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Original Article

The clinical impact of depressive symptom on ADL score in elderly patients with respiratory disease

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ABSTRACT

Ono M, Kono Y, Aoyagi Y, Tsuji Y, Ishikawa A, Sugiura T, Mori E, Tanaka Y, Kagaya H, Hirose M, Horiguchi T, Saitoh E. The clinical impact of depressive symptom on ADL score in elderly patients with respiratory disease. Jpn J Compr Rehabil Sci 2018: 9: 29–33.

Background: This study aimed to clarify the impact of depressive symptom on activities of daily living (ADL) in elderly patients with respiratory disease.

Methods: We studied 160 consecutive patients who met the criterion of no physical disability. During hospitalization, we measured physical function, respiratory function and Hospital Anxiety and Depression Scale (HADS). Firstly, we divided the patients into two groups (depression group and non-depression group) followed by presence of depressive symptom, which was defined as an HADS score of 8 points or more. Then we analyzed the association between depressive symptom and the other clinical variables mentioned above by the chi-squared test and unpaired *t*-test.

Results: There were 40 patients (22.7%) in the depression group. There was no statistically significant difference in age, sex, BMI, physical function or respiratory function. Although we could not find any difference in FIM motor score, the score of NRADL (The Nagasaki University Respiratory Activity of Daily Living Questionnaire), which is a disease-specific ADL score, was significantly lower in the depression group than the non-depression group (71.6 points vs 59.7 points).

Conclusion: We clarified that depressive symptom was closely related to NRADL score, but not to FIM motor score. The results also suggest that it is important to consider the impact of depressive symptom on ADL score when evaluating ADL in elderly patients with respiratory disease.

Key words: elderly patients, respiratory disease, depression, ADL, physical function

Introduction

In Japan, the mortality rate of respiratory diseases is increasing. Particularly, pneumonia and chronic obstructive pulmonary disease (COPD) rank as the third and tenth leading causes of death [1], respectively. According to the report of a study published in 2008 by the World Health Organization, COPD was the fourth leading cause of death in 2010 and is predicted to become the third by 2030 [2]. The Nippon COPD epidemiology study, a large-scale epidemiological study in Japan, found that the prevalence of COPD among individuals aged 40 years or older is 8.6%, with the rate increasing with age [3]. Hence, the number of elderly patients with respiratory diseases, such as pneumonia and COPD, is expected to increase rapidly in line with population aging. Therefore, we should consider therapeutic strategies for elderly patients with respiratory diseases.

It has been indicated that the prevalence of depression is high in patients with chronic diseases. The prevalence of depression in COPD patients has been reported to be approximately 45% [4]. Moreover, the prevalence rate increases with worsening BODE index score, which is an index of dyspnea [5]. It has been reported that depression is associated with a

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decrease in physical function and functional capacity [6], and is considered to be a key factor of the decrease in quality of life (QOL) among patients with COPD [7]. Furthermore, previous research also indicated that depression decreases physical function and increases the risk of death in patients with heart failure [8]. However, the relationships between depression, physical function and activities of daily living (ADL) among elderly patients with respiratory diseases have not been thoroughly examined. Therefore, this study investigated these relationships among such patients.

Methods

1. Participants

From June 2014, we enrolled consecutive patients aged 65 years or older with respiratory diseases who were admitted to Fujita Health University Banbuntane Hotokukai Hospital, an advanced hospital in Nagoya City for patients with acute conditions, due to worsening respiratory conditions. Patients who could not walk 10 m independently, had severe dementia (mini-mental state examination <17), and had a history of psychiatric disorders or a lack of motivation to participate in this study were excluded. The Research Ethics Committee of Fujita Health University approved the study (Approval No: 15-259), and all the study participants provided written informed consent.

2. Study design and protocol

We performed a single-center registry, prospective, observational, correlational study. A baseline examination was conducted during the patients' hospitalization. We measured physical function parameters, conducted a lung function test at discharge and collected laboratory measurements from medical records.

3. Measurement indicators

We selected age, gender, body mass index (BMI), past history, and smoking habits for each patient to provide a background from their medical charts. If a patient had more than two diagnoses, the underlying condition was preferentially selected. For example, when the patient with COPD had acute exacerbation due to acute pneumonia, we define COPD as the primary etiology in this study. We also obtained C reactive protein (CRP), serum protein, and serum albumin from blood tests. The geriatric nutritional risk index (GNRI), a nutrition-associated indicator, was calculated using the serum albumin level and body weight.

