

# Meta-analysis of Smoking Prevalence in Iran

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## Review Article

### Abstract

**Background:** There are numerous studies and documents regarding the prevalence of smoking in Iran. Thus, to provide suitable information for decision-making and policy-making in this regard, the prevalence of smoking in Iran was evaluated using the meta-analysis of the results of the existing researches.

**Methods:** Data were collected by searching the keywords cigarette, smoking, tobacco, and nicotine in English databases, searching their Persian equivalents in Persian Databases, and in non-electronic resources. After studying the titles and texts of collected articles, the repeated and irrelevant cases were excluded. Cases which had the inclusion criteria of this meta-analysis were entered into the Stata software. According to heterogeneity results, random effect model was used to estimate the prevalence of smoking.

**Findings:** In initial studies and non-communicable surveillance system, 274992 Iranian adults were studied regarding daily smoking. Among initial studies, smoking prevalence varied from 12.3% to 38.5% in men, and from 0.6% to 9.8% in women. Based on the meta-analysis of initial studies and risk factors of non-communicable disease surveillance system, smoking prevalence was estimated 21.7% and 19.8% in men and 3.6% and 0.94% in women, respectively. Moreover, smoking prevalence in all subjects was estimated 13.9% according to the meta-analysis of the initial study.

**Conclusion:** The findings of this meta-analysis revealed that a significant part of the general population over 15 years of age, and one fifth of Iranian male adults smoke. Thus, concerning causal relationship confirmed between smoking and most diseases, if suitable guidelines are not employed the diseases related to this factor will increase in Iran.

**Keywords:** Cigarette, Prevalence, Iran, Structured review, Meta-analysis

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## Introduction

Consuming narcotics is one of the main causes of preventable premature mortality throughout the world. It plays an important role in the global burden of the diseases. Cigarette smoking has a causal relationship with many diseases including oral, throat, lung, laryngeal, esophageal, bladder, kidney, pancreatic, cervical, and liver cancers.<sup>1-4</sup> In a 50-year study, it was concluded that non-smokers live ten years more than smokers.<sup>5</sup> According to existing scientific documents, not only is cigarette smoking bad for smokers, but also it is harmful for other people who are close to them.<sup>6</sup>

Cigarettes are significant risks factor for public health. Presenting numbers and figures of the prevalence of this risk factor in every society is an action which can play an important role in the making of policies and decisions to improve public health. Accordingly, numerous studies have been carried out in this regard all over the world. By reporting these results, we can present the capacity of this problem for the related authorities. For example in a report, the prevalence of smoking in Jordan, Pakistan, Qatar, and Saudi Arabia was 30%, 23%, 25%, and 20%, respectively. The same report showed that the prevalence of smoking was 12% in Iran.<sup>7</sup>

Initial electronic search and researchers' experience show that numerous studies have been conducted in the form of primary study or national projects (risk factors of non-communicable disease surveillance system) in different parts of Iran regarding prevalence of smoking. These studies have presented different levels of smoking prevalence. In a research in 1999, smoking prevalence for the Iranian population was 11.9%.<sup>8</sup> In a study carried out by Emami et al., 10.6% of adults were active smokers (they smoked every day).<sup>9</sup> One of the studies conducted in recent years showed that 14% of people in Iran use narcotics; men smoke 6 times more than women. Similarly, it was shown that smoking prevalence in Ilam, Yazd, Golestan, Sistan and Baluchistan, and Boushehr Provinces were 7.6%, 8.6%, 9.1%, 20.3%, and 21.2%, respectively.<sup>10</sup>

Presenting different results of smoking in the Iranian population causes all researchers, health authorities, and other organizations and enterprises to use various numbers and figures

based on the accessibility of information and their preference. Thus, health authorities doubt which results and studies to trust in their preventive programs. One of the most important research methods which help us gain an accurate estimation of the prevalence of a factor in society is a meta-analysis and structured review. Although meta-analysis was just used, in the past, in clinical work-measuring studies, it is now used to combine results of descriptive-analytical studies for various phenomena including different aspects of smoking by different researchers.<sup>11,12</sup>

No meta-analysis has been done to combine results of the prevalence of smoking in the general population of Iran. Therefore, researchers decided to present a reliable evaluation of the prevalence of smoking. This was done through extracting and collecting all available reports, documents, and studies using structured review methods, combining their results using meta-analysis, and by taking into consideration their limitations and the heterogeneity between them. In this case, evidence-based decision makings will be provided for programming and policy making.

## Methods

The present research is a meta-analysis and a systematic review to determine the prevalence of smoking among Iranian adults. Document review method was used in this research.

### *Research strategy*

In this research, to find studies published electronically between 21/03/2001 and 21/07/2012, articles published in foreign and domestic journals and theses available in Persian databases of "SID, Iranmedex, Magiran, Medlib, and Irondoc" and English databases of "Pubmed, Google Scholar, and World Health Organization (WHO) Site" were used. In this search strategy, Persian and English keywords and probable combination of keywords, main, and important words were used. The main keywords included cigarette, smoking, narcotics, tobacco, nicotine, Iran/Iranian, names of provinces of Iran, and operators "and" and "or" and their Persian equivalents. Search was done between 21/07/2012 and 24/07/2012. Moreover, the reference list of these studies was reviewed for more sensitivity and selection of more studies. Research evaluation was done randomly by one

of the researchers; no study was excluded.

To have access to results of the first step of non-communicable surveillance system in Iran, paper reports of these studies published in 2007, 2008, and 2009 were used. To have access to findings of studies carried out in 2004 and 2006 which were not available electronically, information related to the care system of non-contagious disease risk factor were used.

