



A CROSS SECTIONAL STUDY ON COMPARISON OF DECLINE IN LUNG FUNCTION BETWEEN SMOKERS, EX-SMOKERS AND NON-SMOKERS AT IRD SMS MEDICAL COLLEGE JAIPUR RAJASTHAN

Respiratory Medicine

Dr. Jitendra Singh PG Resident, IRD SMS Medical College Jaipur Rajasthan.

Dr. Shashi Prakash Agnihotri Senior Professor & Unit Head IRD SMS Medical College Jaipur Rajasthan.

Dr. Govind Singh Rajawat Associate Professor IRD SMS Medical College Jaipur.

Dr. Ruchika Chahar* Senior Resident RNT Medical College Udaipur. *Corresponding Author

ABSTRACT

Introduction: - Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease which is a leading cause of mortality and morbidity worldwide. Smoking and biomass fuel exposure plays a major role in COPD by oxidative stress which leads to decrease in predicted FEV1% and FEV1/FVC ratio. **Objective:-** Comparison in decline in lung function between smokers, ex-smokers and non-smokers. **Material And Methods:** - This was a hospital-based case control study conducted at Institute of Respiratory Diseases SMS Medical College Jaipur, Rajasthan India. Total 50 healthy controls and 50 Smokers and Ex-Smokers Diagnosed cases of COPD enrolled in study during 2020-2021. **Results:** - FEV1% in cases was 55.86 ± 15.9 and in controls was 89.2 ± 6.65 . FEV1/FVC in cases was 56.62 ± 10.15 and in controls was 76.98 ± 3.61 . **Conclusion:** - Predicted FEV 1% and FEV1/FVC ratio was low in cases as compared to controls and the levels were also low in Smokers as compared to Ex-Smokers.

KEYWORDS

COPD, FEV1%, FEV1/FVC, OXIDATIVE STRESS

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is characterized by persistent respiratory symptoms and airflow limitation in form of cough, dyspnea, and sputum production due to airway inflammation because of exposure to noxious particles or gases. It is also influenced by host factors including abnormal lung development¹. Oxidative stress plays a major role in pathogenesis of COPD and it causes amplification of the airway inflammation which leads to airway destruction and decrease in FEV1 and also decreases in FEV1/FVC ratio which is used in the diagnosis and also to evaluate response to therapy in COPD². FEV1 declines with increasing age but decline rate of FEV1 is rapid in smokers as smoking induces oxidative stress along with intermediate inflammatory markers which leads to destruction of airways. FEV1 and FEV1/FVC is declined in smokers and also in ex-smokers and it depends on the duration of smoking, pack years, gender, age and other comorbidities of airways. FEV1 and FEV1/FVC is measured with the help of spirometry and then patient categorized in to GOLD groups along with history of exacerbations, CAT and mMRC score which is very helpful in deciding the treatment of the patients¹.

MATERIAL AND METHODS

Study Design

This was a hospital-based case control study carried out on COPD patients attending OPD at Department of Respiratory Medicine, Institute of Respiratory Diseases, SMS Medical College, Jaipur during the year 2020–2021.

Sample Size

Sample size is calculated at assuming study power of 80% and α error of 0.05 assuming SD of 4.514 in smokers and control groups. Required sample size was 44 in each group, which was increased and rounded off to 50 each group as final sample size (to allow 10% attrition).

Study Approval

This study was approved by the Institutional review Board, SMS Medical College, Jaipur.

Selection Criteria

Inclusion Criteria:

Inclusion Criteria For Cases:-

- Patients diagnosed as a case of COPD based on recent GOLD guidelines attending Institute of Respiratory Diseases, Jaipur
- Patients was stable for 6 weeks
- Patients who have given written informed consent

Inclusion Criteria For controls:-

- Healthy persons (age and sex matched) with normal spirometry from attenders of COPD cases to avoid confounding factors
- Controls were selected from amongst attenders accompanying COPD cases
- Persons who have given written informed consent.

Exclusion Criteria:

Exclusion Criteria For Cases:-

- Acute exacerbation of COPD
- Asthma and other respiratory diseases
- Cardiovascular disease, thrombosis, renal disease and hepatic disease

Exclusion For Controls:-

- persons diagnosed with any respiratory disease or other illness

Study Protocol:-

This study was approved by the Institutional Review Board, SMS Medical College, Jaipur. After giving full explanation regarding the study, written consent was obtained from all enrolled patients. Consent form includes details of the study plan. After applying inclusion and exclusion criteria, the Study population was selected and divided into cases group and control group.

Statistical Analysis:-

The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data were presented as the means $\pm$ SD and as median with 25th and 75th percentiles (interquartile range). The following statistical tests were applied for the results:

1. The comparison of the variables which were quantitative in nature were analysed using Independent t test.
2. The comparison of the variables which were qualitative in nature were analysed using the Chi-Square test. If any cell had an expected value of less than 5 then Fisher's exact test was used.

