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Original Article

Prevalence of Chronic Bronchitis in the Northwest of Iran: Results of the Pilot Phase of the Azar Cohort Study

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Abstract

Background and aims: Although chronic bronchitis is markedly under-diagnosed in the general population, it has a significant impact on the health status and the well-being of patients as well as healthcare resource consumption. This study aimed to determine the prevalence of chronic bronchitis and its correlates in the northwest of Iran.

Methods: In 2014, all residents aged 35 and over in Khameneh city, East Azerbaijan, were invited to participate in the pilot phase of the Azar cohort study. The respiratory symptoms questionnaires were filled out by two trained general practitioners. Participants with a cough and phlegm on most days during at least three successive months in the previous two years were classified as chronic bronchitis group. Chi-square test was used to compare the chronic bronchitis and smoking status between males and females.

Results: A total of 1036 participants were interviewed, 1006 of whom had completed a respiratory questionnaire, from them 544 (54.1%) were females, and 462 (45.9%) were males. The mean age was 52.5 ± 10.5 years. The prevalence of smoking was 16.2%. According to the chronic bronchitis definition, 24 (2.4%) subjects were classified with chronic bronchitis, and the prevalence was higher in the males (4.1%) than that in the females (0.9%). The prevalence was higher among the active smokers and ex-smokers compared to non- smokers (8.6% and 4.1% vs. 0.8%). The prevalence of cigarette smoking was 16.2% and it was higher in the males than that in the females (33.5% vs. 1.5%).

Conclusion: the prevalence of chronic bronchitis in the population of the region under study was relatively low in comparison to the other parts of Iran and its prevalence was higher in the males than that in the females.

Keywords: Chronic bronchitis, Prevalence, Smoking, Cohort study

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Introduction

Chronic bronchitis (CB) implies the chronic inflammation of the bronchi which causes the swelling and irritation of the respiratory pathways as well as increased mucus production.[1] It does not necessarily imply the presence of infection.[2]

CB is a common disease among the general population, especially among the middle-aged and elderly groups.[3,4] It affects not only about a third of the patients with chronic obstructive pulmonary disease (COPD), but also occurs in the individuals with normal lung function.[5] The estimates indicated that the incidence of CB has been increasing, particularly in developing countries.[4] CB accounts for high morbidity and mortality throughout the world, though it is a preventable disease.[6]

The most common cause of CB, cigarette smoking, increases the risk of getting CB during the smokers' lifetime, as over 40% of the smokers develop CB.[7] Air pollution and dust, or toxic gases in the environment or workplace, and low socioeconomic status can also contribute to the condition.[6,8] Various reports have been received from different parts of Iran on the prevalence of CB. For example, in the study of Golshan and colleagues conducted in 2001, the prevalence of CB was 4.66%,[9] but in another study conducted in 2011, the prevalence was increased to 8.18%.[10] Moreover, in a study in Tehran, the prevalence of CB was reported high (10.9%),[11] while in the study of Amra and Hashemiin Shahrekord, the prevalence was reported low (1.8%).[12] According to the result of a meta-analysis in 2016, the prevalence of CB in Iran was 5.57%.[11] There are limited studies about the prevalence of CB and cigarette smoking status in East Azerbaijan; in this regard, this study may help to determine the extent and burden of CB in the region. Therefore, this study aimed to determine the prevalence of CB and cigarette smoking in the adults of Khamaneh city,

East Azerbaijan, and the smoking status in the subjects who had CB.

Methods

The present study was conducted based on the pilot phase of the Azar cohort study. The Azar cohort study is the state-level of a nationwide cohort study entitled "PERSIAN Cohort Study' in Iran that launched in 2014 in different geographical regions of Iran.[13] The Azar cohort study has been conducted by Tabriz University of Medical Sciences in Shabestar, a county located in the province of East Azerbaijan. All adults aged 35 to 70 years were invited to take part in this study if they met the inclusion criteria (permanent resident of the city, ability to respond to the questions, being Iranian). The pilot phase of the Azar cohort study was conducted in Khameneh, one of the cities in Shabestar county, between October 2014 and January 2015. All residents of Khameneh who were 35 years old and older (n= 1236) were invited by phone to participate in the pilot phase of the study. The respiratory symptoms questionnaires were filled out by 2 trained general practitioners. For epidemiological purposes, CB was only diagnosed through the questionnaire.[14] The respiratory symptom questions were extracted from the Framingham's questionnaire (original cohort-exam 29- form, and generation 3 exam 1 & 2-form).[15] The questionnaire contained the information about the respiratory symptoms (e.g., dyspnea, cough, sputum production, and cough duration), exposure to potential risk factors such as smoking, occupational exposures, respiratory diseases, comorbidities, medication history, and health status. Spirometry was also done to all those for whom the questionnaires were filled out, but due to technical issues, spirometry data were not used.

