (0.98-1.06)	0.340
Lower Socioeconomic class	1.15 (0.86-1.53)	0.347	0.36 (0.19-0.68)	0.002	1.20 (0.66-2.15)	0.522
Having self-injury	1.10 (0.89-1.34)	0.374	-*	-	0.12 (0.01-1.64)	0.108
Participate in friendship smoker groups	1.24 (1.05-1.47)	0.013	1.35 (1.03-1.86)	0.048	2.58 (1.26-5.31)	0.009
Having smoker friend	1.85 (1.21-2.83)	0.004	1.84 (0.78-4.34)	0.160	1.48 (0.62-3.54)	0.382
Ever use of drugs	1.95 (0.17-22.8)	0.595	-*	-	1.71 (0.21-17.5)	0.485
Having smoker in the family	1.01 (0.67-1.52)	0.958	0.52 (0.21-1.28)	0.153	0.94 (0.41-2.18)	0.892
Having general risk taking behavior	1.15 (0.73-1.80)	0.559	2.05 (0.89-4.70)	0.091	2.56 (1.12-5.87)	0.025
Older age	0.87 (0.68-1.11)	0.246	0.99 (0.91-1.08)	0.79	0.97 (0.81-1.17)	0.747
Ever use of alcohol	1.10 (0.77-1.56)	0.597	0.86 (0.18-4.04)	0.847	1.28 (0.79-2.07)	0.314

*Not entered in the model.

The rate of transition through different stages:

During one year, among 1129 never smoker students, 161 students (14.3%, CI 95%: 12.3-16.4) transitioned to the experimenter stage and 32 students (2.8%, CI 95%: 2.0-4.0) transitioned to the regular smoking stage. Among 242 experimenters, 40 students (16.5%, CI 95%: 12.4-21.7) transitioned to the regular smoking stage. Table 1 presents the rate of transition in different stages of smoking according to the key qualitative variables of students and table 2 shows the mean and standard deviation of self-esteem and attitude towards smoking scored in students with and without transition in smoking stages.

The predictor of transition in different stages of smoking

The results of this analysis indicated that among never smokers participating in smoker groups (OR = 1.24), having smoker friends (OR = 1.85) and a positive attitude towards smoking (OR = 1.22) predicted experimentation and participating in smoker groups (OR = 1.35) and a lower socioeconomic class (OR = 0.36) predicted regular smoking in the next 12 months. In experimenters, students having general high risk behaviors (OR = 2.56) and participating in smoker groups (OR = 2.58) were distinguished as those who progressed to regular smoking (Table 3).

Discussion

The present study investigated the prevalence of smoking in three stages of smoking continuum according to Kaplan et al¹³ and the rates of transition through these stages. It also described the predictors of uptake of smoking through these stages within a year in an Iranian adolescent sample, and aimed to find associations between the level of smoking acquisition and determinant personal and socio-environmental factors. In our study, 22.6% of the students had smoked cigarettes (18.2% were experimenters and 4.4% were regular smokers). At the end of follow-up period, 29.5 percent of the students had smoked (23.1% were experimenters and 6.4% were regular smokers). The results Hoving et al²¹ study in six European countries showed that 7% of never smoker adolescents with the mean age of 13.3 years transitioned to smoking monthly or more often at one year follow-up. Smoking prevalence has been reported in an extended range from 5 to 59.5% in different studies.^{15, 21-24} It seems that this extended range may be the result of different definitions of smoking, but various smoking prevalence rates within states shows that factors beyond individual ones affect tobacco use.²² At the end of 1-year follow-up, our results showed that overall 29.5 percent of the students tried

smoking which is higher than that in the previous survey of 10th grade students conducted in Iran.²⁵ However, in comparison with the prevalence of smoking in other countries, it was lower in our study. This lower rate of smoking in the Iranian adolescent population can be explained by the following factors: traditional, social and cultural standards, religious beliefs²⁴ prohibition of smoking at educational settings, smoking being regarded as something against cultural values of Iranian families, especially among adolescents, strong disapproval of smoking by adolescents' parents²⁵ and limiting the study population to 10th grade students. Numerous studies have shown a strong association between adolescents' age and smoking stages.^{12,26,27} The results of logistic regression analysis in the present study indicated that the age of students played no role in the transition process from one stage to another. The lack of age variability in this study may explain these findings. The findings of this study are consistent with those of the other studies carried out on the Iranian population.²⁵ Logistic regression analysis indicated that participating in smoker groups was a strong predictor for transition to intense smoking stages in all stages of smoking (never smoking to experimenting and regular smoking, and from experimenting to regular smoking). Although the results of nationwide studies suggest that close friends' smoking is a strong predictor for transition between different stages of smoking and is important in starting smoking^{25,28} theorists have suggested that close friends' smoking has little or no influence on adolescent higher smoking transitions because such higher transitions are hypothesized to reflect psychological and physiological processes derived from the smoking experience.¹⁸ Our study showed that close friends' smoking had a significant relationship with transition only from never smoking to experimenting, but in higher smoking transitions (never smoking to regular smoking, and from experimenting to regular smoking) close friends' smoking was not a significant predictor. Numerous studies have shown that adolescent smoking is related to the presence of a smoker in the family, especially a smoking father.^{29,30} In our study, no evidence was found to support the hypothesis regarding the influence of "having a smoker in the family" on adolescents' smoking transition consistent with the Bricker et al.¹⁸ The results of our study indicated that a positive attitude towards smoking had a significant relationship with

