



A Study on BODE Index as a Predictor of Health Related Quality of Life in Patients with COPD

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ABSTRACT

Introduction: COPD is an important cause of mortality and morbidity throughout world. The complexity of COPD and its frequent co-morbidities require assessment and staging of the disease beyond airflow limitation. BODE index is a promising achievement in this field. This study was aimed at assessment of BODE index as a predictor of health related quality of life in patients of COPD.

Materials and Methods: This was a case control cross sectional study. 116 patients as cases and 36 healthy people as controls were included. Everyone filled the SGRQ questionnaire at the time of presentation. BODE index was calculated for everyone.

Results: BODE index and SGRQ score both were higher among cases than controls. BODE index and SGRQ score both were progressively higher with increasing age. Increasing BODE score and SGRQ score was associated with more number of smoking pack years ($p < 0.001$). BODE score was significantly associated with higher hospital stay and more impairment of quality of life.

Conclusion: BODE index is a composite index with ability to predict mortality as well as impairment of quality of life in patients with COPD. Determination of BODE index requires only a spirometer. This index may be of great practical value in primary health care set up to identify individuals who are at need for further evaluation at higher centre.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is an important cause of morbidity and mortality throughout the world. COPD is currently the fourth leading cause of death in world but is projected to be the 3rd leading cause of death by 2020. Globally the COPD burden is projected to increase in coming decades because of continued exposure to COPD risk factors and aging of population. American Thoracic Society (ATS)

define COPD as a disease state characterized by the presence of airflow obstruction due to chronic bronchitis on emphysema, the airflow obstruction is generally progressive, may be accompanied by airway reactivity, and may be partially reversible. European Respiratory Society (ERS) and British Thoracic Society (BTS) have adopted similar definitions. Primarily the severity of COPD was assessed by a staging system bases on FEV1 as at that time, it was believed that majority of patients

follow a path of disease progression in which the severity of COPD tracks the severity of airflow limitation. It is now recognized that survival and physiological measures by themselves do not represent the full experiences of patients with COPD. Clinicians and researchers realized that improving symptoms, functional status, quality of life and reducing exacerbations are important goals in management of COPD.

Hence multiple multi-dimensional index for assessment of severity of COPD were designed in recent years. These developments have enabled a new assessment system that dreams together a measure of the impact of the patients symptom and measurement of patient's risk of having serious adverse health event. BODE index is such a multidimensional scoring system where higher score indicates more progression of disease.

In this study, I analysed BODE index as a predictor of hospitalization and derangement in quality of life. This new approach can be utilized to move COPD treatment towards individualized medicine-matching the patient's therapy more closely to his on her needs.

AIMS AND OBJECTIVES

This study was done to assess relationship of BODE index with status of health related quality of life (by SGRQ questionnaire). Relationship of BODE index with duration of hospital stay was also assessed.

MATERIALS AND METHODS

In the department of general medicine Darbhanga Medical College and Hospital a cross sectional study was done on patients attending medicine outpatient department including 116 patients as cases and 36 patients as controls from December 2014 to August 2016. Male patients presenting with symptoms and pulmonary function test results suggestive of COPD (according to GOLD criteria) were included as cases and male patients coming for routine health check up were included as controls. Spirometry proven bronchial asthma, recent myocardial infarction (4 months), unstable

angina, congestive heart failure (NYHA class III or IV), inability to perform spirometry or six minute walk test, unrelated life threatening major illness, liver diseases, patients with acute exacerbation were excluded from the study.

For each enrolled subject, detailed history of smoking, personal and family medical histories were obtained. On the day of enrollment, height and weight were measured twice during the examination and the average of two values were taken. Weight was measured to the nearest 100 grams with bare foot. Height was measured to the nearest mm with the stadiometer. Body mass index (BMI) was calculated by the formula.

$$\text{BMI} = \text{Weight in Kg} / (\text{Height in Ms})^2$$

Spirometry was performed with an equipment that met the American Thoracic society performance criteria, in each of the cases on enrollment into the study and 20 minutes following the administration of salbutamol nebulisation. To adjust for the height, sex, age and sex published prediction equations for forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC) were used. FEV1 and FVC were calculated. The procedure was repeated on 2 occasions and the average value was taken.

A detailed history of the dyspnea experienced by the patient was taken. mMRC (modified medical research council) dyspnea scale was used to score the patients dyspnea. Six minute walk test was performed twice with a gap of 30 minutes rest in between and the average was taken. Periods of rest taken, was also included in the 6 minutes test period. The BODE index was calculated for each patient.

