

## The prevalence of smoking among Iranian middle school students, a systematic review

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**Objectives:** The mean age of cigarette smoking has decreased along with an increase in its prevalence, in developing countries. The aim of this systematic review is to determine the prevalence of lifetime, current and daily smoking among middle school students in Iran.

**Methods:** Various search methods have been used in this study including searching different international databanks such as Pubmed, ISI web of Science, PsychInfo, CINAHL, Embase, as well as domestic databanks including IranPsych and IranMedex. All original studies and researches in Persian or English, which had described any kind of use including lifetime, current and daily use of cigarette, hookah, and pipe among middle school students, were included in the study with no restriction on date of publication, and were qualitatively assessed. Subsequent to data extraction, heterogeneity test was carried out on indicators for which more than two studies were found, and meta-analysis was done using random effects model.

**Results:** The combined 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), respectively. The combined prevalence of "current tobacco use of all kinds" was 15% (95% CI: 10.4-19.5), as well.

**Conclusions:** The prevalence of smoking in this age range is lower in Iran compared to other countries. However, a conclusion cannot be made about the changes in the prevalence of smoking in recent years. Moreover, studies carried out to the present have several qualitative limitations, which points to the necessity of high quality repeated surveys.

**Keywords:** *Meta-analysis, Prevalence, Review, Students, Smoking, Hookah*

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At the beginning of the 21st century about one third of adults in the world used tobacco (1). Tobacco was estimated to account for 4 million annual deaths in 1998. It has been estimated that tobacco-attributable deaths will rise to 8.4 million in 2020 and will reach 10 million annual deaths in about 2030 (2).

The role of cigarette smoking as a risk factor has been proven in many medical illnesses, and this substance is considered to be one of the 10 risk factors responsible for the whole burden of diseases (2).

There has been a significant decline in cigarette smoking in recent decades in developed countries, due to legal restrictions and health education activities (3, 4). Based on this fact and because tobacco markets are profitable, cigarette companies have changed their target markets and smoking has significantly increased in developing countries. It has been reported that within two decades there was a 400 percent and 300 percent increase in cigarette smoking in India and New Guinea, respectively (5).

In the year 1999, it was estimated that 80 percent of the 1.1 billion cigarette smokers across the world live in

the low or middle income countries (6).

Along with the increase in the prevalence of smoking, there has been a significant decrease in its age of onset, and most studies show that the majority of smokers have started smoking in their adolescence and before the age of 18 (7-11). Cigarette smoking during adolescence is a strong predictive factor for cigarette use in the adulthood. Adolescents can develop nicotine dependence after smoking relatively few cigarettes (12). Early smoking initiation predicts longer duration of smoking, heavier daily consumption, and increased chances of nicotine dependence (13). In addition, studies have showed associations between current cigarette use with alcohol and other drug use, suicidal thoughts, and age at first sexual intercourse (14, 15). Moreover, fifty percent of young people who continue to smoke will die from smoking (1).

The prevalence of cigarette use in Iran has been studied in different ages and educational levels, as well as different provincial or district levels. Carrying out a systematic review cannot only provide an overview of the present information, but can also prevent the launch

of nationwide epidemiologic studies, for which huge amounts of human and financial resources are needed. The aim of the present systematic review was to determine the prevalence of tobacco use among middle school students, according to the indicators of lifetime, current and daily use. In addition, the qualities of the studies have been assessed in the present study.

## Materials and Method

### *Selecting the studies*

The methods for carrying out the present study were adopted from the book "Systematic review to support evidence-based medicine" (16). The search for articles was done via five international and two domestic electronic databanks, namely, Pubmed, ISI web of Science, PsychInfo, CINAHL, Embase, IranPsych and IranMedex. All searches were completed between April and June 2008.

