Association of Depression with Body Mass Index in Patients with Chronic Obstructive Pulmonary Disease

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ABSTRACT

Background: *There are several reports on the association between body mass index (BMI) and depression in the general population and in patients with some chronic diseases. However, despite the established effects of weight changes and depression on the outcomes of patients suffering from respiratory disorders, little data exists on the topic in relation to chronic obstructive pulmonary disease (COPD). This study assessed the relationship between BMI and depression in patients with COPD.*

Materials and Methods: *This cross-sectional study was conducted on 148 COPD patients admitted to the chest clinic of Baqiyatallah Hospital from October 2006 to February 2007. Patients were selected by systematic sampling. Demographic data (gender, age, marital status, monthly income and level of education), clinical data (symptoms, and medications), spirometric findings (VC, FEV1, FVC, FEV1/FVC, PEF, MMEF, predicted VC, predicted FVC, and predicted FEV1), depressive symptoms assessed by "Hospital Anxiety Depression Scale" (HADS), and body mass index (BMI) were recorded for each patient. Patients were divided into three groups. Group I had (GOLD) stage I; FEV1$\geq$ 80%, group II had GOLD stage II, 50% $\leq$ FEV1<80% and group III had GOLD stage III, FEV1< 50%. The two-by-two correlations between BMI, depressive symptoms and pulmonary function indices were evaluated separately.*

Results: *A significant association was found between BMI and depressive symptoms (r=0.429, P<0.001), but not between pulmonary indices and BMI or the severity of depressive symptoms.*

Conclusion: *There was a significant correlation between BMI and depressive symptoms indicating the important effect of mental health on weight in COPD patients. A multidisciplinary approach by a team of specialists from different disciplines is mandatory to address these factors in COPD patients. (**Tanaffos 2007; 6(3): 47-53**)*

Key words: *Body mass index, Depression, Chronic obstructive pulmonary disease*

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) refers to conditions that progressively and often irreversibly impair expiratory airflow. Two major entities lead to COPD: emphysema and chronic bronchitis. COPD is more commonly seen in middle-aged or elderly men with a considerable history of cigarette smoking (1). Fourteen to twenty million people suffer from COPD in the United States, with COPD being the fourth leading cause of death in this country (2). Among the senile population (older than 65 years), 34.1 persons per 1000 suffer from this condition (3). Long periods of disabling dyspnea, repeated hospitalizations for disease exacerbation and premature death, make COPD a serious disease (4).

To date, the diagnosis of COPD, its intensity and prognosis have been based on pulmonary indices, such as forced expiratory volume in 1 second (FEV1) or arterial oxygen pressure (PO_2), and therapeutic modalities have mainly addressed these issues (5). However, it is known that COPD is usually accompanied by some extra-pulmonary disorders which can seriously affect outcomes of treatment and prognosis of these patients (6).

A common systemic complication of COPD is weight variation (weight gain and weight loss) which can negatively affect the prognosis of patients, independent of other prognostic factors i.e. FEV1 or arterial PO_2 (7, 8). Some researchers have suggested the use of body mass index (BMI) in the evaluation and staging of COPD (8). BMI has been reported to be associated with the severity of dyspnea (9) and the risk of mortality (8) in COPD patients.

It is noteworthy that a large number of COPD patients suffer from psychiatric disorders (10). Depression has been reported as one of the most common psychiatric problems in COPD patients (11), reaching a prevalence of 50 percent in some studies (12, 13). The coexistence of depressive

symptoms and COPD can decrease survival as well as physical and social function of patients, and can lead to frequent hospitalizations (14). Depression may even double the rate of mortality in COPD patients (15).

Former studies on the general population (16) and on patients subjected to operations for weight loss (17) have shown the association between BMI and depression, and some have shown that these factors and their interactions can considerably affect the outcomes of patients (18). Nonetheless, few studies have found the link between BMI and depression in COPD patients (19). We aimed to assess the relation between BMI and depression in COPD patients.

MATERIALS AND METHODS

In a descriptive cross-sectional study from October 2006 to February 2007, 148 COPD patients were selected among those admitted to the Baqiyatallah Hospital by systematic sampling. COPD was defined as FEV1/FVC <0.7 according to the guidelines of the "Global Initiative for Chronic Obstructive Lung Disease" (GOLD) (20).

