

Prevalence of smoking in northwest Iran: a meta-analysis

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Abstract

Background: Tobacco addiction is a major cause of preventable death worldwide. Thus, efforts to eliminate its use have the potential of producing significant health benefits. The purpose of this study was to conduct a meta-analysis to estimate the prevalence of cigarette smoking among people in the age range of 15 to 64. The specific objective of this meta-analysis was to provide valid data that policy makers can use to make evidence-based decisions.

Methods: To determine the prevalence of smoking among the adult population in northwest Iran, we used reports published by the surveillance system used to assess the risk factors for non-communicable diseases in different provinces in northwest Iran for the years 2004 and 2006-2009. Several variables were extracted, including the years of study, gender, ages, and smoking prevalence. Based on the heterogeneity of the results, we used fixed or random effects models to estimate the overall prevalence of cigarette smoking. The analyses were performed using Stata 11 software.

Results: A total of 28,436 subjects (14,248 males and 14,188 females) in five age groups, i.e., 15-24, 25-34, 35-44, 45-54, and 55-64, were interviewed. Meta-analysis in men showed that, across the age groups, the lowest prevalence was 22.9%, the highest prevalence was 26.5%, and the average prevalence was 24.7%. Among women, the lowest prevalence was 0.3%, the highest prevalence was 0.8%, and the average prevalence was 0.5%.

Conclusion: We found that approximately one-fourth of males in the age range of 15-64 in northwest Iran smoked cigarettes daily. Therefore, it is necessary to conduct effective interventions to reduce the prevalence of addiction to tobacco in this area.

Keywords: tobacco, smoking, prevalence, Iran, meta-analysis

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1. Introduction

Cigarette smoking is one of the most important and pre-disposing risk factors associated with increasing the total burden of disease, especially chronic and non-communicable diseases, e.g., cancer and cardiovascular, cerebrovascular, and respiratory diseases. Based on the reports of the U.S. Center for Disease Control, the lung cancer mortality rates in men and women who smoke are 22 and 12 times greater than that of their non-smoking

counterparts, respectively; cigarette smoking is the most common cause of preventable deaths in the world (1-4). In a 50-year study by Dol et al., smokers' life expectancy was 10 years less than that of nonsmokers (5). Scientific evidence has shown that smoking is harmful for those who smoke as well as those who are exposed to second-hand cigarette smoke (6). Based on estimates provided by the World Health Organization (WHO), deaths related to smoking will have decreased by 9% in developed countries between 2002 and 2030, but such deaths are expected to double in developing countries over the same time period (7). During the 1990s, three million deaths annually were attributable to cigarette smoking, and 67% of those deaths occurred in developed countries. In the next two decades, this indicator will increase to 10 million deaths annually, 70% of which will be in developing countries (4, 7). Recent research has shown that 14% of the Iranian people use tobacco in some form, with a male-to-female ratio of 6:1. In this report, the prevalence of smoking was estimated in different provinces in Iran, e.g., Ilam (7.6%), Yazd (8.6%), and Golestan (9.1%), Sistan-Baloochistan (20.3%), and Booshehr (21.2%) (8). Other studies conducted in the central and eastern parts of Iran, reported the prevalence to be between 17 and 26% for males and between 0.5 and 5.9% for females, but only few studies have estimated the prevalence of cigarette smoking in the northern and western parts of Iran, and all of these studies were based on self-reporting questionnaires (9-17). The WHO also has indicated that the prevalence of smoking in developing countries, such as Iran, is increasing (18-21). To reduce the various smoking-related problems with effective interventions, investigations are required that use all available and valid data, including the results of primary and secondary studies, i.e., the pooled results of studies and surveillance conducted in Iran, particularly in northwest Iran. Since the national surveillance of the risk factors associated with non-communicable diseases has included all provinces in Iran in recent years, the collection and pooling of the results via meta-analysis could provide important data that policy makers could use to make evidence-based decisions. Hence, this study aims to estimate the prevalence of cigarette smoking among people in the age range of 15-64 through the use of meta-analysis as a first step in a five-year national surveillance project in the northwest provinces of Iran, including east and west Azarbajejan, Ardabil, and Qazvin.

