



## Original Research Article

# An Assessment of Cognitive Dysfunction among COPD Patients

Authors

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## ABSTRACT

**Introduction:** *The brain, in particular, may be vulnerable to the systemic effects of COPD. Cognitive dysfunction is associated with increased mortality and disability; however, it remains poorly understood in COPD. The hypoxemia seen in some patients with COPD seems to be a crucial factor for cognitive impairment, because it affects the oxygen dependent enzymes that are important in the synthesis of neurotransmitters such as acetylcholine.*

**Methods and Material:** *40 COPD patients were subjected to SMMSE questionnaire, and then statistical analysis were conducted between their FEV1 and SMMSE questionnaire score, and between MMRC dyspnea scale score and SMMSE score.*

**Results:** *Mild cognitive impairment was found in COPD patients and there was significant positive correlation was found between SMMSE score with FEV1, and significant negative correlation between SMMSE score and MMRC score.*

**Conclusion:** *Cognitive impairment was significantly correlated with severity of disease in COPD patients. For early identification of cognitive dysfunction of COPD patients by SMMSE will defiantly helpful to physician to assess the cognitive function.*

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is characterized by irreversible loss of lung function. COPD is a disease, in which lung is affected primarily, but its systemic effects have been increasingly recognized with diverse manifestations involving body systems distant from the lung.<sup>1,2</sup> The brain, may be vulnerable to the systemic effects of COPD. Cognitive dysfunction is associated with increased mortality and disability; however, it remains poorly understood in COPD.

The hypoxemia is common in COPD, seems to be a crucial factor for cognitive impairment, because it affects the oxygen dependent enzymes that are important in the synthesis of neurotransmitters such as acetylcholine.<sup>3</sup> Inflammation may also has a key role in cognitive impairment in COPD as C-reactive protein may be associated with cognitive decline, either through a direct neurotoxic effect<sup>4</sup> or an effect on cerebral atherosclerosis. Other inflammatory mediators like Interleukin-6, interleukin 1beta, tumor necrosis factor- alfa and alfa-1 anti chymotrypsin are also linked to

cognitive impairment.<sup>5</sup> Inhaled cigarette smoke and other irritants activate epithelial cells and macrophages to release several chemotactic or inflammatory factors that attract inflammatory cells, and set the platform for COPD pathogenesis.<sup>6</sup> Smoking may also influence cognitive function by exacerbating cerebral hypoxia due to chronically elevated carbon monoxide causing a left shift of the oxyhaemoglobin dissociation curve.<sup>7</sup> A multicentre European cohort showed that yearly decline in minimal state examination (MMSE) was associated with smoking status.<sup>8</sup>

Obstructive sleep apnea (OSA) is found in 20 % COPD patients,<sup>9</sup> and moderate to severe OSA may be associated with impaired cognitive performance.<sup>10</sup>

Several features of the disease may contribute to impaired cognitive function, including hypoxemia and co morbid cardiovascular disease. In addition, COPD patients has reduced physical activity which may, further increase the risk of cognitive impairment.<sup>3</sup>

Various studies have shown that cognitive impairment has a prevalence of 77% in patients with COPD and hypoxemia.<sup>11</sup> Attention and executive functions are commonly impaired in mild cognitive impairment found in patients with COPD.<sup>12</sup>

Individuals with mild cognitive impairment have a higher risk of developing dementia than the general population.<sup>20</sup> Moreover, cognitive dysfunction in COPD has been associated with poor outcomes and even with an increase in disability and mortality.<sup>21,22,23</sup> Thus, it is essential that this condition is identified early in COPD patients, in order to prevent or delay progression to clinical dementia or increased morbidity.

## OBJECTIVE

- To assess cognitive dysfunction among COPD patients by using Standard minimal state examination.

## METHODOLOGY

The study was conducted in the Department of Pulmonary medicine, SSMC Rewa. Stable patients with post bronchodilator FEV1/FVC <0.70 and FEV1 < 80% of predicted. (as per GOLD guidelines<sup>19</sup>) without any co morbid diseases like any heart disease, diabetes, other respiratory diseases were selected as study subjects. 40 patients fulfilled this criteria and were diagnosed as COPD during the study period.

Cognitive function was assessed by standardized Mini-Mental State Examination Questionnaire (SMMSE), and calculation was done according to guideline for standard mini-mental state examination questionnaire.<sup>13</sup> SMMSE is a reliable instrument that allows practitioners to accurately measure cognitive deficits and deterioration over time. It measures various domains of cognitive function including orientation to time and place; registration; concentration; short-term recall; naming familiar items; repeating a common expression; and the ability to read and follow written instructions, write a sentence, construct a diagram, and follow a three step verbal command. It can be used in a variety of clinical settings.<sup>14</sup>

**Table - 1** showing stage of cognitive function in relation to SMMSE score.<sup>13,14</sup>

Score	Description	Stage
30-26	Could be normal	Could be normal
25-20	Mild	Early
19-10	Moderate	Middle
9-0	Severe	Late

On same day spirometry and dyspnea assessment were done. Modified medical research council (MMRC) dyspnea scale was used for assessment of dyspnea.

## Statistical Analysis

Collected data were entered in the MS Excel and statistical analysis was done using SPSS (Statistical Package for Social Studies) for Windows version 20.0.

