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Review Article:

Prevalence and Correlates of Cigarette Smoking in Adolescent Psychiatric Inpatients in Iran: A Cross-Sectional Study and Narrative Review



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ABSTRACT

Context: Smoking in adolescence is a worldwide health problem. Understanding the prevalence of smoking and its clinical correlates in adolescent inpatients is useful for mental health staff to plan effective programs to reduce its detrimental consequences. In this study, we investigated the prevalence and correlates of cigarette smoking and its sociodemographic and clinical correlates. We performed a narrative review of cigarette smoking prevalence among adolescents as well as a descriptive study in inpatient adolescents in Iran.

Evidence Acquisition: This was a multicentric, cross-sectional, and hospital-based survey. In total, 82 patients (male/female: 66.9% vs. 33.1%) were consecutively recruited from 5 child and adolescent inpatient psychiatric wards of Iran. The study data were collected from patients, their family members and patients' medical records. The descriptive statistics, Pearson's chi-squared test, and univariate logistic regression analyses were employed to analyze the obtained data. Additionally, we added a narrative review to understand the prevalence rate of smoking and its clinical correlates in adolescent inpatients.

Results: The prevalence rate of smoking was 30% in our study sample (24.5% in boys and 39.5% in girls). There was a significant association between smoking with family size, history of suicide attempt, physical illness, drug misuse in patients, and alcohol or drug misuse in family members. The prevalence of mood disorders in the nonsmokers and smokers were 37.5% and 62.5%, respectively. Overall, 26.6% of the subjects had a history of suicide attempt of whom, 52.9% were smokers.

Conclusions: Results of this study about the association between smoking with family size, history of suicide attempt, physical illness, drug misuse, and other related factors, call for both careful screening of smoking and specially designed integrated psychiatric/smoking treatments in these patients.

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1. Context

Smoking in adolescence is a worldwide health problem, and more than 80% of smokers start smoking before the age of 18 (1). An extremely high ratio of the world's smokers is in low- or middle-income countries (2). The global death number due to smoking is estimated to be over 6 million annually, with approximately two-thirds of these deaths occurring in developing countries (3). In addition to all-cause mortality, some prospective studies have revealed a significant relationship between smoking and suicide in adolescents and adults (4).

Nicotine dependence is found in only 12.8% of the USA population; although, 57.5% of all cigarettes are smoked by psychiatric patients in this country (5). The prevalence of cigarette smoking is higher among psychiatric patients than the normal population (6). In many European countries, persons with mental disorders smoke about 2 times higher than the normal population (7). A survey in Germany revealed that cigarette smokers are more vulnerable to psychiatric disorders (8). A cohort study found higher risks of suicide in adolescents who smoke cigarette (9). Psychological autopsy has revealed that previous and current smoking modifies suicide risk related to affective disorders; however, current smoking increases suicide risk associated with substance use disorders (10).

The intersection between psychiatric disorders and two complex multifactorial behaviors, cigarette smoking and suicide, have major public health effects (11). However, whether smoking represents a causal risk factor for completed suicide or only indirectly addresses those with mental disorder remains undiscovered (12, 13). Psychiatric patients account for approximately 50% of cigarette smoking in the United States (14). Cigarette smoking and less successful attempts to quit smoking is 2-4 times higher in people with substance dependence, psychosis, anxiety, and mood disorders, compared to the general population (5). Cigarette smoking in adolescence or early adulthood may be associated with later major depression, an association not related to variables such as alcohol use (15). However, not all studies have reported such association, and some suggest a reverse relationship (16).

A study suggested a slight but significant predictive relationship between depression and tobacco smoking. The same research explains a self-medication hypothesis whereby depressed patients smoke to reduce their symptoms (16). There are strong associations between

anxiety and depression among young persons (14), and tobacco smoking and anxiety disorders like panic disorder (17). Depression is prevalent among adolescents, and suicide is the third cause of death among 15- to 19-year-old people. However, these associated factors have not been systematically studied in a nationally representative sample (18).

