

Cognitive Impairment in patients of Chronic Obstructive Pulmonary Disease – A Comparative Epidemiological Study in a Tertiary Care Hospital of Darjeeling District

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Abstract

Background: COPD has been a major cause of morbidity and mortality throughout the world, amounting to 6.1% of total deaths in developing countries. It is increasing recognised that COPD is a complex multi-component disorder associated with a wide range of psychological and social problems. Unfortunately little attention has been paid to its effects on cognitive function; hence psychiatric disorders are left inadequately treated.

Objectives: This study is mainly focussed towards identification of cognitive loss in patients of COPD.

Methodology: After Institutional ethical committee clearance, the subject was greeted and the entire process had been explained to him/her. After proper history taking and ruling out any major illness in the previous one year, the subject was examined and Pulmonary Function test was conducted. Tabulation and processing of the data was done followed by analysis using appropriate statistical methods and software.

Results: Difference of means is -2.42, and the P-value is <0.0001, hence there is an significant statistical difference between the two groups comprising of normal and COPD subjects, thus indicating that cognition is reduced in COPD patients.

Conclusion: The study has revealed that there is statistically significant decrease in FEV1 in COPD patients; diminished HMSE scores have also been noted in COPD subjects

Keywords: COPD, Cognition, Spirometry, FEV1, HMSE

Conflict of interest: None

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I. Introduction:

Chronic obstructive pulmonary disease (COPD) is a common preventable and treatable disease, characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Symptoms of COPD are dyspnoea, chronic cough and chronic sputum production. Episodes of acute worsening of these symptoms (exacerbations) often occur, which lead to deterioration of general health of the subject and leads to psychiatric complications such as cognitive loss.

Over the past decade, more and more research on the development and validation of questionnaires has been undertaken to quantify the impact of disease on daily life and well-being from the COPD subject's point of view.¹

It is well recognized now that COPD patients suffer from many non-respiratory manifestations as skeletal muscle dysfunction, systemic inflammation, nutritional depletion, malnutrition and neurological impairments. The occurrence of exacerbations may adversely affect the natural course of disease. It also makes many patients feel frustrated and angry about not being able to do perform their daily work.²

Anxiety and depression are frequently associated with COPD and with acute and chronic respiratory diseases in general. Unfortunately, psychiatric disorders are not systematically evaluated and diagnosed in COPD patients, and consequently they are not always treated adequately, hence it also increases healthcare and societal costs.³

The cognitive impairment due to COPD may be attributed to the neuronal damage mediated by hypoxia as a result of the pulmonary disease or the comorbidities that adversely affect the brain, such as vascular disease and smoking.

It has also been suggested that the low performance in neuropsychological test can be a predictor of mortality and disability in certain COPD populations.⁴

COPD impairs quality of life, by preventing people with the condition from socializing and enjoying their hobbies. It also makes many feel frustrated and angry about not being able to do the things they want to.⁵ Compared to Non-smokers, middle-aged male smokers are likely to experience faster 10-year cognitive decline in executive function and global cognition.⁶

Studies mentioned that adults with COPD are having an increased rate of cognitive impairment, especially those who require oxygen therapy.⁷ It is increasingly recognised that COPD is a multi-component disease, but little attention has been paid to its effects on cognitive function.⁸

Mild cognitive impairment also known as incipient dementia is defined as a clinical condition characterized by the decline of cognitive function which is greater than expected for a certain age and educational level of the individual, but not severe enough to interfere with daily activities.⁹

Thereby, a study to evaluate the cognitive function in patients suffering from Chronic Obstructive Pulmonary Disease and compare the parameters with age and gender matched normal population.

II. Materials And Methods

This is a Cross-sectional, institution based study of subjects with diagnosed cases of Chronic Obstructive Pulmonary Disease. Subjects coming to Chest OPD of North Bengal Medical College who have been clinically diagnosed as having COPD will be taken as cases. Prior to participation, all patients have been asked to sign an informed consent form. After that, their Pulmonary Function Tests by Spirometry has been done in the department of Physiology. They have then been tested for cognition using Hindi Mental Scale Examination questionnaire. The study has been conducted for a period of 1 year. The population mainly hails from Siliguri and adjoining areas.

Subjects having current acute illness apart from COPD or has history of acute exacerbation of Chronic Obstructive Pulmonary Disease have been excluded from the study. Subjects having history of long term medications for Psychiatric or Neurological illnesses have also been excluded from the study.

Data Collection

Data collection was started after approval of synopsis by The West Bengal University of Health Sciences and obtaining permission from the Institutional Ethics Committee. Prior meeting was conducted with Faculties and other staffs of the Chest Medicine, Internal Medicine & Physiology department and they were briefed about the purpose of the study and their cooperation was sought.

The COPD cases were identified from the OPD register of the Chest Medicine & Internal Medicine and accordingly the study subjects were approached. Those fulfilling the eligibility criteria were briefed about the purpose and nature of the study and informed consent was obtained. Before collection of the data, the study subjects were assured about confidentiality and anonymity of the information and right to withdraw from study. Then the study subjects were interviewed or examined using the pre-designed pretested schedule. Data regarding socio-demographic characteristics and other associated factors was obtained by interview and review of available records. Pulmonary function test was done at the physiology department of North Bengal Medical College.

Analysis of Data

After double checking collected data was entered in Microsoft Excel Sheet. Then Data was presented in tabular & diagrammatic format using principles of descriptive & inferential statistics. Data was analysed using IBM Statistical Package of Social Sciences (SPSS) V20.