Mean and standard deviation was calculated and Pearson's correlation was applied to study the

correlation between various parameters under study. All tests were performed at a 5% level significance ( $p$  value  $< 0.05$ ).

## RESULTS

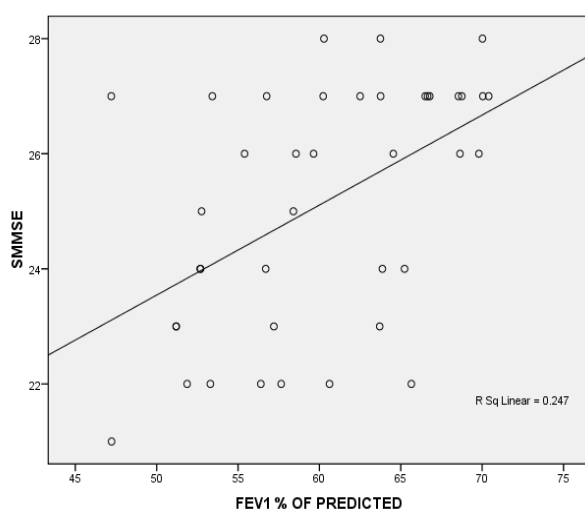
40 COPD patients between age group 60-65 years were assessed for their severity of disease and cognitive impairment and their findings is shown in table - 2

**Table – 2** Mean Values and Standard deviation of Post FEV<sub>1</sub>, MMRC, (Parameters Of Severity Of COPD) and SMMSE

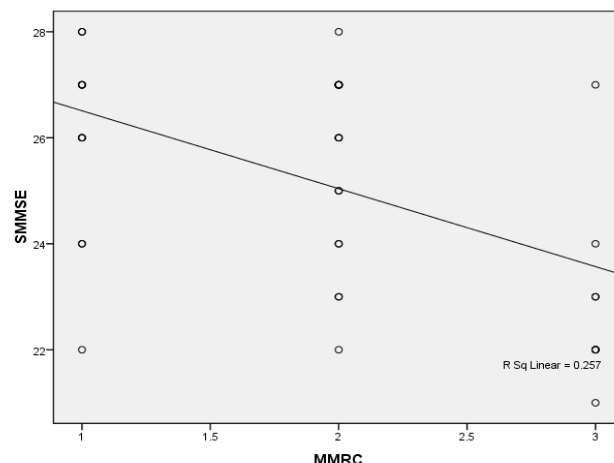
S.No.	Variables	Mean± Standard Deviation
1	FEV <sub>1</sub> % Pred	60.26±6.74
2	MMRC	1.92±0.73
3	SMMSE	25.15±2.11

Cognitive function was assessed by standard Mini-Mental State Examination Questionnaire (SMMSE), and it was observed that SMMSE was found to have a positive correlation with post FEV<sub>1</sub> which was statistically significant. ( $r = 0.497$ ,  $p$  value = 0.001). It was also observed that SMMSE showed a negative correlation with MMRC which was also statistically significant. ( $r = -0.507$ ,  $p$  value = 0.001)

**Figure – 1** showing positive correlation between SMMSE score and post FEV<sub>1</sub>



**Figure -2** showing negative correlation between SMMSE score and MMRC score



## DISCUSSION

It is increasingly accepted that COPD is an inflammatory multicomponent, pathological condition which can affect several functions of different organs. Cognition represents one of these aspects, and needs attention to the effects of COPD on cognition in clinical practice, particularly in the presence of hypoxemia.<sup>24</sup> Although COPD and cognitive impairment have been studied separately (as individual diseases), there is growing evidence of a relationship between the two. Hung et al<sup>15</sup> analyzed cognitive impairment in patients with COPD and found that such patients had a greater risk of developing cognitive impairment than patients without COPD.<sup>13</sup> In a study conducted by Irene Torres-Sánchez<sup>17</sup> has shown the prevalence of cognitive impairment in patients with COPD was found to be associated with the severity of the disease, being 3.9% among patients with mild COPD, 5.7% among patients with moderate COPD, and 7.7% among patients with severe COPD. A study found Mild Cognitive Impairment in 36% of COPD patients after comprehensive neuropsychological testing. They reported that a MMSE score of 27 provided optimal maximum accuracy and a diagnostic cutoff ( $< 27$  indicated impairment), with 97% specificity and 73% of patients correctly classified.<sup>18</sup>

In our study post FEV<sub>1</sub> was highly and positively correlated with SMMSE, and MMRC dyspnea scale score was negatively correlated with

SMMSE. Both FEV1 and MMRC are parameters of severity of COPD. Similar to other studies our study also found a significant association cognitive impairment with severity of COPD. Beside the complex neuropsychological testing SMMSE questionnaire is simple tool to assessment of cognitive impairment in COPD patients which can be a reflection of severity of disease.

## CONCLUSION

In our study, mild grade of Cognitive impairment is found in COPD patients, and that was correlated with severity of COPD as per denoted by the above findings. This shows that cognitive evaluation is an important aspect for clinical care of COPD patients. Early identification of cognitive dysfunction of COPD patients by SMMSE is definitely helpful for physician to assess the cognitive function.

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