BODE Score	0	1	2	3
FEV1	$\geq 65\%$	50-64%	36-49%	$\leq 35\%$
6 minute walk test	$\geq 350\text{ms}$	250-349m s	150-249m s	$\leq 149\text{ms}$
Dyspnea scale	0-1	2	3	4
BMI	$>21\text{kg/m}^2$	$\leq 21\text{kg/m}^2$		

Mild COPD (0-2)

Moderate COPD (3-5)

Severe COPD (≥ 6)

A detailed history regarding number of days of hospital admission due to COPD in the last two years was obtained from the patients. Patient's discharge cards were also reviewed.

At enrollment, all patients completed the St. George's Respiratory Questionnaire (SGRQ). The SGRQ is a self administered, standardized, pulmonary specific health status questionnaire, containing 50 items and 76 weighted responses that is divided into 3 subscales; symptoms (8 items), activity (16 items), and impacts (26 items). SGRQ scores were calculated using score calculation algorithms and missing data imputation recommended by its developer. For each subscale and for the overall questionnaire, score range from zero (no impairment) to 100 (maximum)

Statistical analysis was done using statistical software SPSS version 20. For independence of attributes Pearson's Chi Square test and unpaired t test/one way ANOVA were used where applicable. An alpha level of 5% has been used for the analysis; i.e. if any p value is less than 0.05 it has been considered as significant.

RESULTS

A total of 152 (100%) patients including 116 (76.31%) patients with COPD as cases and 36 (23.68%) healthy individual as controls were enrolled in the study. All the cases and controls were males. 56(48.27%) patients had mild COPD. 26 (22.4%) patients had moderate COPD. 34(29.31%) patients had severe COPD.

TABLE-1

Group	No. of Participants	Mean Age
Control	36	49.64
Mild COPD (0-2)	56	49.11
Moderate COPD (3-5)	26	59.08
Severe COPD (≥ 6)	34	73.15
Total	152	56.32
P value		<0.001

TABLE-2: Variation of hospital stay, SGRQ score in different age group Only cases:

AGE	Hospital stay (day) in last 2 years	SGRQ score
<50	0.33	25.91
50-70	5.30	44.85
>70	13.78	71.78
P value	<0.001	<0.001
Significance	Significant	Significant

Both duration of hospital stay in last 2 years (in days) and SGRQ score were seen to increase with increasing age. In people with age <50 years of age, mean hospital stay was 0.33 days whereas it was 13.78 days in people >70 years of age.

Average SGRQ score were 24.91, 44.85, 71.78 in age group <50 years, 50-70 years, >70 years respectively. The difference was statistically significant.

TABLE-3 SGRQ score and hospital stay in last 2 years in relation to smoking in pack years only cases:

Smoking pack years	SGRQ score	Hospital stay in last 2 years (in days)
<10	32.36	1.88
10-20	64.62	10.14
>20	70.95	15.26
P Value	<0.001	<0.001
Significance	Significant	Significant

SGRQ score and hospital stay in last 2 years both were seen to be increased with increasing smoking in pack years. The difference was statistically significant.

Hospital stay and SGRQ score in relation to smoking pack years

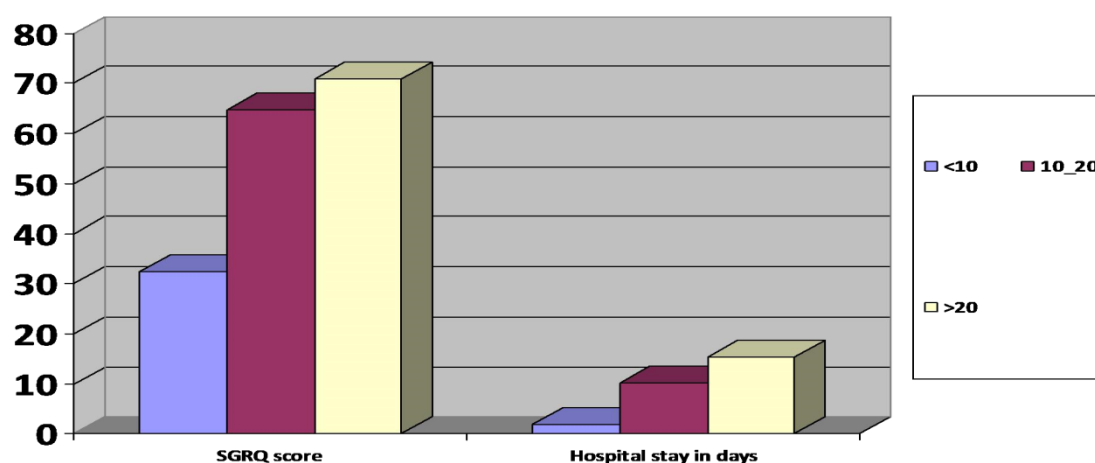
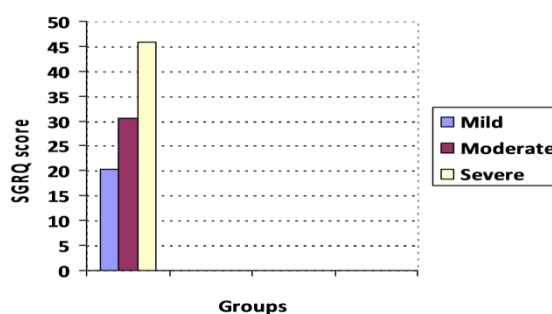


