The Association of Socio-Economic Factors, and Smoking Behavior With COPD Severity in an Industrial City of Iran

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Abstract- Socioeconomic and lifestyle factors are regarded as important influencing issues regarding a wide range of chronic diseases, including chronic obstructive pulmonary disease. This study aimed to explore the role of such factors as determinants of disease exacerbation among COPD patients. A cross-sectional study was conducted among 150 COPD patients who were referred to an outpatient respiratory care center in Qazvin, Iran, to undertake respiratory function tests from December 2017 to June 2018. Disease severity was determined by the Initiative for Chronic Obstructive Lung Disease (GOLD) index. Odds ratios were applied to find out factors associated with exacerbation. Study findings affirmed that within COPD severity groups, there were significant differences among patients in terms of educational level, smoking status, income, and occupation. Factors associated with severe COPD were found to be smoking (OR 3.6, 2.6-4.2), lower education (OR 1.4, 0.9-2.6), insufficient income (OR 2.3, 0.6-3.1), and unsupportive family (2.7, 1.5-3.6). Due to the obtained evidence about the effect of socioeconomic status on the prognosis of the disease, it is suggested that clinicians should also consider the nonclinical and social aspects associated with the disease in advancing patients' therapeutic procedures and management algorithms.
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Introduction

Chronic obstructive pulmonary disease (COPD) is a type of obstructive lung disease leading to advanced failure in pulmonary function. It is also described by continuing breathing problems and main symptoms including breathing difficulty, chest tightness, lack of energy, cyanosis of lips or fingernails, wheezing, and chronic cough with sputum production (1,2). The leading causes of COPD in developed and developing countries are relatively regarded as long-term cigarette smoking, genetic vulnerability, air pollution, and exposure to dust or fumes (3).

In 2013, COPD was the fourth most common cause of death worldwide. As a result of the increasing number of elderly people and growing proportions of smoking among the global population, World Health Organization (WHO) has anticipated that COPD will become the third main cause of mortality by 2020 (4). According to the latest reports, the prevalence rate of COPD was expected to be 9.2% in Iran (5,6). In spite of an increasing trend in the prevalence of COPD in developing countries like Iran, health policymakers haven't paid enough attention to the disease control strategies, which might be due to deficient data on major determinants of COPD in the country (7). These determinants can be modifiable (such as smoking, alcohol consumption, and unhealthy diet) or non-modifiable (e.g., age and heredity factors) that can be used in the assessment of COPD severity (8).

To assess the severity, there are several methods. One of the most popular one, which is both recommended by the American and European guidelines, is based on FEV1 measurement through

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spirometry (9). Furthermore, through collaborations of informed experts and professional societies in COPD, Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines have been published to help healthcare providers in the diagnosis and treatment of the disease. According to this guideline, patients are categorized into four groups, as mentioned in Table 1.

Table 1. Patients categorization based on COPD severity and gold grading

Severity	FEV1 % predicted
Mild (GOLD 1)	≥80
Moderate (GOLD 2)	50–79
Severe (GOLD 3)	30–49
Very severe (GOLD 4)	<30

Although many factors might play a significant role in the severity of COPD, so far, data on socioeconomic determinants has been limited (10-12). Socioeconomic status (SES) is related to one's social or economic position, which is determined through a combination of several measures, including income, educational level, employment status, living place, and housing condition (13,14). Although the important role of SES in clinical outcomes and patients' access to healthcare services, this is the least reported factor regarding COPD severity among the population (15).

Although COPD is one of the leading causes of mortality in Iran, little is known about the impact of SES as a modifiable risk factor on COPD health outcomes. It seems that this chronic disease doesn't receive enough attention from Iran's health system authorities. Thus, much great effort should be made by the Ministry of Health and Medical Education as a governing body and affiliated research bodies to explore the role of sociodemographic and lifestyle factors as predictors of COPD severity. Recent studies have confirmed that SES plays a significant role in morbidity, mortality, and clinical outcomes. In this respect, Pandolfi *et al.*, (2018) acknowledged that socioeconomic factors are among the main risk causes for COPD development. They also affirmed a significant association between smoking behavior and disease severity (16). In line with this study, Hiscock *et al.*, (2012) added that the smoking rate is higher among socially deprived groups (17). In fact, smoking cessation opportunities are not easily available for lower social groups due to their lack of awareness toward effective alternatives and relatively high costs. In a study conducted to assess the relationship between smoking cessation and socioeconomic status, Broms *et al.*, (2004) found that a higher level of education was significantly associated with higher rates of smoking cessation (18). In terms of income, Lewis *et al.*, the study showed that lower household income was another risk factor for COPD severity and mortality (19). Living place and housing conditions were other sociodemographic factors that some of the researchers have proven as risk factors for COPD (20,21).

