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Exposure to stressful life events among patients with chronic obstructive pulmonary disease: a prospective study

Abstract

Introduction: Although depression and anxiety have been widely investigated among patients with chronic obstructive pulmonary disease (COPD), experiencing stressful life events and its effect on increasing risk of exacerbations was rarely assessed. This study aimed to clarify the association between facing with stressful events among COPD patients and their disease severity leading to hospitalization.

Material and methods: A prospective study was conducted among 128 COPD patients from the population of Qazvin, a north-west, industrialized city of Iran from December 2017 to December 2018. Patients were followed up for one-year and their related measures were gathered. To compare variables among patients stratified by reporting stressful life conditions, Pearson's chi--square and Fisher's exact tests were used. Furthermore, to assess the effect of several covariates on the response variable, a logistic regression modelling was applied. Results were reported in form of odds ratios and their 95% confidence intervals.

Results: Study findings affirmed that patients who had experienced stressful situation had lower BMI, were retired, experienced more frequent exacerbations, and reported higher levels of anxiety/ depression. Moreover, those with stressful conditions were among current or former smokers ($p < 0.05$). Logistic regression analysis revealed that facing with stressful situations was significantly associated with the severity of COPD disease (OR 1.9; 95% CI 2.5 to 5.6), smoking habit (OR 2.8; 95% CI 1.6 to 4.2; OR 1.5; 95% CI 1.4 to 2.2), and hospitalization during one-year follow up (OR 1.2; 95% CI 1 to 3.3).

Conclusions: To improve health outcomes of COPD patients, close attention should be given to their psychological disorder and appropriate strategies should be applied to reduce patients' exposure to stressful life events and subsequent anxieties.

Key words: anxiety, depression, stressful life event, chronic obstructive pulmonary disease, severity

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Introduction

Chronic obstructive pulmonary disease (COPD) is defined as a disease leading to reduced air flow in pulmonary function, and shortness of breath which is largely due to an exposure to irritants like air pollution, noxious particles or tobacco smoking [1, 2]. It is anticipated that the disease will have become the fourth prominent death cause and the seventh prominent factor of disability worldwide by 2030. High blood pressure, diabetes mellitus, lung cancer, ischemic heart disease, anxiety disorder, and depression are among important comorbidities for advanced COPD. Literature has affirmed that COPD patients who suffer from comorbidities are more likely to be hospitalized in a frequent manner [3]. Psychological issues like anxiety and depression are key factors which cause significant burden of mortality, and morbidity, among patients [4].

Indeed, patients with symptoms of depression experience more frequent hospitalization, failure in smoking cessation, and worse prognosis of the disease. Furthermore, such mental disorders might lead to desperateness, and distress among patients which subsequently would lead to a defective cycle that perpetuates anxiety and depression [5, 6]. Thus, addressing psychological disorders in

the clinical management of COPD has got a great importance, though still little is known about the diagnosis and management strategies of such disorders and their impact on COPD patients' health status. In a study conducted by Gianjoppe-Santos to compare anxiety and depression symptoms between patients in stable and post-exacerbated groups, findings revealed that the latter group of patients experienced more anxiety symptoms compared to the former one [7]. Furthermore, some of the studies have surveyed the potential relationships between psychological distress, and COPD exacerbation. Almost all the studies affirmed that patients with depression or potential anxiety faced with more exacerbations and subsequent hospitalization [8–10]. Similarly, Laurin *et al.* found that patients with anxiety and depressive disorders were at higher risk of exacerbation [11].

Identification of these influencing factors empowers policy makers to develop more effective strategies for the disease management. Although depression and anxiety have been widely investigated in patients with chronic obstructive pulmonary disease, experiencing stressful life events and its effect on increasing risk of exacerbations or death was rarely assessed [12, 13]. Due to lack of evidence about the impact of stressful life events on patient health outcomes in cohort studies, mainly in Iran, this study aimed to clarify the association between facing with stressful events among COPD patients and their disease severity leading to hospitalization.