Ethical Issues

Prior to study, Ethical approval was obtained from the Institutional Ethics Committee of North Bengal Medical College, Darjeeling West Bengal. Before collection of the data, the study subjects were assured about confidentiality and anonymity of the information and right to withdraw from study. The purpose and procedure of the study was explained to them and then informed consent was obtained.

III. Results

The distribution of HMSE scores amongst the two groups of subjects was shown in Table 1. The difference of means is -2.42, and the P-value is <0.0001, hence showing statistical significance between the two groups, thus indicating that the cognition is reduced in COPD patients.

Table 2 shows distribution of FVC amongst COPD and control subjects. The z-value is -1.716, while the P-value is 0.086, which indicates that there is no statistical difference between the two groups. Regarding, the distribution of FEV1 amongst COPD and non-COPD patients, it was found that, the difference in means is -0.55 & the Z-value is -3.188 and there is significant statistical difference between the two groups as evident by the fact that P-value is 0.001. The percentage of FEV1/FVC ratios amongst the two groups shows that the

difference of means is -20.32, while the Z-value is -2.152 and there is no statistical significance between the two groups as the P-value is 0.31.

IV. Discussion

Most people over their lifespan suffer a gradual diminution of cognition; the most important aspect being affected is memory. The decline in cognition is usually gradual, which may be uncomfortable to the patient, does not compromise normal daily activities.

Mild cognitive impairment is classified into amnesic and non-amnesic. There is significant memory impairment in amnesic type but language, visuo-spatial skills and executive functions are not impaired. Non-amnesic mild cognitive impairment leads to mild decline in functions unrelated to memory, attention and language skills.¹⁰ This decline in cognitive impairment has been a significant matter of concern in aged individuals as it may cause functional disabilities and decreased quality of life.

The aim of the study was to determine the occurrence and severity of cognitive dysfunction. With regard to various studies done previously on these topics, it has been seen that there is deterioration of cognition in COPD patients. The study evaluated the cognition profile of COPD patients with the help of neurophysiological tests.

Searching for literature for the questionnaire to be used for evaluation of cognition, it was found that the Mini-Mental scale examination has been the most commonly used scale. But to suit the population in the study who hail mostly from the villages, pre-validated Hindi version of the scale was used as the tool for detecting decline in cognition with respect to COPD.

Another study by Kojima S et al. showed that COPD risk is gradually increased with ageing, and that there was a dose-response relationship between smoking and COPD risk.¹¹

In the year 1993, a case-control study was done by Incalzi et al on 32 patients with moderate COPD, and it was found that cognitive impairment was significantly and positively correlated with duration of chronic respiratory failure.¹²

As per an observational study conducted by Dodd et al assessing the neuropsychological performance in COPD patients hospitalised after an acute exacerbation and recovery, it was concluded that patients hospitalised with an acute exacerbation, those with impaired cognitive function is associated with worse health status and longer length of hospital stay.¹³ There was another observational study conducted by Dodd et al. evaluating differences between COPD patients and control subjects, and it was seen that in stable, non-hypoxaemic COPD, there is reduced white matter integrity throughout the brain and widespread disturbance in the functional activation of grey matter, which might contribute to cognitive dysfunction.¹⁴ White matter microstructural integrity is independent of smoking and co-morbid cerebro-vascular disease, but grey matter functional activation is not. The mechanisms remain unclear but could include cerebral small vessel disease caused by COPD.

In the year 2008, Borson et al. did a case control study with 18 COPD patients (Severe, Very severe) and 9 healthy controls and found that the patients with oxygen dependent COPD had lower scores on cognitive measures than non-oxygen dependent patients.¹⁵

In the year 2006, Ortapamuk et al. conducted a case control study with 18 patients of COPD and 10 healthy controls and observed that hypoxaemic patients showed more deterioration in cognitive performance than non-hypoxaemic patients.¹⁶

It was observed in the index study, that patients with COPD have a lower HMSE score indicating that COPD affects cognition. Decrease in cognitive functions have been associated with increased inflammatory markers in patients of COPD. The mechanisms causing this are yet to be identified and studied for further understanding of the disease.

V. Conclusion

This study has been done amongst COPD subjects and those individuals who do not suffer from COPD or have any thoracic or abdominal abnormality. The study reveals that there is statistically significant decrease in FEV1 in COPD patients compared to non-COPD patients. The PEFr also shows a decrease in COPD patients compared to the control population. HMSE Scores indicate a significant difference amongst the two groups, indicating that Cognition is deteriorated in COPD patients.

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Tables1:

Scores of HMSE	Normal		COPD		Mean differences	p-value
	N	%	N	%		
15-18	16	38.1	40	95.2	-2.42	*0.0001
19-22	19	45.2	2	4.8		
>=23	7	16.7	0	0		

Tables2:

Scores of HMSE		15-18		19-22		>=23		Mean differences	Z value	p-value
		Normal	COPD	Normal	COPD	Normal	COPD			
FVC	<1	0	3	0	1	0	0	-7.89	-1.716	0.086
	1-1.99	5	23	10	1	0	0			
	2-2.99	3	14	18	0	5	0			
	3-3.99	0	0	1	0	2	0			
FEV1	<1	0	11	0	2	0	0	-0.55	-3.188	*0.001
	1-1.99	5	25	11	0	1	0			
	2-2.99	2	4	15	0	5	0			
	3-3.99	0	0	0	0	1	0			
FEV1/FVC	<80	0	17	0	1	0	0	-20.32	-2.152	0.31
	80-99	2	2	5	0	1	0			
	100-119	6	10	3	1	0	0			
	120-139	2	11	9	0	0	0			

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