The databanks of scientific articles and theses have been developed in Iran in recent years. As a specialized databank- the databank for research in mental health in Iran (IranPsych: <http://iranpsych.tums.ac.ir>) provides soft and/or hard copies of articles published in scientific journals and post-graduate theses, as well as abstracts of scientific articles presented at scientific congresses. The databank covers psychological science, neuroscience, social and cultural sciences related to mental health, the epidemiology of mental disorders and mental health issues, clinical sciences, and mental health services, with no time limitation. Iranpsych contains Iranian articles published in non-Iranian journals with links in ISI, Pubmed, and PsychInfo, as well. At present, this databank contains more than 7000 articles and 3500 student dissertations. Iranmedex ([www.iranmedex.com](http://www.iranmedex.com)) provides research articles in medical science and contained 43000 records from 146 scientific journals in Iran at the time of the searching for this review.

Searching strategies in the databanks PsychInfo, ISI web of Sciences, Pubmed, CINAHL, and Embase includes three parts: English transcription of Iran and cities with universities of medical sciences and the name of the universities (adopted from Farhoudian et al.) (17), the terminology related to epidemiology and prevalence estimation, the terminology related to tobacco. The searching strategy in Iranian databanks was the English and Persian transcription with terms related to epidemiology and cigarettes. Considering the limitation in the use of a large number of keywords and the simultaneous use of the logical operators "and" and "or", each group of keywords were separately evaluated in Iranian databanks and common cases were omitted. The strategy was adapted to each of the databanks.

In addition to electronic search, manual search was carried out in the list of references of articles found in the electronic search and dissertations and related article abstracts presented in conferences in Iran, as well as reports of research projects carried out by different universities and organizations available as

hard copies- not yet converted into electronic copies- in Iranpsych. Authors of articles were contacted when necessary in order to provide missing information. No time limit was considered in the search strategy.

### *Included studies*

Original observational studies in Persian and English, that had stated the prevalence of any kind of use, including lifetime, current and daily use of cigarette, hookah (called Ghelyoon in Persian), and pipe (called Chopogh in Persian) among school students were included in case the prevalence was also categorized according to educational levels. No time limitation was considered for the publication of the articles. Lifetime use of tobacco indicates the experience of using tobacco during lifetime. Current use includes the use of any form of tobacco on a daily basis as well as occasionally, at the time of interview. Regular use is defined as the daily or almost daily use of tobacco.

### *Excluded studies*

The titles and abstracts of the retrieved studies were reviewed by one of the reviewers. Then the full texts of the selected studies were reviewed by two groups of two reviewers, independently. All the disagreements were being discussed with the third reviewer.

### *Accordingly, the following studies were excluded:*

- 1- Studies that were not carried out on the middle school students or had been carried out in the general population but did not contain information categorized by educational level;
- 2- Studies that had not quantitatively stated the prevalence or had not provided a specific definition of use;
- 3- Studies in which the studied sample did not represent student population (e.g. adolescent inmates of correctional centers, individuals with behavioural or mental disorders, child labourers, street children, delinquents, and children of drug addicts).

### *Qualitative evaluation of studies*

The complete texts of the included studies were randomly given to two groups of two reviewers, and were separately assessed by both reviewers in the group. In case an article was excluded by any of the two reviewers, the reason of exclusion would be discussed in the same group, and in case of uncertainty or disagreement, a third researcher from another group would make the final decision.

For assessing the quality of the studies, Quality Assessment Checklist for Prevalence Studies -with minor changes- was used. The checklist evaluates the method of sampling, the instruments, and method of analysis. In quality assessment, the inability of providing data necessary for systematic review, led to the exclusion of some studies. These instances included not stating the prevalence of tobacco use categorized by age or educational level, lack of definition of indicators of use or the lack of possibility for

calculating the confidence interval of tobacco use prevalence.

Subgroup analyses were not done based on the quality of the studies. However, the information on the quality of the studies has been provided in the evidence table.

**Data extraction**

English and Persian articles were assessed in their original language. The data was extracted by two groups of two reviewers, and the differences were rechecked. The following data was extracted for each study: year of field work, anonymity of interviewees (with or without individual identification), sample size, location of study and geographical extension of data collection, indicator of use (lifetime, current, daily) in the total sample and differentiated by sex, method of research (household, school and specific environments).

