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Factors that Impact Anxiety and Depression in Patients with Chronic Obstructive Pulmonary Disease

Rumi Kaneda, RPT, MS[1,2], Hideaki Senjyu, RPT, PhD[1], Asuka Iguchi, RPT, MS[1], Yoshika Hayashi, MS, PhD[3], Shoko Iwai, OTR, MS[1], Toru Tsuda, MD, PhD[2], Hiroki Ozawa, MD, PhD[3], Sumihisa Honda, PhD[1]

[1] *Courses of Health Sciences, Nagasaki University Graduate School of Biomedical Sciences: 1–7–1 Sakamoto Nagasaki-City, Nagasaki 852-8520, Japan. TEL: +81 95-819-7963, FAX: +81 95-819-7963, E-mail: senjyu@nagasaki-u.ac.jp*
[2] *Department of Rehabilitation, Kirigaoka Tsuda Hospital*
[3] *Department of Neuropsychiatry, Unit of Translational Medicine, Nagasaki University Graduate School of Biomedical Science*

Abstract. [Purpose] There are numerous reports about anxiety and depression in patients with chronic obstructive pulmonary disease (COPD) in the literature. However, the incidence of and the factors that affect anxiety and depression differ depending on cultural backgrounds and assessment methods. In Japan, there is insufficient understanding of the mental and psychological conditions of COPD patients. To examine the comorbidity of anxiety and depression in inpatients and outpatients with COPD and to evaluate the factors affecting anxiety and depression. [Method] Mental and psychological assessments based on medical information, family composition, educational history, occupational history, respiratory function tests and the Hospital Anxiety and Depression Scale (HADS) were conducted with 156 patients with COPD as subject. [Results] The comorbidity of anxiety in all patients with COPD was 26%; moreover, the comorbidity of depression in these patients was 44%. Among inpatients, 42% displayed anxiety and 69% exhibited depression, whereas among outpatients, 18% displayed anxiety and 32% demonstrated depression. Factors causing anxiety included of living alone and hospitalization. Factors causing depression included of hospitalization, low BMI and low education level. [Conclusion] The data suggest that the causes of anxiety and depression in patients with COPD are affected by individual background. Consideration of the factors that cause these effects is important.

Key words: Chronic obstructive pulmonary disease (COPD), Anxiety, Depression

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a progressive condition caused mainly by smoking. The number of patients with COPD in Japan was estimated as approximately 5.3 million people based on the results of the Nippon COPD Epidemiology Survey (NICE study) conducted in 2001; moreover, COPD prevalence among people over 40 years of age is 8.5%[1]. Since progression of COPD is gradual, many patients believe that their shortness of breath is a consequence of age; as a result, these individuals do not seek medical assistance. Thus, persons diagnosed with COPD consist largely of individuals who are elderly or who exhibit advanced stages of the disease.

The mental and psychological states of patients with COPD are easily affected by psychological aspects such as symptoms of anxiety and depression, and they are aggravated by the overlapping of symptoms with disturbances in ADL and organ damage, e.g., cor pulmonale and polycythemia, as well as secondary symptoms, e.g., headaches and insomnia, due to respiratory failure[2–4]. Based on the ACCP/AACVPR Guidelines, the psychological distress of patients with COPD is comparatively high, with an incidence of depression of 7 to 57% and an incidence of anxiety of 10 to 96%. In addition, many factors such as oxygen therapy, BMI, pulmonary function and living alone have been reported as affecting anxiety and depression[5,6]. However, large variations exist in the literature regarding the incidence of and the factors affecting anxiety and depression. Sufficient studies have not been conducted investigating the factors that affect anxiety and depression in patients with COPD.

The objectives of this study were to examine the comorbidity of anxiety and depression in inpatients and outpatients with COPD as well as to identify those factors, from among hospitalization, living at home, age, BMI,

respiratory functions, smoking status, family composition, education history, occupational history, hospitalization history and previous medical history, that affect anxiety and depression.

SUBJECTS AND METHODS

The study subjects were 156 patients with mild to severe COPD who were hospitalized at or who regularly visited eight facilities in Japan between November 2007 and December 2008 (Table 1). Among these patients, 52 were hospitalized (45 males and 7 females; average age, 75.0 ± 7.2) and 104 were outpatients (94 males and 10 females; average age, 72.0 ± 8.2). The objectives of hospitalization were treatment for acute exacerbation, respiratory rehabilitation and at-home oxygen introduction. Selection criteria were used to ensure both hospitalized and home care outpatients were stable cases, and cases exhibiting unstable medical conditions and/or cases where communication was not possible were excluded from the study.