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 21.0.

OBSERVATIONS AND RESULTS

Table 1:- Comparison Of Demographic Characteristics Between

Cases And Controls.

Demographic characteristics	Cases (n=100)	Controls (n=50)	Total	P value
Age(years)				
41-50	31 (31.00%)	19 (38.00%)	50 (33.33%)	0.317 ⁺
51-60	51 (51.00%)	19 (38.00%)	70 (46.67%)	
61-70	18 (18.00%)	12 (24.00%)	30 (20.00%)	
Mean $\pm$ SD	54.13 $\pm$ 6.95	54 $\pm$ 7.25	54.09 $\pm$ 7.03	0.915 ⁺
Median (25th-75th percentile)	56(48-59)	52.5(49-59)	540(48-59)	
Range	41-69	42-68	41-69	
Gender				
Female	30 (30%)	15 (30%)	45 (30%)	1 ⁺
Male	70 (70%)	35 (70%)	105 (70%)	

Independent T Test,⁺ Chi Square Test

Above Table no 1 shows that the distribution of age was comparable between cases and controls. (41-50 years: -31% vs 38%, 51-60 years: -51% vs 38%, 61-70 years: -18% vs 24%). (p value=0.317) and also that the Mean $\pm$ SD of age(years) in cases was 54.13 $\pm$ 6.95 and controls was 54 $\pm$ 7.25 with no significant difference between them. (p value=0.915). This table also shows that distribution of gender was comparable between cases and controls. (Female: - 30% vs 30% respectively, Male: -70% vs 70% respectively) (p value=1).

Table 2:- Comparison Of FEV1% Predicted Between Cases And Controls.

FEV1% predicted	Cases (n=100)	Controls (n=50)	Total	P value
Mean $\pm$ SD	55.86 $\pm$ 15.9	89.2 $\pm$ 6.65	66.97 $\pm$ 20.77	<.0001 ⁺
Median (25th-75th percentile)	59.5 (46-68)	88.5 (84.25-91.75)	68 (53.25-84)	
Range	23-79	80-110	23-110	

***Independent t test**

Table 2 illustrates that the Mean $\pm$ SD of FEV1% predicted in cases was significantly lower as compared to controls.

Table 3: - Comparison Of FEV1% Predicted Between Smokers And Ex-smokers.

FEV1% predicted	Smoker (n=50)	Ex-Smoker (n=50)	Total	P value
Mean $\pm$ SD	48.12 $\pm$ 15.51	63.6 $\pm$ 12.17	55.86 $\pm$ 15.9	<.0001 ⁺
Median (25th-75th percentile)	50 (33.5-59.75)	66 (57-72.75)	59.5 (46-68)	
Range	23-78	26-79	23-79	

***Independent t test**

Table 3 shows that in our study the mean FEV1% predicted in Ex-Smoker was 63.6 $\pm$ 12.17 and in smokers was 48.12 $\pm$ 15.51

Table 4: - Comparison Of FEV1/FVC% Between Cases And Controls.

FEV1/FVC%	Cases (n=100)	Controls (n=50)	Total	P value
Mean $\pm$ SD	56.62 $\pm$ 10.15	76.98 $\pm$ 3.61	63.41 $\pm$ 12.86	<.0001 ⁺
Median (25th-75th percentile)	60.18 (54.202-63.45)	77 (75-79)	63.45 (58.448-75)	
Range	31.12-68.15	70-85	31.12-85	

***Independent t test**

Above table illustrated that Mean $\pm$ SD of FEV1/FVC% in cases was significantly lower as compared to controls.

Table 5: - Comparison Of FEV1/FVC% Between Smokers And Ex-smokers.

FEV1/FVC%	Smoker (n=50)	Ex-Smoker (n=50)	Total	P value
Mean $\pm$ SD	52.87 $\pm$ 11.88	60.37 $\pm$ 6.17	56.62 $\pm$ 10.15	0.0002 ⁺
Median (25th-75th percentile)	56.16 (42.86-62.128)	61.23 (59.172-64.143)	60.18 (54.202-63.45)	
Range	31.12-68.15	36.15-68.14	31.12-68.15	

***Independent T test**

Table 5 shows that the Mean $\pm$ sd of FEV1/FVC% in Ex-Smoker was 60.37 $\pm$ 6.17 which was significantly higher as compared to smoker (52.87 $\pm$ 11.88). (p value=0.0002)