Respiratory physical examinations were also carried out. The diagnosis of CB was only made when the physician was satisfied that the patient had a chronic productive cough for at least 3 consecutive months in the previous 2 years.[16,17] The following questions were asked from the study subjects: "Are there months in which you cough on most days?", "Is your cough persistent or intermittent?", "Do not you cough most days for 3 months every year?", "For how many years have you had this cough?", "Do you have a productive cough or a dry cough?" and "Has your doctor ever said you have had CB?"

Smoking status was classified as non-smoker (someone who never smoked or smoked fewer than 100 cigarettes in his/her lifetime), ex-smoker (someone who has not smoked for 6 months and more), and current smoker (someone who currently smokes one or more cigarettes per day). Age was classified into 3 categories: <45, 45-65, and >65 years old.

Statistical Analysis

Descriptive statistics were calculated for all variables. Quantitative variables were presented as the mean ± standard deviation (SD), and categorical variables as numbers with a percentage. The distribution of mean age was not normal (normality was checked with Kolmogorov-Smirnov test). Therefore, the Mann-Whitney U test was used to compare the mean age between the males and females. Chi-square ($\chi 2$) test was also used to compare the age group, smoking status, and CB between the males and females. Factors associated with the presence of CB symptoms were examined by univariate and multivariate logistic regressions, with the following covariates as potential risk factors such as age, sex, smoking status, and exposure to passive smoke. SPSS software version 15.0 (SPSS Inc., Chicago, Illinois, USA) was used to analyze data. A *P* value less than 0.05 was regarded as statistically significant.

Results

A total of 1236 adults aged 35 to 70 were invited to participate in the Azar cohort study. A number of 1038 people participated in the study (with 84% participation rate) and the respiratory questionnaire was completed for 1006 individuals. Of the 1006 individuals, 544 (54.1%) were female and 462 (45.9%) were male. The mean age was 52.5 ± 10.5 years. A history of current or past smoking was more frequent in the males than that in the females. Of all participants, 163 (16.2%) were smokers; out of which, 155 (33.5%) were male and 8 (1.5%) were female; 99 (9.8%) were ex-smokers. The prevalence of CB (in adults aged ≥35 years) was 2.4% and was higher in the males (4.1%) than that in the females (0.9%) (Table 1).

Seventy-nine percent of the individuals who had CB were male. The prevalence of CB was higher among the active smokers and ex-smokers compared to non-smokers (8.6% and 4.1% vs. 0.8%). The prevalence of cigarette smoking was 16.2% and was higher in the males than that in the females (33.5% vs. 1.5%). Furthermore, hookah smoking was higher in the males than that in the females (3.5% vs. 0.6%) (Table 2).

The frequency of respiratory symptoms in the present study population is presented in Table 3. The most commonly reported respiratory symptoms were dyspnea, cough, sputum production, and wheeze, respectively.

Table 4 shows the unadjusted odds ratios associated with each variable and those adjusted odds ratios with some variables in the model including age, gender, and smoking status.

Although in univariate logistic regression analysis, the relation between sex and CB was positive and significant (Odds ratio [OR]=4.62, *P*= 0.003), that is, the chance of CB was 4.6 times higher in the men than that in the women, in the multivariate analysis, this relation was not significant (OR=1.85, *P*= 0.30). In the univariate analysis, the relation between old age (>60 years old) and CB was not statistically significant (OR= 2.76, *P*= 0.99), but it was significant in multivariate analysis (OR=4, *P*=0.04). Both univariate and multivariate analyses revealed that CB was related to the cigarette smoking (*P*<0.05) and the chance of CB in the current smokers was 12.5 times higher than that in the non-smokers (OR= 12.5, *P*<0.001). Our results showed that there was no relationship between hookah smoking, a local form of smoking known as Ghalian, and CB, because the