**Results**

In the first stage of the search, 2590 documents were collected from 5 international and two national databanks, as well as non-electronic sources. According to the limitations in advanced search of Iranian databanks and using the keywords with high sensitivity, the number of retrieved studies was high in this stage. After the exclusion of repeated cases and evaluating their abstracts, 8 articles, 2 research reports and one conference abstract were included in the second stage. In the next stage, after assessment of full text, three articles and two research reports were ultimately selected. Table 1 shows the excluded studies and the reasons for their exclusion.

The characteristics of included researches and details of the resulted data can be found in Table 2. Three nationwide studies and two studies in the capital city of Tehran were included. Those studies have been conducted between 1999 and 2007, and the number of

respondents varied from 216 to 5934 individuals. All studies were carried out on both sexes, but only two studies have reported the results for each sex, separately. In studies where results are differentiated by sex, the prevalence for the whole sample has been adjusted by the authors of this review with the assumption that the numbers of male and female students are equal in Iranian population .

Meta-analysis was carried out and combined prevalence was calculated for lifetime and daily use of cigarettes as well as current use of all tobacco products, without considering differences in sex. Stata (version 8) software was used for data analysis. First, heterogeneity test was carried out. Considering the presence of heterogeneity, random effects model was used for analyses. The estimation of prevalence of lifetime use of cigarette, and current use of all tobacco products was provided in the forest plot. There were limited studies regarding other indicators; therefore, the results for those indicators are only described or presented in the table.

**Lifetime use of tobacco**

Four studies including two nationwide studies (24, 25) and two studies in the city of Tehran (26, 27) had assessed “lifetime cigarette use”. Except for one study (27) that had categorized the results by sex, the other studies had only presented the general results for the total samples. These results varied between 9.2 percent and 26.8 percent. Figure 1 presents the result of the meta-analysis. The combined prevalence of lifetime cigarette use in the middle school students is calculated as 14.2% (95% CI: 6.6-21.7).

Only one study (26) had reported a 24.5 percent prevalence of “lifetime use of hookah” in the city of Tehran in the total sample (95% CI: 20.1-29.3).

**Table 1: studies excluded from the systematic review and the reasons for exclusion**

Reference	Reason for Exclusion
Jahromi, Z. A. (18)	Experimental study and non-random sampling
Kelishadi, R. (19)	Not having access to abstract or full text
Ayatollahi, S. A. (20)	Carried out only on high school students
Kelishadi, R. (21)	Despite contacting the author, there was no possibility of accessing the results differentiated according to middle school students
Mosavi Jarrahi, A. (22)	Results differentiated according to middle stage were not present
Ziaadini, H. (23)	Carried out on a home to home basis on general population; and the results were not differentiated based on middle school students

Table 2: Evidence table of the prevalence of tobacco use in middle school students, categorized by sex and pattern of use

Ref.	type of ref.	target population	substance used	year of study	place	life time prevalence				current use				daily use				response rate	quality index
						girls	boys	total	definition of index	girls	boys	total	definition of index	girls	boys	total	definition of index		
Azaripour, H.; 2007	report	3 <sup>rd</sup> grade students of middle school	cigarette	2007	national	-	-	n=218 16.9%	ever smoked cigarettes even one or two puff	-	-	n=216 4.7%	any cigarette use in the past 30 days	-	-	n=216 0.6%	smoked cigarettes in 20+ days in the past 30 days	93.1 <sup>***</sup>	1 & 3
Barikani A; 2008	article	middle school students	cigarette	2005	Tehran	-	-	n=355 9.6%	at least once during lifetime	-	-	-	-	-	-	-	-	not mentioned	1
CDC, 2004	fact sheet	middle school students	cigarette	2003	national	-	-	n=1168 9.2%	ever smoked cigarettes even one or two puff	-	-	n=1154 1.3%	any cigarette use in the past 30 days	-	-	n=1154 0.2%	smoked cigarettes in 20+ days of the past 30 days	95 <sup>***</sup>	1
Poureslami M.; 2003	article	middle school students	cigarette	1999-2001	Tehran	n=3028 11.7%	n=2903 30.2%	n=5931 20.9%**	experienced cigarette smoking	-	-	-	-	n=3028 1.1%	n=2903 3.8%	n=5931 2.5%**	smoked ≥ 1 cigarette /day	84	-
Azaripour, H.; 2007	report	3 <sup>rd</sup> grade middle school students	tobacco	2007	national	-	-	-	-	-	-	n=227 28.3%	used any form of tobacco in the past 30 days	-	-	-	-	93.1 <sup>***</sup>	1 & 3
Barikani A; 2008	article	middle school students	water pipe	2005	Tehran	-	-	n=355 24.5%	at least once during lifetime	-	-	-	-	-	-	-	-	not mentioned	1
Kelishadi R.; 2006	article	middle school students	tobacco	2003-2004	national	-	-	-	-	n=2868 8.1%	n=2786 13.5%	n=5554 10.8%**	occasional use + daily use	-	-	-	-	92	3
CDC, 2003	fact sheet	middle school students	tobacco	2003	national	-	-	-	-	-	-	n=1181 10.8%	used any form of tobacco in the past 30 days	-	-	-	-	95 <sup>***</sup>	1

