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CORRELATION OF CAT SCORE WITH BODE INDEX IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Objective: To determine correlation of Chronic Obstructive Pulmonary disease Assessment Test score with Body mass index, airflow Obstruction, Dyspnea and Exercise index in patients with stage II and III chronic obstructive pulmonary disease.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Pulmonology, Fauji Foundation Hospital, Rawalpindi, Pakistan from Jul, 2017 to Dec 2017.

Methodology: This study was conducted on Stage II and III chronic obstructive pulmonary disease patients. We analyzed demographic variables; Body mass index (BMI), 6-min walktest, modified Medical Research Council dyspnea scale to calculate Body mass index, airflow Obstruction, Dyspnea and Exercise index score. Spirometry was performed on each patient. The chronic obstructive pulmonary disease Assessment Test was used to assess symptoms of these subjects.

Results: A total of 80 subjects participated in the study with mean age of 58.5 ± 8.0 years. The mean chronic obstructive pulmonary disease Assessment Test and Body mass index, airflow Obstruction, Dyspnea and Exercise scores were 25.5 ± 7.7 and 5.14 ± 2.0 respectively. Pearson's correlation showed positive correlation between chronic obstructive pulmonary disease Assessment Test score and Body mass index, airflow Obstruction, Dyspnea and Exercise score (r^2=0.810, p=0.0001). A positive correlation coefficient was obtained between chronic obstructive pulmonary disease Assessment Test score and Body mass index, airflow Obstruction, Dyspnea and Exercise class (r^2=0.784, p=0.00012).

Conclusion: Chronic obstructive pulmonary disease Assessment Test score correlated positively with Body mass index, airflow Obstruction, Dyspnea and Exercise index score in stage II and stage III chronic obstructive pulmonary disease patients.

Keywords: Body mass index, Chronic obstructive pulmonary disease assessment test, Correlation, Dyspea.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD), a common respiratory disorder, is often under diagnosed and associated with significant morbidity and mortality. According to the World Health Organization (WHO) estimates, 65 million people have moderate to severe chronic obstructive pulmonary disease (COPD)[1]. In Pakistan, 14% females and 6% males have COPD in the population over 65 years of age in rural areas[2]. COPD patients present with common symptoms of dyspnea, cough, sputum production, exercise intolerance, sleep disturbances and social problems. COPD diagnosis and management is dependent on assessment of pulmonary functions using spirometric techniques. In addition to pulmonary function testing, dyspnea grading, degree of impairment of health status / quality of life and numbers of exacerbations are the important factors in the management and treatment of COPD[3].

Several health status and quality of life questionnaires are available for assessment and grading of COPD. These include St. George's Respiratory Questionnaire (SGRQ)[4], Chronic Respiratory Questionnaire (CRQ)[5], Clinical COPD Questionnaire (CCQ)[6], and COPD Assessment Test (CAT)[7]. CAT questionnaire was introduced

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in 2009 for assessing severity of COPD. It is self-completed questionnaire by the patient and has eight components and comprises questions regarding symptoms, energy, sleep and activity[8].

Although BODE (Body mass index, airflow Obstruction, Dyspnea, and Exercise capacity) score has a high value in evaluating severity of COPD based on symptoms; evaluation of nutritional status of the patient, exercise capacity and calculation of post-bronchodilator FEV1 require lot of resource enriched clinical facility[9]. The spirometric measurements and 6 minute walk test require an equipped cardio-pulmonary rehabilitation center and qualified staff for gathering and interpretation of results. BODE index, hence is not considered applicable in remote rural areas due to resource-deficiency settings[10]. In contrast, the information gathered by CAT is much patient friendly and does not require highly specialized personnel to collect the information. It is easy to complete by the patients themselves at their outdoor visits. Furthermore, serial CAT assessments allow for early and effective detection of changes in severity of COPD and timely necessary intervention.

Earlier studies have demonstrated agreement between CAT and SGRQ in COPD patients[12]. But data on correlation between CAT and BODE are plausible and needs more research in this area to determine correlation between CAT and other COPD assessment tools. We conducted this study to determine the correlation between COPD assessment test (CAT) score and BODE index. The correlation of CAT impact and BODE class in stage II and III COPD was our secondary endpoint.