TABLE-4 Duration of hospital stay in different groups in relation to severity of COPD according to BODE index

		Group			
		Control	Case		
		Mean ± Std. Deviation	Mean ± Std. Deviation	P value	Significance
Duration of hospital stay		0.14 ± 0.35	5.57 ± 6.38	<0.001	Significant
	SEVERITY OF COPD				
	Mild	Moderate	Severe		
	Mean ± Std. Deviation	Mean ± Std. Deviation	Mean ± Std. Deviation	p Value	Significance
Duration of hospital stay	0.3 ± 0.6	5.08 ± 1.65	14.62 ± 2.74	<0.001	Significant

TABLE-5 SGRQ score in different groups according to severity of COPD

	Group		p Value	Significance
	Control	Case		
	Mean \pm Std. Deviation	Mean \pm Std. Deviation		
SGRQ Score	5.94 \pm 0.98	44.52 \pm 21.05	<0.001	Significant
	Mild	Moderate		Severe
SGRQ score	27.93 \pm 2.88	51.15 \pm 8.81		71.71 \pm 4.91
P value				<0.001 (significant)

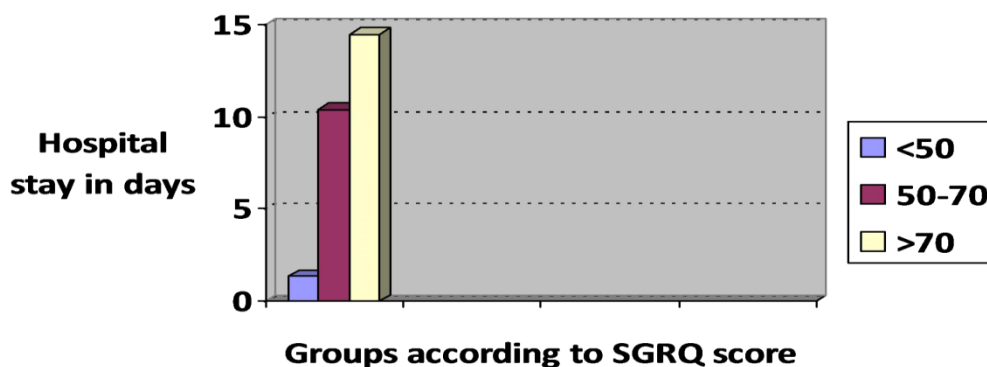
SGRQ score according to severity of COPD

SGRQ score was found to vary significantly in relation to severity of COPD according to BODE score. The mean SGRQ score was 5.94 in

controls, whereas 44.52 in cases. The average SGRQ score were 24.93, 51.15, 71.71 in mild, moderate, severe cases of COPD respectively.

TABLE – 6 Relationship between SGRQ score and hospital stay In cases:

SGRQ score	Hospital stay in days
<50	1.34
50-70	10.42
>70	14.5
P value	<0.001

Hospital stay in relation to SGRQ score

Hospital stay in last 2 years was found to be increased with increasing SGRQ score. The difference was statistically significant.