\* 1- Imprecise or less than 70 percent sample response, in which the features of non-responding individuals were not presented.

2- The anonymity of the samples not being clearly stated in the study, or instances in which the interviewer had been able to identify the sample.

3- Imprecise sampling or choosing a sample not representative of the target population.

\*\* The prevalence have been recalculated and adjusted by the authors of this review, with the assumption that equal numbers of boys and girls are studying in the middle schools in Iran.

\*\*\* The response rate has been reported for the total of middle and high school participants in the study.

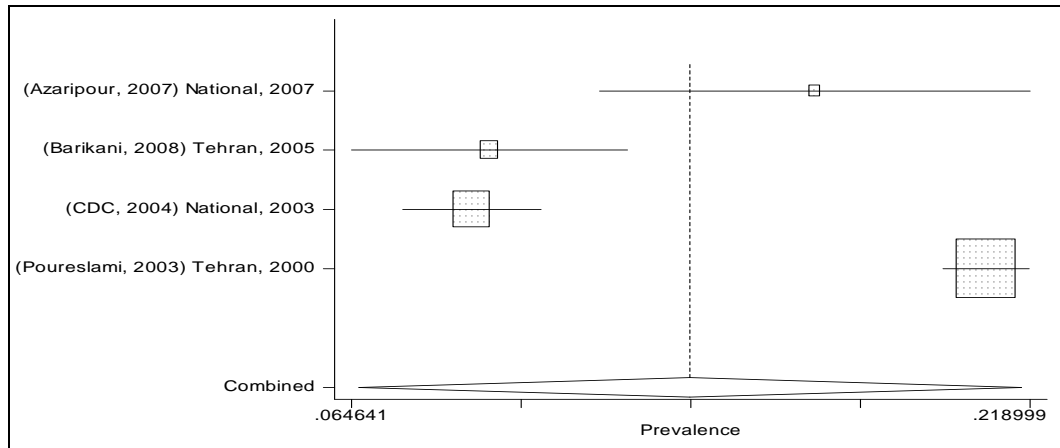


Figure 1. Prevalence of “lifetime cigarette use” among the total middle school students

