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Risk factors of chronic obstructive pulmonary disease in men and women in Sanandaj, Iran

Naseh Sigari[1], Fatemah Alhani[2], Jamal Seidi[3], Ghader Salehnejad[4], Alireza Gharib[5], Roshani Daem[6]

1 Department of Internal Medicine, School of Medical Sciences, Kurdistan University of Medical Sciences, Sanandaj, Iran
2 Associate Professor, Department of Nursing, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran
3 Department of Nursing, Kurdistan University of Medical Sciences, Sanandaj, Iran
4 Department of Nursing, Kurdistan University of Medical Sciences, Sanandaj, Iran
5 Deputy of Research and Technology, Kurdistan University of Medical Sciences, Sanandaj, Iran
6 Assistant Professor, Department of Biostatistics and Epidemiology, School of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran

Original Article

Abstract

BACKGROUND: Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of death in the world. While smoking has been identified as the main cause of COPD in many studies, other causes may include environmental pollution and genetic vulnerability in both genders. Considering lifestyle of rural women, and the old structure of Sanandaj (Kurdistan Province, Iran) which is different with other parts of the country, this study compared the risk factors for COPD in men and women.

METHODS: In a descriptive, analytic study 400 subjects of both genders (200 female and 200 male) were evaluated. The files of patients with COPD admitted to Besat Hospital (Sanandaj, Iran) during 2006-11 were randomly selected using a systematic sampling method. The sampling continued until a total of 200 patient files were collected in each group. Eventually, data was analyzed with SPSS.

RESULTS: Smoking was the major risk factor (56.5%) for COPD in both men and women (n = 226). While only 32.5% of women (n = 65) had a history of smoking, the rate was as high as 80.5% in men (n = 161). Most women (60.5%) were more exposed to fossil fuel smoke than men. Fisher's exact test results showed a significant difference in the risk factors (including Smoking and tobacco use, Exposure to fossil fuel smoke and air pollution) and the type of jobs between the two genders.

CONCLUSION: Based on the results of our study, it is better to obtain an accurate history of exposure to smoke of wood or biomass and a history of residing in rural areas as the main risk factors for developing COPD in patients who have no history of high-risk occupations or other risk factors of the disease (e.g. smoking).

KEYWORDS: Chronic Obstructive Pulmonary Disease, Epidemiological Study, Risk Factors

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Introduction

Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of death in the world. Regardless of gender, tobacco use is the major cause of COPD. However, other causes may include air pollution and genetic susceptibility.[1,2] Several studies have suggested fossil fuel fumes as an etiologic factor for development of COPD. This association has been reported to be significant in females. Fossil fuels like firewood, charcoal, animal waste, and plants are used in baking, cooking, heating, and

Corresponding Author:
Fatemah Alhani
Email: alhani_f@modares.ac.ir

home lighting.[3] In developing countries, fossil fuels are the main cause of indoor pollution and studies have shown that the inhalation of these pollutants are responsible for lung diseases, particularly COPD.[4]

A great deal of recent research in developing countries has reported symptoms of obstructive lung disease in persons without previous history of cigarette smoking or occupational or industrial exposure. Bronchoscopic procedures revealed black particles in the airways of these patients (anthracosis). Since most of these patients have been in contact with fossil fuels, pollutants inhaled from such fuels could be the main culprit of COPD.[5-10] The majority of the mentioned studies have been performed in developing countries such as Turkey, Iran, India, Mexico, Bolivia, Tanzania, Kenya, Nepal, China, and rural areas of South Korea.[11-20]

The incidence of obstructive lung disease after exposure to fossil fuels occurs mainly in women. In 2009, some cases of COPD with anthracosis were reported. They were mostly rural women with long-standing history of exposure to fossil fuels.[4] Based on numerous clinical experiences, COPD is observed in non-smoking women as well.[4] However, in 2008, Seidi found the majority (97%) of patients with COPD and a history of smoking in Sanandaj (Kurdistan Province, Iran) to be male.[2] Therefore, it is necessary to identify gender-related risk factors of COPD and to compare them with other related studies. Kurdish women have a traditional lifestyle in the old dwellings of Sanandaj. Considering the increased indoor fossil fuel pollutants in recent years and previous research in this field,[2,4] this study was conducted with a particular emphasis on gender-based risk factors of COPD. It eventually evaluated the risk factors for developing COPD in female and male populations in the city of Sanandaj.

Materials and Methods

This descriptive, analytic (cross-sectional) study included 400 (200 male and 200 female) patients with COPD admitted to Besat Hospital (Sanandaj) from 2006 to 2011 during which a total of 400 subjects for both sexes were included in the study. The study protocol was approved by the ethics committee of Kurdistan University of Medical Sciences, Sanandaj, Iran).