Measurements of physical function comprised the circumference of the upper arm, lower leg, and abdomen; grip strength; isometric knee extension muscle strength; 6-minute walking distance (6MWD); gait speed; and modified functional reach test. The circumference of the upper arm was measured at the midpoint between the acromion and olecranon when the upper extremity was lowered to the trunk side, and the circumference of the lower leg was measured at the largest point of the calf with the knee extended. The circumferences of both the right and left side were measured, and the maximum value was used in the analysis. Handgrip strength was measured by a Jamar dynamometer. The participants were asked to sit with their wrist in a neutral position and elbow flexed to 90°. Grip strength was measured three times for each hand, and the highest value was used for the analysis. Isometric knee extensor muscle strength was measured using a digital hand-held dynamometer (μTasF-1, Anima Co., Chofu, Tokyo, Japan), a device that has been validated and shown to be reliable among the elderly. During testing, the participant adopted a sitting position with the arms supported on the edge of the table and was fitted with a hand-held dynamometer on the anterior aspect of the measured ankle, which was fixed to the table leg by a vinyl strap. The participant was asked to extend the legs and push with maximum effort twice for each leg. The leg length was also measured from the lateral joint space of the knee to the lateral top of the device belt. The best performance was used as the maximum power and was transformed into Newton-meters adjusted by weight (Nm/kg). Walking speed was evaluated by the 10-m usual walk test; subjects were requested to walk at their usual pace for 14 m, of which the middle 10 m was timed. The test was performed twice, and the speed in the faster trial was used for analysis. Cognitive function was assessed using the Mini-Mental State Examination. For the 6MWD, preparations and procedures were conducted in accordance with the guidelines of the American Thoracic Society [9]. Subjects were requested to walk as far as possible in 6 min. If the subjects normally required walking aids including canes or walkers for daily walking, these were used. The lung function test was performed using the Autospiro AS-507 (Minato Medical Science Co., Ltd.,Osaka, Japan), which measures vital capacity percentage and forced expiratory volume$_{1.0\%}$. These were measured twice, and the maximum value was used in the analysis.

In addition, we performed a questionnaire survey, and the following tools were used for evaluating cognitive function and QOL: the revised Hasegawa's dementia scale, and the COPD assessment test (CAT). The Nagasaki University Respiratory ADL (NRADL) questionnaire, which is a self-reported questionnaire, was used to evaluate perceived difficulty in ADL, and the functional independence measure (FIM), which is an objective measure of ADL, was utilized for ADL evaluation. We used the hospital anxiety and depression scale (HADS) for the evaluation of depression, which measures the total score of seven items related to depression. In the original tool, a total score of 0–7 indicates no anxiety/depression, a score of 8–10 indicates suspected anxiety/depression, and a

score of 11–21 indicates a definitive diagnosis of depression [10]. However, in the present study, we allocated patients into the group without depression if they had a score of ≤7 and into the group with depression if they had a score of ≥8.

4. Analysis methods

All participants were divided into two groups based on their HADS score: those with depression (depression group) and those without depression (non-depression group). To compare these two groups, sex and disease types were analyzed using the chi-squared test, and other items were analyzed using the unpaired *t*-test. The analyses were performed using the Statistical Package for the Social Sciences software, version 24 (SPSS Japan, 2016, Tokyo), and the significance level was set at 5%.

Results

1. Patient attributes

Among the 272 participants included in the present study, 160 met the inclusion criteria (males: 96, mean age: 76.9 ± 10.0 yo) and were included in the analyses (Figure 1). Depression was observed in 40 patients (22.7%). The background of the participants is shown in Table 1.

2. Comparison of clinical variables

The results of the comparisons between the groups are shown in Tables 1 and 2. There was no difference between the groups in terms of patients' background, physical function, lung function, and FIM score; however, the depression group showed significantly higher CAT scores and significantly lower NRADL scores than the non-depression group.

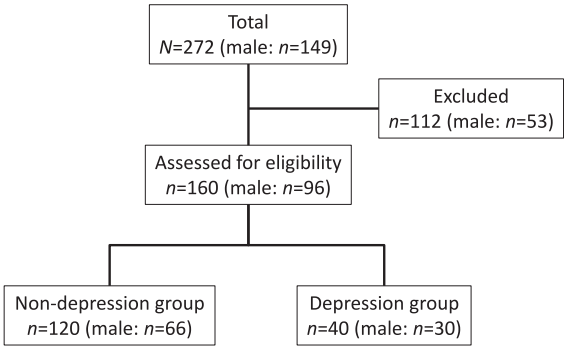

Figure 1. Flow of patients of the study sample.