Identification of these factors and their role in COPD severity and health outcomes enables health policymakers to plan more effectively for disease management among different socioeconomic groups. This is particularly essential when the purpose is to decrease the social and economic burden of COPD through applying appropriate strategies. Thus, our study aims to clarify the association of socioeconomic factors, gender, and smoking with COPD severity.

Materials and Methods

Study design, participants, and ethics

This cross-sectional study was conducted among the population of Qazvin, a northwest industrialized city of Iran, from December to June 2018. Subjects were enrolled among patients who were referred to an outpatient respiratory care center to undertake respiratory function tests. A total of 130 patients aged between 40 to 75 years attending the outpatient care center were recruited in the research. Inclusion criteria included patients aged over 40 years old with a COPD diagnosis according to Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines which were in a stable phase of the disease (22).

Those patients who refused to contribute to the study had other concurrent pulmonary diseases or taking drugs other than those for COPD were excluded from the study. According to this guideline, COPD patients were classified into four groups, including mild (GOLD 1), moderate (GOLD 2), severe (GOLD 3), and very severe (GOLD 4).

Ethics statement

The current study was an observational research type that applied no drug or treatment procedure regarding study participants. Patients' demographic, SES, and lifestyle data were collected by a clinic's specialist during a routine consultation. Only patients who signed informed consent were enrolled in the study.

Socio-economic and lifestyle variables

To assess factors contributing to the disease severity, data on socioeconomic and lifestyle factors were collected by a physician through the use of a pre-determined questionnaire which was developed to gather information on age, gender, marital status, educational status, occupation, average income, living place, history of smoking, associated comorbidity, number of previous admissions for COPD exacerbations, and body mass index.

Study outcome

COPD severity was the study outcome variable. To measure the variable, a disease-specific COPD severity score that had previously been validated in epidemiologic research was used. The score consists of five aspects, including respiratory symptoms, corticosteroid use, COPD medication use, previous hospitalization for respiratory disease, and oxygen use. After considering the weight of each domain, an overall index of disease severity ranging from 0 to 35 was calculated (23).

Statistical analysis

Statistical analysis was conducted using Stata software, version 12.0. Descriptive statistical analysis of data was done using mean±standard deviation (SD) and frequency (relative frequency). To compare variables among COPD GOLD groups, Pearson's chi-square and Fisher's exact tests were used.

To examine the pooled impacts of demographic, SES, and lifestyle factors on COPD severity, a multivariable linear regression analysis was applied. In the first model, the impact of SES factors was analyzed on severity indicators, controlling for age and sex. Then, we included both demographics and SES variables to study their independent impacts. Finally, exposure to cigarettes was included in the model. A two-sided $P<0.05$ was considered to be statistically significant.

Results

Results regarding the socioeconomic and lifestyle characteristics of patients are depicted in Table 2. As data confirm, the majority of the study population was male (100, 78.1%), with a mean age of 65.3±11.9 years. Furthermore, 94.5% of patients had a diploma, 75.8% were retired, and more than 45% of them were ex-smokers.

Table 2. Sociodemographic characteristics of COPD patients

Patients' characteristics		n	%
Gender	**Female**	100	78.1
	Male	28	21.9
Employment status	**Employed**	25	19.5
	Unemployed	6	4.7
	Retired	97	75.8
Income	**Low**	81	63.2
	Moderate	45	35.1
	High	2	1.7
Smoking status	**Non-smoker**	15	11.7
	Former smoker	72	56.2
	Smoker	41	32.1
Educational level	**Basic**	121	94.5
	Academic	7	5.5
Marital status	**Single**	2	1.6
	Married	116	90.6

Based on the GOLD Guideline, patients have been categorized into three groups according to their disease severity: 60 mild COPD, 32 moderate COPD, and 36 severe COPD. Study findings affirmed that within

COPD severity groups, there were significant differences among patients in terms of educational level, smoking status, income, and occupation (Table 3).

Table 3. Socioeconomic characteristics of COPD patients

Characteristics		COPD Severity Based on GOLD Standard			P
		Mild	Moderate	Severe	
Age, mean±SD		61.2±5.7	63.4±7.4	64.9±8.4	0.46
Gender	Female	16(57.1)	12(42.9)	-	0.57
	Male	46(46)	52(52)	2(2)	
Education	Diploma	12(9.37)	26(20.3)	2(1.5)	0.001
	University degree	40(31.33)	48(37.5)	-	
Smoking status	Smoker	-	40(31.25)	1(0.78)	0.000
	Former smoker	-	71(55.4)	1(0.78)	
	Non-smoker	13(10.29)	2(1.5)	-	
Income	Low	5(3.9)	76(59.3)	-	0.02
	Moderate	8(6.25)	35(27.55)	2(1.5)	
	High	2(1.5)	-	-	
Occupation	Employed	15(11.7)	10(7.8)		0.01
	Un-employed	-	6(4.8)	-	
	Retired	16(12.5)	79(61.7)	2(1.5)	

In the multivariate logistic regression analysis, low income (OR 1.8, 95% CI 0.9-2.2) increased the risk for COPD in patients, while gender and age between 30-60 years old were not regarded as significant risk factors for them. Furthermore, smoking (OR 3.1, 95% CI 2.8-4.6) was found to be another important risk factor. Among socioeconomic characteristics, the lower educational level increased the risk for COPD (OR 2.6, 95% CI 1.2-3.8), the same as lower-income (OR 1.8, 95% CI 0.9-2.2). In the regression model adjusted for gender, age, and smoking status, a lower educational level was proved to be a significant risk factor associated with the development of COPD. Lower Income, unemployment, and lack of family support were also other determinants of COPD (Table 4).

