**FACTORS AFFECTING THE BODE INDEX OF THAI OLDER ADULTS WITH COPD**

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#### ABSTRACT

**Rationale**: The aim of this cross-sectional study was to explore factors attribute to the severity of COPD among older adults with COPD in southern Thailand.

**Methods**: This study was conducted with 105 older adults who are 60 years and above with diagnosed COPD for a year and recruited by using systemic random sampling technique. The subjects were assessed BODE index: the body-mass index (B), the degree of airflow obstruction (O) measured by FEV1 percentage of the predicted value, dyspnea (D) measured by the modified Medical Research Council (MMRC) dyspnea scale, and exercise capacity (E) measured by the 6 minute walk distance (6MWD). The higher scores indicate a higher risk of death. Socio-demographic information, Personal Health Questionnaire Depression Scale (PHQ-9), smoking status, and other clinical data were collected. Descriptive and multiple regression analysis were applied for data analysis.

**Results**: Most patients (84%) were male; they had a mean (SD) age of 72(8) years and mild to severe COPD (FEV1% 69(10) predicted) with BODE index score 3(2) points. The study showed that BODE index scores related to age (r = .26, *p* < .01), length of stay (r = .20, *p* < .05), income (r = -.25, *p* < .05) and depression (r = .26, *p* < .01). The regression analysis shows that BODE index score were affected by age (*p* < .05) and depression (*p* < .05).

**Keywords**: Severity of COPD, BODE index, Thai older adult, Depression

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**BACKGROUND**

Chronic obstructive pulmonary disease (COPD) is a heterogeneous disease with various clinical presentations (WHO, 2002). The basic abnormality in all patients with COPD is airflow limitation. COPD is a leading cause of morbidity and mortality worldwide and results in an economic and social burden that is both substantial and increasing (Lopez, Shibuya, Raco, et al., 2006; Mathers & Loncar, 2006). According to Global Burden of Disease Study, COPD which ranked sixth as a cause of death in 1990, will be the fifth leading cause of disability (DALYs) and the third leading cause of death by 2020; a newer projection estimated COPD will be the fourth leading cause of death in 2030 (Mathers & Loncar, 2006).

In Asia-Pacific Countries, the total number of moderate to severe COPD cases among 12 countries of this region was 56.6 million with an overall prevalence proportion of 6.3%. The COPD prevalence proportions among the countries range from 3.5% (Hong Kong and Singapore) to 6.7% (Vietnam) and 5 % in Thailand (Tan & Ng, 2008). The proportion of death and ill which defined the causes of COPD found from 4% in New Zealand to more than 40% in Sri Lanka and Thailand (Lopez, Mather, Essati, Jamison, & Murray, 2006). Morbidity and mortality resulting from COPD relate to the real impact of the disease.

The prevalence and burden of COPD are projected to increase in the coming decades due to continued exposure to COPD risk factors and the changing age structure of the world’s population (with more people living longer and therefore expressing the long-term effects of expose to COPD risk factors) (Mathers & Loncar, 2006). Age-related physiological changes contribute to impaired pulmonary function and contribute to the increased prevalence of COPD with age. Aging itself is a risk factor for COPD and aging of the airways and parenchyma mimic some of the structural changes associated with COPD (Maciewicz, Warburton, & Rennard, 2009). At age 70 years, forced expiratory volume in one second (FEV1) decreased by about 30%, forced vital capacity (FVC) expected to decline by about 20%, and FEV1/FVC expected about 74% (GOLD, 2013). The Latin American Project for the Investigation of Obstructive Lung Disease (PLATINO) (Menezes, Perez-Padilla, Jardim, et al., 2005) examined the prevalence of post-bronchodilator airflow limitation among persons over age 40 in five major Latin American cites indicated the prevalence of COPD increased steeply with age, with the highest prevalence among those over age 60 ranging from 7.8-19.7%.

