Research

Depression, anxiety, stress, and related factors among elderly patients with chronic obstructive pulmonary disease in National Hospital Kandy, Sri Lanka

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Abstract

Chronic obstructive pulmonary disease is a major cause of chronic morbidity and mortality in the elderly population worldwide. Around 40% of people with COPD suffer from depression and anxiety which remains mostly not diagnosed and untreated. Hence, this study aimed to examine anxiety, depression, stress and its associated factors among elderly patients with COPD in the respiratory treatment unit of Kandy National Hospital, Sri Lanka. These relationships were evaluated with a demographic questionnaire and the "Depression, Anxiety and Stress Scale-21" (DASS-21). Multiple regression analysis was used to examine the relationships between these variables. The sample consisted of 180 elderly patients with a mean age of 68.69±6.25(Mean±SD). Out of them, 177 (98.4%) were males. The results indicated that the risk factors account for 51.2% of the variance in depression, 64.2% of the variance in anxiety and 11.7% of variance in stress. Of those without a pre-existing diagnosis of anxiety, depression or stress, 26.4% met the criteria for at least moderate depression, 23.9% met the criteria for at least moderate anxiety and 24.2% met the criteria for at least moderate stress. Monthly household income had a negative correlation while number of presenting comorbidities apart from COPD and number of COPD exacerbations in the last year were positively correlated with the construct of depression, anxiety and stress. These findings suggest that screening programmes for other comorbidities and commencing early treatment, encourage patients to participate in follow-up visits and to establish supportive economic strategies for the patients during the economic crisis.

Key words: Depression, anxiety, stress, elderly patients, COPD

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is one of the major causes of morbidity, disability and mortality among elderly population [1]. COPD is a widespread, preventable, and treatable condition characterized by persistent respiratory symptoms and airflow limitation caused by airway and /or alveolar abnormalities, which are most commonly triggered by considerable exposure to noxious particles or gases [2]. Globally, COPD accounts for 3.23 million deaths and is the third leading cause of mortality [2]. Over 80% of COPD-related deaths occur in low- and middle-income countries [2].

Since the COPD is common among elderly population, the disease categorized by high symptom burden, healthcare utilization, mortality, and unfulfilled needs for patients and their caregivers [3]. Caring for the older patient with COPD poses significant challenges [3]. While COPD is a primary contributor to respiratory failure and dyspnea in older adults, several other health issues, alongside heart failure, pulmonary embolism,

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and anxiety; medication side effects; as well as other factors like deconditioning and malnutrition; can worsen COPD symptoms [3]. Tobacco smoking is the most significant risk factor for COPD, while genetic problems, aberrant lung development, and accelerated ageing also contribute to the development of COPD [4]. However, other environmental factors such as exposure to biomass fuels and air pollution may play a role [5]. Aside from exposures, host factors (e.g., occupational hazards, poor nutrition, pneumonia or childhood respiratory infections, obesity, and insufficient physical activity) also have a role [5].

In Sri Lanka, the overall prevalence of COPD was 10.5% out of which the severity was stage 1 in 85.0%, stage 2 in 12%, stage 3 in 1.5% and stage 4 in 1.4% [6]. The urban and rural prevalence were 6.4% and 4.1%. The female prevalence was 6.0% compared to 16.4% in males. 57.1% of the COPD patients were non-smokers [6]. In males, the presence of COPD was significantly related to a history of smoking and a past history of tuberculosis. In females, COPD wasn't related to any risk factor or any comorbidity [6].

COPD is not just a pulmonary disease; it is a complex and multifactorial disease often associated with considerable psychological distress, including symptoms of anxiety, stress, and depression [7]. Depression and anxiety may worsen the physical symptoms of COPD, including breathlessness and fatigue, and can create a vicious cycle affecting the overall quality of life [7,8]. However, the symptomatology can overlap with physical signs of COPD and these conditions are often underdiagnosed, leading to underuse of treatment and suboptimal management [8].

Depression is associated with increased morbidity, nonadherence to medical treatment and recurrent hospitalizations in COPD patients [7,8,9]. Anxiety causes panic attacks and hyperventilation, which lead to worsening of respiratory symptoms [8,10]. The psychological aspects of these conditions lead to significant emotional distress, social isolation, and impaired participation in physical activity, all of which play an important role in managing COPD [10].

