A comparison of cognitive functions in stable patients with COPD and age-matched healthy volunteers using mini-mental state examination questionnaire

Dr S Palani

Assistant Professor, Govt Kilpouk Medical College, Chennai, Tamilnadu , India.
Corresponding author: Dr S Palani

Abstract:

Chronic Obstructive Pulmonary Disease (COPD) is an airway disease characterized by air flow limitation and is not fully reversible. COPD is a multisystem disorder and is a major public health problem. Cognitive dysfunction is common and clinically important in COPD patients.To check the cognitive function we did Mini Mental State Examination in 50 clinical stable COPD patients and 50 healthy volunteers at Dept of physiology and Experimental Medicine ,GovtKilpauk Medical College Chennai for a period of one year.Data were analyzed by independent samples t-test. Stable COPD patients scored a mean of 22.34(borderline impaired cognitive functions) and control group scored a mean of 25.84. The mean MMSE score was significantly lower in stable COPD patients. A score of 23 and above out of 50 is considered as normal cognitive function. In conclusion, MMSE can be used as a screening tool to detect cognitive dysfunction in stable COPD patients.
Keywords: Chronic Obstructive Pulmonary Disease, Cognitive function, Mini-Mental State Examination.

Introduction:

COPD is an airway disease characterized by air flow limitation and is not fully reversible. The airflow limitation is progressive and associated with an abnormal inflammatory response of the lung tissues to noxious particles or gases. It is the sixth leading cause of death in worldwide. It is associated with peripheral neuropathy, motor neuron involvement, encephalopathy and derangement of cognitive functions. Risk factors are cigarette smoking, smoke from combustion of solid fuels like wood, dried cow dung, smoke from automobile and industries,chullah smoking in village side host factors like alpha 1 antitrypsin deficiency, airway hyper-responsiveness and reduced maximal attained lung functions. Pathogenesisof COPD is characterized by chronic inflammation throughout the airways, parenchyma and pulmonary vasculature. Inflammatory cells like macrophages, T- lymphocytes (CD 8 +) and neutrophils are increased in the lungs. There is release of inflammatory mediators like leukotrienes B4, interleukin 8, TNF- alpha which damage the lungs. Imbalance between proteinases and anti-proteinases in the lungs, and oxidative stress factors released during inflammation are other reasons for the pulmonary damage. Diagnosis is made clinically from the history of chronic cough with sputum expectoration, dyspnoea and exposure to known risk factors mentioned above. COPD is confirmed by Spirometry test by GOLD criteria - FEV1/FVC less than 0.7, FEV1 < 80 %.

The Mini Mental State Examination (MMSE) or Folstein test is a brief 30-point questionnaire test. It was introduced by Folstein *et al.* in 1975. It is used as a screening test for cognitive function. It is also used to estimate the severity of cognitive impairment and to follow the course of cognitive

323

changes in an individual over a period of time. It is also used as a tool to document an individual's response to treatment. The test can be performed in about 10 minutes. The MMSE test includes simple questions and problems in a number of areas: the time and place of the test, repeating lists of words, arithmetic such as the serial sevens, language use and comprehension, and basic motor skills.

The present study is to assess cognitive dysfunction in stable patients with COPD using Folstein Mini-Mental State Examination Questionnaire.

Aim and objective:

To assess cognitive functions in stable patients with COPD compared to age-matched healthy volunteers using Mini-mental state examination questionnaire.

Materials and methods:

Study Design: case control study

Subject selection: Total sample size – 100 subjects, Stable COPD patients – 50, healthy Controls - 50

Period of study: September 2012 –August 2013 for a period of one year.

Place of study: Department of Physiology & Experimental Medicine Kilpauk Medical College,Chennai.

Inclusion criteria: Stable COPD patients diagnosed at the Medicine OPD, KMCH, male and female > 40 years, duration of illness > 5 years, minimum educational qualification of Std VIII and above.