2. Material and Methods

2.1. Selection of evidence

We used published reports that resulted from the first step of the non-communicable disease risk factors surveillance system in the northwest provinces of Iran for the years 2004 and 2006-2009. This national program was launched in 2004 in accordance with WHO's guidelines to investigate the situation and trend of risk factors for non-communicable diseases, such as smoking, unhealthy nutritional habits, low physical activity, hypertension, obesity/overweight, and diabetes mellitus among the population in the age range of 15-64. The first step of this national project was conducted in 2004 and 2006-2009. These national studies were conducted using standardized questionnaires. Sample selection in these studies relied on the Islamic Republic of Iran's post office database using a systematic approach and the one-stage cluster sampling method in all provinces. In each province, 50 postal codes were selected randomly as executive clusters (seeds). The 50 clusters in 2006-2009 included 20 subjects, but, in 2004, the number of clusters varied among the provinces. General information was collected through face-to-face interviews in the participants' homes.

2.2. Quality assessment

Since all reports selected for meta-analysis were conducted and published based on the standards of WHO with a similar methodology in all provinces of Iran, no quality assessment was necessary. All questionnaires and equipment for data collection in these surveillance projects were standardized based upon WHO's previously-validated protocols (19).

2.3. Data extraction

We extracted data based on the year of study, total sample size, and the sample sizes in the gender and age groups. Data entry was done using an Excel spreadsheet. The validity of the data was evaluated by two independent investigators who conducted some re-analysis of the raw data before conducting the statistical analyses.

2.4. Inclusion and exclusion criteria

Only the results acquired by the national non-communicable disease risk factors surveillance system (first step) over a five-year period in northwest Iran were included in the study.

2.5. Statistical analysis

Stata V.11 software was used for the analyses. Smoking prevalence and its standard error were calculated for each study based on the binary distribution formula. Tests of heterogeneity among the studies were calculated with a

Cochrane test (fixed model $p > 0.05$; random effects model $p < 0.05$), and the results were used to estimate the pooled prevalence of cigarette smoking in the total population (random effects model) and within the gender and age groups (fixed model in the age ranges of 15-24 and 35-44 due to non-significant Q statistics, and a random effects model was used in the others that had significant Q statistics). In addition, to reduce the effect of random variation, we used the Bayesian technique to estimate the pooled prevalence of smoking. Finally, using a meta-regression technique, the effect of variables that were susceptible to heterogeneity among the studies was investigated. The 95% confidence interval of prevalence was estimated and demonstrated using forest plots (Figures 1 and 2).

3. Results

Based on national census data from 2006, the total population of north-west of Iran was 8,772,081 (East Azarbaijan: 3,527,267, West Azarbaijan: 2,873,459, Ardabil: 1,228,155, Qazvin: 1,143,200), which constituted approximately 12.5 percent of Iran's total population. From this total population, a total of 28,436 people were interviewed (14,188 males and 14,248 females), and the interviewees included the following five age groups: 15-24, 25-34, 35-44, 45-54, and 55-64. The sample size in 2004 was 12,436 people, and, over the following four years, 4,000 people were recruited annually to participate in the study. The prevalence of cigarette smoking by males varied from 18.6% in Qazvin Province (2007) to 28.5% in West Azarbaijan Province (2008). The pooled prevalence (95% CI) of smoking by males in this meta-analysis was estimated to be 24.7%, with a range of 22.9 to 26.5%. By age and gender, the prevalence of smoking for males in the 15-24 age range varied from 3% in Qazvin Province (2004) to 13% in West Azarbaijan Province (2008); in males in the 25-34 age range, the prevalence of smoking ranged from 17% in Ardabil Province (2004) to 37.6% in Ardabil (2009); in males in the 35-44 age range, the prevalence of smoking ranged from 31% East Azarbaijan Province (YEAR) to 47.9% in Qazvin Province (2006); in males in the 45-54 age range, the prevalence of smoking ranged from 25.2% in East Azarbaijan Province (2007) to 52.5% percent in Ardabil Province (2007); and, in males in the 55-64 age range, the prevalence of smoking ranged from 19.6% in Qazvin Province (2006) to 44.4% in West Azarbaijan Province (2008). In females, the prevalence of cigarette smoking varied from 0% in Qazvin Province (2009) to 1.28% in West Azarbaijan Province (2008). The pooled prevalence of smoking in females was estimated to be 0.5%, with a range of 0.3% to 0.8%. Smoking prevalence varied less than 1% in females in the age range of 15-24; 0% to 1.3% in females in the 25-34 age range; 0% to 7.7% in females in 35-44 age range; 0% to 8.4% in females in the 45-54 age range; and 0% to 9% in females in the 55-64 age range. We added the year of the study in the meta-regression model if the heterogeneity of the studies was significant, and we found no significant effect of the year of the study on the heterogeneity of the results ($p > 0.05$).