Discussion

The primary finding of this study was that there was no significant difference in terms of physical function and FIM score between the groups with and without depression; however, the depression group had significantly lower NRADL scores than the non-depression group. The present study is the first report to show the relationship between depression and ADL among elderly patients with respiratory diseases.

Among the participants, 22.7% had depression. Previous studies reported that the prevalence of depression among COPD patients is approximately 20–45% [4, 11, 12]. In this study, the prevalence of depression among patients with COPD was 31%,

Table 1. Demographic and clinical characteristics of patients.

	Total (*N*=160)	Non-depression (*n*=120)	Depression (*n*=40)	*p*
Age	78.3 (9.9)	78.6 (10.6)	77.1 (7.3)	0.314
BMI	20.2 (3.8)	19.8 (3.6)	20.9 (4.2)	0.158
GNRI	89.4 (15.3)	88.5 (16.1)	92.2 (12.2)	0.125
Serum Alb (g/dl)	3.4 (0.5)	3.4 (0.5)	3.5 (0.6)	0.673
%VC (%)	66.4 (22.2)	68.3 (22.7)	60.2 (19.5)	0.055
$FEV_{1.0\%}$ (%)	67.6 (20.4)	67.4 (18.8)	68.0 (26.0)	0.907
Etiology				
COPD (*n*)	59	41	18	0.745
Pneumonia (*n*)	43	34	9	
IP (*n*)	18	16	2	
Bronchial asthma (*n*)	11	8	3	
Bronchiectasis (*n*)	3	0	3	
Lung cancer (*n*)	8	5	3	
Others (*n*)	18	16	2	

The data are the number of patients (%), and mean (standard deviation) in other variables.
BMI, Body Mass Index; GNRI, Geriatric Nutrition Risk Index; Alb, Albumin; VC, Vital Capacity; $FEV_{1.0\%}$, %Forced Expiratory Volume in One Second; COPD, Chronic Obstructive Pulmonary Disease; IP, Interstitial Pneumonia.

Table 2. Results of comparison between the groups.

	Non-depression (*n*=120)	Depression (*n*=40)	*p*
Grip (kg)	17.7 (9.0)	19.6 (10.6)	0.331
KEMS (Nm/kg)	3.3 (2.1)	3.0 (2.0)	0.480
6MWD (m)	269 (113)	241 (117)	0.241
10 m Walking time (sec)	11.3 (6.7)	12.1 (6.9)	0.544
FIM motor (points)	75.4 (20.0)	73.1 (20.2)	0.529
FIM cognitive (points)	31.6 (6.7)	30.3 (6.9)	0.308
CAT (points)	14.0 (8.1)	20.0 (7.0)	<0.001
NRADL (points)	71.6 (19.0)	59.7 (26.1)	0.020

The data are shown as mean (standard deviation).
KEMS, Knee Extensor Muscle Strength; 6MWD, 6-Minute Walk Distance; FIM, Functional Independence Measure; CAT, COPD Assessment Test; NRADL, The Nagasaki University Respiratory Activities of Daily Living Questionnaire.

indicating that our results are consistent with those of previous studies. Another study showed that the number of mood disorders, such as depression, bipolar disorder, and dysthymic disorder, has been rapidly increasing in recent years, especially in elderly populations, accounting for 40.5% [13]. A study conducted by the Ministry of Health, Labour and Welfare also found that 58.3% of inpatients with mental disorders were aged 65 years or older [14]. Although the participants of the present study were relatively older than those of previous studies, the prevalence of depression was almost the same as in previous studies; underlying diseases may have influenced this result. Accordingly, our study demonstrated a similar high rate of depression comorbidity among elderly patients with respiratory diseases.

Our results showed that FIM (motor and cognitive) scores at discharge did not differ between the two groups. However, this group exhibited significantly high CAT scores and significantly low NRADL scores. Moreover, unlike patients with musculoskeletal diseases, those with COPD were able to execute ADLs themselves, although the motions were limited due to symptoms such as dyspnea. Thus, it is difficult to identify the ADL limitations of such patients based on standard measurements of ADL [15]. In a study that examined the relationship between ADL and depression based on the Medical Research Council (MRC) dyspnea scale, significant differences between MRC grades III and IV in terms of FIM scores were observed. However, no difference was observed between grades I and II and grades II and III in terms of FIM scores. Moreover, significant differences were noted between all the grades, except grades I and II in terms of NRADL scores [16]. Based on the above, FIM may not reflect disease-specific ADL limitations when evaluating the ADLs of patients with respiratory diseases, indicating the need to include ADL indices that are disease-specific.

