Factors Affecting Cigarette Smoking in Adolescents: A Systematic Review

Vahid Ranaei1, Hamid Abasi2, Mostafa Peyambari3, Leyla Alizadeh4, Zahra Pilevar5*

1Student Research Committee, Faculty of Health, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
2Department of Public Health, Neyshabur University of Medical Sciences, Neyshabur, Iran
3Department of Psychology, Karaj Branch, Islamic Azad University, Karaj, Iran
4Department of Food Quality Control and Hygiene, Science and Research Branch, Islamic Azad University, Tehran, Iran
5School of Health, Arak University of Medical Sciences, Arak, Iran

Abstract

Background: Smoking cigarettes is among the strongly addictive habits and is a prevalent cause of a wide range of diseases. The aim of this study was to systematically review the factors that affect cigarette smoking in adolescents.

Methods: Persian and English databases including Google Scholar, EBSCOhost, Proquest, Scopus, Science Direct, Web of Science, PubMed, Scientific Information Database, and IranMedex published from January 2005 to July 2022 were examined by systematic review method due to their comprehensiveness and containing the closest articles related to the subject of the present study. There were no restrictions when searching the electronic database regarding the duration of intervention, type of participants, and place of the study. The key terms searched for were adolescence OR young adult OR youth OR teenagers OR boys OR girls OR children AND uptake AND factors affecting smoking AND adolescent smoking.

Results: In the initial search, 803 articles were retrieved from different databases. According to the inclusion criteria in the study and the elimination of duplicate articles, 56 articles were included in the study. The majority of studies were cross-sectional. All studies contained middle and high school students, one study included students, and one study included employed and non-employed youth. In adolescents, different variables at personal, family, psychological, social, and educational levels were considered effective on smoking behavior. Meanwhile, the relationship between smoking and the impact of family members and friends was more prominent.

Conclusion: To reduce smoking in adolescents, male students should be targeted before they enter high school.

Keywords: Adolescents, Smoking, Cigarette, Prevention, Systematic review

Introduction

Smoking cigarettes is a cause of various diseases such as cancers, cardiovascular diseases, heart coronary disease, and chronic obstructive pulmonary disease (1-5). Among adolescents, the use of electronic cigarettes has increased compared to the use of combustible cigarettes (6, 7). There is enough evidence for the causal relationship between cigarette smoking and increased risk of at least 10 types of cancer (1, 2, 4). As reported by the World Health Organization (WHO), smoking cigarettes accounts for an annual rate of about 6 million mortalities on a global scale. More than 5 million mortalities occur among beginners, and the rest results from exposure to second-hand smoke (6). Though the adverse effects of smoking cigarettes are well-documented and many attempts have been made to reduce the rate of smoking cigarettes, 20.5% of men and 15.3% of women are still smoking cigarettes (7). Ehsani-Chimeh et al in 2020 (8) and Aryaie et al in 2021 (9) found that the prevalence of smoking in male adolescents was significantly higher than that of females. As reported by the WHO, a high percentage of mortalities induced by cigarette smoking occurs in Asia, and the related data indicate that smoking begins early in adolescence (6). In fact, the majority of cigarette smokers begin smoking in adolescence, and when they are grown-up, they set a bad example for the youth and would fuel this vicious circle (10). It is estimated that between 3000 and 5000 adolescents try smoking cigarettes on a daily basis (11). As reported, cigarette smoking is highly prevalent among adolescents and is of great importance in many countries such as Pakistan, India, Bangladesh, and Nepal (12). Adverse effects of smoking cigarettes on health are correlated with the length and frequency of smoking. Beginning to smoke cigarettes in adolescence is correlated with a higher rate of addiction in adulthood and a higher risk of noncontagious diseases such as...
cancer and chronic heart and pulmonary diseases (13). Adolescent cigarette smokers are faced with a higher risk of diseases and mortalities (14). Half of the adolescent smokers become ordinary smokers in adulthood, and as expected, the other half of the population die due to diseases associated with cigarette smoking. This would further highlight the irreparable consequences of smoking cigarettes among the youth and the need to eliminate this habit (15). Therefore, a sound knowledge of factors correlating with smoking cigarettes can help policymakers and specialists to take effective cultural and supportive measures to reduce the rate of smoking in general and smoking among adolescents in particular. So far, many studies have addressed factors affecting cigarette smoking among adolescents (13, 16-20). Given the growing interest in cigarette smoking behavior among adolescents, the limited studies among the related literature on factors affecting cigarette smoking behavior by adolescents, and the importance of health in adolescents, this study was an attempt to cover the gap in the field of the study. It aimed to investigate the complex interrelationship between and among factors at several levels (e.g., personal, social, and environmental) and develop preventive general health programs and particular interventions for adolescents.