#### *Description of studies of risk factor of non-communicable disease surveillance system in Iran*

This study has been carried out since 2004 according to the recommendations of the World Health Organization to achieve valid and comparable data in national and international levels.<sup>13</sup> Its first phase finished in 2009 (five reviews in 2004, 2006, 2007, 2008, and 2009). It was a periodic study which used questionnaires. Samples were selected for the first time in all provinces of Iran using information available in databases of Post Coding and Geographical General Office of the Islamic Republic of Iran Post Company through a systematic approach and a multi-step cluster sampling method. In this study, sampling was done equally for men and women in the five age groups of 15-24, 25-34, 35-44, 45-54, and 55-64. In describing different statuses of smoking, the methods proposed by WHO were used; a person who smoked at least one cigarette a day (7 cigarettes a week) at the time of the study was considered an active smoker.<sup>14</sup>

#### *Study selection*

The full text or summary of all articles, documents, and reports obtained from our research were extracted. After studying titles, repeated items were excluded. It is worth mentioning that to avoid republication of results of studies of non-communicable surveillance system, findings were examined by researchers to recognize and exclude repeated studies. Then, articles were carefully studied by researchers and the relevant articles were selected and the irrelevant ones were excluded.

#### *Quality evaluation*

After the relevant studies were determined in terms of title and content, STROBE checklist content was reviewed.<sup>15</sup> Questions which covered different aspects of methodology including determining suitable sample volume, sampling

method, statistical universe, variable measuring methods, data collection tools, description of smoking criterion, statistical analysis, study geographic area, research objectives, suitable presentation of findings, and presentation of results based on objectives were determined to evaluate the quality of documents. Every question had one score. Every article which obtained at least 8 scores could enter meta-analysis.

#### *Data extraction*

Data was extracted by researchers in terms of article title, corresponding author, research year, total sample volume, sample volume in terms of gender, research place, smoking prevalence index, prevalence of smoking in terms of gender, age group, number of cigarettes smoked a day, and smoking criterion of study population. Then, data were entered into Excel program.

#### *Study inclusion criteria*

After the evaluation process and obtaining necessary scores, all Persian and English studies which had determined the prevalence of smoking in Iranian adults were selected.

#### *Study exclusion criteria*

After the initial research, irrelevant studies were excluded after their titles, abstracts, and full texts were studied. The quality of the remaining articles was evaluated using a checklist; those that achieved scores less than eight were also excluded.

#### *Analysis*

To analyze data, Stata Statistical Software (version 11; Stata Corporation, College Station, TX, USA) was used. Standard error of prevalence of smoking was calculated in every study according to the binomial distribution formula. Finally, Cochran's test was used to determine the heterogeneity index among studies. According to heterogeneity results (with Meta command in meta-analysis), random effects model was used to estimate the prevalence of smoking in the total general population in terms of gender. In addition, to minimize random scattering, point estimation of findings of all studies were calculated using adjusted analysis. Finally, meta-regression method was used to study the effects of variables which were determined as probable causes of heterogeneity in studies. Point estimation of smoking prevalence level was

estimated in forest plots, in which square size showed that the weight of every study and lines

on both sides indicate confidence interval of 95% (Figures 1 and 2).

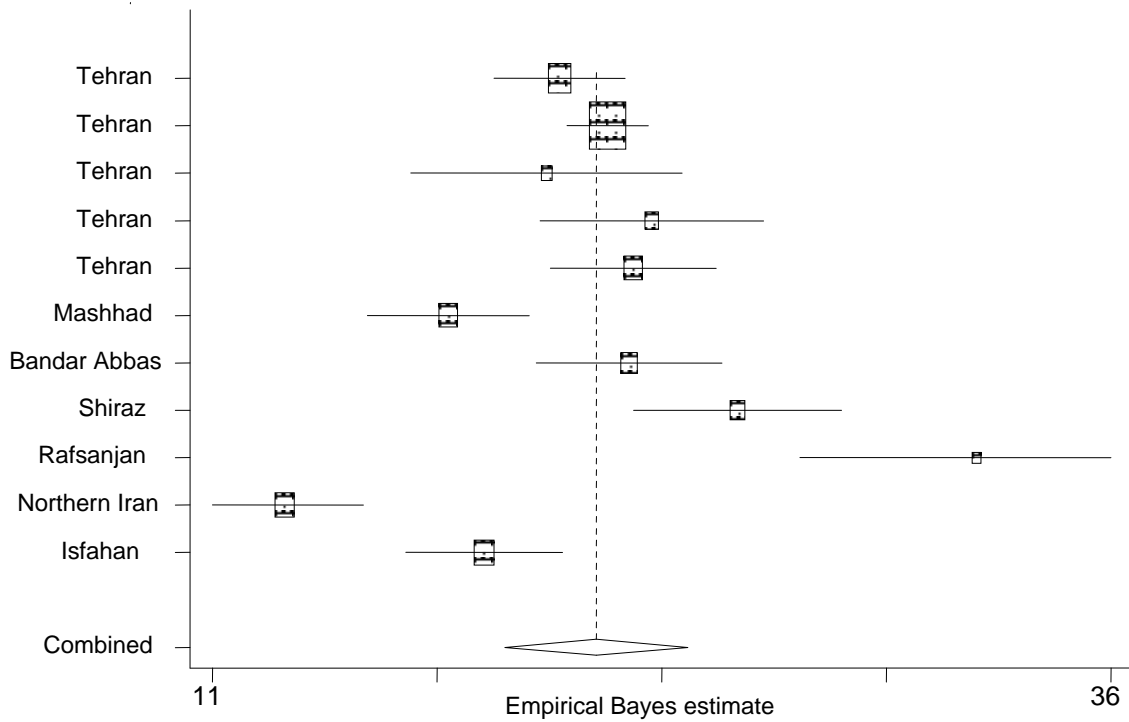


Figure 1. Difference between the estimated prevalence of smoking among men in each individual study and overall