Morbidity and mortality resulting from COPD relate to the real impact of the disease. Measure this impact using CAT ("COPD Assessment Test"), specific instrument for self-evaluation of health in this disease, may be complementary to the BODE index, an indicator of mortality. The specific instrument for self-evaluation of health in this disease, may be complementary to the BODE index, an indicator of mortality (Tashkin, 2011). Recently a multidimensional grading system based on the BODE index - has begun to be used increasingly for the evaluation COPD patients. It is capable of predicting COPD-related hospitalization and mortality more than its individual components (Celli et al., 2008). The BODE index was a better predictor of exacerbation than the FEV1 alone (*p* < 0.01) (Marin et al., 2008).

Many studies have investigated factors influencing quality of life in older adults COPD sufferers, but little attention has been described to the severity of COPD among older adult that leads to greater risk of death. The aim of this cross-sectional study was to describe the severity of COPD among older adults diagnosed COPD and explore factors attribute to the severity of COPD among them living with socio-demographic status (age and income) and health status (emergency department visit, length of stay and depression). Hopefully, future intervention on COPD severity should consider these factors. It is possible that the COPD severity in older adults with COPD will be decrease when they are provided with clinical therapeutics to prevent these risk factors, especially the aged group.

**METHOD**

**Setting**

This study was adescriptive correlation study conducted to test a relationship of BODE index in Thai older adults with COPD. The study was conducted at five Tambon Health Promotion Centers in Nakhon Si Thammarat in the southern Thailand. The centers provide services for COPD patient were selected by simple random samplings with random number during October 2012 to September, 2013 because (1) the policy of the Public Health Ministry was to improve the potential of health centers to take care of patients with chronic diseases under the Universal Health Care Coverage Scheme. As a result, chronic care service for chronically ill patients had been established at these health centers, (2) those health centers had a chronic care service for caring for older adults with COPD following the guidelines for the treatment of COPD (GOLD, 2013) that was the same standard care as other health care services in Thailand, and (3) this area was easily accessible.

**Sample**

The participant for this study was older persons aged 60 years and over diagnosed by physician as having mild to severe stage of COPD according to the guidelines of the European Respiratory Society and the American Thoracic Society (ERS/ATS) (Celli & MacNee, 2004). who received chronic care services and respiratory drug treatment at health center in Thasala, Nakhon Si Thammarat, Thailand.

The participants were selected based on their eligibility. The researcher first reviewed medical records and interviewed all participants to determine whether the participants were eligible. Prospective participants fulfilling all of the following criteria were invited to participate in this study. Inclusion criteria included age 60 years and above at the time of the initial screening; post-bronchodilator FEV1/FVC ratio < 0.70; post-bronchodilator FEV1 percent predicted ≤ 70 percent; good cognitive function which was assessed by standard Mini Mental Status Examination (Thai Version 2002) (Thai Cognitive Test Development Committee, 2002); good functional status was assessed by Chula ADL Index; and willing to participate in this study. The study participants included 105 older adults with COPD attending at outpatients department of the five participating health centers.

**Instruments**

1. Socio-demographic included age, gender, education and income; health status: re-hospitalization, length of stay, emergency department visit, depression; smoking status: current smoking, packed-year.
2. Personal Health Questionnaire Depression Scale (PHQ-9) a screening tool of major depression within last 2 weeks consisting of 9 items rating from 0 (none) to 3 (every day). A total score of 7 points or greater, out of 27 points, is considered to indicate the presence of depression, with sensitivity was of 0.84 and specificity was of 0.77. This is a validated screening questionnaire for psychiatric morbidity that is widely used in COPD patients (Lotrakul, Sumrithe, Saipanish, 2008).
3. BODE index is a multidimensional grading system that comprises as follows:
	1. The body-mass index (B)
	2. The degree of airflow obstruction (O) measured by FEV1 percentage of the predicted value, based on a standardized protocol of American Thoracic Society (1995)
	3. Dyspnea (D) measured by the modified Medical Research Council (mMRC) dyspnea scale
	4. exercise capacity (E) measured by the 6 minute walk distance (6MWD), based on a standardized guidelines for the six-minute walk test of American Thoracic Society (2002).