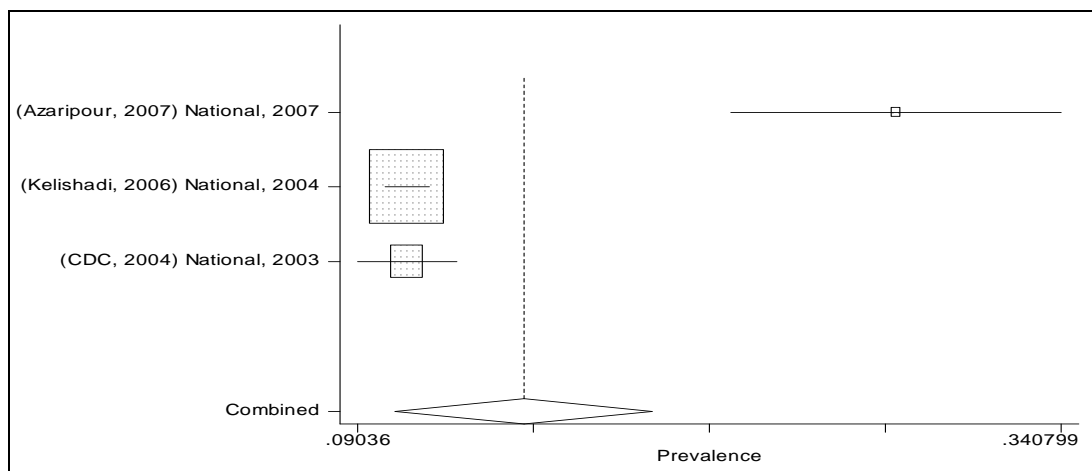


Figure 2. Prevalence of “current tobacco use” among the total middle school students

**Current use of tobacco**

Two nationwide studies (24, 25) have assessed the “current use of cigarette”, with a combined prevalence of 2.7 percent (95% CI: 0.5-5.9) for the total samples . These two studies as well as one other nationwide study (28) had also assessed the “current use of all tobacco products”. Their results varied from 10.8 to 28.3 percent for total samples. According to the result of the meta-analysis shown in figure 2, the combined prevalence of current use of all tobacco products is 15 percent (95% CI: 10.4-19.5) in the middle school students.

**Daily use of tobacco**

Three studies including two nationwide studies (24, 25) and one study in the city of Tehran (27) had presented the “daily use of cigarette”. Their results varied from 0.2 and 2.5 percent for the total sample. The combined prevalence of daily use of cigarette for middle school students is 1.1 (95% CI: 0.6-2.8).

**Discussion**

The prevalence of cigarette use during adolescence is a valuable indicator for the prediction of future harms caused by cigarette smoking, and is therefore important for health-related policymakers and program-planners in the country.

This is the first systematic review of the prevalence of cigarette use among middle school students in Iran. There is also a lack of similar studies globally; perhaps the systematic review of Campo-Arias on nicotine dependence is the only study with some similarities to the present review. Campo-Arias combined the results of 6 studies in different parts of the world, with the aim of determining the current and one year prevalence of nicotine dependence in the adult general population (29). The prevalence of nicotine dependence and heavy smoking as well as the daily number of smoked cigarettes have higher importance for public health planning in the adult population. However, prevalence of cigarette use in lifetime, last three months and last

month are more useful indicators in the population of school students, where assessments are done with the aim of monitoring the future situation and planning for prevention.

This systematic review showed that the number of studies carried out on the prevalence of tobacco use in the middle school students is very limited and the available studies had used a variety of definitions for tobacco use and had assessed different kinds of tobacco products. However, the mean prevalence of lifetime, current and daily cigarette use among middle school students is estimated as 14.2, 2.7, and 1.1 percent respectively.

Few studies have been carried out across the world on the prevalence of cigarette use in middle school students. In recent years, the World Health Organization has designed the Global Youth Tobacco Survey (GYTS) in collaboration with the office on smoking and health at the Center for the Control and Prevention of Diseases in the United States of America, and is offering consultation to the six regions of the World Health Organization. One hundred and twenty six countries from among the 192 members of the World Health Organization had completed the aforementioned survey by early 2004. The member countries collect and report the data every 4 to 5 years. In these studies, one of the target groups are students aged 13 to 15 (30). Most studies conducted across the world such as GYTS have not provided the results of middle school and high school students separately.

Cyprus National Study, which was a part of GYTS has provided the results categorized by educational level, and has reported a 9.9 percent of current cigarette use among middle school students in the years 2005 and 2006 (31). In the National Youth Tobacco Survey of United States of America the current use of cigarette among middle school students was reported to be 9.8 percent in 2002 (32). Both of these figures show that the prevalence of cigarette use in middle school students in Iran is much lower than the similar figures in Cyprus and USA.

For the use of all tobacco products, the "prevalence of current use" has been mainly studied and the resulted prevalence is 15 percent. There is a significant difference between current cigarette use (2.7 percent) and current use of all tobacco products, which can be attributed to smoking hookah in the first place and smoking pipe to a lesser degree. Smoking hookah is also prevalent among school students in other countries of the Middle East, making it the most popular method of tobacco use in most of these countries (33). In some countries, cigarette is the major form of tobacco used by school students (32). In other countries, use of other forms of tobacco is more prevalent; for example in the United States of America, the use of cigars also has a significant prevalence (32).