Identifying and treating these mental health issues are important components of complete COPD treatment [11]. The evidence demonstrate that untreated anxiety and depression can adversely affect disease outcomes, with more disease progression and mortality [7,8,9,10]. Thus, an integral part of the management of patients with COPD should be a global approach that includes routine screening for psychological symptoms, as well as health education and personalized interventions, including cognitive-behavioral therapy (CBT), pharmacotherapy, and pulmonary rehabilitation programs [12]. As there is a scarcity of publications locally describing depression, anxiety, stress, and related factors among elderly patients with COPD in Sri Lanka, our endeavor was to fill the vacuum with this study.

Materials and methods

This descriptive cross-sectional study aimed to evaluate the risk factors associated with depression, anxiety, and stress among elderly patients with chronic obstructive pulmonary disease (COPD) at the Respiratory Treatment Unit Two of the National Hospital Kandy, Sri Lanka.

The study was conducted to answer two research questions:

- How well do the five individual risk factors (age, marital status, number of comorbidities apart from COPD, number of COPD exacerbations in last year, and monthly household income) predict depression, among elderly patients with COPD in Respiratory Treatment Unit-2, National Hospital Kandy, Sri Lanka?
- How well do the five individual risk factors (age, marital status, number of comorbidities apart from COPD, number of COPD exacerbations in last year, and monthly household income) predict anxiety, among elderly patients with COPD in Respiratory Treatment Unit-2, National Hospital Kandy, Sri Lanka?
- How well do the five individual risk factors (age, marital status, number of comorbidities apart from COPD, number of COPD exacerbations in last year, and monthly household income) predict stress, among elderly patients with COPD in Respiratory Treatment Unit-2, National Hospital Kandy, Sri Lanka?

Patients aged 60-80 years diagnosed with COPD using GOLD criteria were included in the study [13]. The inclusion criteria were a diagnosis of COPD confirmed with a medical record; contact with the patient; ability of the patient to provide written informed consent; availability of medical records; and the ability to perform the pulmonary function test. Exclusion criteria were serious comorbidities, cognitive deficits and mobility limitations. Its systematic sampling and sample size were calculated at a confidence level of 95.0%, a

prevalence of 13.1% of depression, anxiety, and stress in COPD patients, and a 5% margin of error, bringing with it 180 participants plus a possible loss. Data were collected using a pretested interviewer administered questionnaire. The questionnaire consisted of two parts which consisted of demographic and clinical data and the Depression, Anxiety and Stress Scale-21 (DASS-21 scale) which categorized the emotional state of participants into normal, mild, moderate, severe, and extremely severe levels.

Continuous variables were presented as means ± standard deviations, and categorical variables were presented as numbers and percentages. Multiple linear regression analysis was used to assess the relationship between depression, anxiety, and stress and their associated factors. In this study, the dependent variables were the DASS-21 scores for depression, anxiety, and stress, while the independent variables included age, marital status, income, comorbidities, and the number of COPD exacerbations in the last year. All variables were included in a pre-tested demographic and clinical data questionnaire. These variables were included in a demographic questionnaire.

Prior to the data analysis, assumptions of the multiple linear regression were assessed [14]. The linearity of variance was confirmed by creating scattered plots for each predictor variable and the response variable. The absence of multicollinearity was confirmed by assessing the Variance Inflation Factors (VIF) and Tolerance statistics. Tolerance statistics were ranged between T=.594 and T=.867 and all VIFs were below 5, ranging between 1.2 and 1.7. To confirm that the observations are independent, the Durbin-Watson test was performed, and the value is 1.136 and between +1 and +3 which means that the independence of the observation has been met [15]. The homoscedasticity was confirmed by using standardized residual plots. The residuals had constant variance at every point in the linear model. To ensure that the residuals of the model are normally distributed, quantile-quantile plots (Q-Q plots) were created. Data analysis was carried out by using the IBM SPSS version 25.00 statistics data editor. Ethical approval was granted by the Ethical Review Committee of the National Hospital Kandy, Sri Lanka.