Exclusion criteria: Pulmonary tuberculosis, Diabetes mellitus, hypertension, alcoholism, neurological disorders, kyphoscoliosis, anemia, vitamin deficiencies, drugs causing neuropathies, thyroid disorders and acute severe COPD.

Controls: 50 healthy volunteers were taken as controls.

Screening Procedures: Patients who were qualified under the inclusion criteria were enrolled in the study. Heart rate, blood pressure, height and weight were measured. Brief history was taken to rule out HT/DM/Pulmonary tuberculosis/ alcoholism/drug intake. General clinical examination was done.

Consent : A written consent were taken from the patients and controls after explaining the procedure and its significance in their vernacular language. Ethical clearance was obtained.

Method: Cognitive functions were assessed with Folstein Mini Mental State Questionnaire. Folstein Mini Mental State Questionnaire tests under four headings **– I. ORIENTATION** – carries maximum score of 10. **II.IMMEDIATE RECALL** - carries maximum score of 3. **III. ATTENTATIONAND CALCULATION** - carries maximum score of 5. **IV. RECALL** - carries maximum score of 3. **V. LANGUAGE** - carries maximum score of 9. **MAXIMUM SCORE** is 30. Score of 23 – 30 is considered normal; 19 – 23 is considered borderline impairment; < 19 is considered impaired.

Results and Statistical analysis:

Results were derived by statistical analysis of the data obtained and expressed in tables and charts.. The data were analyzed using SPSS 7.5 for windows student version software. The data were analyzed using independent samples t-test.

TABLE – I   Comparison of age, height, weight and BMI between cases and controls

Variable	Group	Numbers	Mean	S.D	P value
Age	Case	50	50.12	5.752	0.145
	Control	50	51.72	5.131	
Height	Case	50	1.6986	0.06105	0.857
	Control	50	1.7008	0.06044	
Weight	Case	50	69.82	5.185	0.537
	Control	5	69.20	4.806	
BMI	Case	50	24.2106	1.45328	0.270
	Control	50	23.8828	1.50071	

There is no significant difference between cases and controls in respect to age, height, weight and BMI.

TABLE – II Comparison of education between cases and controls

EDUCATION		GROUP		TOTAL
		CASE	CONTROL	
8	COUNT	11	11	22
	% WITHIN GROUP	22%	22%	22%
9	COUNT	14	10	24
	% WITHIN GROUP	28%	20%	24%
10	COUNT	12	12	24
	% WITHIN GROUP	24%	24%	24%
11	COUNT	4	10	14
	% WITHIN GROUP	8%	20%	14%
12	COUNT	9	7	16
	% WITHIN GROUP	18%	14%	16%
TOTAL	COUNT	50	50	100
	% WITHIN GROUP	100%	100%	100%

P =0.480

In our study, cases and controls were selected with minimum qualification of standard VIII and above (P value 0.480). There was no significant difference in education qualification between cases and controls.

TABLE – III

Comparison of Folstein MMSE scores between cases and controls

Variable	Group	Number	Mean	S.D	P VALUE
Folstein MMSE score	Case	50	22.34	2.869	<0.001
	Control	50	25.84	1.822	

We observed there was borderline impairment of cognitive function in stable COPD patients as per MMSE scores (P < 0.001).