Material and methods

Study design, participants and ethics

This was a prospective study conducted among 128 patients with COPD who referred to an outpatient pulmonary clinic in Qazvin, Iran between December and June 2018. Patients aged over 40 years old, with a COPD diagnosis according to Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines were included in the study (n = 146); among which 18 patients excluded from the research due to having concurrent pulmonary disease, or taking drugs other than those for COPD. Finally, 128 patients (78.1% male, mean age 65.3 ± 11.9) were enrolled. The patients were followed up for a year and their related measures were gathered and recorded during this period of time.

Ethics statement

The ethics committee of Qazvin University of Medical Sciences approved the study, and written informed consent was obtained from each of the participants.

Measurements

Hospital Anxiety and Depression Scale (HADS) was used to measure anxiety/ depression among patients. The 7-item subscale with a score scale ranging from 0 to 21 has been previously used in several studies and was proved to have validity and reliability [8, 14]. According to defined cut-off points, those who got score under 11, were regarded to have low level of anxiety, while patients with 11 to 14 score were mentioned in moderate and those with 15 to 21 score were categorized in severe anxiety group.

Besides assessing patients' anxiety, researchers asked a number of questions to assess stressful situations which patients faced with during 1-year follow up. The questions were mainly about the issues including losing a family member, patient's disability due to severe illness, lack of adequate support from relatives and friends, financial difficulties, retirement, and divorce. They also asked the patients to try to recall the date/month/year of the occurrence of the events.

Statistical analysis

Statistical analysis was conducted using Stata software, version 12.0. Patients' characteristics including their age, BMI, educational level, profession, and living situation, also their mean HADS score comprised of depression and anxiety were calculated for each of the patients based on their exposure to stressful life situations. Furthermore, for each patient who had at least one distressful situation during 1-year period of follow-up time, number of exacerbations was calculated. To compare variables among patients stratified by reporting stressful life conditions, Pearson's chi-square and Fisher's exact tests were used.

Finally, using a logistic regression modelling, the impact of exposure to stressful situations on some of the measures including disease severity, smoking behavior, and hospitalization was assessed. For all analyses, P < 0.05 was considered statistically significant.

Results

This study included and followed 128 patients for a year. Table 1 depicts the characteristics of study participants based on their hospitalization during the follow-up period. Results

affirmed that the mean age of patients who were hospitalized was slightly higher (65.5 ± 11.3 versus 62.4 ± 12.6). In relation to smoking, 30% of patients who continued smoking at the time of study experienced at least one hospitalization. Furthermore, 12.64% of patients with severe COPD and 14.2% with comorbidity faced with the disease exacerbation leading to hospitalization. Average score of anxiety and depression among patients who reported hospitalization during 1-year period was respectively 18.7 ± 10.2 and 17.1 ± 8 confirming higher levels of psychological disorder among these patients (p < 0.05).

In the second step, stressful conditions which patients were facing during the follow up period of time, were assessed. Table 2 shows patients' characteristics based on their report of stressful life events. Overall, seventy percent of patients declared that they had encountered with at least one stressful and distressing situation during the last year. Those who had experienced stressful situation had lower BMI, were retired, lived alone, experienced more frequent exacerbations, and reported higher levels of anxiety/ depression. Moreover, those with stressful conditions were among current or former smokers (p < 0.05).