This study has several limitations. Firstly, the sample size of the present study was relatively small for a survey, which may have affected the prevalence rate of depression. Furthermore, we analyzed both chronic diseases (COPD) and acute diseases (community-acquired pneumonia) at the same time, which might have caused bias related to disease type. Disease staging data were not eliminated, and the sub-analysis of these factors was also challenging due to the sample size. Nevertheless, because no studies targeting older patients with respiratory diseases have been conducted in Japan, our study is significant for providing preliminary data. Further detailed studies, including a large-scale case registry study and follow-up study, are required to elucidate the relationship between depression and ADLs, taking disease and staging into account.

Conclusions

The present study revealed a high prevalence of depression among elderly patients with respiratory diseases. Although actual ADL and physical function did not differ due to the prevalence of depression, increased perceived difficulty in performing ADL, which was disease-specific, was observed. These results also suggest the necessity of assessing depression when evaluating the difficulty of ADL for patients with respiratory diseases.

References

1. Ministry of Health, Labour and Welfare: Overview of the 2015 Vital Statistics. Available from: http://www.mhlw.go.jp/toukei/saikin/hw/jinkou/geppo/nengai15/dl/kekka.pdf. Japanese.
2. World Health Organization: World Health Statics 2008.

Available from http://www.who.int/whosis/whostat/2008/en/ (cited December 31, 2017).
3. Fukuchi Y, Nishimura M, Ichinose M, Adachi M, Nagai A, Kuriyama T, et al. COPD in Japan: the Nippon COPD Epidemiology study. Respirology 2004; 9: 458–65.
4. Suzuki J. The characteristics and treatment of depression in patients with COPD. Pharma Medica 2014; 32: 178–9. Japanese.
5. Iguchi A, Senjyu H, Hayashi Y, Kanada R, Iwai S, Honda S. Relationship between depression in patients with COPD and the percent of predicted FEV_1, BODE index, and health-related quality of life. Respir Care 2013; 58: 334–9.
6. Honda H, Sendo M, Takahashi E, Hirata C, Ueki S. Relationship between physical function and depression in community dwelling elderly. J health Soc Serv 2004; 3: 51–61. Japanese.
7. Omachi TA, Katz PP, Yelin EH, Gregorich SE, Iribarren C, Blanc PD, et al. Depression and health-related quality of life in chronic obstructive pulmonary disease. Am J Med 2009; 122: 778. e9–15.
8. Vaccarino V, Kasl SV, Abramson J, Krumholz HM. Depressive symptoms and risk of functional decline and death in patients with heart failure. J Am Coll Cardiol 2001; 38: 199–205.
9. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med 2002; 166: 111–7.
10. Zigmond AS, Snaith RP. Hospital anxiety and depression scale. Arch Psychiatr Diagn Clin Eval 1993; 4: 371–2. Japanese.
11. Senda K. COPD and depression. Nippon Ronen Igakkai Zasshi 2013; 50: 755–8. Japanese.
12. Hanania NA, Müllerova H, Locantore NW, Vestbo J, Watkins ML, Wouters EF, et al. Determinants of depression in the ECLIPSE chronic obstructive pulmonary disease cohort. Am J Respir Crit Care Med 2011; 183: 604–11.
13. Honda Y. Agenda of social support for elderly population with depression. Yakuzen Kagaku Kennkyujo Kiyou 2010; 3: 33–8. Japanese.
14. Ministry of Health, Labour and Welfare: 2014 (2014) Overview of the patient survey. Available from: http://www.mhlw.go.jp/toukei/saikin/hw/kanja/14/dl/kanja.pdf. Japanese.
15. Yohannes AM, Roomi J, Waters K, Connolly MJ. A comparison of the Barthel index and Nottingham extended activities of daily living scale in the assessment of disability in chronic airflow limitation in old age. Age Ageing 1998; 27: 369–74.
16. Eriguchi K, Nagata T, Itaki M, Matsuda T, Sumimoto K, Kawamata M, et al. The severity of respiratory disease patients are not reflected by FIM scoring. J Jpn Soc Respir Care Rehabil 2010; 20: 166–9. Japanese.