**Table 1** Scoring the BODE Index (Celli et al, 2004)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 |
| FEV1% predicted | ≥ 65 | 50-64 | 36-49 | ≤ 35 |
| 6MWD (m) | ≥ 350 | 250-349 | 150-249 | ≤ 149 |
| mMRC (score) | 0-1 | 2 | 3 | 4 |
| BMI (kg/m2) | > 21 | ≤ 21 |  |  |

Scores derived using the BODE index can be divided into 4 quartiles: quartile I is a score of 0–2; quartile II is a score of 3–4; quartile III is a score of 5–6; and quartile IV is a score of 7–10.Total BODE Index score is to 0-10 units. The higher scores indicate a higher risk of death.

**Procedure**

 This study was approved by the Institute Review Board Committee of Walailak University. Data were collected over 1 year (October 2011 to September 2012). Before data collection, the participants received information regarding the study and signed consent forms. Data were collected by interview following questionnaire, personal health-record information, and met with participants individually. Approximately 30-40 minutes was needed to complete all test and questionnaire. The interview technique was used in this study because this method is appropriate for Thai older adults who illiterate and/or visually impaired and reduce ambiguity and confusion among them.Trained interviewers administered test and questionnaires to participants.

**Data Analysis**

Number, Mean, SD were used to describe the demographic characteristics and health status of the participants. Descriptive statistics and assumptions underlying multiple regression analysis were determined using the Statistical Package Program for Social Sciences, version 17.

**RESULTS**

Most patients (84%) were male; they had a mean (SD) age of 72 (8) years and mild to severe COPD (post-bronchodilator FEV1 69(10)% predicted) with BODE index score 3(2) points (Table 2). The study revealed that age (r = 0.260, p < .01), income (r = - 0.252,  *p* < .01), length of stay (r = 0.202, *p* < .05), and depression (r = 0.237, *p* < .05) were correlation to BODE index (Table 3). The Stepwise Multiple Regression Analysis show age (β = 0.251, *p* = 0.008), length of stay (r = 0.185, *p* = 0.050), and depression (β = 0.19, *p* = 0.044) affected to BODE index about 15% (Table 4).

**Table 2** Personal characteristic of participants (n=105)

|  |  |
| --- | --- |
| Characteristics | Mean ±SD or N |
| Male/female gender, N/N | 91/17 |
| Age, year (range 60-93) | 72.1 ± 7.9 |
| Income, $ (range 15.63-937.50) | 136.5 ± 140.7 |
| BODE index (range 0-9) | 3.3 ± 1.9 |
| Body mass index, kg/m2 (range 12.89-34.60) | 21.7 ± 4.4 |
| FEV1 % predicted (range 45.78-93.55) | 70.5 ± 9.9 |
| Modified MRC dyspnea scale | 1.9 ± 1.0 |
| Six-minute walking distance, meter (range 30-393) | 246.1 ± 98.1 |
| Length of stay, day (range 0-59) | 6.44 ± 10.8 |
| Depression (range 0-22) | 8.8 ± 5.9 |

**Table 3** Correlation Matrix among variables (n=105)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | BODE index | Age | Income | LOS | ER Visit |
| Age | .260\*\* |  |  |  |  |
| Income | -.252\*\* | -.242\* |  |  |  |
| LOS | .202\* | -.036 | -.050 |  |  |
| ER Visit | .033 | -.073 | .039 | .602\*\* |  |
| Depression | .237\* | .086 | -.139 | .141 | .183 |

\*\*p < .01, \*p < .05

LOS: Length of stay

**Table 4** Stepwise multiple regression for the BODE index score (n=105)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | B | SE | *β* | *p* | R2 change |
| Age | .069 | .025 | .251 | .008 | .068 |
| Depression | .416 | .204 | 0.19 | .044 | .047 |
| Length of stay | .036 | .018 | .185 | .050 | .033 |
| Constant |  -2.83 |  |  |  |  |
| R2 |  0.15 |  |  |  |  |