The Hospital Anxiety and Depression Scale (HADS)[7,8], which is universally applied as a self-completed questionnaire measuring psychological symptoms (anxiety and depression) of patients with physical disorders, was employed. This evaluation chart comprises 7 items related to depression and 7 items related to anxiety (total of 14 questions). Respondents select one of the four answers provided corresponding most closely to their perceived state, and responses are given a score ranging from 0 to 3 points. A total score of 0 to 7 points represents no symtom; a total score of 8 to 10 points represents suspect diagnosis; and a total score of 11 to 21 points represents definite diagnosis. In terms of the cutoff point, scores of ≥ 8 were assigned the possibility of depression or anxiety in order to reduce false-negatives.

For pulmonary function, vital capacity (VC), % vital capacity (%VC), forced expiratory volume in one second (FEV_1), % forced expiratory volume in one second ($\%FEV_1$) and forced expiratory volume in one second as percent of FVC ($FEV_1\%$) were measured or calculated in accordance with the respiratory function test guidelines of the American Thoracic Society[9].

Patient characteristics consisted of body mass index, previous history (complications), family composition, oxygen inhalation status, smoking status, education history and hospitalization history (hospitalization within one year prior to the survey period and during the survey period).

Explanations regarding tests were provided to inpatients when their symptoms were stable and to outpatients at the time of health examinations. Collection of general information, HADS and respiratory function tests were conducted only for those subjects from whom consent was obtained. General information was obtained based on interviews and medical records. HADS was completed by the patients themselves, except those who could not complete HADS themselves due to issues with eyesight. For those patients a therapist read the questions to the patients and completed the evaluation form.

The incidence of anxiety and depression based on HADS of patients with COPD exhibiting scores of 8 points or higher was calculated. To determine the factors affecting anxiety and depression in inpatients with COPD, anxiety or depression was assigned as the dependent variable and age, BMI, living environment, marital status, oxygen inhalation, smoking status, occupational history, hospitalization history and diseases other than COPD were set as independent variables; and step-wise logistic regression analysis was performed. The odds ratios (OR) and 95% confidence intervals (CI) were calculated. Analyses were conducted to determine which items affected anxiety and depression the most. Furthermore, as a sub-analysis, in order to identify which characteristics of inpatients and outpatients demonstrated significant differences, the Mann-Whitney U test was conducted for age, BMI, respiratory function test values and HADS scores, and the chi-squared (χ^2) test was utilized for smoking status, family composition, hospitalization history and previous medical history. For statistical processing, SPSS 16.0J for Windows was employed with the level of significance chosen as less than 5%.

RESULTS

The patients in this study (139 males and 17 females; average age, 73.0 ± 8.0 years) displayed COPD severity ranging from mild to severe based on GOLD classifications. Average HADS scores were 6 ± 4 and 7 ± 4 points for anxiety and depression, respectively. Seventy-three percent of the patients had received a high school education or lower and 55% of the patients were engaged in manual labor. With regard to diseases other than COPD, 29% of the patients exhibited hypertension (Table 1).

Based on HADS scores, the comorbidity incidence of anxiety in all patients displaying a score of 8 points or higher was 26.2% (suspect diagnosis: 14.1%; definite diagnosis: 12.2%); furthermore, the incidence of depression in all such patients was 44.2% (suspect diagnosis: 22.4%; definite diagnosis: 21.8%). The incidence of anxiety among inpatients was 42.3%, of whom 19.2% received a suspect diagnosis and 23.1% received a definite diagnosis. The incidence of depression among inpatients was 69.2% (suspect diagnosis: 28.8%; definite diagnosis: 40.4%). The incidence of anxiety among outpatients was 18.2%, of whom 11.5% received a suspect diagnosis and 6.7% received a definite diagnosis. The incidence of depression among outpatients was 31.7%, of whom 19.2% received a suspect diagnosis and 12.5% received a definite diagnosis. The incidence of both anxiety ($p=0.001$) and depression ($p<0.001$) was significantly higher among inpatients.