Results

A total of 180 participants from Respiratory Treatment Unit-2, National Hospital Kandy participated in the study and all completed the instruments successfully. Participants were assessed on an individual basis during a month and a half long time frame. Of those who participated, 177 (98.4%) were male and 3 (1.6%) were female. The mean age of respondents was 68.7 years (SD 6.25 years). Of these participants, 74.4% were married, 12.8% were unmarried, 7.8% were divorced and 5% lived alone. All the participants do not receive any form of psychological or psychiatric consultation. In this study population, 67 (37.2%) had at least one comorbidity apart from the COPD. Out of them, two comorbidities were found in 19 (28.4%) of the diseased patients, namely hypertension and asthma. Three comorbidities were found in 12 (17.9%) which included ischemic heart disease in addition to hypertension and asthma. Table 1 summarizes the demographic characteristics of the sample. Hypertension was the commonest comorbidity which accounted for 28 (13.3%), followed by asthma 22 (12.2%), ischemic heart disease 14 (7.8%) and bronchiectasis 13 (7.2%). Little more than one fourth of the study population reported a monthly household income lower than Rs 10000 per month.

Prior to analysis, data were screened to ensure complete and accurate completion of instruments. All the participants completed the assessments. 12 participants requested Tamil versions of the instruments. In addition, all of the participants requested for the researcher to orally administer the assessment tools due to one or several medical impediments. There were no missing values in categorical data to interfere with analysis. Therefore, all participants' responses were considered valid.

Depression, anxiety and stress were assessed for each participant. Participants completed a demographic questionnaire and a screening instrument (DASS-21 questionnaire). The composite scores of symptom severity for depression, anxiety and stress were developed after calculating of final DASS-21 score. The mean and SD for the composite score of anxiety, depression and stress are shown in the Table 2. Gender was excluded from the multiple regressions as the reported male predominance (98.4%).

Of those without a pre-existing diagnosis of anxiety or depression, 26.4% met criteria for at least moderate depression, 23.9% met criteria for at least moderate anxiety and 24.2% met criteria for at least moderate stress. The levels of depression, anxiety and stress were summarized in Table 3.

Table 1. Demographic characteristics of the sample

Characteristic (No. of responders)	*Criteria*	*Number*	*Frequency (%)*
Gender	Male	185	98.4%
	Female	3	1.6%
Age		68.69± 6.25(Mean ±SD)	
Marital status	Married	134	74.4%
	Unmarried	23	12.8%
	Divorced	14	7.8%
	Living alone	9	5%
Monthly household income	< Rs 10000	46	46 (25.6%)
	Rs 10000-30000	53	29.4%
	Rs 30000-40000	57	31.7%
	>Rs 50000	24	13.3%
Comorbidities apart from COPD	Asthma	22	12.2%
	Bronchiectasis	13	7.2%
	Diabetes Mellitus	8	7.4%
	Hypertension	28	13.3%
	Ischemic Heart Diseases	14	7.8%
	Heart Failure	12	6.7%
	Interstitial Lung Disease	2	1.1%
	Chronic Liver Cell Disease	2	1.1%
	No other medical conditions	113	62.8%
Number of COPD exacerbations in last year		1.12±1.37 (Mean ±SD)	

Table 2. Mean DASS-21 and DASS-21 Anxiety, DASS-21 Depression, DASS-21 Stress sub scale scores

	Mean± SD
DASS-21 Depression	11.28 ±8.3
DASS-21 Anxiety	16.46 ±12.2
DASS-21 Stress	09.85 ±7.6

Table 3. Levels of depression, anxiety and stress

	DASS-21 depression	*DASS-21 anxiety*	*DASS-21 stress*
Normal	53.9%	50%	63.8%
Mild	20%	19.4%	12.3%
Moderate	13.9%	12.9%	16.6
Severe	6.1%	11.1%	5.6%
Extremely Severe	6.1%	7.3%	1.7%

N=180; The level in each category is based on the percentile corresponding to Lovibond and Lovibond's cut-offs (1995) (Onie et al., 2019).

To test the hypotheses for the first research question, the independent variables (age, marital status, monthly household income, number of COPD exacerbations in last year, and number of comorbidities apart from COPD) were entered into a multiple regression analysis with the DASS-21 Depression score as the dependent variable. The results indicated the risk factors account for 51.2 % of the variance of Depression as measured by the DASS-21 score. The overall regression (Table 4) was statistically significant, F (5, 174)=43.73, p<.001, Adjusted R^2=.482.