Table 4. Socioeconomic factors and smoking status as risk factors associated with COPD development

Patients' charactristics		Crude OR	95% CI	Adjusted OR	95% CI
Age	<30	1	-	1	-
	30-60	1.2	1.5-2.8	2.4	2.9-4.7
	>60	2.5	1.5-4.9	2.7	2.1-5.6
Gender	Women	1	-	1	-
	Men	2	2.2-2.6	1.4	1.5-2.9
Education	Academic degree	1	-	1	-
	Basic	2.6	1.2-3.8	1.4	0.9-2.6
Income	High	1	-	1	-
	Middle	1.2	0.6-1.8	1.1	0.8-1.6
	Low	1.8	0.9-2.2	2.3	0.6-3.1
Occupation	Employed	1	-	1	-
	Unemployed	1.4	0.8-1.7	1.7	0.7-2.1
	Retired	1.6	1.9-3.2	1.6	2.1-3.2
Current Smoking	Non-smoker	1	-	1	-
	Former-smoker	2.2	1.7-3.4	2.7	1.5-3.9
	Smoker	3.1	2.8-4.6	3.6	2.6-4.2
Family support	Yes	1	-	1	-
	No	2.2	1.7-5.2	2.7	1.5-3.6

Discussion

The main objective of the study was to assess socioeconomic factors and smoke behavior as determinants of COPD exacerbation, including mortality or hospitalization among patients. In line with previous

literature, findings showed that socioeconomic status, as well as smoking and aging, were identified as risk factors for COPD development (16). In fact, those with lower educational levels and inadequate income were considerably suffered from poor COPD outcomes, which might be due to the probable delay in their disease diagnosis both as a result of their deficient knowledge, and financial unaffordability to pursue the management of their health condition (24). Thus, socioeconomic status was directly associated with appropriate access to healthcare services. Those in high levels of socioeconomic status could benefit from recent advances in pharmacotherapy and disease management facilities which consequently affected COPD severity and related clinical outcomes. Moreover, such socioeconomic factors might negatively affect the physical environment where individuals face with including their place of living, type of career, and other environmental factors (25). Having exposure to dust or other aerosols in the workplace is another factor that is influenced by the type of job one handles; this occupational exposure is also affected by an individual's socioeconomic status (26).

Furthermore, some of the studies affirmed the relationship between socioeconomic factors and unhealthy lifestyles such as smoking, lack of physical activity, and poor nutrition (27). In contrast, some others suggested the main role of low socioeconomic status as a risk factor of COPD apart from smoking behavior (28,29). In this regard, several studies found a significant association between smoking behavior and the severity of COPD (17,30).

Social support was another potential determinant of COPD exacerbation (31-33). Indeed, those who had the possibility to benefit from their family support or social networks had a relatively better physical performance. This finding was also confirmed in several types of research (34,35). On the contrary, those who do not have supportive family relationships face more mental distress and poor quality of life, which ultimately might lead to unhealthy behaviors such as smoking and physical inactivity. Literature has affirmed that improving supportive plans for COPD patients, such as promoting their family roles and providing leisure activities, could be beneficial in the development of patients' ability to manage their health status (36,37).

There are some limitations regarding our study. First, a self-reported questionnaire to provide data regarding household income lacked a valid method of income verification. Second, the small sample size of current research decreases the generality of study results.

Due to the obtained evidence about the effect of socioeconomic status on the prognosis of the disease, mortality, and clinical outcomes, it is suggested that clinicians should also consider the nonclinical and social aspects associated with the disease in advancing patients' therapeutic procedures and management algorithms. Such an approach could be beneficial for physicians to marshal high-risk patients for more holistic disease management guidelines to effectively prevent undesirable outcomes. Acknowledging the influencing role of risk factors such as smoking and exposure to low-quality air conditions due to an individual's career or living place condition might be significant for adopting health promotion policies with a social approach which potentially could reduce the number of exacerbations among COPD patients.

Furthermore, facilitating social support through some governmental schemes along with family sympathy and support will positively affect self-care behaviors among patients who suffer from chronic pulmonary diseases. Considering this fact would enable clinicians to apply more effective treatment strategies in COPD patients through which positive behavioral modification and health outcomes will be achieved.

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