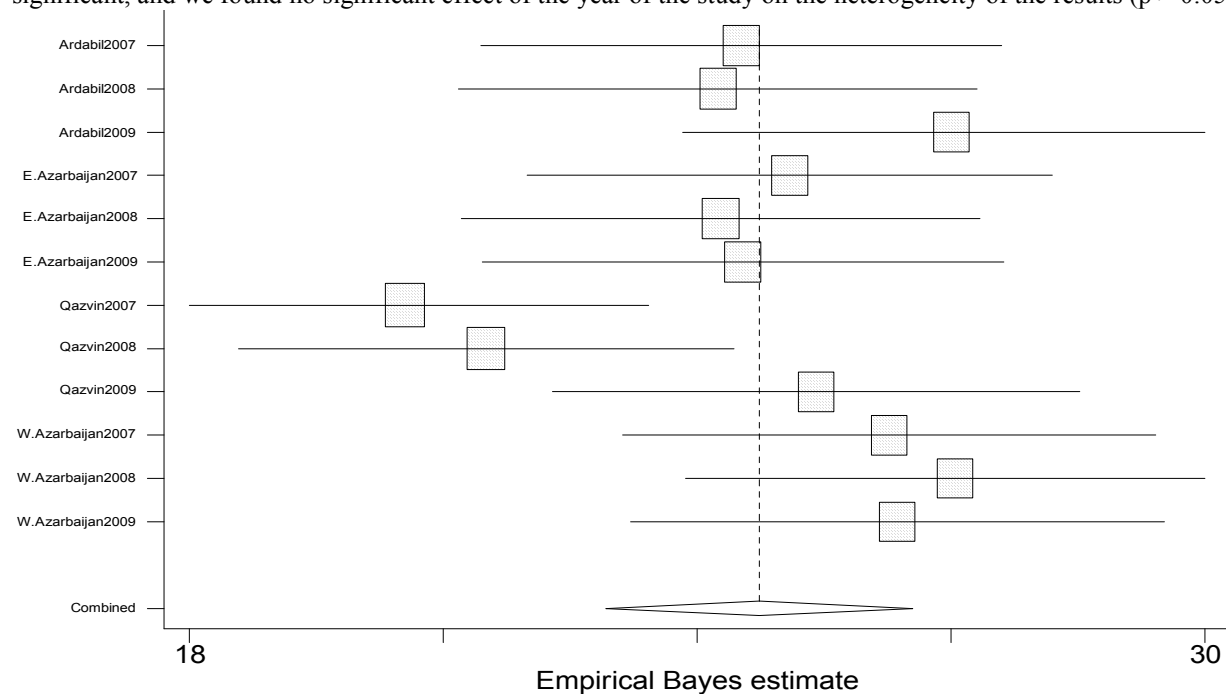


Figure 1. Individual and pooled estimates of the prevalence of smoking among males: This chart shows that the range of prevalence of smoking among males was 20.6% to 27.04% percent (based on Bayes analysis)