During the study, 2000 files were randomly selected for each gender. Then, systematic sampling was used to select one case from every 10 files. In order to start sampling, file number seven was chosen among files one to 10 at random. Other files were then selected by adding multiples of 10 to seven. Therefore, files seven, 17, 27, and so on were until a total of 200 files were collected in each group.

We only considered bronchitis and emphysema as COPD. Hence, asthma, pneumonia, and other respiratory diseases were excluded from this study. After obtaining permissions from Besat Hospital, questionnaires containing questions on the history of COPD were filled out based on patient files. Diagnosis of COPD had been confirmed through spirometry as a standard test (the spirometric values were recorded in patient files). Patients with productive cough for more than three months in two consecutive years and forced expiratory volume in 1 second (FEV1) to forced vital capacity (FEV1/FVC) of less than 70% were considered to have COPD. These patients' conditions did not improve in spite of receiving bronchodilators.

Patient history including clinical symptoms such as cough, sputum, and dyspnea, chest X-ray, arterial blood gas measurements, history of smoking, exposure to fossil pollutants, history of previous exposure to chemical warfare, history of medications, and Alpha1-antitrypsin values (for patients younger than 45 years of age) were also recorded in the specified questionnaires.

The collected data was analyzed using Fisher's exact test to compare statistical differences between male and female groups. All analyses were performed with SPSS for Windows (version 16.0, SPSS Inc., Chicago, IL, USA).

Results

The mean age of all subjects was 67.45 ± 1.21

years (66.61 ± 1.36 years in men and 68.30 ± 3.70 years in women). Overall, 124 female patients (62.0%) were housewives or stayed at home because of poor health or senility. Most men (n= 144; 72.0%) and 70 women (35.0%) were farmers or had a lifetime history of agricultural work. Although 110 women (55.0%) and 137 men (68.5%) were urban dwellers, about 360 patients (90.0%) from both sexes had spent more than 40 years of their lives in rural areas. Fisher's exact test results showed significant differences in risk factors and types of jobs between the two genders. However, men and women were not significantly different in terms of seasonal incidence and exacerbation.

Smoking was the major risk factor of COPD in both men and women (n = 226; 56.5%). Meanwhile, only 41 women (20.5%) versus 161 men (80.5%) were smokers (P < 0.001) (Table 1). In contrast, significantly higher number of women had the history of exposure to fossil fuel smoke [131 women (65.5%) vs. 29 men (14.5%); P < 0.001] (Table 1). The presence of other factors, e.g. infection and genetic factors, had been recorded for eight women (4.0%) and 10 men (0.5%).

Moreover, when exposed to cigarette exposure, men had 9.407 times higher chance of developing COPD than did women (P < 0.001; 95% confidence interval: 5.930-14.92). On the other hand, exposure to fossil fuel smoke increased the risk of developing COPD 0.855 times more in women than in men (P < 0.001; 95% confidence interval: 0.808-0.905). Finally, male and female patients did not have any significant differences in other risk factors like infection and genetic abnormalities (P = 0.400, 95% confidence interval: 0.488-3.270) (Table 2).

Discussion

We found men to be more affected with cigarette smoke while women were more likely to experience the side effects of fossil fuels. Many studies have identified smoking and air pollution as main causes of COPD regardless of gender.[1,21-23] However, the lifestyle of rural women in Kurdistan Province, smoke from the conventional home oven, old houses in villages, and old structure of the city of Sanandaj were the main culprits behind COPD. Overall, 32.5% of women and 80.5% of men were smokers. On the other hand, 65.5% of women and 16.0% of men were exposed to fossil fuel smoke. A meta-analysis by Halbert et al. suggested smoking, air pollution, and occupation as the main risk factors for the disease.[21] In large and industrial cities, air pollution is the most important risk factor for the incidence and aggravation of COPD.22 Halvani and colleagues detected occupation-related

Table 1. Distribution of absolute and relative risk factors of chronic obstructive pulmonary disease in male and female patients (n = 200 each) admitted to Besat Hospital in Sanandaj, Iran

	Female		Male		Fisher's exact test results
	Number	Percent	Number	Percent	
Smoking and tobacco use					
Yes	61	30.5	161	80.5	df = 1 P < 0.001
No	159	69.5	39	19.5	
Exposure to fossil fuel smoke and air pollution					
Yes	131	65.5	29	14.5	df = 1 P < 0.001
No	59	34.5	171	85.5	

Df: Degree of freedom

Table 2. Odds ratio (OR) and 95% confidence interval (CI) of risk factors of chronic obstructive pulmonary disease in male and female patients (n = 200 each)

Variables	OR	95% CI	P
Smoking	9.407	5.930-14.923	< 0.001
Fossil fuel smoke and air pollution	0.855	0.808-0.905	< 0.001
Other factors (genetic and infection)	1.260	0.488-3.270	0.405