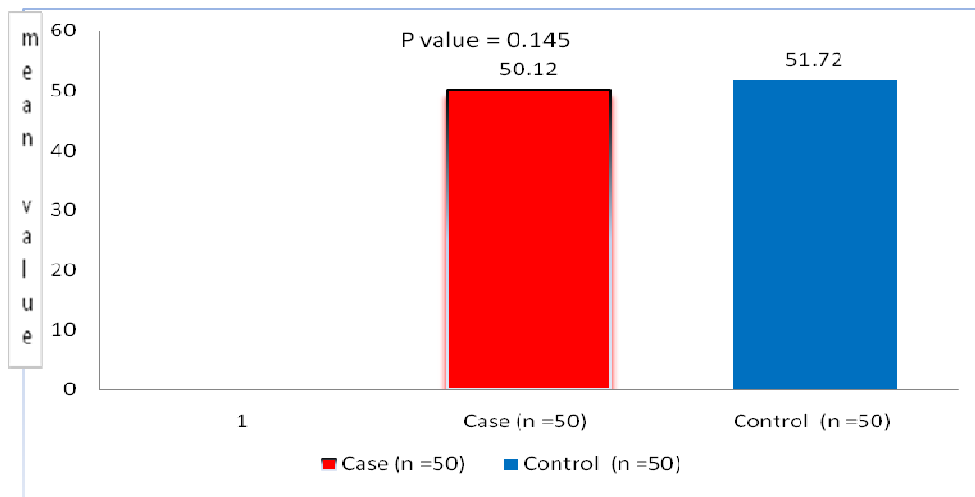**Plate -I**

Comparison of age between case and control

Plate -II

Comparison of BMI between se and control

PLATE -III

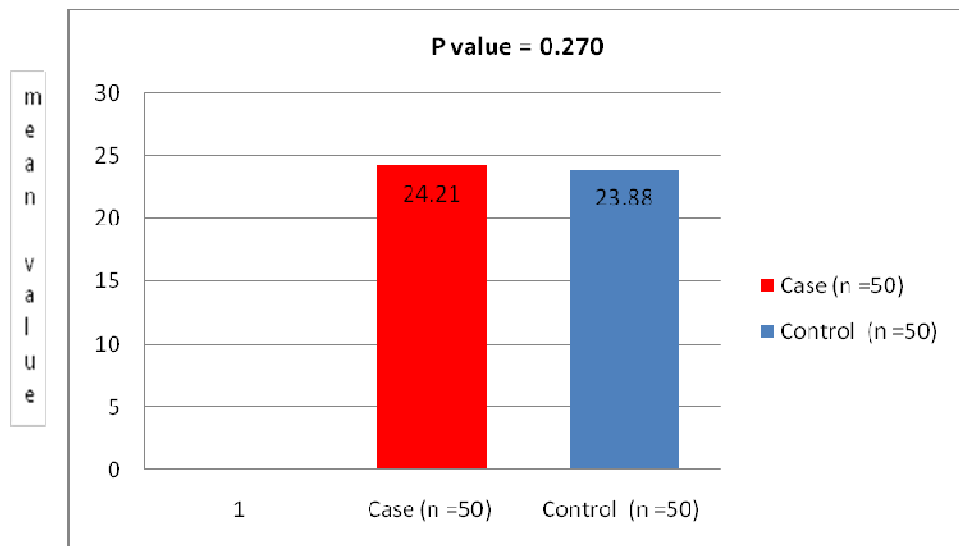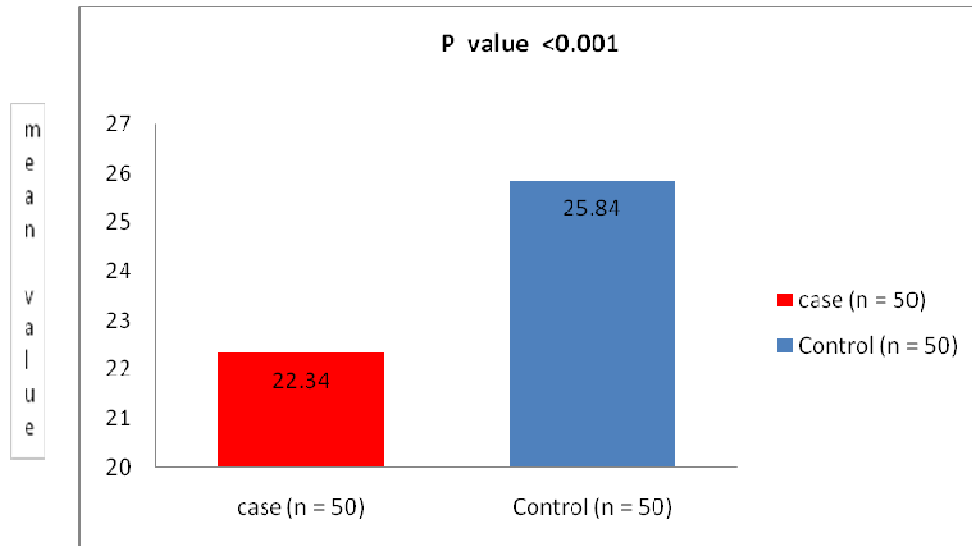**Comparison of MMSE scores between case and control**