DISCUSSION

COPD is predicted to be one among the most common killer disease affecting a large number of individuals by the year 2020. In the recent years, more stress has been given to formulate a simple but effective index for assessing the severity of COPD. In 2004, Celli et al coined BODE index which is hypothesized as a multidimensional grading system to assess the respiratory and systemic expressions of COPD. To form a multidimensional index Celli stipulated that each variable should correlate independently with the prognosis of COPD, it should be easily measurable and should serve as a surrogate of other potentially important variables. Researchers have found that BODE index would fulfill this necessity. Most of studies has been limited to finding the usefulness of the index in predicting the mortality in COPD. In this study it has been tried to evaluate its usefulness in predicting its correlation with quality of life in patients. Only male patients were included in this study, since COPD is more common among male patients. This was aimed at making the study group as uniform as possible.

Studies by Celli et al in 2004 and Kian Chung et al in 2005 has proven that grouping COPD patients into three groups with BODE scores 0-2 as first group, 3-5 as second and 6 or more as the third group correlates well with severity in terms of hospitalization and mortality. Hence this study accepted the same classification and grouped the above groups as mild, moderate and severe COPD.

In past a simple measure like mMRC grading was considered adequate alone for assessment of symptoms, as mMRC relates well to other measures of health status and predicts future mortality risk. It is now recognized that COPD impacts patients beyond just dyspnea. For this reason, a comprehensive assessment of symptoms is recommended rather than just a measure of breathlessness. CAT (COPD assessment test), CRQ (chronic respiratory questionnaire), SGRQ (St. George's respiratory questionnaire), CCQ

(COPD control questionnaire) have been developed for assessment of health related quality of life in patients with COPD. SGRQ is the most widely documented comprehensive measure, scores <25 are uncommon in diagnosed COPD patients, whereas scores >25 are very uncommon in healthy persons. In this study correlation of BODE index with SGRQ score was assessed. Kian Chung et al in 2005 and Celli et al in 2004 has shown in their respective studies that BODE score increases with age. This could be due to progression of COPD and increase in comorbidities with age. However results from studies of Burrows B et al 1991 and Domingo-Salvany A et al in 2002 do not show significant progression of COPD with age. The difference is mainly due to the fact that duration of smoking was not proportional to age in those studies.

Smoking is a well recognized risk factor for COPD. Results from this study go along with most other studies, with 100% cases being smoker. Studies by Kian Chung et al, Celli et al, have proven beyond doubt that higher duration of smoking is associated with higher BODE index. This study also revealed significant increase in BODE index in patients with higher duration of smoking. In this study, it was also found higher SGRQ score in people with history of more smoking pack years reflecting more impairment of quality of life. However, studies of Kerkhof M et al in 2015 has found no independent association between smoking and frequent exacerbation. This may be due to so called "healthy smoker effect" in which those with poorer lung function tend to quit smoking, whereas less severely affected patients do not.

Kian Chung et al in 2005 found that BODE index helps better to predict hospitalization for COPD. Jose M Marin et al, Bu XN, Yang T, Thompson MA et al also reported similar finding. This study also found average duration of hospital stay increases with increasing BODE score. It may be speculated that the superior value of BODE index compared to FEV1 in predicting hospital admission is accounted for by the

evaluation of physical performance status among the individual components of BODE scoring system.

SGRQ score is a well validated tool to assess health related quality of life in patients with COPD. I.M. Osman, D.J. Godden et al found SGRQ score to be significantly related to readmission. Sarioglu N, Alpaydin AO et al showed that SGRQ subcategory scores as well as total score were significantly associated with BODE score. Nivia L Nonato et al reported similar finding. In the present study SGRQ score was found to vary significantly with BODE score ($P < 0.001$).

CONCLUSION

Admission to the hospital and heavy use of health care resources impart high burden on health care system for COPD. A clinical implication of the present study is that the BODE scoring system may prove to be helpful in health care resource allocation and in guiding therapy for individual patients in the future. This multistage scoring system, which incorporates variables that can be evaluated easily in any office setting, should not be difficult or costly to implement routinely. As the BODE index can provide useful prognostic information of survival and hospitalization, as well as impairment in quality of life, the findings of the present study are in support of the utility of BODE index as an assessment tool for COPD patients.

CONFLICT OF INTEREST: Nil

FUNDING: Nil

ABBREVIATION: SGRQ: St. George's Respiratory Questionnaire, FEV1: Forced Expiratory volume in first second, FVC: Forced vital capacity, GOLD: Global Initiative For Chronic Obstructive Lung Disease, mMRC: modified Medical Research council, BMI: Body Mass Index, BODE index: B=body mass index; o=obstruction of airflow; D=dyspnoea; E=exercise capacity

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