Regression weights were examined and are shown in Table 5. Of the independent variables, monthly household income (β=-0.148, p<.001) and number of exacerbations in last year (β=.214, p<.001) made statistically significant contributions. Number of COPD exacerbations in previous year was positively correlated with the DASS-21 depression score and individuals with frequent exacerbations/hospitalizations had higher level of depression. Monthly household income was negatively correlated with the DASS-21 Depression score and low monthly household income contributes to higher levels of depression among the elderly patients with COPD.

Table 4. Model summary of variance for depression, as measured by the DASS-21 score

R	*R²*	*Adjusted R²*	*F*	*df1*	*df2*	*p Value*
0.743[a]	0.512	.482	43.73	5	174	0.000[a]

Note: [a] *Independent variables: age, marital status, monthly household income, number of COPD exacerbations in last year, and number of comorbidities apart from COPD.*

Table 5. Summary of analysis for variables predicting depression, as measured by the DASS-21 score

Measure	*B*	*Std. Error*	*β*	*t*	*p*
Age	.430	.232	.113	.013	.631
Number of comorbidities apart from COPD	.471	.345	.167	1.201	.063
Number of COPD exacerbations in last year	.536	.243	.177	2.246	.012
Marital status	.387	.183	.146	1.624	.099
Monthly household income	-.453	.478	-.348	-2.230	.001
Constant	2.449	1.946		.353	.832

Note: B=Unstandardized β, Std Error=standard error of the mean for unstandardized β, Std B=standardized β

Based on the findings of the analysis, the null hypothesis for the research question "There is no any relationship between depression and age, marital status, number of present comorbidities, number of COPD exacerbations in last year, and monthly household income of elderly patients with COPD in the respiratory treatment unit of Kandy National Hospital, Sri Lanka" was rejected. The alternate hypothesis was supported indicating a significant predictive relationship exists by at least one of the individual risk factors (number of COPD exacerbations in last year, and monthly household) and the construct of depression.

To test the hypotheses for the second research question, the independent variables (age, marital status, monthly household income, number of COPD exacerbations in last year, and number of comorbidities apart from COPD) were entered into a multiple regression analysis with the DASS-21 Anxiety score as the dependent variable. The results indicated the risk factors account for 64.2 % of the variance of anxiety as measured by the DASS-21 score. The overall regression (Table 7) was significant, F (5,174) =76.41, p<.001, Adjusted R2= .622.

Regression weights were examined and are shown in Table 8. Of the independent variables, monthly household income (β=-0.348, p<.001) made the largest unique contribution, although number of COPD exacerbations in last year (β=.214, p<.001) and, number of comorbidities (β=.197, p<.001) also made statistically significant contributions.

Monthly household income was negatively correlated with the DASS-21 Anxiety score. Hence, low monthly household income contributes to higher levels of anxiety among the elderly patients with COPD. Number of comorbidities positively correlated with the DASS-21 Anxiety score. Thus, patients with multiple comorbidities tended to have higher levels of anxiety than patients without any other comorbidity. Number of COPD exacerbations in previous year also positively correlated with the DASS-21 Anxiety score and individuals with frequent exacerbations/hospitalizations had higher level of anxiety.

Table 6. Model summary of variance for anxiety, as measured by the DASS-21 score

R	*R^2*	*Adjusted R^2*	*F*	*df1*	*df2*	*p Value*
0.842[a]	0.642	0.622	76.41	5	174	0.000[a]

Note: *[a] Independent variables: age, marital status, monthly household income, number of COPD exacerbations in last year, and number of comorbidities apart from COPD.*

Table 7. Summary of analysis for variables predicting anxiety as measured by the DASS-21 score

Measure	*B*	*Std. Error*	*β*	*t*	*p*
Age	.511	.652	.070	.613	.831
Number of comorbidities apart from COPD	.311	.185	.197	3.201	.002
Number of COPD exacerbations in last year	.285	.115	.214	3.458	.001
Marital status	.076	.394	.028	.530	.077
Monthly household income	-.250	.166	-.348	-4.240	.000
Constant	0.673	1.876		.353	.742

Note: B=Unstandardized β, Std Error=standard error of the mean for unstandardized β, Std B=standardized β

Based on the findings of the analysis, the null hypothesis for the research question "There is no any relationship between anxiety and age, marital status, number of present comorbidities, number of COPD exacerbations in last year, and monthly household income of elderly patients with COPD in the respiratory treatment unit of Kandy National Hospital, Sri Lanka" was rejected. The alternate hypothesis was supported indicating a significant predictive relationship exists by at least one of the individual risk factors (monthly household income, number of comorbidities, and number of COPD exacerbations in last year) and the construct of anxiety.