**Methods**

In this systematic review, the stages of the search for literature, selection of studies, data extraction, and methodological quality assessment of studies were as follows:

**Literature Search and Review**

Seven international scientific databases and two Iranian scientific databases, including Google Scholar, EBSCOhost, Proquest, Scopus, ScienceDirect, Web of Science, PubMed, Scientific Information Database (SID) (Iranian database), and IranMedex (Iranian database) were searched from January 2005 to July 2022. These databases were comprehensive in content and contained the most relevant academic papers.

**Search Strategy**

To find articles on cigarette smoking among adolescents, a search strategy was made by following keywords with Boolean operators:

- adolescence OR young adult OR youth OR teenagers OR boys OR girls OR children AND uptake AND factors affecting smoking AND adolescent smoking.

The operating key AND was used in the search to find more relevant results, and OR was used to extend the search and include keywords similar to the search.

**Primary Outcomes**

The prevalence of smoking and factors related to smoking in adults were the main outcomes of the study. The present study used the definition by the WHO (18) for adolescence as the age between 10 and 19 years.

**Inclusion and Exclusion Criteria**

The inclusion criteria were access to full-text, Persian or English language to ensure the absence of any bias in translation, only scientific research since they have already met the necessary conditions of scientific approach, and publication between 2005-2022 to make sure of the recency of content, and focusing on adolescents aged between 10-19 years.

The search process was done independently by three researchers. In cases where the search results of two researchers did not agree, the search of a third researcher was used. No limit was set in terms of the type of participants and place of the study. A manual search was done among journals, books of abstracts in conferences, conventions, and dissertations. The process of selecting the papers involved an initial manual search of the relevant journals and abstracts of conferences, conventions, and dissertations by two independent authors. Next, the recurrent papers were eliminated. The next step was to further limit the search so that irrelevant results could be discarded. After a review of abstracts and titles of all papers and considering the inclusion criteria, potential papers for inclusion were selected. The full text of the target papers was reviewed by two authors and discussed until consensus was achieved.

As for data extraction, the specific features of each paper were extracted using a standard form developed by the present researchers. This form included such information as the title (of paper), authors’ names, place of study, year of study, the purpose of study, type of study, target population, sample size, and the main findings.

**Methodological Quality Assessment**

To critically evaluate the quality of papers, the Joanna Briggs Institute checklist was used, which measures the specificity and applicability of each study in 8 dimensions. The 8 dimensions included the clarity of the inclusion and exclusion criteria of the study, the clarity of the statistical population, the adequacy of the sample size, the reliable and valid instrument, the clarity of the purpose of the study, the clarity of confounding factors, the precise statement of method, and appropriate analysis and interpretation.

**Results**

The initial search led to the selection of 801 papers. In the next step, the recurrent cases were discarded which led to 561 papers. Then, 445 and 51 papers were eliminated, respectively, after a review of the titles and abstracts. The remaining 65 papers were evaluated by the two authors. A third reviewer was consulted to check the final papers which led to the inclusion of 56 papers overall (Figure 1). According to Table S1, the majority of papers were cross-sectional in type, 4 papers were longitudinal, and
2 were prospective cohorts. Regarding the target group, all papers were conducted on junior high school or high school students, while one was conducted on university students (21), and one was carried out on employed and unemployed youths (22). Overall, the age range of the participants was between 10-25 years. With regard to the place of research, 17 papers were conducted in Iran, 10 in Nigeria, 7 in America, 3 in China, 3 in India, 2 in Indonesia, 2 in Hong Kong, 2 in Brazil, and in other countries such as Canada, Chile, Iceland, Taiwan, Bangladesh, Japan, and Greece. Concerning sample size, the smallest sample contained 215 subjects (23), and the largest one contained 45,273 subjects (24) (See Supplementary file 1) (21, 22, 24-75).