In this regard, understanding the prevalence of smoking and its clinical correlates in adolescent inpatients is useful for mental health workers to plan effective programs to reduce its detrimental consequences. The current study aimed to conduct a narrative review on cigarette smoking prevalence among adolescents in Iran. We also investigated the rate and related factors of smoking among adolescent psychiatric inpatients in Iran.

2. Evidence Acquisition

In a narrative review, electronic databases including, PubMed, Medline, Scopus, Google Scholar and National Persian databases of SID, IranDoc, IranPsych, IranMedex, and Magiran were utilized to find relevant articles about the prevalence of cigarette smoking in adolescents. The included studies were the quantitative estimates of cigarette use prevalence among adolescents in Iran from 2000 to 2017, using the following search keywords: "adolescents", "teen", "teenager", "youth", "smoking", "cigarette smoking", "tobacco smoking", and "Iran". Finally, 22 studies were included. The interested measures were the prevalence rates of current or lifetime experimental smoking in adolescents.

In a study in Tehran on 984 patients with Serious Mental Illness (SMI), 70% of participants were smokers, 4.8% were former smokers, and 70.0% were occasional smokers (19). The prevalence rate of current smoking in 365 male adolescent students in Zarandieh City, Iran was 15.1% (20). Overall, 51% (95%CI: 46.5-55.7) of the male high school students of Shahroud (northeastern Iran) reported at least one time history of smoking, and 7.1% (95%CI: 5-10) of them were current smokers (21). In total, 14.7% of 2538 the secondary and high school students from 10 provinces in Iran reported current use of tobacco (22). In 860 high school student samples, 6.4% (6.1% of male students and 6.6% of female students) smoked at least once in their life. Moreover, 2.1% of the students (1.7% of males and 2.3% of females) smoked occasionally, and 1.2% (2.8% of males and 0.4% of females) were current smokers (23).

In another study, 25.5% of 4523 high school students never smoked cigarettes, and 22% smoked more than

5 cigarettes per day at the time of the study (24). Totally, 77.4% of 1785 students in Tabriz City reported that they never smoked, 18.2% had smoked cigarettes at least once, and 4.4% reported that they were current smokers (25). A systematic review estimated the prevalence of cigarette and substance use among 80588 high school students in Iran as 16.8% (95%CI: 16.4-17.2) (26). In another study, 7.4% of a total of 2911 students with the mean age of 13 years in middle schools in Iran were smokers (27). Other researchers have reported that 19% of 220 students aged 18-22 years reported daily cigarette smoking (28).

Of 397 high school students (200 girls and 197 boys; mean age: 15.85 and 17.28 years, respectively) 25.4% reported current cigarette use (29). In a cross-sectional study in Rasht City (north of Iran) among 1297 students (14 to 18 years old), 366 (28.2%) subjects never smoked and 195 (15%) were current smokers. Among current smokers, 54.6% were irregular smokers, 45.5% were daily smokers, of whom 24.8% were daily smokers of more than 1 cigarette per day (30). In another northern city of Iran (Sari), 11.5% of the 812 participants were nicotine dependent for at least 6 months. About half of the samples started smoking at the age of 13 years or younger. All of them smoked less than 10 cigarettes per day (31).

Research on 470 Iranian secondary school male students with the mean age of 13.6 years, 82 (17.5%) students reported lifetime tobacco smoking of once or more and 29 (6.2%) were current tobacco dependents (32). Furthermore, in 4786 Iranian male people in Isfahan, the smoking prevalence was 26.2%, about 8.5% of respondents had previously smoked and 26.2% of them were current smokers (33). Additionally, in 1132 tenth grade students at 20 high schools in Shiraz, 19.4% reported histories of smoking. Moreover, 80.6%, 16.9%, and 2.5% had never smoked, had positive smoking histories, and were regular smokers, respectively (34). A population-based study reported the frequency of cigarette smoking as 11.7%, in a total number of 1810 \geq 15 years old residents of Bandar Abbas Port (35).