Table 1. Patients' characteristics based on reporting stressful situations

Characteristics		Encountered with stressful situation		p-value
		Yes	No	
Age, mean [SD]		63 (10.7)	62.7 (18.5)	0.21
BMI, mean [SD]		25.2 (12.5)	24.9 (9.8)	0.04
Education, n [%]	Diploma	27 (30)	26 (70)	0.15
	University degree	63 (70)	12 (30)	
Smoking status, n [%]	Smoker	20 (22)	7 (18)	< 0.001
	Former smoker	64 (71.7)	24 (64)	
	Non-smoker	6 (6.3)	7 (18)	
Living condition, n [%]	Alone	67 (25)	10 (25)	0.12
	With family	23 (75)	28 (75)	
Occupation, n [%]	Employed	18 (20)	6 (15)	0.01
	Un-employed	13 (15)	—	
	Retired	59 (65)	32 (85)	
Number of exacerbations, n [%]	0	20 (22.3)	18 (47.9)	< 0.001
	≥ 1	70 (77.7)	20 (52.1)	
HADS anxiety, mean [SD]		12.2 (7.7)	10.7 (6.9)	< 0.001
HADS depression, mean [SD]		14.5 (6.5)	11.1 (5.7)	< 0.001

BMI — body mass index; HADS — Hospital Anxiety and Depression Scale

Table 2. Patients' health outcomes and behavior based on reporting stressful situations

Patients' characteristics	Stressful life event reported (baseline to follow-up)	Mean (95% CI)	p-value
Number of hospitalization	Yes	0.8 (0.5–1.1)	< 0.001
	No	0.7 (0.4–0.9)	
Cigarette use (number per day)	Yes	5.2 (4.5–7.7)	< 0.001
	No	3.5 (2.8–4.6)	
HADS anxiety	Yes	12.2 (10.6–14.2)	< 0.001
	No	10.7 (9.2–11.6)	
HADS depression	Yes	14.5 (10.2–18.7)	< 0.001
	No	11.1 (9.7–13.5)	

HADS — Hospital Anxiety and Depression Scale

Table 3. Univariate analysis to compare patients experiencing hospitalization during one-year follow-up

Characteristics		Hospitalization				
Categorical variables		No	Yes	P	OR	95% CI
Gender, n [%]	Male	91 (91)	9 (9)	0.11	1.2	0.83–2.6
Marital status, n [%]	Married	112 (92.6)	9 (7.4)	0.25	1.1	0.92–4.4
Educational level, n [%]	University degree	6 (85.8)	1 (14.2)	0.26	0.8	0.77–2.02
Current smoker, n [%]		21 (70)	9 (30)	< 0.001	2.9	2.1–5.7
COPD grade, n [%]	Moderate	62 (48.4)	4 (3.12)	0.06	1.1	0.87–3.08
	Severe	32 (25)	4 (3.12)	0.001	1.2	1.12–5.3
	Very severe	3 (2.34)	12 (9.25)	< 0.001	1.5	1.38–3.1
Comorbidity, n [%]		36 (85.8)	6 (14.2)	< 0.001	1.3	1.17–2.2
Experiencing stressful life event, n [%]	Yes	79 (87.7)	11 (12.3)	0.52	1.07	9.02–2.4
Continuous variables		Mean (SD)	Mean (SD)	P	OR	95% CI
Age		62.4 (12.6)	65.5 (11.3)	0.07	1.12	0.77–1.36
BMI		25.5 (4.9)	23.3 (3.8)	0.05	0.95	0.87–1.0
HADS anxiety		7 (2.1)	18.7 (10.2)	< 0.001	1.17	1.01–4.8
HADS depression		10.2 (4.5)	17.1 (8)	< 0.001	1.21	1.12–3.7

BMI — body mass index; COPD — chronic obstructive pulmonary disease; HADS — Hospital Anxiety and Depression Scale

Then the impact of exposure to stressful situations on some of the measures including disease severity (FEV_1 GOLD measure) was analyzed. Data are reported in Table 3.

Logistic regression analysis revealed that facing with stressful situations was significantly associated with the severity of COPD disease (OR 1.9; 95% CI 2.5 to 5.6), smoking habit (OR 2.8; 95% CI 1.6 to 4.2; OR 1.5; 95% CI 1.4 to 2.2), and hospitalization during one-year follow up (OR 1.2; 95% CI 1 to 3.3).

Finally, we adjusted the model for age, gender, educational level, occupation, income, and smoking history and assessed the impact of stressful conditions on the risk of COPD exacerbation among study patients. Results are shown in Table 4.