This chart shows that the range in prevalence of smoking among men is 13.1-32.25% (based on Bayes analysis)

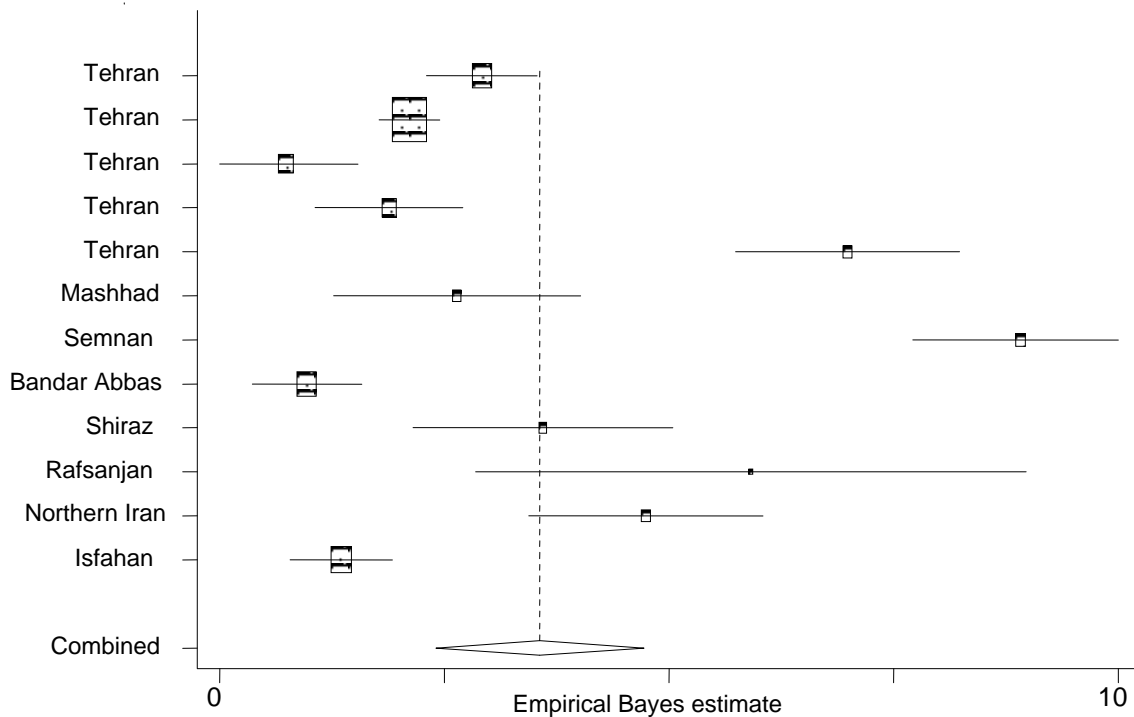


Figure 2. Difference between the estimated prevalence of smoking among women in each individual study and overall

This chart shows that the range in prevalence of smoking among women is 0.7-8.9% (based on Bayes analysis)

## Results

In this study, findings of 17 individual studies (Figure 3 and table 1) and a 5-year review of the risk factor of non-communicable disease surveillance system in 30 provinces of Iran were used according to search strategies.<sup>9,16-31</sup> It should be mentioned that 3 individual articles were published from results of the risk factor of non-communicable disease surveillance system; in order to prevent republication they were excluded.

Total sample volume of primary studies was 65588 (29036 men, and 34642 women). Nonconformity between total sample size and sample size in terms of gender is due to total sample volume has been reported only in two studies (Table 1).

Smoking was defined only in 6 studies; age group of subjects were determined in 88.2% of studies (in most cases, it was more than 15 years of age, except for two cases in which age was higher than 12 years). Average cigarette smoked by smokers was between 11 and 16.8 cigarettes a day (Table 1).

Of 17 individual studies, 1 (Ebadi, 2011) was carried out in all provinces of Iran and the remaining 16 were conducted in only 9 provinces (Tehran, Kerman, Isfahan, Ahvaz, Mazandaran, Khorasan Razavi, Shiraz, Semnan, and Bandar Abbas). 35.3% of the studies have been published since 2009 (Table 1).

Total prevalence of smoking in studies which were entered into this meta-analysis varied from 6.9% in a study by Estaji et al. (sample volume: 1570 subjects; age group: 15-65; city: Sabzevar; smoking criterion was not mentioned) to 30% in a study by Soori (sample volume: 1600 subjects; age group: 18-84; city: Ahvaz; smoking criterion was not mentioned).<sup>18,28</sup> Total estimation of smoking prevalence in this meta-analysis is 13.9% (10.2-17.6) based on random effect model (due to the presence of heterogeneity between studies  $P = 0.0001$ ,  $Q = 2745.8$ ) (Table 1).

In 11 studies which reported smoking prevalence in men, smoking prevalence varied from 12.3% in a study carried out by Moghimbeigi et al. (sample volume: 809 men out of 1745 subjects; age group: 15-20; area: north of Iran; smoking criterion was not mentioned) to 38.5% in a study by Esmaili-Nadim and Ahmadi (sample volume: 247 men out of 391 subjects; age group:

over 20; city: Rafsanjan; at least one cigarette a day during a year).<sup>29</sup> In this meta-analysis, smoking prevalence in Iranian men was 21.7% (19.1-24.1) based on random effect model; due to the presence of heterogeneity between studies (Table 1).