Tables 2 and 3 illustrate the results obtained for the factors affecting anxiety and depression in all patients with COPD. Living alone (OR: 8.66; 95% CI: 1.86–39.64) and hospitalization (OR: 4.34; 95% CI: 1.02–18.50) demonstrated a high probabilities of causing anxiety, whereas hospitalization (OR: 5.33; 95% CI: 2.21–12.85), low BMI (OR: 4.23; 95% CI: 1.55–11.51), low education level (OR: 2.96; 95% CI: 1.13–7.76) and hypertension (OR: 2.84; 95% CI: 1.16–6.95) demonstrated a high probabilities of causing depression.

Table 1. Characteristics of patients with COPD (n=156)

Variables	mean ± SD	Variables	mean ± SD
Sex (Male/Female)	139/17	Living alone (%)	11.5
Age	73.0 ± 8.0	No spouse (%)	21.8
Body Mass Index (kg/m^2)	21.1 ± 3.6	Education level (%)	
Respiratory function		Less than junior high school	44.9
FEV1.0 (L/sec)	1.20 ± 0.59	High school	27.6
%FEV (%)	52.2 ± 25.7	More than a junior college	17.3
FEV1.0% (%)	50.6 ± 16.4	Occupation (%)	
VC(L)	2.65 ± 0.77	Deskwork	28.8
%VC (%)	83.9 ± 20.1	Manual labor	55.1
HADS anxiety score	5.8 ± 3.9	Oxygen inhalation (%)	39.1
Anxiety prevalence (≥8;%)	26.2	Hospitalization history (%)	46.2
HADS depression score	7.0 ± 4.0	Comorbidity (%)	
Depression prevalence (≥8;%)	44.2	Hypertension	28.8
Smoking status (%)	94.9	Diabetes mellitus	13.5
Current smoker	13.5	Heart disorder	9.6
Ex-smoker	72.4	Bronchial asthma	8.3
Non-smoker	4.5	Cerebrovascular disease	5.1
		Other	26.9
		Osteoarthritis/Surgery	14.7

Table 2. Factors affecting anxiety in patients with COPD

Anxiety state		Odds ratio (95%IC)
Family composition	Living alone	8.66 (1.89–39.64)**
Living environment	Hospitalization	4.34 (1.02–18.50)*

* : p<0.05, ** : p<0.01.

Table 3. Factors affecting depression in patients with COPD

Depressed state		Odds ratio(95%IC)
Living environment	Hospitalization	5.33 (2.21–12.85)***
Body Mass Index	<18.5 kg/m^2	4.23 (1.55–11.51)**
Education	Less than junior high school	2.96 (1.13–7.76)*
Comorbidity	Hypertension	2.84 (1.16–6.95)*

* : p<0.05, ** : p<0.01, *** : p<0.001.

Hospitalization greatly affected both anxiety and depression. Consequently, a comparison of the inpatients and outpatients was conducted. Inpatients were characterized by older age, low BMI, high severity levels and high HADS scores. The results demonstrate the strong possibility that many inpatients suffered from anxiety and depression (Table 4).

DISCUSSION

The comorbidity incidence of anxiety in patients with COPD was 26.2% and that of depression was 44.2%. These findings are consistent with those of past reports[5,6]. In addition, living alone and hospitalization were found to lead to anxiety, whereas hospitalization, low BMI, low education history and hypertension were found to lead to depression. Thus, hospitalization influenced both depression and anxiety. This finding is attributable to hospitalization leading to a decline in body functions, resulting in growing patient pessimism due to aggravation of symptoms, which exerts spillover effects on various aspects, e.g., depression, anxiety and loss of appetite[10,11]. In order to avoid hospitalization, patients' capacity for self-management need to be increased. Also, the continuity of exercise treatment should be promoted to maintain and improve exercise tolerance, and home medical care should be enhanced to combat acute exacerbation at an early stage.