An exploration of the studies revealed that among demographic features, older age (24, 32, 49, 51, 56), male gender (23, 31, 32, 48, 51, 57, 61, 66), socio-economic status (57), receiving pocket-money (24, 51), level of education (35, 40, 42), and living in slums (55) affect smoking cigarettes in adolescents. Among family-related variables, less monitoring by parents (24, 59), parents’ level of education (37, 42), warm and receptive environment for talks (59), satisfaction with the home environment (61), family conflicts (37, 61, 66, 31), parents’ divorce or death (71), mother’s working outside the home (42, 53), mother’s anxiety (27), and mother’s smoking during pregnancy (31) were found to affect cigarette smoking among adolescents. Moreover, adolescents’ exposure to cigarette smokers in family (24-26, 28-31, 33, 35, 37-41, 44, 45, 48, 52-55, 58, 59, 61, 66, 67, 72, 76), friends and peers (21, 22, 29, 32, 37-39, 41, 46, 47, 49, 52-56, 58, 66, 67, 69, 72, 73), teachers (39, 51), and other social audiences (39, 51, 61) predicted cigarette smoking among adolescents.

Psychological variables such as stress (21) and relieving stress (68), metacognitive beliefs such as negative beliefs in the uncontrollability and hazard of concerns and cognitive self-awareness and attachment styles (53), depression (26), loneliness (21), low self-confidence (56), impulsive (26, 53), rebellious behavior (38), low behavioral control (55, 63), the experience of self-damage (60), perceived susceptibility of health issues due to smoking cigarettes (64), low perceived risk (24) were among factors affecting smoking cigarettes among adolescents. Other factors included an obsession with risky behaviors (56) such as the previous experience of smoking cigarettes (32), consuming alcohol (40, 47, 71), consuming tramadol (60), consuming marijuana (71), sexual behaviors (66), stimulating effects of cigarettes (23), emotional intelligence (53), inability to say No (55), gaining attention (72), and smoking cigarettes as a sign of maturity (23), psychological resistance (e.g., the tendency toward independence, self-sufficiency, and feeling useful) (34), more curiosity (23, 42, 65), and failure at work (37).

Concerning sociocultural variables, family and peer pressure (23, 34, 47, 57, 65, 71-73), mass media and commercial breaks in movies or on TV (41, 46, 49), cultural values of smoking (59), and religious beliefs (24, 61, 63) can be considered effective factors. As for educational and school-related variables, attitude toward

| SID       | Google scholar 245 | Science direct 231 | PubMed 68 | Scopus 75 | Web of science 69 |
|-----------|---------------------|--------------------|-----------|-----------|-------------------|
| Partially relevant papers to keywords 803 |
| Remaining papers 563 |
| Full text papers 67 |
| Selected papers 56 |
| Excluded full text papers 2 |
| Inadequate reports or results 8 |
| Low quality 1 |

Figure 1. Paper Selection Procedure.
Factors Affecting Cigarette Smoking in Adolescents

and interest in school (24), wandering at school (24), academic performance (24, 37, 38, 49), and smoking cigarettes to help study better (68) were found to affect smoking in adolescents. Finally, among the constituent variables of the sociocultural theory, inadequate knowledge of smoking and its adverse effects (57, 58, 64), positive attitude toward smoking (56–58, 63), subjective norms of smoking (38, 58, 63), low self-efficacy (55, 58), and easy access to cigarettes (37, 73) were reported as effective variables, which were also identified in this study.

Discussion

The present study aimed to explore the effective factors in cigarette smoking among adolescents. The body of reviewed research varied in terms of research methodology, target variables, measurement instruments, and target population. This can make the direct cross-comparison of these studies demanding. Despite this challenge, a systematic review could provide comprehensive information about different factors affecting cigarette smoking among adolescents.