In 12 studies which reported smoking prevalence in women, smoking prevalence varied from 0.6% in a study carried out by Aryanpur et al.<sup>19</sup> (sample volume: 342 women out of 684 subjects; age group was not mentioned; city: Tehran; more than 100 cigarettes a day) to 9.8% in a study by Esmaili-Nadim and Ahmadi (sample volume: 144 men out of 391 subjects; age group: over 20; city: Rafsanjan; at least one cigarette a day during a year).<sup>29</sup> In this meta-analysis, smoking prevalence in Iranian women was 3.6% (2.4-4.7) based on random effect model; due to the presence of heterogeneity between studies (Table 1).

Using meta-regression single-variable analysis, variables which caused heterogeneity (publication year and quality evaluation score) entered the model. However, the effect of these factors was not significant statistically ( $P > 0.05$ ). After reviewing irrelevant studies and excluding them, meta-analysis was done again; in this case,  $Q$  level (heterogeneity) was reduced but not removed completely. Considering table 1 and by reviewing studies, it can be said theoretically that lack of using the same criterion to describe smoking is one of the most important probable reasons of heterogeneity.

In the first step of reviewing of risk factors of non-communicable disease surveillance system, which was done for five periods (2004, 2006, 2007, 2008, and 2009) on a national level in all provinces of Iran, results of 148 studies (considering results of every province in every step an independent finding) entered this meta-analysis. In these studies, 209404 Iranian subjects (50.2% men and 49.8% women, aged 15-64) who lived in cities and villages were studied; population distribution was equal in terms of gender and 5 age groups (15-24, 25-34, 35-44, 45-54, and 55-64).

Based on the results of the first step of risk factors of non-communicable disease surveillance system, the prevalence of smoking in Iranian men in 148 studies, carried out in five years, varied from 10.78% in Ilam (2009) to 32.4% in Hamadan (2007).<sup>13</sup> In this meta-analysis, total prevalence of smoking in men was 19.8% (19.01-20.7) (Table 2). Moreover, its prevalence among men aged 15-24

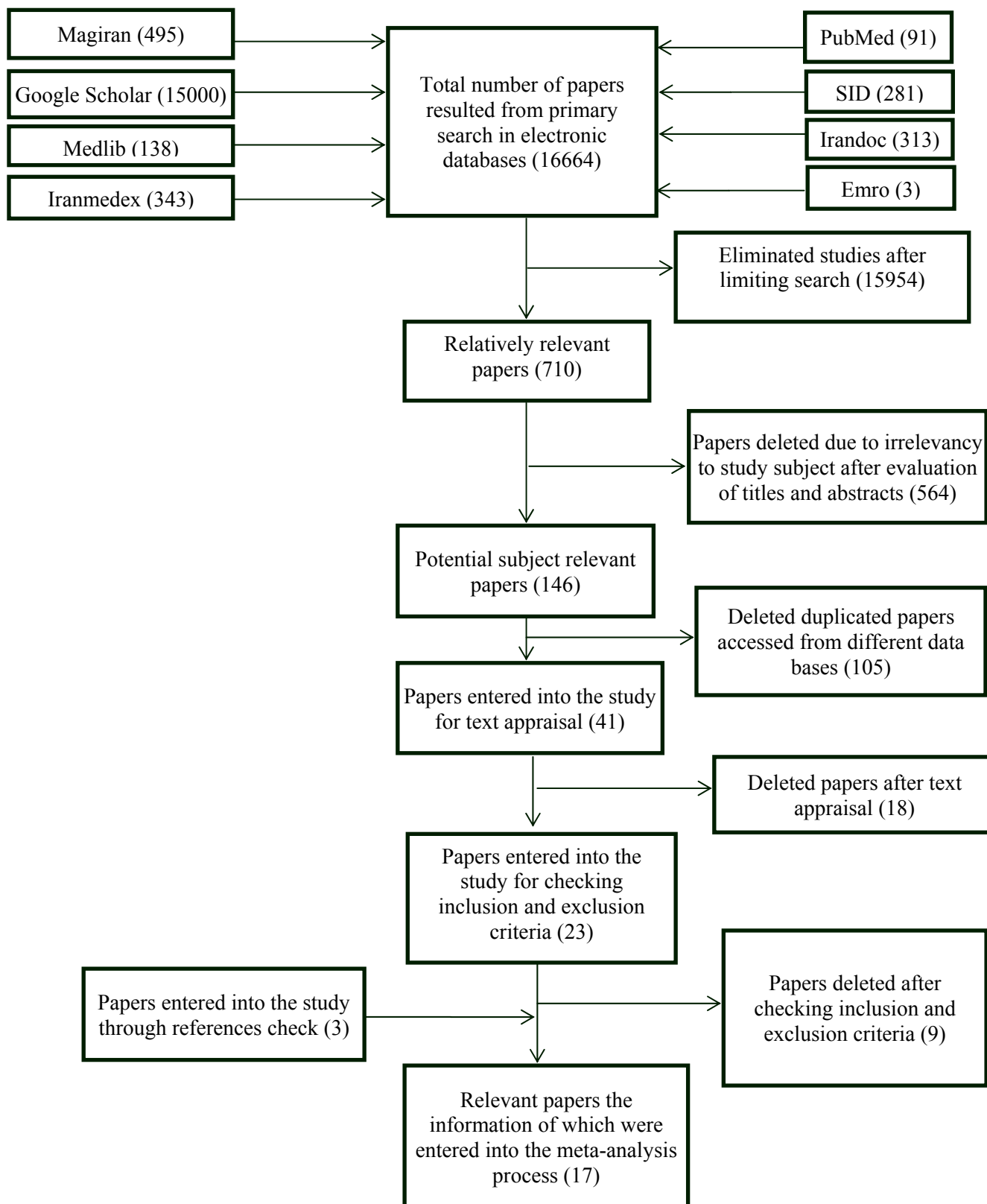


Figure 3. Search and analysis flowchart for selection of individual studies

Table 1. Description of the individual studies included in the meta-analysis and the pooled estimate of the prevalence of smoking