A cross-sectional study on 1064 male high school students in Zanjan City, Iran revealed that 7% of adolescents were regular smokers and 27% reported usage of tobacco once during their lifetime (34). A meta-analysis reported the highest and lowest prevalence of experimental smoking in Qazvin Province in 2001 (43%) and Kerman in 2001 (8.5% to 11%), respectively. Also, the highest prevalence of regular smoking was reported from Gilan Province in 2004 (15%). In addition, the

lowest prevalence was reported from Kerman in 2001 (2%) (36). This rate has been reported much higher in Kerman University students (31% never smoked and 11% were current smokers) (37). However, the separate prevalence of lifetime, current, and daily cigarette smoking were calculated as 14.2% (95%CI: 6.6-21.7), 2.7% (95%CI: 0.5- 5.9), and 1.1% (95%CI: 0.6-2.8), among 5934 Iranian middle school students, respectively. The combined prevalence of current tobacco use of all kinds was 15% (95%CI: 10.4-19.5) in this population (38).

Eftekhari et al. stated that the self-reported lifelong prevalence and the prevalence of current smoking are much lower in Iran compared to many other Middle East countries. However, the number of smoking cessation attempts in Iran is lower than the stated rate in other countries of the region (39). Momtazi and Rawson argued that the early onset of tobacco smoking, with a daily use rate between 4.4% and 12.8% in Iranian high school students, is an important risk factor for other substance abuse problems (40).

2.1. Descriptive study

A multicenter cross-sectional study was conducted on 82 patients (aged 13-18 years) admitting to 5 psychiatric hospitals in Iran during one year. Adolescents were referred from Mazandaran, Tehran, Northern Khorasan, Eastern Azerbaijan, Lorestan, Hamedan, Qom, Isfahan, Southern Khorasan, Khorasan Razavi, and Khozestan provinces to these hospitals. After obtaining informed consent forms from their parents, data were collected from patients, their family members, and patients' medical records. In this study, "smoker adolescent" indicates an adolescent with a lifelong history of smoking at least a few puffs of tobacco cigarettes on a regular basis. Moreover, "nonsmoker" indicates a teenager who never smoked even a few puffs on a regular basis. Drug misuse demonstrates the improper use of medications.

2.1.1. Psychiatric diagnosis

The patients were assessed by the child and adolescent psychiatrists and diagnosis were made based on DSM V-TR criteria. Extensive information on sociodemographic factors, parental, family conditions, smoking, alcohol problems, and drug misuse was also collected.

2.1.2. Data analysis

The descriptive analyses, as well as the Chi-squared tests (The Pearson's chi-squared test, Fisher's exact test and Linear-by-Linear association test), were employed.

In addition, we applied univariate logistic regression analyses to identify the study variables associated with suicidal ideation, physical illness, alcohol or drug misuse, smoking in the family, history of suicide, family size, and other related variables. There is sufficient evidence that smoking is associated with an increased risk of suicidal behaviors (41).

Current smoking is reliably associated with suicide in case-control and cohort studies (42). Variables that were associated with suicide attempts at $P \leq 0.05$ were included in the multivariate logistic regression models in this study. Logistic regression analyses were used to examine the association between smoking and other variables. The data were adjusted in terms of several sociodemographic and clinical characteristics. All analyses were performed in SPSS.

3. Results

In total, 82 of the 101 patients accepted to participate in the project and responded to the questions about demographic variables and substance and alcohol abuse, cigarette smoking, and drug misuse. Their age range was 13-18 years and their mean age was 15.7 years. The participants included 25 (30%) smokers and 57 (70%) nonsmokers (Figure 1), and 49 males and 33 females. Overall, 12 (24.5%) boys and 13 (39.5%) girls were smokers. The prevalence number of cigarette smokers in our study was 25 (30%), substance abuse was 9 (11%), alcohol consumption was 13 (16%), and drug misuse was 6 (7%) subjects. The prevalence of smoking in the family members of smokers and nonsmokers were 83% and 39%, and the prevalence of drug misuse in smokers and nonsmokers were 86% and 14 %, respectively.

Moreover, 17 (26.6%) patients had a history of suicide attempt, of whom 9 (52.9%) were smokers.