OR: Odds ratio; CI: Confidence interval

risk for COPD in 77.7% of patients. They reported high-risk occupations for men and women as bakery (54.4%) and agricultural jobs (46.6%), respectively.[23]

Two-thirds of women and one fifth of men in the present study had no history of smoking. Wood smoke exposure was prevalent in more than half of the women and about 90.0% of patients had a history of living in rural areas. The results of our study suggest obviously different epidemiological results in male and female patients with COPD. This is consistent with many studies on the causes of COPD in which the gender differences was included in the study[24-35] (Table 3), nevertheless the results were different when the gender was not included in the study.[1,2]

Generally, etiologic diagnosis of COPD in non-smokers is a major medical challenge.[5] A closer look at the results of this study and other parallel studies indicates the importance of household contact with contaminants as an etiologic cause of COPD especially in women. In recent years, many studies have shown that contact with fossil fuel smoke is a major cause of airway diseases such as anthracosis of the airway. In this regard, Amelie presented his first report by which 10 female patients with symptoms of COPD had airways anthracosis.[24] A great number of other studies have also reported a higher prevalence of anthracosis in women.[24-34]

The high prevalence of COPD among our non-smoking, female participants could be explained by their contact with fossil fuel smoke. Most rural houses, where rural women spent most of their time cooking and baking, lack adequate ventilation and are thus polluted with carbon particles. Our study didn't explain a history of significant risk factors such as smoking in patients with respiratory problems such as symptoms of chronic obstructive pulmonary disease. Therefore, elements such as having close contact with fossil fuel smoke, place of residence, and house ventilation have to be considered as main components in history taking. Appropriate measures should then be taken for faster detection and elimination of these risk factors.

The female/male ratio of bronchitis caused by exposure to fossil fuel smoke was 11/121 which is consistent with the results of some other relevant studies.[24-34] These studies reported the higher prevalence of COPD in

Table 3. Distribution of published studies considering male and female components, on the incidence of bronchitis caused by smoke exposure of burning fossil fuels

Country	Number of patients	Mean age of the patients	Female to male ratio	Author
Iran	778	63	399/372	Sigari and Mohammadi[34]
	102	60-62	42/60	Amoli[24]
	34	61.8	15/19	Hemmati et al[30]
	40	70	14/26	Sigari and Bahari[3]
	63	60	-	Mirsadraee and saeedi[27]
	47	70	24/23	Najafizadeh et al[25]
	10	62.5	0/10	Amoli[26]
	96	68.2	44/52	Aslani et al[28]
South Korea	54	75	19/35	Jang et al[32]
	166	72.5	23/143	Gupta and Shah[29]
	54	67	16/38	Kim et al[35]
	22	55-84	8/14	Bekci et al[31]
	28	64	8/20	Chung et al[7]
Turkey	27	68.8	25/2	Torun et al[8]
UK	7	71	5/2	Wynn et al[33]

women than in men to be justified by women's contact with household pollutants like fossil fuels, poorly ventilated kitchens, and insanitary dwellings.[24-34] The first study in this field was published by Amoli in 1998. It presented 10 female patients with a long history of contact with pollutants inside the house.[24] Other studies revealed higher female to male ratio in patients exposed to fossil pollutants.[7-35]

Numerous recent studies have evaluated bronchitis due to exposure to fossil fuel smoke in rural communities especially in women exposed to fuels from animal and firewood. Sigari and Bahari found that the majority of patients with anthracotic bronchitis were either housewives residing in rural areas or male farmers who developed COPD as a result of smoking.[3] Since the target population in this study has mainly been rural women, the findings of Sigari and Bahari are comparable to ours. The high prevalence of COPD in rural housewives or those live in the outskirts of urban areas could be explained by exposure to indoor carbon contaminants. In previous studies, the incidence of bronchitis and respiratory symptoms were higher among rural women who used firewood or biomass as fuel for food preparation.[2,4-6,8-15]

In patients with respiratory symptoms and COPD who have no specific history of risk factors, not only the occupational history of the patient, but also the use of firewood or biomass for cooking and heating has to be particularly considered. At last housekeeping in rural areas and outskirts of urban areas should be considered as an important risk factor and bronchitis caused by exposure to smoke from burning fossil fuels in women and to a lesser extent in men should be considered as an important factors in contracting the disease.

Conclusion

Some studies have introduced tobacco smoking as the main cause of COPD in both genders. Similar to previous research, fossil fuel smoke was another important risk factor for the disease. Thus, it is better to obtain an accurate history of exposure to smoke from firewood or biomass and the history of residing in rural areas as main risk factor of COPD patients with no history of high-risk occupations or smoking.

Conflict of Interests

Authors have no conflict of interests.

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