**DISCUSSION**

Most of older adults in this study were women and middle-old group with poor income. The findings were congruent with the report of the National Statistical Office (2007b). Most of the older adults had a monthly family income that was less than the average national monthly income for Thailand (National Statistical Office of Thailand, 2007a). This indicates that most of older adults had a low socioeconomic status. Linear regression was used to determine which components of the BODE index were independently associated with the depression score: β = 0.19, p = 0.044. (Table 3). This study demonstrates that depressive symptoms are common in patients with advanced COPD. The BODE index is superior to the GOLD classification for explaining these symptoms. Depressive symptoms were explained by both dyspnea and reduced exercise capacity. COPD is increasingly considered as a disease not only of the lungs. The prevalence of depression showed a significant association with BODE stage. Depression among these patients was associated with greater impairment in respiratory function and with poorer Modified Medical Research Council dyspnea scale (Iguchi, A., Senjyu, H., Hayashi, Y., et al., 2013). Moreover, Van Manen et al (2002) assessed the prevalence of depression and related factors in 162 COPD patients, using the CES-D. They found the prevalence of depression to be 19.6% in patients with mild to moderate COPD, and 25.0% among patients with severe COPD, Van Manen et al. (2002) suggesting an association between the severity of lung function and depression. Dowson et al (2001) reviewed the prevalence of depression and anxiety, using the HADS, in 79 in-patients with COPD, and found that those with more severe impairment in lung function had higher scores of depression and anxiety. They acknowledged the association between COPD severity, depression and anxiety, indicating that disease severity affects the psychological status of patients and that improvement may be possible with interventions such as pulmonary rehabilitation.

Furthermore, the study demonstrated length of stay caused by acute exacerbation of COPD (AECOPD) was affecting BODE index as well (Table 4). The result can able to describe by Donaldson et al. (2003) showed that frequent exacerbators were admitted for longer periods of time, had a faster rate of decline in FEV1 (40.1 mL/y, 95% CI 38 to 42 vs 32.1 mL/year, 95% CI 31 to 33, p < 0.05) and had increased hospitalization admissions and inpatient hospital stay. Makris et al. (2007) found similar results in a cohort of 102 patients.

Bahadori showed that among 310 patients admitted for AECOPD 38%, 9%, and 7% had one, two, or three or more readmissions for AECOPD, respectively. This finding was supported by McGhan et al (2007), who demonstrated 25% rehospitalizations at 1 year and 44% at 5 years. AECOPD leads to worsening muscle function and weakness that is, often, very slow to recover. Reasons for this are likely multifactorial, including steroids, bed rest, and systemic inflammation (Spruit, et al., 2003). This weakness has implications on outcome because it leads to longer hospital stays and disease progression. AECOPD are important events in the lives of COPD patients. We have reviewed the definitions of, risk factors for, and outcomes of AECOPD, focusing on severe AECOPD and those requiring hospitalization. Many factors both predict AECOPD and may result from them, such as lower lung function, inactivity, and depression. The strongest predictor of AECOPD is a prior acute COPD exacerbation. Factors associated with lower risk of AECOPD, and, presumably, better outcomes, include adherence to therapy, pulmonary rehabilitation, and influenza vaccination. Better prevention and treatment of AECOPD are central in the management of our patients with COPD.

**IMPLICATIONS FOR NURSING PRACTICE**

 In this study, it was found that age, depress, and length of stay have an effect on BODE index. These relationships for BODE index can guide researchers and nurses to understand the relative strength of predictors for BODE index. Such knowledge will enable nurses to understand health status of older adults as a mediating factor and to develop intervention for monitor BODE index among them.

 In addition**,** depression is the strongest influencing factor, had a significant positive effect on BODE index. Family members play an important role to psychological support of older adults, nurses should involve family member in the nursing interventions.

**LIMITATIONS**

This study is conducted with Thai older adults with COPD that visited Tambon Health Promotion Center. Therefore, future studies should be conducted to validate the BODE index among Thai older adults with COPD in other areas such as general hospitals.

**CONCLUSION**

####  The study findings showed that depression was the most influential factor affecting BODE index. Nursing intervention to strengthen psychological support and decrease length of stay are critically needed to improve BODE index in the aged group. Future intervention research on COPD severity should consider these factors. It is possible that the COPD severity in older adults with COPD decrease when they are provided with clinical therapeutics to decrease depression, especially the aged group.

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