Reference	Year of Publication	Province	Sample size			Prevalence			Criteria based on the prevalence smoking	Age group (year)	Average number of cigarettes per day	Score
			Male	Female	Total	Male	Female	Total				
Fotouhi et al. <sup>16</sup>	2009	Tehran	1794	2771	4565	20.6	2.9	11.9	>100 cigarettes per day	> 15	11.6	12
Ebadi et al. <sup>17</sup>	2011	Total of Iran	13619	14045	27664	-	-	25.4	Indeterminate	18-65	-	11
Emami et al. <sup>9</sup>	2001	Tehran	5023	6778	11801	22.0	2.1	10.6	At least one cigarette a day	> 15	-	12
Estaji et al. <sup>18</sup>	2006	Sabzevar	741	829	1570	-	-	6.9	Indeterminate	18-65	-	10
Aryanpur et al. <sup>19</sup>	2009	Tehran	342	342	684	19.9	0.6	10.2	Daily consumption of cigarettes	-	-	10
Nouri et al. <sup>20</sup>	2004	Tehran	615	958	1573	23.5	1.8	9.7	Indeterminate	25-64	15.0	11
Eftekhari Ardebili et al. <sup>21</sup>	2007	Tehran	1177	1528	2705	22.8	7.4	14.1	Indeterminate	> 15	-	11
Boskabady et al. <sup>22</sup>	2011	Mashhad	999	436	1435	17.2	2.5	12.7	Indeterminate	> 10	-	10
Rashidipour et al. <sup>23</sup>	2010	Semnan	-	2104	2104	-	9.5	9.5	At least smoke a cigarette per day	30-70	-	8
Aghamollaei and Zare <sup>24</sup>	2008	Bandar Abbas	912	898	1810	22.7	0.9	11.7	Indeterminate	> 15	14.7	10
Ziaadini and Ziaadini <sup>25</sup>	2006	Kerman	847	823	1670	-	-	7.3	Indeterminate	> 12	11.0	10
Ahmadi et al. <sup>26</sup>	2001	Shiraz	782	553	1335	26.2	3.6	16.8	Indeterminate	16-90	13.4	10
Meysamie et al. <sup>27</sup>	2004	Babol	-	-	310	-	-	17.2	Indeterminate	-	16.8	8
Soori <sup>28</sup>	2003	Ahvaz	-	-	1600	-	-	30.0	Indeterminate	18-84	-	9
Esmaili-Nadim and Ahmadi <sup>29</sup>	2004	Rafsanjan	247	144	391	38.5	9.8	24.2	At least one cigarette a day for one Yr	> 20	12.1	9
Moghimbeigi et al. <sup>30</sup>	2009	North western provinces	809	936	1745	12.3	4.9	10.2	Indeterminate	15-20	-	9
Sarraf-Zadegan et al. <sup>31</sup>	2004	Isfahan	1129	1497	2626	18.3	1.3	8.8	At the time of the survey smoked cigarettes every day	≥ 19	-	12
Pooled estimate	-	-	29036	34642	65588	21.7 (19.1-24.1)	3.6 (2.4-4.7)	13.9 (10.2-17.6)	-	-	-	-
Heterogeneity (Random)	-	-	-	-	-	Q = 123.9 P = 0.001	Q = 264.5 P = 0.001	Q = 2745.8 P = 0.001	-	-	-	-

**Table 2.** The pooled estimate of the prevalence of smoking among 15- to 64-year-old Iranian people [based on the study data of surveillance system of non-communicable diseases (NCD)-risk factor in 2004-2009]

Gender	Sample size	Pooled estimate (random effect)		
		%	Q (Heterogeneity)	P
Male	105082	19.80 (19.01-20.7)	1258.5	0.001
Female	104322	0.94 (0.80-1.1)	1230.0	0.001

varied from 0% (Hormozgan, 2006) to 16.0% (Ilam, 2006); for men aged 25-34 it varied from 10% (Ilam, 2007) to 42.4% (Hamadan, 2008); for men aged 35-44 it varied from 14.7% (Ilam, 2006) to 55.1% (Hamadan, 2007); for men aged 45-54 it varied from 11.6% (Sistan and Balouchestan, 2004) to 57.3% (Hamadan, 2007); and for men aged 55-64 it varied from 9.9% (Boushehr, 2008) to 67.9% (Markazi, 2004).<sup>13</sup> According to results of this meta-analysis, total prevalence of smoking in men in age groups 15-24, 25-34, 35-44, 45-54, and 55-64 were 5.2%, 22.9%, 32.9%, 31.9%, and 25.4%, respectively.