The only study found on the lifetime use of hookah, shows a higher prevalence of the use of this substance in comparison to cigarettes. The use of this substance, even in adolescence, is more accepted than cigarette

smoking; but it should be noted that in addition to harmful physical effects, this tobacco product could be a gateway for tobacco use and lead to cigarette smoking in the future.

This review confirmed the presence of a difference between girls and boys regarding the use of tobacco. A higher prevalence of cigarette use among boys has been showed in two studies. This difference has been 1.7 times for the current use of all tobacco products and 3 times for the lifetime and daily use of cigarettes. There seems to be a lower difference between the two sexes with regard to the use of other tobacco products. In the study carried out in 12 countries on 13 to 15 year old students, in most country, a higher prevalence of cigarette use has been reported in boys in comparison to girls. The authors of the study have attributed the reversed findings in some countries to the success of advertising by the tobacco industry in making cigarettes fashionable (34).

In many countries across the world, the difference in the prevalence of cigarette use in the adult population for women compared to men is higher than one to ten (1). Similar figures have been reported from Iran and it has been shown both in a nationwide study in 1999 (35) and in a study in the city of Tehran in 2001 (36). In addition, in some countries, the difference between the two sexes with regard to cigarette use is lower in younger ages; and the continuance of this trend in these countries points to a change in the gender pattern of cigarette use among adults in the future (24, 37). Similarly, in Iran gender difference with regard to cigarette use is lower among school students than in the adult population. This suggests that we will be facing an increase in smoking prevalence among young girls in near future.

The qualitative assessment of the included studies in this systematic review shows shortages in the methods, study conduction and reporting the results. In some studies, the response rate has not been reported, the sampling method has not been explained adequately, the total results have not been corrected by appropriate weighting of the different numbers of participated boys and girls, the data collection mechanism has not been clarified and it is not known if a self-administered questionnaire was utilized or the participants have been interviewed, which is important in studies on sensitive questions.

Iran has participated in GYTS in two stages in the years 2003 (25) and 2007 (24), with conducting nationwide surveys. The sample population in these two surveys was comprised of third grade middle school as well as first and second grade high school students. The results of these two surveys have been included in the present systematic review. Contrary to what is stated as similar research methods used in the GYTS survey studies, the sample size and sampling method in Iran had significant differences in the years 2003 and 2007. In addition, with regard to the wide confidence interval in the 2007 study, the basis upon which a very small sample (about 220 individuals) has

been considered as representative of the third grade middle school student population is not clear. Moreover, insufficient information about the method and results was presented in the reports, and personal communication and secondary analysis were used for the completion of this information.

Some factors have been known to have correlations with the prevalence of cigarette use among youth. Examples include tobacco industry propaganda, easy access to cigarettes, and their low cost (1). In Iran all kinds of tobacco advertising have been banned for many years now; however, cigarettes are easily accessible and their cost is low. Each packet of cigarette costs as much as two bottles of carbonated soft drinks. Cigarette prices underwent a 10 to 20 percent increase in the past three years. In addition, preventive education is being continuously presented through the media. Based on article 12 of 2006 Act on tobacco control, the sales and supply of cigarettes to individuals below 18 years of age, or with the involvement of the same age group, is prohibited and financial penalties have been considered for it (38). However, this law has been implemented only to a relative degree. Despite utilizing these strategies, their effect on reducing cigarette use is not clear.

In Iran, studies that are based on cigarette use in adults indicate a decreasing trend in the use of cigarettes in recent decade (35). However, considering the results of the studies used in this systematic review, a decreasing trend in cigarette and tobacco use cannot be confirmed in the case of middle school students. On the contrary, the only studies conducted by same research team and use of identical tool (the GYTS studies), indicate a significant increase in the use of cigarette and tobacco products from 2003 to 2007. Therefore, carrying out more efficient longitudinal repeated studies for monitoring changes and assessing the impact of control policies is essential.

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