In 24% of the smokers, two or more than two family members, and in 76 % of them, three or more than three family members were smokers. Furthermore, 16 smokers lived with both parents, 7 smokers lived with one parent and 2 smokers lived with no parents. The same rates were 47, 7, and 3 in non-smokers. About 77% of smokers' family members were alcohol and or substance users. The frequency of psychiatric disorders, cigarette smoking, and alcohol/substance use are presented in Tables 1, 2, and 3.

Using the Chi-Squared test, the difference between alcohol consumption and drug misuse was significant ($P=0.001$). Also, there was a significant difference between drug misuse and cigarette smoking ($P=0.028$) and alcohol consumption ($P=0.029$) in the subjects' family members. Logistic regression analyses revealed a significant association between smoking and family size ($P=0.04$), history of suicide attempt ($P=0.01$), physical illness ($P=0.03$), drug misuse in patients ($P=0.02$), and alcohol or drug misuse in their family members ($P=0.0001$). The Chi-squared test suggests a significant difference between smoking and smoking in family members ($P=0.0001$). There was no significant difference between smoking, drug misuse, and alcohol use in terms of gender and age ($P>0.05$).

There was no significant difference between the misuse of drugs, substance abuse, alcohol abuse and smoking by province ($P=0.7, 0.1, 0.1, 0.5$). No significant difference was observed between drug misuse and physical illnesses ($P=0.6$).

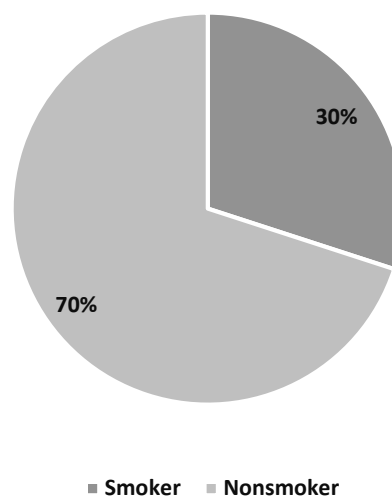


Figure 1. The prevalence of cigarette smoking among adolescent psychiatric inpatients in Iran

Logistic regression analyses demonstrated no significant difference between substance abuse and suicidal ideation, physical illness, alcohol or drug misuse, smoking in the family, history of suicide and family size ($P>0.05$). A significant difference was detected between substance abuse and drugs misuse ($P=0.03$), smoking ($P=0.0001$), and living with parents ($P=0.02$). A significant difference was observed between alcohol consumption and drug misuse, history of suicide, substance abuse, and smoking in the family ($P=0.001$, $P=0.046$, $P=0.0001$, $P=0.0001$, $P=0.0007$, respectively). However, no significant difference was observed between alcohol consumption and suicidal ideation, family size, physical illnesses and living with parents ($P>0.05$).

No significant difference was detected between physical illnesses and family size ($P>0.05$). The prevalence of mood, anxiety, and psychotic disorders, Attention/Deficit-Hyperactivity Disorder (ADHD), personality disorders, anorexia nervosa, and intellectual disability were 55%, 8.3%, 10.5%, 11%, 0.9%, 0.9%, and 2.8%, respectively.

Table 1. Smoking status and psychiatric diagnosis

Psychiatric Diagnosis	No. (%)	
	Smokers	Nonsmokers
Mood disorder n=48	18(37.5)	30(62.5)
Anxiety disorder n=8	0(0)	8(100)
ADHD/Disruptive behavior disorder n=7	2(29)	5(71)
Psychotic disorder n=7	0(0)	7(100)
Others	2(67)	1(33)

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Table 2. Drugs misuse, alcohol and substance abuse and suicidal ideation in smoker and nonsmoker patients

Variable		No. (%)	
		Smokers	Nonsmokers
Drugs misuse	Yes	5(71)	2(29)
	No	17(25)	52(75)
Alcohol abuse	Yes	10(83)	2(17)
	No	30(45.5)	36(55)
Suicidal Ideation	Yes	9(53)	8(47)
	No	8(17)	39(83)
Substance abuse	Yes	6(75)	2(25)
	No	16(23.5)	52(76.5)