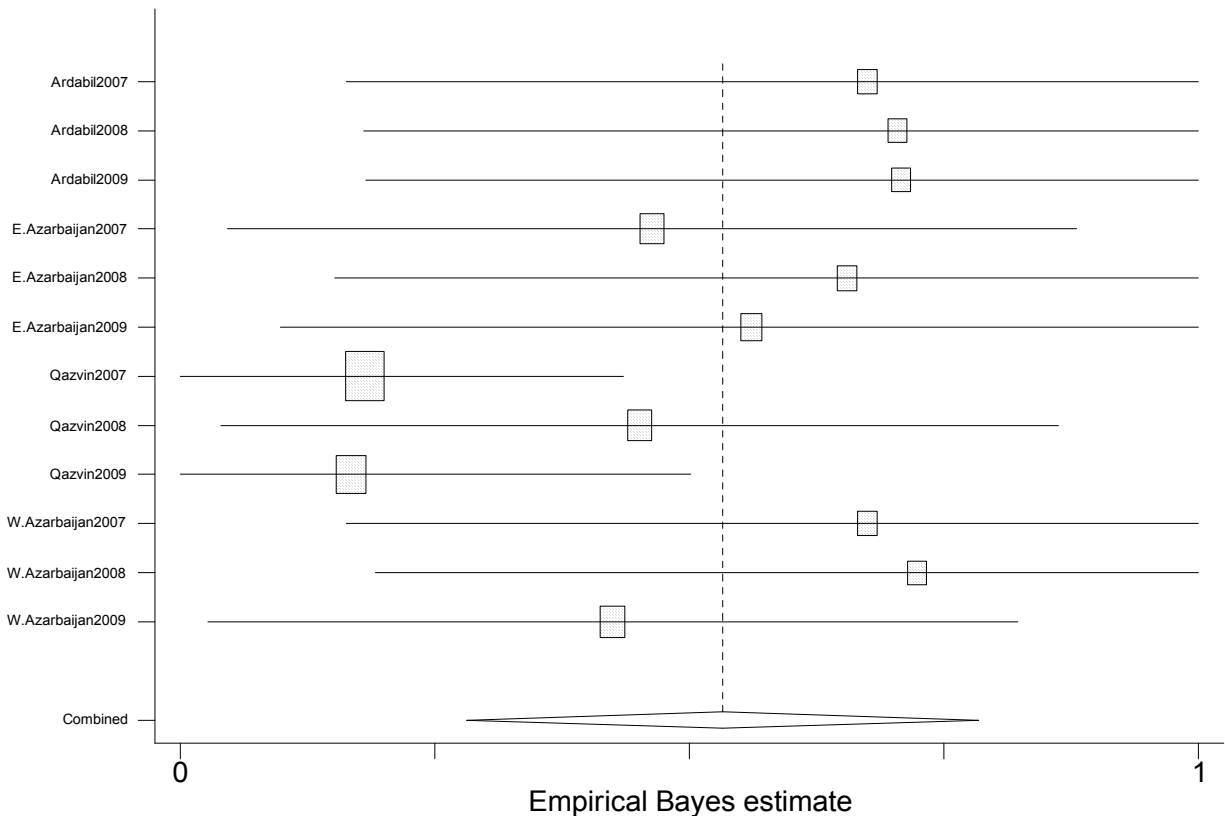


Figure 2. Individual and pooled estimates of the prevalence of smoking among females: This chart shows that the range of prevalence of smoking among females was 0.2% to 0.7% (based on Bayes analysis).

4. Discussion

Our meta-analysis showed that about 25% of male residents in northwest Iran were current cigarette smokers. If the prevalence of other smoking products, such as hookahs and pipes, were considered along with cigarette smoking, sizeable adverse effects would be expected among the people in this area. The prevalence of tobacco use seems to be greater than it is in other regions of Iran. For example, in a study of Isfahan Province (Sarrafzadegan, YEAR), it was found that, among 2626 people in the age range of 19 and up the prevalence of self-reported cigarette smoking in males was 18.7% (9). Two other studies conducted in Tehran reported the prevalence of smoking among men at 20.6% and 22% (10, 11). In the city of Mashhad (in northeast Iran), 17.2% of males (172 of 999 subjects) were current smokers, and the rates were higher among those with low incomes and low levels of education (12). In another study, about 26% of males in the city of Shiraz (southern Iran) were found to be smokers (13). These findings indicate that there is a high prevalence of cigarette smoking in males in all parts of Iran, including the northwest area, which was the focus of the current study. Our study also showed that people in the 15-24 age range smoked less than those in this age range in other countries, e.g., U.S.: 43.7%, Brazil: 14.7% and Malaysia: 29.7%, so the differences could be attributable to cultural and social factors (11, 14).