After adjusting the model for mentioned variables, results revealed that patients who faced with stressful situations were 2.8 times more likely to be hospitalized due to exacerbation (OR 2.28; 95% CI 1.04 to 2.84).

Discussion

In our study, we found that experiencing stressful life events is associated with COPD exacerbation. This finding emphasizes on the importance of psychological factors in COPD patients which has been similarly confirmed in several studies. Literature highlights that patients with psychological stress may reveal unhealthier behaviors which ultimately worsens their health condition and increases the risk of COPD exacerbation [15]. In a survey conducted by Yohannes *et al.*, results revealed higher rate of hospitalization among depressed patients [16]. Similar studies also affirmed significant associations between psychological disorder and exacerbation leading to disease-related hospitalizations. This suggests that COPD patients are more in danger when experiencing stressful events [11, 17].

Regarding this issue, Xu *et al.* reported that after one-year follow up, patients with some degrees of anxiety and depression encountered significantly more exacerbations and subsequent hospitalizations [18]. These findings were in line with Laurin *et al.* report emphasizing on a significant association between psychological distress and higher rates of exacerbations [11]. However, Fan and colleagues stated that using various types of cut-off scores through the Beck Depression Inventory leads to different findings. In fact, analysis of depressive symptoms as continuous predictors is not going to be associated with hospitalizations. While, using quantile measurements approves the relationship between depressive symptoms and higher risk of COPD-re-

Table 4. Multivariate models of risk factors for hospitalization of COPD patients

Variables		P	OR	95% CI	
				Lower	Upper
COPD grade 5.6	Severe	< 0.001	1.19	1.11	5.6
Current smoker		< 0.001	2.8	1.6	4.2
Comorbidity		0.001	1.34	1.005	2.8
Depression		0.005	2.28	1.04	2.8

COPD — chronic obstructive pulmonary disease

lated hospitalizations [19]. In a study conducted by Yu *et al.* results disclosed that stressful life events were significantly related to symptoms of depression and anxiety among patients. Otherwise, stressful life events were not associated with COPD exacerbations which reported to be due to the small sample size of study or short time frame of follow-up [8]. Similarly, some of the researches highlighted that after adjusting the model for covariates namely gender, disease severity, oxygen use, history of COPD hospitalization, and comorbidity the association between psychological distress and hospitalizations became non-significant. Such uneven results also highpoint the effect of differences in analysis methods and use of varying cutoffs.

Our findings also affirmed that facing with stressful conditions reinforces the smoking behavior as a risk factor for severity of COPD, hospitalization and restriction for daily activities which could also increase the risk of depression or anxiety in patients. In agreement with these results, several studies have shown that anxiety and depression are associated with feelings of desperateness and lack of self-confidence which will consequently lead to poor health behaviors namely smoking or physical inactivity [16, 20]. Andrenas *et al.* ascertained that most of the patients evaluated their stressful situation as a threat, and challenging issue which inversely affects their coping skills with distressful disorders [21]. They also believed that such worrying conditions have a harmful effect on patients' mental health and their quality of life [22–24]. Literature also revealed that deterioration in the immune system of patients with anxiety and depression is more likely which eventually weakens their resistance toward pathogens [25–27].

Despite several studies conducted to explore the relationship between the experience of stressful situations and increased risk of COPD exacerbation, our research tried to obtain more robust findings through applying a prospective

study design and choosing shorter time frame for asking patients to recall their stressful life experiences. In our study, stressful situations were asked monthly from patients and documented through a prospective approach. Otherwise, there are some limitations regarding the current study. First, we were dependent on a self-reported scale which identified exposure to stressful conditions based on patients' perception.

Conclusions

In conclusion, our study found that experiencing stressful conditions was connected with more anxious and depressing signs among COPD patients which ultimately worsened the disease severity. Thus, to improve health outcomes of COPD patients, close attention should be given to their psychological disorder and appropriate strategies should be applied to reduce patients' exposure to stressful life events and subsequent anxieties.

Conflict of interest

None declared.

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