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4. Conclusions

In our study, the prevalence of cigarette smoking was 30%. Studies report various smoking prevalence rates in deferent populations. According to a meta-analysis study in Iran, overall estimates for adolescents' cigarette smoking and chewing tobacco/pan/nas in the general population were 16.8% and 10.0%, respectively (26). A national Global Youth Tobacco Survey in Nepal reported that overall, 10% of the students were ever cigarette smokers and 20.4% were tobacco users in other forms (43). In a school-based cross-sectional study conducted over a period of one year in Kashmir, India, a higher proportion of rural adolescents tried cigarette smoking (38.78% rural vs. 20.78% urban) (10).

Another study estimated tobacco smoking prevalence among 2475 psychiatric patients attending healthcare facilities in Brazil and assessed the associated factors in a cross-sectional multicenter analysis. The current smoking prevalence rate was 52.7% (44).

Table 3. Cigarette smoking by provinces

Provinces	Cigarette Smoking		Total No. (%)
	No. (%)		
	No	Yes	
Mazandaran	19(79)	5(21)	24(100)
Tehran	25(66)	13(34)	38(100)
Northern Khorasan	1(50)	1(50)	2(100)
Eastern Azerbaijan	1(100)	0(0)	1(100)
Lorestan	0(0)	1(100)	1(100)
Hamadan	1(100)	0(0)	1(100)
Qom	1(100)	0(0)	1(100)
Isfahan	1(50)	1(50)	2(100)
Southern Khorasan	1(100)	0(0)	1(100)
Khorasan Razavi	6(60)	4(40)	10(100)
Khoozestan	1(100)	0(0)	1(100)
Total	57(70)	25(30)	82(100)

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The current smoking prevalence rate in our research is lower than that study.

In a school-based study in Nepal, gender was found significantly related to the prevalence of ever tobacco users. There were higher odds of tobacco use among boys, compared with girls. The overall prevalence of 'ever users' of tobacco products was 25.3%. The prevalence of tobacco users among boys and girls were 31% and 14.4%, respectively. The correlates of tobacco use were gender, ethnicity, family members and friends using tobacco products; students were exposed to tobacco at home and public places (43).

Another study explored the two groups of schizophrenia and other psychiatric disorders in patients hospitalized in Kerman (Iran). In the schizophrenia group, the lowest age of smoking was 10 and the highest was 31 years. However, in the other group, the youngest age of smoking onset was 9 years and the oldest was 47 years (45). A study on adolescent psychiatric inpatients examined factors related to smoking status in this population. They concluded that 44.7% smoked 7 days a week and smokers have met the criteria for substance abuse/dependence (46). Additionally, a cohort study followed 542 inpatients with psychosis for 10 years after the first

hospitalization. In total, 52.4% of participants were current smokers and 69.3% were lifetime smokers (47), compatible with 30% lifetime smokers in our study.

Adolescents admitted to the psychiatric ward smoke more than the general adolescent populations in Iran and Nepal. Although in the general population of Kashmir, this ratio is higher than the population of Iranian adolescent psychiatric patients. However, the Iranian adolescents admitted to psychiatric wards created about half of the Caucasian patients. A large longitudinal 13-year population-based study in Norway revealed that young adult (13-27 years) smokers had clearly higher rates of anxiety, depression, and parasuicide.

After adjustment of confounding variables, nicotine dependence was still related to anxiety, depression, and parasuicide. There was also a significant association with later depression in smokers (15). The prevalence of mood disorders in our sample of nonsmokers and smokers were 37.5% and 62.5%, respectively. All patients with anxiety disorder were nonsmokers in our study. About 26.6% of our patients had a history of parasuicide of whom, 52.9% were smokers.

In another study on 950 psychiatric adult patients with serious mental illnesses who were admitted to Razi Mental Health Hospital in Tehran, Iran, 70% of samples (73.2% males and 26.8% females) were smokers, and 219 participants had a history of suicide attempt. In the regression analysis model, gender, age, and cigarette smoking were significantly related to previous suicide attempts (19).