Discussion:

In our study, we enrolled 50 stable COPD patients and 50 healthy controls after a general clinical examination.The mean age of the control group was 51.72 ± 5.131 ranging from 40 – 60 years. The mean age of the COPD patients was 50.12 ± 5.752 ranging from 40 – 60 years. P value is 0.145(not statistically significant). The mean height of the control group was 1.7008 ± 0.06044. The mean height of the COPD patients was 1.6986 ± 0.06105. P value is 0.857 (not statistically significant). The mean weight of the control group was 69.20 ± 4.806. The mean weight of the COPD patients was 69.82 ± 5.185. P value is 0.537 (not statistically significant). The mean BMI of the control group was 23.8828 ± 1.50071. The mean BMI of the COPD patients was 24.2106 ± 1.45328. P value is 0.270 (not statistically significant). The mean

MMSE score of the control group was 25.84 ± 1.822. The mean MMSE score of the COPD patients was 22.34 ± 2.869(borderline impaired cognitive function). P value is < 0.001(statistically significant). **We observed there was borderline impairment of cognitive function in stable COPD patients as per MMSE scores (P < 0.001).**

Conclusion:

Thus from the above study, it is evident that there was borderline cognitive impairment in stable COPD patients compared to age, height, weight, BMI and education matched healthy controls. This study highlights the importance of using MMSE for assessing cognitive functions, which is inexpensive, non-invasive, and also easy to execute clinically.

327

Bibliography

1. Antonelli-Incalzi R et al, Dement GeriatrCognDisord. 2007; 23(4) :264-   70.Epub 2007 mar 12. Screening of cognitive function in chronic obstructive pulmonary disease. MMSE and 5-item IADL scale can be used to exclude cognitive dysfunctions in COPD patients.

2. FolsteinMF,FolsteinSE,McHughPR (1975)"Mini-mental state". A practical method for grading the cognitive state of patients for the clinician.Journal of Psychiatric Research 12 (3): 189-98.

3. Gupta PP et al, Lung India. 2013 jan; 30(1): 5-11. A comparison of cognitive functions in non-hypoxemic chronic obstructive pulmonary disease (COPD) patients and age-matched healthy volunteers using mini-mental state examination questionnaire and event- related potential , P300 analysis.

4. Incalzil RA et al, Aging ClinExp Res. 2002 oct;14(5):395-401. To assess both the prevalence and main correlates of subclinical cognitive dysfunction in older patients with non-hypoxemic COPD.

5. Incalzi RA et al, Respir Med. 1998 mar;92(3):527-33.Predicting cognitive decline in patients with hypoxemic COPD.

6. Isoaho R, IntPsychogeriatr. 1996 Spring; 8(1): 113 – 25.Chronic obstructive pulmonary disease and cognitive impairment in the elderly.

7. John J.Reilly et al,Chronic obstructive Pulmonary Disease, Harrison"s Principles of Internal Medicine, 18[th]e, p2151-60.

8. Mini-Mental State Examination.Psychological Assessment Resources, Inc.".Retrieved 2006-06-22.

9. Salik Y et al, Arch GerontolGeriatr. 2007 nov-dec; 45(3)273-80.Epub 2007 mar 6. Cognitive function and its effects on the quality of life status in the patients with chronic obstructive pulmonary disease (COPD).

10. US,Folstein MF, Folstein SE & PR McHugh, "Mini-mental state : a practical method for grading the cognitive state of patients for the clinician", published 2000-06-08