Prevalence of smoking in Iranian women in studies carried out in five years on risk factors of non-communicable disease surveillance system varied from 0% in Ilam (2008) to 17.9% in Sistan and Balouchestan, (2004); in this meta-analysis, total prevalence of smoking in women was 0.94% (0.8-1.1) (Table 2). It was shown in 114 results of risk factors of non-communicable disease surveillance system that prevalence of smoking was 0% among women aged 15-24. In other studies, its prevalence varied from 0.3% (Zanjan, 2004) to 6.2% (Isfahan, 2004). 97 studies reported that smoking prevalence was 0% in women aged 25-34; in other results, it varied from 0.3% (Qom, 2004) to 19.1% (Isfahan, 2004). In 59 cases of results, its prevalence was 0% in women aged 35-44, while other studies showed that its prevalence fluctuated between 0.4% (Sistan and Balouchestan, 2004) and 20.8% (Isfahan, 2004).<sup>13</sup> In 37 studies, smoking prevalence was reported 0% for age group 44-55, while it was between 0.4% (Qom, 2004) and 30.7% (Markazi, 2004) in other studies. Finally, 32 studies revealed that smoking prevalence was 0% in women aged 55-64, while others reported that it varied from 0.9% (Esfahan, 2006) to 35.4% (Markazi, 2004). According to results of this meta-analysis, total prevalence of smoking in women in age groups 15-24, 25-34, 35-44, 45-54, and 55-64 was 0.23%, 0.50%, 1.03%, 1.80%, and 2.30%, respectively.

Publication year was entered into this meta-

regression model as a probable cause of heterogeneity. There was a reverse relationship between smoking prevalence and publication year in both men and women. In various studies carried out on men, this variable was insignificant in causing heterogeneity of smoking prevalence, while it was significant in studies on women. The results of assessing the source of heterogeneity for men were coefficient = -0.2, P = 0.300, and for women were coefficient = -0.4, and P = 0.001).

## Discussion

Results of the present meta-analysis showed that a great part of the general population over 15 years of age smoke every day. Almost all studies carried out in this regard have shown that smoking prevalence is completely different among men and women. According to this meta-analysis, smoking prevalence in men is 6.02 times more than that in women. However, a completely clear trend has not been observed in studies during the recent decade. It should be noted that smoking prevalence in men increases drastically after the age of 25, while it plummets after the age of 45. In women, however, there is a direct relationship between age and smoking and the maximum smoking prevalence is found in ages 55-65.

In spite of the high prevalence of smoking in adults in Iran, this estimation is less than the results found in countries like Malaysia, Singapore, Australia, China, Egypt, and Italy. However, it is more than the results of Saudi Arabia and Oman; and is similar to Pakistan (Table 3).<sup>32-40</sup> In an article extracted from findings of surveillance system of risk factors of non-communicable diseases in 2004, smoking prevalence was 15.3% in 15-64 year olds; this is higher than the results of this research.<sup>27</sup> By reviewing various provinces and regions of Iran, different levels of prevalence can be found. In a study by Emami et al. (Tehran), 10.6% of studied adults were active smokers.<sup>9</sup> In a study carried out in Tehran on 4565 participants, the prevalence of smoking was 11.9% (10.6-13.3).<sup>16</sup> Ebadi et al.



Table 3. The prevalence of smoking in other countries

Country	Islamic countries of EMRO region			Islamic country in developing Non EMRO region		Developed countries with western culture					
	Egypt <sup>34</sup>	Pakistan <sup>33</sup>	Oman <sup>40</sup>	Kuwait <sup>32</sup>	Saudi Arabia <sup>38</sup>	Malaysia <sup>39</sup>	China <sup>39</sup>	Singapore <sup>39</sup>	Australia <sup>39</sup>	Italy <sup>35</sup>	America <sup>36,37</sup>
Male	48.5%	25.4%	13.4%	34.4%	21.1%	41.0%	66.9%	26.9%	29.9%	30.0%	23.1%
Female	1.5%	3.5%	0.5%	1.9%	0.9%	4.0%	4.2%	3.1%	24.2%	22.5%	18.1%
Total	27.2%	19.4%	7.0%	17.0%	11.6%	-	-	-	-	26.2%	20.6%
Sample size	2120	13104	7011	3859	8310	-	-	-	-	3050	-

EMRO: Eastern Mediterranean regional office

reported that smoking prevalence was 25.4% in 18-65 year olds.<sup>17</sup> In another study, smoking prevalence in Tehran was 14.1%.<sup>21</sup> 11.7% of study subjects smoked in Bandar Abbas (people over 15 years of age), and 12.7% in Mashhad; most results match the results of this meta-analysis.<sup>22,41</sup>

Based on the meta-analysis of individual studies and meta-analysis of studies of the healthcare system, results of smoking prevalence in men were 21.7% (19.1-24.1) and 19.8% (19.01-20.7), respectively. These figures are similar to the findings of studies by Sarraf-Zadegan et al.,<sup>31</sup> Fotouhi et al.,<sup>16</sup> Boskabady et al.,<sup>22</sup> and Ahmadi et al.<sup>26</sup> In this research, smoking prevalence in the age group of 15-24 was less than the results of other studies (America: 43.7%; Brazil: 14.7%; Malaysia: 29.7%); this difference is a result of sociocultural factors.<sup>42</sup>

The highest prevalence was found in the age groups of 35-44 and 45-54. Figure 4 shows that differences observed in these two groups are not meaningful, but the prevalence of smoking in these two groups is statistically more significant than other groups. According to figure 4, smoking prevalence increases in age groups 15-24 to 35-44 and decreases in higher age groups; most studies confirm this trend.<sup>16</sup> Significant and meaningful differences between 25-34 and 15-24 year olds can be attributed to some factors like financial independence in older people, less control of their family over them, and their involvement in social networks. Decreased prevalence in higher ages can be a result of some factors including prevalence of diseases related to smoking, understanding the dangers of smoking, and higher mortality in this age group.