In our study, 73% of samples (24.5% of males and 39.5% of females) were smokers, and 26.6% of our studied patients had previously committed suicide of whom, 52.9% were smokers. There was no significant difference between smoking and gender in our study. In a study in Korea in middle and high school students, the most highly correlated variables with suicidal attempts were smoking, depression, and inhalation experience (48). There was a significant association between smoking and suicide attempt in our study, too. In a consecutive large sample of adult patients admitting to a general hospital, suicidal ideation was related to tobacco smoking (49).

In Lineberry et al. study in adult psychiatric inpatients in Rochester (USA), 45.9% were current smokers, and 51.1% of them aged 18-24 years. Investigating current smoking in other psychiatric inpatient groups, substance abuse, and psychotic syndrome diagnosis were significantly correlated with current smoking (50), that is compatible with our study where a significant difference was found between smoking and substance abuse. Smoking has been identified as one of the 6 powerful independent factors in generating clinical prognostic models predicting later suicide behaviors in psychiatric patients (51).

A significant difference was observed between smoking and a history of suicide in our study, too. It has been suggested that the association between smoking and suicide attempts possibly results from depression and anxiety as well as alcohol dependency (52). In a representative sample of the USA adults, relapse, tobacco use initiation, and persistent tobacco use (which are amenable to intervention) were related to the risk of suicide attempt (53). In another study in the USA, longer lifetime smoking was associated with higher odds of suicide (54).

In another study on the USA household population, over four-fold risk for definite and or life-threatening suicide attempts was reported among smoking adolescents in inpatient psychiatric facilities compared with nonsmokers. Suicidality was more frequent among girls than boys and in adolescents suffering from depression. Suicide attempt was higher in smoker patients

than nonsmokers (55). In the Dunedin Multidisciplinary Health and Development Study that is a community-based investigation on 1037 New Zealanders born in Dunedin during 1972-1973, the authors examined the association between suicidal ideation in early adulthood and daily tobacco smoking in 764 participants. Early tobacco smoking was significantly predictive of later suicidal ideation (56).

Another study on a large population-based sample of younger people investigated the relationship between smoking and suicide mortality. Compared to youth who avoid high-risk behaviors, involvement in any drinking, smoking, and or sexual activity was related to significantly increased odds of depression, suicidal ideation, and suicide attempts (57). In our study, alcohol consumption was significantly correlated with a history of suicide, substance use, drug misuse, smoking or substance abuse in family members. In a random sample of Chilean teenagers, 25% of respondents had committed suicide at least once during life. In addition, female gender, smoking, and recent suicidal ideation were significant independent predictors of suicidal behavior (58).

Regarding the prevalent smoking behavior and its correlates in the studied patients, careful screening of smoking habits, and specially designing integrated psychiatric disorder treatments, as well as smoking cessation interventions are required. Intensified efforts are also greatly needed to prevent adolescents and young adults from starting to smoke. Furthermore, preventing adolescents from starting to smoke requires further investigating multiple background factors. The sample size was a limitation in this study and to analyze the study outcomes, a much larger sample and longer follow-up periods are needed.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by Ethics Committee of Mazandaran University of Medical Sciences and executed in accordance with the Declaration of Helsinki and its subsequent revisions. Subjects were informed of the research protocol and then they provided an informed consent.

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Authors contributions

Conceiving the original idea for the study, sought and obtaining the necessary fundings: Mehran Zarghami; Designing the study protocol: Fatemeh Taghizadeh, Mehran Zarghami, Arefeh Beygom Shafaat; Conducting the study and managing the day-to-day running of the research: Fatemeh Taghizadeh; Statistical analyses: Alireza Khalilian; Clinical interpretation of the results: Mehdi Bina, Elham Shirazi, Mehdi Tehranidoost; Writing the first draft of the manuscript: Fatemeh Taghizadeh; Revising the manuscript critically for important intellectual content: Mehran Zarghami, Ebrahim Abdollahian, Mozghan Kar Ahmadi, Nasrin Bali Lashak; and Reading and approving the final version: All authors.

Conflict of interest

The authors declared no conflict of interest.

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