transition from never smoking to the experimenting stage of smoking consistent with the findings of other studies.^{25,31} People of lower SES are more likely to start smoking, more likely to become regular smokers, and less likely to quit.³² Our results showed that lower SES was a protective factor for transition from never smoking to experimenting but the comparability of this finding with other studies is low since most of the other studies are done on adult people. Also, the indicators of adolescent SES are subject to measurement error; and various dimensions of adolescent SES probably represent different aspects of adolescent conditions. Although higher smoking rates among individuals with lower self-esteem have been demonstrated in some studies,²⁶ other studies have reported weak evidence to support this finding.^{25,33} Similarly, the role of self-esteem was not significant in our study. As shown in various studies, experiencing drugs and alcohol abuse play an important role in leading students to various stages of smoking.^{12,13} Although the prevalence of alcohol and drug abuse in Iranian adolescent is low due to religious and legal prohibitions, having general high risk behaviors was a predictor for transition from experimenting to regular smoking. In spite of satisfactory methodology and sampling method, there were several issues in this study that limit the generalizability of findings; e.g., sampling was limited to 10th grade male students, the study relied on self-report data and students' proxy report of parental smoking, and finally, we evaluated the predictors at the beginning of the study but they could change during the period of the follow-up. In conclusion, this research provided new evidence to identify the variables in different stages of smoking, but this work was just the first step to better understanding of the smoking phenomenon among adolescents and more research on the adolescent population is necessary to support our findings. However, programs aimed at prevention and intervention should be based on these risk factors.

Conflict of interest: The Authors have no conflict of interest.

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پیش‌بینی کننده‌های گذر از مراحل مصرف سیگار: یک مطالعه طولی

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چکیده

هدف مطالعه حاضر تعیین شیوع مصرف سیگار، میزان گذر از مراحل مصرف (غیر سیگاری به سیگار آزموده و سیگار معمول و سیگار آزموده به سیگاری معمول) و عوامل پیش‌گویی کننده گذر در این سه مرحله بود.

از بین دانش‌آموزان مقطع اول دبیرستان شهر تبریز، ۱۷۸۵ نفر دانش‌آموز به صورت تصادفی نمونه‌گیری شدند و دو بار با فاصله زمانی ۱۲ ماه مورد بررسی قرار گرفتند. نخست در شروع مطالعه متغیرهای پیش‌گویی کننده اندازه‌گیری شدند. بعد از ۱۲ ماه دوباره همان دانش‌آموزان پرسش‌نامه دیگری در رابطه با رفتار مصرف سیگار تکمیل کردند. آنالیز داده‌ها توسط روش‌های آماری رگرسیون لجستیک و تحلیل مؤلفه‌های اصلی صورت گرفت.

در طول مطالعه، ۱۴/۳ و ۲/۸ درصد از دانش‌آموزان غیر سیگاری به ترتیب به مرحله سیگار آزموده و سیگاری معمول انتقال یافتند. همچنین ۱۶/۵ درصد از دانش‌آموزان سیگار آزموده به مرحله سیگاری معمول انتقال یافتند. برای گذر از مرحله غیرسیگاری به سیگار آزموده، شرکت در گروه‌های سیگاری (OR = ۱/۲۴)، داشتن دوست نزدیک سیگاری (OR = ۱/۸۵) و نگرش مثبت به مصرف سیگار (OR = ۱/۲۲) نقش داشتند. شرکت در گروه‌های سیگاری (OR = ۱/۳) و سطح اقتصادی اجتماعی پایین (OR = ۰/۳۶) انتقال به مرحله سیگاری معمول را پیش‌گویی می‌کردند. همچنین پیش‌بینی کننده‌های گذر از مرحله سیگار آزموده به سیگار معمول، رفتار پرخطر بهداشتی (OR = ۲/۵۶) و شرکت در گروه‌های سیگاری (OR = ۲/۵۸) بودند.

برنامه‌هایی که جهت پیش‌گیری از مصرف سیگار طراحی می‌شوند، باید بر عوامل مؤثر بر گذر از مراحل مختلف سیگار و افراد خاص هر یک از این مراحل متمرکز شوند.

مصرف سیگار، دانش‌آموز، مطالعات طولی، تبریز.

مقدمه:

روش‌ها:

یافته‌ها:

نتیجه‌گیری:

واژگان کلیدی:

تعداد صفحات: ۹

تعداد جدول‌ها: ۳

تعداد نمودارها: -

تعداد منابع: ۳۳

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