METHODOLOGY

This was a cross-sectional study conducted in Department of Pulmonology, Fauji Foundation Hospital, Rawalpindi from July 2017 to December 2017. The study was conducted following declaration of Helsinki after approval of its synopsis from Ethical Review Board of the same institution. An informed written consent was taken from all the study participants before enrollment for the study. A sample size of 80 patients was calculated by using WHO sample size calculater and considering the correlation coefficient between CAT score and BODE index to be 0.326 as reported in an earlier study[11-13]. The patients were recruited following non-probability consecutive sampling using following inclusion and exclusion criteria. Patients, both male and female, aged 40 to 70 years who were diagnosed cases of COPD stage II and stage III were included in the study. Patients with radiological changes suggestive of an alternate diagnosis, patients in exacerbation, unstable coronary artery disease, with history of congestive heart failure, significant orthopedic, neurological, renal, hepatic or other medical diseases were excluded from the study.

Spirometry was performed on each patient according to the American thoracic Society/ European Respiratory Society (ATS/ERS) recommendations using a standard Pulmonary Function Tests (PFT) unit at baseline[14]. Body mass index (BMI), the modified Medical Research Council dyspnea scale (mMRC), the 6-min walking test (6MWT) and pulse oximetery before and after the 6MWT were also assessed on the baseline. BODE index was calculated using above mentioned parameters and patients were classified into four stages according to severity. Only patients with Gold stage II and III were included in the study. Gold stage II patients had moderate COPD defined as FEV1/FVC <0.7 and FEV1 50%-80% predicted[15]. Whereas, Gold Stage III patients had severe COPD and were defined by FEV1/FVC <0.7 and FEV1 30%-50% predicted[15].

The COPD Assessment Test (CAT) was applied to all subjects during the first visit. CAT was also classified into four classes. Patients having CAT score of 0-10 were labeled to have slight impact, with score 11-20 had medium impact, and with score 21-30 had high impact and score more than 30 had very high impact.

The statistical analysis was performed using SPSS version 20. Quantitative variables like age, BMI, FEV1 and 6MWD were presented as mean ± standard deviation (SD) and qualitative variables

such as gender, Gold stage, BODE class and CAT impact were calculated as frequency and percentages. Pearson's correlation test and chi-square was used to see any correlation and association between CAT score and BODE index score. The *p*-value ≤0.05 was considered statistically significant.

RESULTS

There were 80 subjects in the study with mean age of 58.5 ± 8.0 years (range: 40-70 years). There were 38 females and 42 male patients. A total of 31 (38.8%) patients had Gold stage II COPD whereas 49 (61.2%) had stage III COPD. The mean values of BMI, FEV1and 6 minutes walking distance (6MWD) were 23.1 ± 4.8kg/m², 50.5 ± 13.9% & 258 ± 97.8m respectively (table-I).

Table-I: Demographic characters of patients.

Variable	Mean ± SD	
Age (years)	58.5 ± 8	
BMI (kg/m²)	23.1 ± 4.8	
FEV%	50.5 ± 13.9	
6MWT (m)	258 ± 97.8	
BODE Score	6 ± 2	
CAT score	28 ± 7	
Variable	**Frequency**	
Gender	Male	42 (52.5%)
	Female	38 (47.5%)
COPD Stage	II	31 (38.8%)
	III	49 (61.3%)
BODE Class	1	8 (10%)
	2	23 (28.7%)
	3	27 (33.8%)
	4	22 (27.5%)
CAT Impact	Slight	6 (7.5%)
	Medium	18 (22.5%)
	High	38 (47.5%)
	Very high	18 (22.5%)

Table-II: BODEL class CAT impact by Chi-square.

Count		CAT Impact				*p*-value
		1	**2**	**3**	**4**	
Bode Class	1	6	2	0	0	0.001
	2	0	16	7	0	
	3	0	0	27	0	
	4	0	0	4	18	

The mean CAT and BODE scores were 28 ± 7 and 6 ± 2.0 respectively. Analysis of CAT impact showed that 6 (7.5%), 18 (22.5%), 38 (47.5%), and 18 (22.5%) had slight, medium, high and very high CAT impact respectively. Similarly, 8 (10.0%), 23 (28.7%), 27 (33.8%), and 22 (27.5%) had BODE class I, II, III and IV respectively (table-I).