The hypothesis for the third research question was tested in the third multiple regression analysis by entering the independent variables (age, marital status, monthly household income, number of COPD exacerbations in last year, and number of comorbidities apart from COPD). The results indicated the risk factors account for 11.7% of the variance of Depression as measured by the DASS-21 score. The overall regression (Table 8) was statistically significant, F (5, 174)=23.84, p<.001, Adjusted R^2=287.

Regression weights were examined and are shown in Table 9. Of the predictor variables, monthly household income makes the only significant contribution (β= .274, p<.001). Thus, low monthly household income contributes to higher levels of stress among the elderly patients with COPD. Although this predictive relationship exists; the strength is not very strong. Based on the findings of the analysis, the null hypothesis for the third research question, "There is no any other relationship between stress and age, marital status, number of present comorbidities, number of COPD exacerbations in last year, and monthly household income of elderly patients with COPD in the respiratory treatment unit of Kandy National Hospital, Sri Lanka" was rejected. The alternate hypothesis was supported indicating a significant predictive relationship exists by at least one of the individual risk factors (monthly household income) and the construct of stress.

Table 8. Model summary of variance for stress, as measured by the DASS-21 score

R	*R^2*	*Adjusted R^2*	*F*	*df1*	*df2*	*p Value*
0.383[a]	0.117	.287	23.84	5	174	0.002[a]

Note: [a] *Independent variables: age, marital status, monthly household income, number of COPD exacerbations in last year, and number of comorbidities apart from COPD.*

Table 9. Summary of analysis for variables predicting stress as measured by the DASS-21 score

Measure	*B*	*Std. Error*	*β*	*t*	*p*
Age	.586	.707	.070	.829	.438
Number of comorbidities apart from COPD	.285	.282	.082	1.011	.083
Number of COPD exacerbations in last year	.319	.180	.146	1.772	.079
Marital status	.387	.183	.146	1.624	.099
Monthly household income	-.436	.129	-.274	-3.367	.001
Constant	.623	1.753		.375	.654

Note: B=Unstandardized β, Std Error=standard error of the mean for unstandardized β, Std B=standardized β

Based on the findings of the regression analyses the null hypotheses regarding the predictive relationships between the individual risk factors (age, marital status, number of comorbidities, number of COPD exacerbations in last year, monthly household income) and depression, anxiety, and stress were rejected and alternative hypotheses were retained. The overall results support the premise that at least one individual risk factor (number of comorbidities apart from COPD, number of COPD exacerbations in last year, monthly household income) strongly predicts high levels of depression, anxiety, and stress as measured by the DASS-21 scale, among elderly patients with COPD in the respiratory treatment unit of Kandy National Hospital, Sri Lanka.

Discussion

Chronic Obstructive Pulmonary Disease (COPD) is a significant contributor to morbidity, disability, and mortality, particularly among the elderly population [1]. It is characterized by persistent respiratory symptoms and airflow limitations resulting from airway or alveolar abnormalities, often caused by prolonged exposure to harmful particles or gases [1]. This study sought to address the scarcity of empirical data concerning elderly COPD patients, particularly in minority populations, by examining the relationship between specific risk factors – age, marital status, comorbidities apart from COPD, number of exacerbations, participation in household activities, and monthly household income and depression, anxiety, and stress as measured by the DASS-21.

Tobacco smoking is widely recognized as the most significant risk factor for COPD. However, other factors, including genetic predispositions, aberrant lung development, aging, and environmental exposures such as biomass fuels and air pollution, also play a role in its pathogenesis. Beyond these exposures, host factors such as occupational hazards, poor nutrition, childhood respiratory infections, obesity, and physical inactivity contribute to COPD progression [2]. Locally, COPD prevalence was found to be 10.5%, with male prevalence significantly higher (16.4%) compared to females (6.0%). Non-smokers had a surprisingly high predicted prevalence of 16%, underscoring the role of other factors such as air pollution and genetic predispositions [6].