Based on the meta-analysis of individual studies and meta-analysis of studies of the healthcare system, results of smoking prevalence in women were 3.6% (2.4-4.7) and 0.94% (0.8-1.1), respectively. Significant and meaningful differences were observed in these two meta-analyses. Studies of the healthcare system focused on smoking prevalence and other risk factors, and there were many questions which focused on different topics rather than one. Therefore, participants answered the questions less carefully and some of them did not answer them. It was observed in this meta-analysis that smoking prevalence increased as women got older. The highest frequency was observed in women aged

55-64. Differences between prevalence of smoking in various age groups were meaningful in regards to the confidence interval determined for these levels (Figure 5). Different levels of prevalence have been reported in individual studies conducted in various parts of Iran by Fotouhi et al.,<sup>16</sup> Rashidipour,<sup>23</sup> Mehrabi et al.,<sup>43</sup> Ahmadi et al.,<sup>26</sup> and Boskabady et al.;<sup>22</sup> some of them are in accordance with the results of this meta-analysis and some are not. Some of these studies were carried out in remote areas and their description of smoking was the main reason for

this lack of agreement between the results.

Smoking prevalence among women in other countries must also be taken into consideration. Findings in table 3 show that smoking prevalence is different in women of different countries. According to this meta-analysis, smoking prevalence in women in Iran is higher than in Egypt, Kuwait, Saudi Arabia, and Oman, is similar to Singapore, Malaysia, and China, and is less than Italy, America, and Australia.

Among various age groups, smoking prevalence in men is significantly higher than that

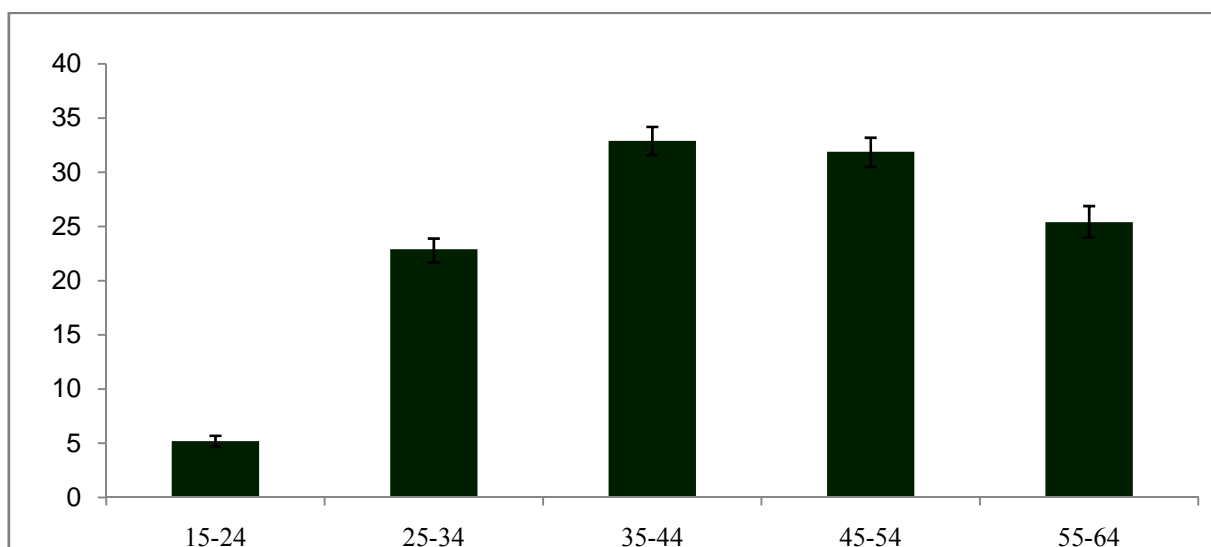


Figure 4. The pooled estimate of the prevalence of Smoking in men in different age groups and their 95% confidence interval [based on the study data of surveillance system of non-communicable diseases (NCD)-risk factors]

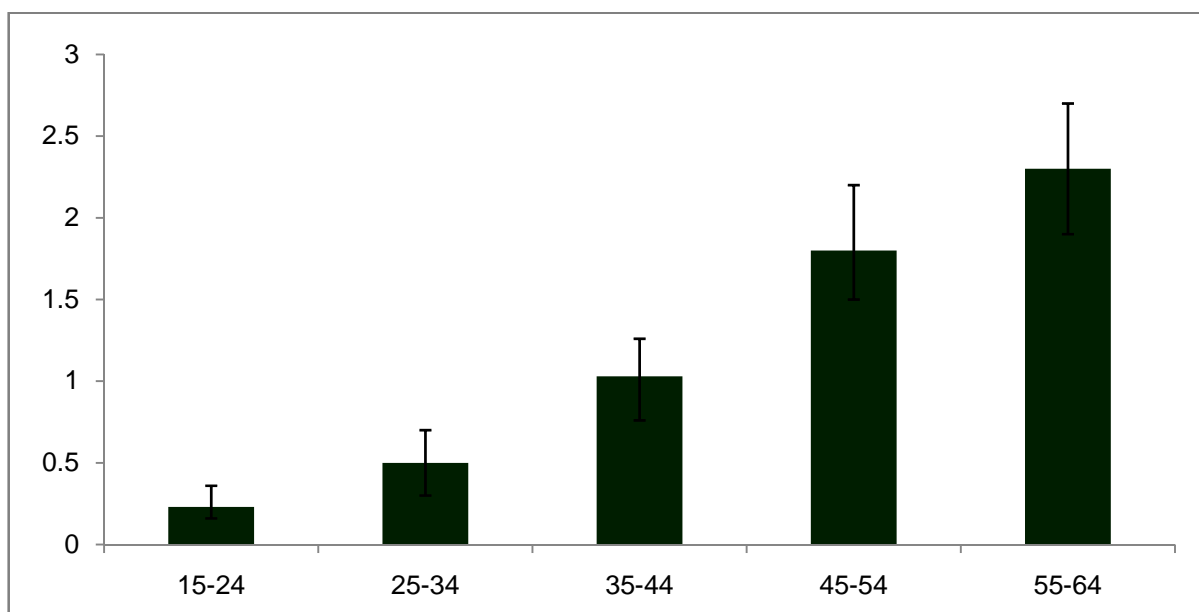


Figure 5. The pooled estimate of the prevalence of Smoking in women in different age groups and their 95% confidence intervals [based on the study data of non-communicable diseases (NCD)-risk factors]

in women. This is in accordance with studies carried out both in Iran and in other Islamic and traditional countries which have a similar culture to Iran (Table 3). In these cultures, differences among men and women are due to the fact that smoking is considered bad and unacceptable for women and that is why they mainly do not report their smoking habits.