DISCUSSION

In our study distribution of gender was comparable between cases and control with a male preponderance (Female: -30%, Male: -70%). The male preponderance in cases group & control group was statistically non-significant (P=1.000) which was similar to study by Anand Kumar et al³ who reported out of 60 patients with COPD, 50 were males. In our study also the distribution of age was comparable between cases and controls. (p value=0.317). Mean $\pm$ SD of age (years) in cases was 54.13 $\pm$ 6.95 and controls was 54 $\pm$ 7.25 with no significant difference between them (p value=0.915). Their age ranged from 41 to 69 for cases and 40 to 68 in controls which corresponds to a study in the United States of America the prevalence of COPD increased from 3.2% among those less than 44 years to 11.6% among those >65 years it is also observed in the study which was performed by Rakesh Kumar⁴ and he observed that out of 51 cases, 41 (80.39%) were males and 10 (19.6%) were females with mean age of 58.48 $\pm$ 11.43 years and 58.20 $\pm$ 12.89 years respectively. Most of the cases [51 (70%)] belonged to the 61-70-year age group. Out of 40 control groups, 30 (75%) were males and 10 (25%) were females with mean age of 59.05 $\pm$ 11.65 years and 58.23 $\pm$ 10.76 years respectively. Most of the cases belonged to the 51-60 [13 (32.5%)] and 61-70 [12 (30%)] years age group.

In current study the mean value of FEV1% in cases was 55.86 $\pm$ 15.9 and in controls was 89.2 $\pm$ 6.65 which was significantly lower in cases as compared to controls with a p value <.0001. The Mean FEV1 % predicted in Ex-Smokers was also high compared to Smokers in our study. Also, the Mean $\pm$ SD of FEV1/FVC% in cases was 56.62 $\pm$ 10.15 which was significantly lower as compared to controls was 76.98 $\pm$ 3.61.(p value <.0001) which came in accordance to the study results of X.XU et al⁵ (1993)in which they concludes that more rapid decline in FEV1 in smokers as compared to life time non-smokers, also D.Makris,J.Moschandreas et al⁶.(2006) concludes in their study that frequency of exacerbations more in smokers and ex-smokers and associated with decline in FEV1,Karima A. Abd EL Khalek et al⁷.also observed in their study that FEV1%and FVC% was significantly lower in case groups (66.070 $\pm$ 10.265) as compared to control group (81.435 $\pm$ 5.978) and similar results were published by Shivanand K.G,Manjunath M.L. ,Das Shirahatti K⁸(2012)and they concludes that FEV1% and FEV1/FVC% in smokers(48.09 $\pm$ 20.85,52.05 $\pm$ 5.94) was low as compared to non-smokers(81.89 $\pm$ 11.87,75.47 $\pm$ 7.79) respectively as in our study, DhruvM.Shah, Ravish M. Kshatriya,Rajiv Paliwal⁹(2021) observed in their study that postbronchodilator FEV1 among smokers (42.63) was low compared to non-smokers(56.63) which was similar to our study.

CONCLUSION

The conclusion of the present study is that both FEV1% predicted and FEV1/FVC was low in cases as compare to controls and the levels were also low in SMOKERS as compare to EX- SMOKERS and level of FEV1 and FEV1/FVC is not returned to the level of healthy controls in EX-SMOKERS. So smoking plays a major role in airway abnormality which newer come to healthy level even after quit smoking but it may slow down in decline in airway function so quitting smoking is a great tool in preventing development of COPD.

REFERENCES

- Global Initiative for Chronic Obstructive Lung Disease (GOLD). <https://gold.copd.org/2022-gold-reports-2/> accessed on feb.15,2021.
- Barens PJ. Mediators of Chronic Obstructive Pulmonary Disease. Pharmacol Rev 2004; 56:515-548.
- Anand Kumar, Sanjay Kumar Verma, Achal Mehrotra, Avdesh Kumar, Sudhir Chaudhri, C.M. Verma, Rajendra Prasad and Surya Kant. A Study on Microalbuminuria in Patients with Chronic Obstructive Pulmonary Disease at a Tertiary Care Centre in North India. Indian J Chest Dis Allied Sci 2017; 59:17-21.
- Kumar R. Study of Stable COPD. Ann. Int. Med. Den. Res. 2016;2(3):95-8.
- Smoking. Changes in smoking habits and rate of decline in FEV1: new insight into gender differences. X. Xu, S.T. Weiss, B. Rijcken, J.P. Schouten.Eur Respir J,1994, 7,1056-1061.
- D. Markis et al. Exacerbations and lung function decline in COPD: New insight in current and ex-smokers. Doi: 10.1016/j.rmed.2006.10.012
- Abd El Khalek KA, El Seify MY, Youssef OI, Badr MM. Diagnostic value of exhaled carbon monoxide as an early marker of exacerbation in children with chronic lung diseases. ISRN Pediatr. 2012; 2012:859873. doi: 10.5402/2012/859873. Epub 2012 Sep 11. PMID: 22997589; PMCID: PMC3446676.
- Shivanand K. G et al FEV1% and FEV1/FVC% in smokers with special reference to chronic obstructive pulmonary diseases. IJBR 3[10][2012]405-408.
- Shah DM, Kshatriya RM, Paliwal R. Comparison of demographic, clinical, spirometry, and radiological parameters between smoking ang non smoking COPD patients in rural Gujarat, India. J Family Med Prim Care 2021; 10:3343-7.