Demographic data (gender, age, marital status, monthly income, and educational level), clinical data (symptoms and medications), spirometric findings such as vital capacity (VC), forced expiratory volume in one second (FEV1), forced vital capacity (FVC), FEV1/FVC, peak expiratory flow (PEF), maximum mid-expiratory flow (MMEF), predicted VC, predicted FVC, and predicted FEV1 were assessed. Depression assessed by Hospital Anxiety Depression Scale (HADS), height and weight were also recorded.

BMI was calculated as the weight (kg) divided by height squared (m^2). It was categorized according to the WHO BMI levels as the following: low weight (BMI < 18.5), appropriate weight (18.5<BMI< 25), over weight (25.1<BMI<29.9), and obese

(BMI≥30)(WHO, 1998).

COPD stage was classified according to the 2003 update of the WHO/ GOLD criteria (20). The severity of COPD was divided into 4 stages: - Mild (GOLD stage I, FEV1 predicted ≥ 80%), - Moderate (GOLD stage II, 50%≤ FEV1 predicted <80%), - Severe (GOLD stage III, 30%≤ FEV1 predicted <50%), - Very severe (GOLD stage IV, FEV1 predicted <30%).

Patients were divided into three groups: Group I (GOLD stage I, FEV1≥80%), group II (GOLD stage II, 50%≤FEV1<80%) and group III (GOLD stage III, FEV1< 50%).

HADS questionnaire was used to assess symptoms of anxiety and depression and consists of two subscales, anxiety and depression, and contains 14 items. Each item is graded on a four-point scale from 0 to 3. The maximum score was 21 for anxiety and depression. Scores below 11 were considered normal, while scores equal to or higher than 11 in any subscale signified abnormal symptoms (21). HADS was validated for application in the Iranian population by Montazeri and coworkers in 2003 (22). HADS has been routinely applied for the evaluation of anxiety and depression in different nations, and judged by the published articles, its use by researchers has been quadrupled over the period between 1996 and 2002 (23).

Statistical analyses were performed using SPSS (version 13) software. Quantitative variables were defined by measures of central tendency and variability, and qualitative variables were defined using tables of frequency. The two-by-two correlation between BMI, depression and pulmonary function indices were evaluated using Pearson's test. ANOVA was also used to compare BMI and severity of depression among patients with different GOLD stages. Depression was compared in patients with different GOLD stages using the same test. P<0.05 was considered significant.

RESULTS

Subjects

Out of 148 patients, 92 (62%) were men and 56 (38%) were women. The mean age of the patients was 58.7±11.2 yrs. (range 40-79 years). The mean ±(SD) BMI was 26.08 ± 3.81 (range 14.88-36.30). Five patients (3.4%) had BMI less than 18.5; 62 (41.8%) had BMI between 18.5 and 25; 57 (38.6%) had BMI between 25.1 and 29.9; and 24 (16.2%) had BMI 30 or over.

The mean and range of spirometric findings are shown in table 1. Predicted FEV1 level was ≥80% in 71 subjects, and <80% in 77.

Table 1. Pulmonary indices in 148 patients with COPD

Pulmonary index	Mean ±SD	Range
Vital capacity (VC)	3.6 ±0.9	1.7-5.8
Forced expiratory volume in one second	2.8 ±0.9	1.0-4.8
Forced vital capacity (FVC)	3.6 ±0.9	1.6-5.8
FEV1/FVC	0.7 ±0.1	0.4-0.79
Peak expiratory flow (PEF)	6.7 ±2.4	1.7-11.5
Maximum mid-expiratory flow (MMEF)	2.6 ±1.4	0.3-6.4
Predicted VC	83 ±13	41-109
Predicted FVC	83 ±13	43-109
Predicted FEV1	77 ±16	32-105

Correlation between BMI and depression score

There was a direct correlation between BMI and the level of depressive symptoms (r=0.429, P<0.001).

Correlation between BMI and pulmonary findings

No significant association was found between BMI and any of the pulmonary indices.

Depression and pulmonary indices

There was no significant association between the severity of depressive symptoms and indices of pulmonary function.

BMI and depression in patients at different stages of GOLD and other clinical data

Severity of respiratory symptoms, and also the medications were not significantly associated with BMI or depressive symptoms. BMI and severity of

depressive symptoms were not significantly different between patients with different GOLD stages (Tables 2 and 3).