A critical finding of this study is the high prevalence of mental health comorbidities such as depression and anxiety among COPD patients. Despite their frequent underdiagnosis and undertreatment, these conditions significantly impact patients' quality of life, independence, and treatment compliance, ultimately increasing morbidity and mortality. Patients with untreated depression often experience lower quality of life, reduced functional capacity, and increased healthcare dependency. Therefore, it is imperative to address psychological factors alongside physical health conditions to enhance overall treatment outcomes and improve patients' well-being.

The findings align with prior studies that have identified comorbidities as significant predictors of depression and anxiety in COPD patients [9.10,11]. Multiple comorbidities exacerbate disease burden and limit patients' ability to engage in daily activities, thereby contributing to mental health deterioration. This study's findings further corroborate that participation in household activities mitigates anxiety, depression, and stress in COPD patients. However, only 18.3% of participants engaged in household activities two to three times per week, while 4% reported no participation at all. These findings are consistent with Wang et al. (2021), who emphasized the protective role of regular engagement in household and social activities in reducing psychological distress among patients with chronic respiratory disorders [11].

Contrary to previous research, this study did not identify frequent exacerbations as a significant predictor of severe anxiety or depression [9.10]. However, it was noted that exacerbations lead to prolonged hospitalizations, which could contribute to higher levels of psychological distress. This highlights the need for improved management strategies to prevent exacerbations and minimize their impact on patients' mental health. The study also observed that monthly household income significantly influenced levels of depression, anxiety, and stress. In the context of Sri Lanka's economic crisis, low-income families face barriers to accessing adequate healthcare, exacerbating the psychological burden on COPD patients. Addressing socioeconomic disparities through targeted interventions and financial support programs could significantly alleviate this burden.

Another key finding of this study is the significant association between monthly household income and psychological outcomes. Economic hardship exacerbates the mental health burden on COPD patients, particularly in low- and middle-income countries like Sri Lanka, where access to healthcare is often limited. As highlighted by Ministry of Health, Sri Lanka,

economic crises further disrupt healthcare accessibility, leaving low-income families struggling to afford essential treatments. Implementing policies to support low-income families through subsidies, financial aid, and accessible healthcare services is crucial to address these disparities [16].

The study's limitations, such as reliance on self-reported data and a predominantly male sample, highlight the need for future research to address these gaps. Expanding the scope of risk factors to include physical diagnoses, medication use, and prior mental health history could provide a more nuanced understanding of the interplay between physical and psychological health in COPD patients. Additionally, incorporating objective measures of psychological outcomes, such as clinical diagnoses or standardized assessments, would enhance the reliability and validity of the findings.

Despite these limitations, the study contributes valuable insights into the psychological burden of COPD and its associated risk factors. Understanding these relationships is essential for developing targeted interventions to improve mental health outcomes and enhance the efficacy of COPD treatment regimens. Nurses and other healthcare professionals play a critical role in identifying and addressing psychological distress in COPD patients. Providing in-service training on the importance of treating patients with dignity and respect, particularly those who are highly dependent on others, can help minimize emotional distress and improve patient satisfaction.

Screening programs to identify comorbidities and initiate early interventions are crucial for improving mental health outcomes in COPD patients. Emphasizing the importance of follow-up visits and implementing supportive measures at both inpatient and outpatient levels can further enhance treatment efficacy. For low-income families, introducing government and non-governmental programs to improve income levels and access to healthcare is imperative to mitigate the economic barriers to treatment.

In conclusion, this study underscores the importance of addressing mental health comorbidities in COPD management. Depression, anxiety, and stress significantly impact patients' quality of life and treatment compliance, necessitating a comprehensive approach to care that incorporates psychological support alongside medical treatment. Future research should explore a broader range of risk factors, including gender differences, medication use, and prior mental health history, to develop a more holistic understanding of the factors influencing psychological outcomes in COPD patients. By addressing these gaps, healthcare providers can better support COPD patients in achieving improved physical and mental health outcomes.

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