In their meta-analysis study in 2020, Ehsani-Chimeh et al showed that the presence of a smoker in the family, lack of awareness of the consequences of smoking, easy access to cigarettes, lack of government laws to sell it to adolescents, death of family members, parents, gender, having smoking friends, family dissatisfaction, highly emotional environment, divorce, family disputes, history of running away from school and home, curiosity about the experience of smoking, social problems, low education level of parents, and low economic level of the family were determinants of smoking behavior in adolescents (8). As can be observed, these findings are consistent with the individual, family, psychological, and social factors obtained in the present study. In line with the present study, in a systematic review study in 2020, Alotaibi et al found that individual factors (e.g., older age, male gender, unemployment, high income, low awareness, being single, and stress), social factors (e.g., smoking friends, teachers, and parents, parents’ education, and parents’ occupation), and environmental factors (e.g., media and laws) are among the factors influencing adolescent smoking (77). In a systematic review study in 2016, Talip et al found that individuals who are more prone to smoking are older male adolescents who have parents with low socioeconomic status and low level of education, individuals with low parental supervision and with high-risk behaviors for health, and those who have no conversation about smoking at home (78).

Further, the findings of a study by Wang et al in 2016 indicated that the factors influencing smoking in older adolescents were being a boy, smoking parents, exposure to second-hand smoke, divorce or separation of parents, academic performance, and belief that smoking is harmful (79).

One of the findings of the present study was that being male is one of the risk factors for smoking in adolescents. In this regard, the meta-analyses by Haghdoost et al in 2013 (80) and Xi et al in 2016 (81) suggested that one possible explanation in this regard could be the difference in the lifestyle of boys and girls. Boys are more at risk and are more likely to smoke due to social conditions, curiosity, tendency to experience high-risk situations, peer pressure, and other health-related problems. In addition, the existence of social stigma regarding smoking in girls can be one of the reasons for a low tendency for smoking in girls.

The present study revealed that smoking cigarettes among family members and peers as well as the consequent pressure were the most influential factors involved in adolescent smoking. For instance, Kumar et al maintained that family members, especially parents smoking cigarettes, affect adolescents. These adolescents probably accept smoking as a positive behavior. This would also help adolescents form positive subjective norms of smoking cigarettes (82). Moreover, research evidence showed that adolescents with more smoking friends exhibit more tendency to smoke cigarettes. Peers can influence adolescents in two ways: implicit effects such as adolescent imitation and explicit effects such as direct pressure to smoke cigarettes (83). Acceptance by friends during puberty is important; hence, adolescents seek to conform to their friends by ignoring their desires and gaining an identity (84).

Furthermore, the evidence from this study suggested that reducing cigarette smoking among adolescent male students should be addressed as soon as possible before entering high school. Implementing such plans should involve all beneficiaries, especially parents, peers, and school employees to be able to approach as an all-inclusive approach to achieve desired goals and reduce the rate of cigarette smoking among adolescents at school in the future. Prevention through health education should be a priority in all schools and society. Adolescents should be helped to learn how to control their behavior. Learning to say No to smoking offers and reject such offers are necessary. Further, adolescents’ social norms, especially the values of cigarette advocates (e.g., adolescents who do not regard smoking as harmful) should change. Adults should stop smoking and set a good example for adolescents to help reduce this negative habit among this population.

Despite all effective factors identified in the present study, a number of factors were not taken into account due to the lack of available evidence. These factors include policy-making such as the price of cigarettes and legalization of cigarette smoking as well as genetic factors. Protective factors and their inherent nature are among the other factors that need to be considered. Are protective factors only the lack of certain risk factors or do they actually affect the relation? Some risk factors might directly (i.e., in the absence of protective factors)
and others may indirectly (i.e., in the presence of protective factors) be involved. Future research should address the topic at hand and the relevant research questions concerning the presence and function of protective factors. Corresponding to the present findings, it appears that cigarette smoking behavior is influenced by different factors such as personal, familial, social, and environmental factors. All these factors should be considered and altogether comprise part of the causal mechanism involved in cigarette smoking by adolescents. Accordingly, future research should develop and test this conceptual model. In fact, statistical testing of the model can evaluate the interaction of the factors and their effect size.