Table 1. Characteristics of the Study Population

Variables	Total Number (%)	Number of Males (%)	Number of Females (%)	*P* Value
Number of participants	1006	462 (45.9)	544 (54.1)	-
Age (mean± SD)	52.5±10.3	53.42±10.47	51.72±10.22	0.003
Age groups				0.108
<45 years old	269 (26.7)	110 (23.8)	159 (29.2)	
45-65 years old	616 (61.2)	290 (62.8)	326 (59.9)	
>65 years old	121 (12)	62 (13.4)	5 (48.8)	
Smoking habits				
Smoking history (+)	262 (26)	250 (54.1)	12 (2.2)	<0.001
Current smoker	163 (16.2)	155 (33.5)	8 (1.5)	<0.001
Ex-smoker	99 (9.8)	95 (20.6)	4 (0.7)	<0.001
Never smoker[a]	744 (74)	212 (45.9)	532 (97.8)	<0.001
Passive smoker at home	166 (16)	22 (13.3)	144 (86.7)	<0.001
Passive smoker in childhood[b]	493 (49)	255 (55.3)	238 (43.8)	<0.001
Hookah smoker	19 (1.8)	16 (3.5)	3 (0.6)	0.001
CB	24 (2.4)	19 (4.1)	5 (0.9)	0.001

Abbreviations: SD, standard deviation; CB, chronic bronchitis.
[a] Someone who never smoked or smoked fewer than 100 cigarettes in their lifetime; [b] Someone who had exposure to parental smoking.

frequency of hookah smoking was zero among our patients with CB.

Discussion

CB, which is markedly under-diagnosed in the general population, has a significant impact on the health status and well-being of patients, and the healthcare resource consumption.[18-20] The prevalence of CB varies from country to country. On average, CB is seen in 3.4% to 22.0% of adults. This various estimation of CB prevalence may be due to various CB definitions (i.e., chronic sputum versus chronic cough and sputum).[2] In the patients with COPD, the prevalence of CB is higher, affecting 14% to 74% of all the patients with COPD.[21] In a 30-year longitudinal study on middle-aged men, the cumulative incidence of CB was 42% in current smokers, 26% in ex-smokers, and 22% in never smokers.[22] In a survey conducted to determine the burden of CB in the general population of France, the results showed that the prevalence of CB was 3.5% among the French population aged ≥40 years [20]. In Canada, the prevalence of CB in adults was 2.5%.[1] However, in India, the prevalence among the individuals aged ≥40 years was higher compared to the individuals aged <40 years (10% vs. 8.5%).[23] A survey in Finland showed that during the last 3 decades (between 1986 and 2007), the prevalence of CB decreased from 19% in 1982 to 13% in 2007 (*P* for trend <0.001).[24]

In Iran, the studies conducted in Shahrekord and Isfahan revealed that the prevalence of CB was 1.8% and 8.1%, respectively.[10,12] During the period between 1999 and 2010 in Isfahan, the prevalence of CB significantly increased. The causes of this phenomenon might be related to the increased air pollution both from traffic sources and industries.[9,10]

Table 2. Prevalence of Chronic Bronchitis Adjusted by Smoking, Sex, and Age

Variables	No. of Subjects	Prevalence of CB (%)	*P* Value
Total	1006	2.4	
Smoking habits			<0.001
Current smoker	163	8.6	
Ex-smoker	99	4.1	
Never smoker	744	0.8	
Gender			0.001
Male	462	4.1	
Female	544	0.9	
Age			0.11
<45 years old	269	1.5	
45-65 years old	616	2.3	
>65 years old	121	5.0	
Male with age			0.14
<45 years old	110	1.8	
45-65 years old	290	4.1	
>65 years old	62	8.1	
Female with age			0.63
<45 years old	159	1.3	
45-65 years old	326	0.6	
>65 years old	59	1.7	

Table 3. Prevalence of Respiratory Symptoms in the Study Population (n = 1006)

Respiratory Symptoms	Number (%)
Dyspnea	88 (8.7)
Sputum production	30 (3)
Cough	66 (6.6)
Dry cough	40 (4)
Persistent cough	9 (0.9)
Intermittent cough	52 (5.2)
Wheeze	14 (1.4)

Table 4. Relationship Between Chronic Bronchitis, Sex, Age, and Smoking (n = 24)