Table 2. Comparison of the depression score in patients with different BMI levels and GOLD stages.

WHO BMI levels N (%)	Depressive score Mean ±SD	(95% CI)	p-value
Low weight (BMI less than 18.5) 5 (3.4%)	14.40 ± 5.49	(7.62 to 21.18)	
Appropriate weight (BMI between 18.5 and 25) 62 (41.8%)	12.03 ±3.29	(11.19 to 12.87)	0.512
Overweight (BMI between 25.1 and 29.9) 57 (38.6%)	11.85 ± 3.79	(10.85 to 12.87)	
Obese (BMI 30 or over) 24 (16.2%)	11.79 ± 3.85	(10.16 to 13.42)	
GOLD stage			
Mild (GOLD stage I): FEV1 predicted > 80%. 71	11.95 ± 3.48	(11.13 to 12.78)	
Moderate (GOLD stage II): 50% ≤ FEV1 predicted <80%, 63	12.12 ± 3.63	(11.20 to 13.11)	0.842
Severe (GOLD stage III): 30% ≤ FEV1 predicted <50%. 14	11.81 ± 3.86	(9.05 to 13.95)	

GOLD: Global Initiative for Chronic Obstructive Lung Disease

BMI: Body mass index

Table 3. Comparison of BMI in patients with different GOLD stages

GOLD stage N	BMI Mean ±SD	(95% CI)	p-value
- Mild (GOLD stage I): - FEV1 predicted > 80%. 71	26.68 ± 3.97	25.74 to 27.62	0.071
Moderate (GOLD stage II): 50%≤ FEV1 predicted <80%, 63	25.24 ± 4.02	24.24 to 26.24	
- Severe (GOLD stage III): - 30%≤ FEV1 predicted <50%. 14	24.56 ± 5.77	20.89 to 28.23	

GOLD: Global initiative for chronic obstructive lung disease

BMI: Body mass index

DISCUSSION

This study showed that higher levels of depression were related to an elevated BMI in COPD patients. Our study supports a previous report from the Netherlands in 2005 on 147 patients suffering from mild to moderate stages of COPD associated with depression and elevated BMI (19).

An American study performed in 1994 suggested an association between obesity – (defined as a BMI ≥30) - and depression in the general population (16). Nonetheless, there seems to be a disparity between results of different studies. Some authors have reported that obesity is related with low levels of depression (24), others have shown that depression predicts long-term variability in body weight (25), and still others have reported that obesity increases the risk of developing depression in the general population (26,27). One study in the US Armed Forces showed that no association existed between obesity and depression (28,29). Others have suggested a gender-related association between obesity and depression (30,31).

Several studies have suggested that some factors may mediate between obesity and depression (32). However, a report by Hasler et al. clearly revealed that the association of body weight variability and depression was independent of antidepressant use, substance use disorder, smoking, physical activity, treatment of weight problems, and demographic variables (25). Yet, some factors have been suggested to be responsible for the psychiatric complications in overweight and obese subjects, of which are social status, severity of obesity, negative feeling toward self-body image, and stigmatizing evaluations by others (33,34). Such factors can damage one's self-esteem and directly lead to high levels of depression in obese subjects (33,34).

On the other hand, the verified link between sleep disorders and elevated BMI (35) and also sleep disorders and depressive symptoms (36) may explain

the mediating role of sleep disorders between BMI and depressive symptoms in COPD patients (37). Furthermore, the wide range of disabilities that COPD patients endure can predispose them to develop depression (38).

In the general population, the association of both obesity and depression with many diseases, such as diabetes mellitus, hypertension, cardiovascular disorders, stroke and malignancies, has been established. Indeed, obesity and depression increase the risk of mortality from such conditions. In addition, obesity and depression are both correlated with a low quality of life and greater comorbidity (18).

In this study, we found no significant association between pulmonary indices and BMI or depression. Some studies have reported no correlation between BMI and severity of airflow obstruction (39), however, some of them reported a decrease in BMI at late stages of COPD (40, 41). The lack of an independent association between pulmonary function, or even disease severity, and depression in mild and moderate stages of COPD has been shown by previous authors as well (19). On the contrary, some studies have exhibited the effect of obesity on respiratory symptoms and disease progress in asthma and chronic bronchitis (9). Thus, with regard to the possible relationship between obesity and respiratory symptoms in COPD patients, more research is warranted in the future.

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