Quint et al.[12] reported that due to acute exacerbation, the amount of time that patients spend outdoors decreases and depression becomes aggravated. Given that the probability of the development of depression is high[13, 14] in patients with low BMI, which is thought to be due to physical symptoms such as dyspnea as well as a decrease in activity levels, skeletal muscle mass and appetite, it is essential for these patients to maintain sufficient activity levels and to undergo nutrition management. In particular, we demonstrated that patients who live alone display a high probability of developing anxiety. Gretchen et al. [15]

Table 4. Characteristics of inpatients and outpatients

Variables	Inpatient	Outpatient
Total (Male/Female)	52 (45/7)	104 (94/10)
Age	75.0 ± 7.2	72.0 ± 8.2*
Body Mass Index (kg/m^2)	20.3 ± 3.7	21.4 ± 3.5*
Respiratory function		
$FEV_{1.0}$ (L/sec)	0.91 ± 0.48	1.34 ± 0.59***
$\%FEV_{1.0}$ (%)	44.6 ± 28.2	56.0 ± 23.6**
$FEV_{1.0}\%$ (%)	45.2 ± 17.0	53.3 ± 15.5**
VC (L)	2.33 ± 0.73	2.81 ± 0.75***
%VC (%)	77.5 ± 20.6	87.1 ± 19.2**
HADS anxiety score	7.1 ± 4.5	5.1 ± 3.3**
Anxiety prevalence (≥8;%)	42.3	18.2**
HADS depression score	9.2 ± 4.0	5.9 ± 3.6***
Depression prevalence (≥8;%)	69.2	31.7***
Smoking status (%)	96.2	96.2
Current	5.8	17.3
Ex-smoker	63.5	76.9
Non-smoker	7.7	2.9
Living alone (%)	15.4	9.6
No Spouse (%)	25.0	15.4
Education level (%)		
Less than junior high school	48.1	43.3
High school	25.0	28.8
More than a junior college	15.4	18.3
Occupation (%)		
Desk work	26.9	29.8
Manual labor	61.5	51.9
Oxygen inhalation (%)	69.2	24.0***
Hospitalization history (%)	100	19.2***
Comorbidity (%)		
Hypertension	36.5	25.0
Diabetes mellitus	11.5	14.4
Heart disorder	11.5	8.7
Bronchial asthma	5.8	9.6
Cerebrovascular disease	7.7	3.8
Other	32.7	24.0
Osteoarthritis/Surgical	23.1	10.6*

* : $p<0.05$, ** : $p<0.01$, *** : $p<0.001$.

reported that improvements were indicated in such patients after the implementation of drug therapy, cognitive behavioral therapy and pulmonary rehabilitation as treatment strategies for anxiety. In the future, the incorporation of these types of specialized treatment will be necessary.

In terms of education levels, Randi et al.[16] reported that among patients with COPD, who were not categorized as hospitalized or receiving home care, a low education level increased the risk of psychological distress. Identical results were obtained in this study. Many of the subjects in the current investigation were males aged in their 70s and 80s. Priority was assigned to working rather than education. Thus, a large number of patients displayed low education levels. A relationship between low socioeconomic status and a decline in pulmonary functions has been documented, and is thought to be attributable to the large number of patients with COPD characterized by low social status[17].

With regard to the relationship between anxiety/depression and an internal disease other than COPD, hypertension was shown to affect depression. Hypertension is reported to be related to accommodation disorders or sympathetic hypertonia [18]. Ohira et al.[19] reported that patients with a high score based on the depression scale exhibited an approximate 2-fold relative risk for total stroke occurrence and a 7-fold relative risk for ischemic heart disease in comparison with patients with a low score. Accordingly, patients with COPD who have hypertension develop depression more easily. Many cases in which cardiovascular lesions including hypertension are comorbid with COPD have been documented; thus, precautions are necessary[20, 21].

De Voogd et al.[22] described a relationship between depression and mortality rates. In order to prevent the development of depression, the promotion of social care, stress management and self-management programs as components of comprehensive pulmonary rehabilitation is important. Accordingly, when implementing pulmonary rehabilitation, it is necessary to discover anxiety and depression early, and to respond appropriately by ensuring that changes in the symptoms of individual patients are not overlooked as well as including mental and psychological assessments in the required assessment items.

Limitations of this study include the fact that assessment of dementia was not conducted, biases existed in the environment, symptoms and severity in the comparison of inpatients with outpatients, and the lack of clear decisions regarding the timing of the performance of the evaluations as selection criteria. In this investigation, it was not possible to conduct causal analysis for inpatients and outpatients due to the small sample sizes. Future studies will need to evaluate each inpatient and outpatient over time and assess whether a patient's mental and psychological states are sustainable during continuation of comprehensive pulmonary rehabilitation.

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