Variables	Total	Unadjusted		Adjusted	
		Odds Ratio	*P* Value	Odds Ratio	*P* Value
Gender					
Male	19	4.62	0.003	1.85	0.30
Female	5	Reference			
Age					
<45 years old	5 (20.8%)	Reference		Reference	
45-65 years old	13 (54.2%)	1.14	0.79	1.43	0.53
>65 years old	6 (25%)	2.76	0.99	4.00	0.040
Smoking habits					
Smoking history (+)	18	9.07	<0.001	8.61	0.002
Smoking history (-)	6	Reference	-	Reference	-
Current smoker (+)	14	7.82	<0.001	6.19	<0.001
Current smoker (-)	10	Reference	-	Reference	-
Ex- smoker(+)	4	0.44	0.16	0.31	0.058
Ex- smoker (-)[a]	14	Reference	-	Reference	-
Ex-smoker	14	5.25	0.011	4.36	0.071
Current smoker	4	11.76	<0.001	12.5	<0.001
Never smoker	6	Reference	-	Reference	-
Passive smoking history					
Passive smoker in childhood(+)	13	1.23	0.613	1.08	0.84
Passive smoker in childhood(-)	11	Reference	-	Reference	-

[a] ex-smoker (-) = current smoker.

The findings of a meta-analysis in Iran showed that the prevalence of CB was 5.6%. However, in the present study, the prevalence of CB among Khameneh adults was found to be 2.4% based on clinical symptoms. Given the fact that Khamene is a small city with low air pollution, the low prevalence of CB in this city is justified.

In comparison, the prevalence of CB in the different parts of Turkey, a neighboring country of Iran, was higher than that in this study (11.7% in Istanbul, 17.7% in Ankara, 13.5% in Kayseri). One reason for this finding may be related to the higher consumption of biomass fuels in these areas[4]. In places where women use biomass fuels for cooking, the prevalence of respiratory symptoms and CB is higher.[25]

Many studies have demonstrated that CB affects men more than women.[26,27] Studies conducted on the American and Chinese population showed that male gender was more associated with the presence of CB.[28,29] On the contrary, according to the report of the National Center for Health Statistics (2009), 67.8% of the patients with CB were women.[28] In some rural areas where women encountered domestic smoke pollution during cooking, this rate was even higher.[14] Our findings showed that the higher prevalence of CB in men was statistically related to higher smoking in them.

In a survey conducted in the US, the highest prevalence of CB was seen among the subjects aged 65 and older,[28] but in our study, the highest prevalence was observed among middle-aged people. Although smoking is the most important risk factor for CB, and as mentioned earlier, the 30-year cumulative incidence of CB among current smokers is 42%,[22,30] factors other than smoking may also contribute to CB including exposure to inhalation of biomass fuels, chemical gases, and dust.[31,32] Smoking cessation can decrease cough in many patients with CB by improving mucociliary function and by decreasing goblet cell hyperplasia.[33] An extensive longitudinal follow-up study found that the incidence rate of CB was much higher in current smokers compared to ex-smokers (42% vs. 26%).[22,34]

In a review article about cigarette smoking in Iran, the prevalence of cigarette smoking in Iran was found to range from 0.4% to 41%,[35] and the result of a meta-analysis in Iran showed that one-fifth of Iranian men (20%) and 2%-3% of women have daily smoking habits. According to this meta-analysis, smoking prevalence among Iranian women is higher than that in some Islamic countries such as Egypt, Kuwait, Saudi Arabia, and Oman, and is similar to Singapore, Malaysia, and China; although it is lower than Italy, America, and Australia.[36] Due to some cultural pressures such as stigma, in Iran and other Islamic countries, the prevalence of cigarette and hookah smoking among women in all age groups is significantly lower than that among men.[36- 38] In the present study, the prevalence of smoking among women was also very low (1.5%) in comparison to men (33.5%). Indeed, one-third of men in Khameneh city were smokers. The prevalence of hookah smoking in this population was low (1.8%) because the hookah smoking culture in the northwest of Iran is less common.

Given the fact that smokers start smoking from adolescence and early adulthood,[39,40] if these age groups were included in our study, the prevalence of smoking would be higher than our estimate. Tobacco use is a risk factor for 6 out of the 8 leading causes of death, such as heart disease, several cancer

types, and lung diseases[41]; therefore, it is necessary to take steps to reduce tobacco use in all age groups.

Conclusion

The prevalence of CB among adults in Khameneh city was slightly lower than that in other cities of Iran, such as Isfahan and Tehran. One reason for this difference might be high levels of air pollution in these big cities. However, the prevalence of smoking in Khameneh is high, because one-third of the men in the city are smokers. Given the importance of smoking as a major risk factor for several diseases and cancers, it is imperative that the authorities take preventive measures to reduce smoking in all age groups.

Ethical Approval

This study received approval from the Ethical Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1393.230).

Conflict of Interest Disclosures

None.

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