Pearson's correlation was used to assess relationship between CAT scores, CAT impact, BODE score and BODE class. We found a positive correlation between CAT score and BODE score with Pearson's correlation coefficient equal to 0.810 and *p*-value 0.0001 (figure). A positive Pearson's correlation coefficient was obtained between CAT score and BODE class (r=0.784, *p*-value=0.00012). There was a statistically significant association between CAT impact with BODE Class as measured by Chi-square test shown in table-II.

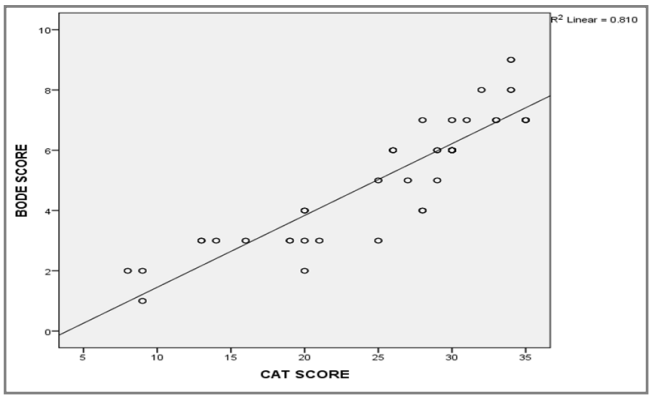

Figure: Correlation Between CAT Score and BODE Score.

DISCUSSION

The primary objective of the study was to determine the correlation between CAT score and BODE index. Our study found a positive linear correlation between CAT score and BODE score. Our study also found a significant correlation between CAT impact and BODE class for Gold stage II and III COPD patients. Majority of the patients belonged to Gold stage III (61.2%), CAT high impact group (47.5%) and BODE class III (33.8%). This finding suggested a linear relationship between Gold stages, CAT impact and BODE class.

The recent medical literature defines COPD as disease with airflow limitation that is preventable, treatable and usually progressive caused by inflammatory response of the lungs to toxic and noxious stimuli especially cigarette smoking[11-15]. There have been many efforts to devise a staging system for the diagnosis of COPD that is easy for patient, reproducible and applicable to all the stages of the disease in all populations worldwide. GOLD guidelines proposed that the assessment of COPD to be done not only using the airflow obstruction measured by FEV1/FVC index but also should take into account the patient's symptoms[15]. So, dyspnea scale and frequency of COPD exacerbations were also included in COPD assessment[16].

Since CAT score is a new assessment tool, the studies on its comparison with other tools are scarce. Liu *et al* also presented a statistically significant correlation between COPD Questionnaire with BODE score (p<0.001) and concluded that this questionnaire was a reliable method to evaluate the severity of COPD[17]. Similarly, Ladeira *et al* reported a positive correlation between CAT score and impact with BODE index score with R=0.475, p<0.01, and R=0.377, p=0.004 respectively; and with BODE index class: R= 0.357, p=0.011, and R=0.326, p=0.021[13]. Our study found even stronger and linear association between CAT and BODE which might be explained by the inclusion of only Gold stage II and III cases in our study. The former study included patients with all Gold stages in their study which could have led to a relatively weaker association. The strong correlation could also imply that the results of CAT and BODE indices are very close to one another in advanced cases of COPD making use of CAT well rationalized in such cases[17,18].

Our study has numerous future implications. We recommend performing similar studies on population based samples to know the validity of CAT questionnaire on general population as well. How far does this new instrument is valid can be ascertained in multi-center studies from general practitioners and respiratory physicians. However, its high correlation with other popular indices like BODE score demonstrates that the questionnaire is reliable and feasible tool in ambulatory settings.

CONCLUSION

COPD is a chronic progressive inflammatory disease affecting the airways. Its diagnosis needs utility of techniques and instruments that are feasible and have high reliability in predicting quality of life and disability caused by the disease. COPD assessment test is relatively new tool to assess severity of COPD. In patients with Gold stage II and III, CAT score and impact correlated positively and strongly with BODE score and BODE class.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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