Smoking pattern is influenced by different factors such as individual factors like age, sex, education, socioeconomic level, and social development.<sup>11</sup>In their study, Ebadi et al. showed that smoking prevalence increased by 2% for every unit of increase in age, while it decreases by 5% for every unit of increase in education. In regard to sex, men smoke 5 times more than women. Employees smoke 1.4 times more than retired employees and 2 times less than unemployed people. Concerning marriage, divorced people smoke more. These factors must be taken into consideration in various programs.

One of the main limitations of the present meta-analysis was related to the nature of the research, i.e. it was a secondary research and it was not possible to understand the agreement between the results of the primary studies. Moreover, heterogeneity was another restriction. It was not possible to recognize the sources of this heterogeneity, but it could be due to the difference in the criteria of different researchers in describing smoking, differences among interviewers and participants, filling the questionnaires according to their viewpoints, and differences in time, place and conditions of questions.

Concerning different methodologies used in individual studies, it is recommended that a

standard methodology be proposed for sampling method, study tools, and study method and a study be carried out periodically at a national level so as to provide a more comprehensive viewpoint in this regard. It is also suggested that more comprehensive programs and activities be implemented in all areas of Iran with regards to controlling narcotics including public and political supports, increased social pressures on inhibiting smoking, systematic education to understand risks of narcotics, and to make tobacco cessation programs a fundamental expectation and demand in society, and availability of effective cigarette-quitting interferences (counseling and medical therapy) with the aim of decreasing smoking prevalence among adults and decreasing the burden on public health by diseases related to smoking.

### Conclusion

According to the results of the present meta-analysis, one fifth of Iranian men and 2-3% of women have daily smoking habits. This pattern increases dramatically from the age of 30 and is similar to the pattern in Islamic countries in the eastern Mediterranean region. It is clear that smoking must be considered a serious risk factor in every society due to its confirmed effects on smokers and their relatives as passive smokers.

### Conflict of Interests

The Authors have no conflict of interest.

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## متاآنالیز شیوع مصرف سیگار در جمعیت ایران

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### مقاله مروری

### چکیده

**مقدمه:** مستندات زیادی در خصوص شیوع مصرف سیگار در ایران وجود دارد. بنابراین در این تحقیق به منظور فراهم نمودن اطلاعات مناسب جهت عرصه تصمیم‌گیری و سیاست‌گذاری و با متاآنالیز نتایج تحقیقات موجود، شیوع مصرف سیگار در ایران برآورد شد.

**روش‌ها:** روش مطالعه حاضر مرور مستندات بود که با جستجوی الکترونیکی کلید واژه‌های «Nicotine و Tobacco, Smoking, Cigarette» در پایگاه‌های اطلاعاتی انگلیسی و جستجوی معادل فارسی این واژه‌ها در پایگاه‌های اطلاعاتی فارسی و همچنین منابع غیر الکترونیکی، نسبت به دریافت اطلاعات اقدام شد. با بررسی و مطالعه عناوین و متن مستندات، موارد تکراری و غیر مرتبط حذف گردید. مطالعات دارای معیارهای ورود جهت انجام متاآنالیز وارد نرم‌افزار Stata نسخه ۱۱ شدند. بر اساس نتایج هتروژنیته از مدل اثر تصادفی برای برآورد شیوع کلی سیگار استفاده گردید.

**یافته‌ها:** در مطالعات اولیه و نظام مراقبت غیر واگیر، ۲۷۴۹۹۲ ایرانی بزرگسال از نظر مصرف روزانه سیگار مورد بررسی قرار گرفتند. در بین مطالعات اولیه، دامنه شیوع مصرف سیگار در مردان از ۱۲/۳-۳۸/۵ درصد و در زنان از ۹/۸-۰/۶ درصد متغیر بود. شیوع مصرف سیگار در مردان بر اساس متاآنالیز مطالعات اولیه و نظام مراقبت عوامل خطر بیماری‌های غیر واگیر به ترتیب ۲۱/۷ و ۱۹/۸ درصد و در زنان به ترتیب ۳/۶ و ۰/۹۴ درصد برآورد شد. همچنین، شیوع مصرف سیگار در کل جمعیت بزرگسال بر اساس متاآنالیز مطالعات اولیه ۱۳/۹ درصد تخمین زده شد.

**نتیجه‌گیری:** بخش قابل ملاحظه‌ای از کل جمعیت عمومی بالای ۱۵ سال و یک پنجم از جمعیت بزرگسال مردان ایرانی سیگاری هستند. بنابراین، با توجه به روابط علیتی ثابت شده بین مصرف سیگار با بسیاری از بیماری‌ها، در صورت عدم بهره‌گیری از راهکارهای مناسب، بار بیماری‌های مرتبط با این عامل در ایران افزایش خواهد یافت.

**واژگان کلیدی:** سیگار، شیوع، ایران، مرور ساختار یافته، متاآنالیز

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