Most of the male smokers were in 35-44 and 45-54 age groups. Table 1 shows that there was a significant difference in smoking prevalence among men aged 15-24 compared to other age groups. This might have been partially due to the fact that most of these younger age groups are educated in schools and are under full control and supervision of their families and educational systems; they have had little opportunity for exposure in the community. The low financial authority of young people within families in Iran could be another reason. It has also been shown that the prevalence of smoking increased from the 15-24 to the 35-44 year old age groups, and, then, it decreased, which is in agreement with the results of most other relevant studies (11). This reduction could be due to cigarette-related diseases and mortality and better perception of its risks in the older age groups.

The estimated pooled prevalence of cigarette smoking among female residents of northwest of Iran was 0.5%; there was an increasing trend by age, with women in the 55-64 age range smoking more than women in the other age

groups. The rates in first three age groups were significantly different from those in older age groups. Some of the studies in different parts of Iran reported similar findings. Fotouhi et al. (2009) and Ebadi et al. (2011) reported that the prevalence of cigarette smoking by Iranian women was 2.9% and 2.1%, respectively (11, 15). The prevalence for females in the 30 to 70 age range in Semnan (northern Iran) was 0.5%, while Mehrabi et al. (2007) found that 5.9% of women in the 15 to 64 age range were smokers (16, 17). In Mashhad (northeast Iran), 2.5% of the women smoke cigarettes, while, in Shiraz (southern Iran), 3.6% of women smoke (12, 13). This relatively low prevalence of cigarette smoking in women is similar to other Middle Eastern and South Asian countries. For instance, a study in Pakistan showed that 5% of females in the 25-44 age range smoke and that 7.8% in the 45-64 age range smoke (22). In Egypt, 1.5% of females in the 15 to 80 age range smoke, and, in Kuwait, 1.9% of adult females currently smoke (23-24). Interestingly, the prevalence of cigarette smoking in female adults in Italy was 22.5%, and, in the U.S., it was 17.4% (25, 26). The current study has shown that smoking among women is less prevalent in Iran than in most other countries.

We also found that the prevalence of cigarette smoking in males was considerably more than that of women in all age groups. This pattern was similar in all other studies in Iran and in other countries, including China, Korea, European countries, and the U.S. (27-30). Patterns of cigarette smoking depend on different factors, such as age, gender, level of education, and socioeconomic class and development (10). Ebadi et al. (2011) showed that, with each year of increase in age, a 2% increase in the prevalence of smoking occurs and that each level of education decreases that prevalence by approximately 5%. Five times more males than females smoke cigarettes, employed people smoke slightly more than retired people, and people who are jobless smoke twice as much as people who are employed. He also reported that divorced people smoke more than any other category (15).

One of the main causes of variations in the results of different studies is likely due to the various definitions of smoking that are used, e.g., defining "smokers" according to the number of cigarettes smoked in a given time period, the duration of smoking, and time a person spends smoking each day. Another source of heterogeneity was the determination of prevalence based on the self-reporting of study subjects, which can lead to recall bias and interview bias. The magnitude of this bias is different in various populations, based on their socio-cultural situations and their levels of acceptance of smoking and the stigma associated with it. Thus, self-reporting was one of the main limitations in this study, because the socio-cultural situation and lack of social acceptance of smoking could have increased the probability of underreporting the prevalence of smoking in both genders (especially females) to a greater extent than in studies conducted in other countries. The method of data collection in the original surveillance project was based on the 'self-report' method and also face-to-face interviews, which are prone to respondents' biases. Unfortunately, no objective markers were used for verification of the real exposure to cigarette smoke. For example, in a recent study, the prevalence of smoking based on the 'self-report' method was 18.7% and 1.3% in men and women, respectively. But laboratory tests have shown that these rates were actually 21.2% and 6.7% percent, respectively (9). Therefore, we can expect that our reported prevalence is an underestimation for both males and females, but especially for females.

5. Conclusion

In this study, the prevalence of cigarette smoking was estimated using valid data and meta-analysis. Our estimation of the prevalence of cigarette smoking indicated that smoking continues to be a main health problem in the northwest provinces of Iran. Therefore, it is necessary for policy makers to conduct and support effective intervention with the goal of reducing the prevalence of smoking in these provinces.

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All of authors contributed to this project and article equally. All authors read and approved the final manuscript.

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