One limitation of the present study was that concluding and integrating all findings were difficult due to the different research methodologies, measurement instruments, and data analyses. Furthermore, this would make the comparison of studies difficult. In addition, the outcomes of these studies differ and even when a certain outcome is labeled the same, different definitions may be involved. The majority of reviewed studies were cross-sectional in type which further limits the inference of a causal relationship between the factors and cigarette smoking behavior. Furthermore, the present study only employed Persian and English language academic papers excluding papers written in other languages. Moreover, the lack of access to all scientific databases was another limitation of the present study. Nevertheless, this study can provide a comprehensive insight into different effective factors in adolescent cigarette smoking.

Conclusion
The demographic features (e.g., older age, male gender, socio-economic status, receiving pocket money, level of education, and living in slums), family-related variables (e.g., less monitoring by parents, parents’ level of education, warm and receptive environment for talks, satisfaction with the home environment, family conflicts, parents’ divorce or death, mother’s working outside the home, mother’s anxiety, mother’s smoking during pregnancy, adolescents’ exposure to cigarette smokers in family and among friends, peers, teachers, and other social audiences) predicted cigarette smoking among adolescents. Moreover, psychological variables (e.g., stress and relieving stress, metacognitive beliefs such as negative beliefs in the uncontrollability and hazard of concerns, cognitive self-awareness, attachment styles, and depression (25-29), loneliness, low self-confidence, impulsivity, rebellious behavior, low behavioral control, the experience of self-damage, perceived susceptibility of health issues due to smoking cigarettes, and low perceived risk affected smoking cigarettes among adolescents (23-27). Other factors affecting adolescent smoking were the obsession with risky behaviors such as the previous experience of smoking cigarettes, consuming alcohol, tramadol, and marijuana, sexual behaviors and stimulating effects of cigarettes, emotional intelligence, inability to say No, gaining attraction and smoking cigarettes as a sign of maturity, psychological resistance, more curiosity, and failure at work (59-63). Sociocultural variables (e.g., family and peer pressure, mass media and commercial breaks in movies or on TV, cultural values of smoking, and religious beliefs), and educational and school-related variables (e.g., attitude toward and interest in school, wandering at school, academic performance, smoking cigarettes to help study better) were among the other factors influencing smoking in adolescents.

Among these, smoking by family and peers and their influence are the most prominent and common factors affecting smoking in adolescents. In addition, the evidence from this study suggests that to reduce smoking in adolescents, male students should be targeted as soon as possible before they enter high school. Similar to the present findings, it appears that cigarette smoking behavior is influenced by different factors such as personal, familial, social, and environmental factors. All these factors comprise part of the causal mechanism involved in cigarette smoking by adolescents. Considering the negative consequences of smoking, understanding the factors associated with smoking will help legislators and health professionals to reduce and prevent smoking among different classes, particularly among adolescents. However, future research should be developed to test this conceptual model. In fact, statistical testing of the model can evaluate the interaction of the factors and the effect size of each. Yet, this study can provide a comprehensive insight into different effective factors in adolescent cigarette smoking. This study is more comprehensive than studies that only looked into certain psychological or social factors. Given that several factors at different levels affect cigarette smoking in adolescents, differences in methods, tools, communities, and analyses in various studies prevent the aggregation and integration of results. Accordingly, designing and implementing programs that target different levels of influencing cigarette smoking in adolescents can be effective in preventing and reducing smoking among this age group.

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Authors’ Contribution
VR provided research proposal and final report. VR and ZP did the data collection and analysis, MP and HA provided, reviewed, and edited the manuscript. LA also participated in manuscript provision. All authors read and approved the final manuscript.

Conflict of Interest Disclosures
The authors declare no competing interests.

Ethical Statement
This study was approved by the Ethics Committee of Hormozgan
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Supplementary files
Supplementary file 1 contains Table S1.

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Factors Affecting Cigarette Smoking in Adolescents

145

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