

Original Article

FACTORS LEADING TO THE DEVELOPMENT OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN ADULT PAKISTANI MALES

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Objective: The study was conducted to determine the factors associated with development of COPD among adult Pakistani men of 40 to 70 years of age.

Material & Methods: This case control study was conducted with total sample of 88 males aged 40 to 70 years old, 44 cases and 44 matched controls with 1:1 ratio. Cases were selected from the patients admitted in the Pulmonology Department Jinnah Hospital Lahore and controls from the other departments of the same hospital, during one month period. The data was collected through questionnaire consisting of variables like age, locality, occupation and smoking status. The spirometric cut off points (FEV1<80% of predicted and FEV1/FVC ratio <70% of predicted) were used as diagnostic tool for COPD. Cross tabulation was performed with dependent variables as presence of COPD and independent variables such as smoking, age, occupational exposure, locality etc. Multivariate logistic regression model was used with backward elimination technique for the adjustment of age, locality, income status, occupation, previous history of disease and smoking status.

Results: Cigarette smoking and age of more than 55 yrs have shown significant relationship with the development of COPD (p value<0.05). Adjusted odd's ratio was 9.1065 for smoking and 4.2315 for age. Urban residents have a risk of developing COPD 2.14 times more than that of rural residents.

Conclusion: Cigarette smoking is most important risk factor for development of COPD, so efforts should be made to control it.

Keywords: COPD, Smoking, Adjusted odd's ratio.

Introduction

Chronic obstructive pulmonary disease is defined as a disease state characterized by airflow limitation that is not fully reversible, is usually progressive, and is associated with an abnormal inflammatory response of the lungs to inhaled noxious particles or gases.¹ COPD diagnosis is confirmed by a simple test called spirometry, which measures how deeply a person can breathe and how fast air can move into and out of the lungs. Such a diagnosis should be considered in any patient who has symptoms of cough, sputum production, or dyspnea (difficult or labored breathing), and/or a history of exposure to risk factors for the disease.²

Spirometry is essential for diagnosis and provides a useful description of severity of pathological changes in COPD. Specific spirometric cut off points (e.g. post bronchodilator FEV1/FVC ratio < 0.7 or FEV1 <80% of predicted) are used for purpose of simplicity.³

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease with some significant extra-pulmonary effects that may contribute to severity in individual patients. Its

pulmonary component is characterized by airflow limitation whereas weight loss, nutritional abnormalities and skeletal muscle dysfunctions are well recognized extra-pulmonary effects and patients are at risk of increased myocardial infarction, angina, osteoporosis, respiratory infections, bone fractures, depression, diabetes, sleep disorders, anaemia and glaucoma.³

COPD is a leading cause of morbidity and mortality worldwide and results in an economic and social burden that is both substantial and increasing. The global burden of disease study has projected that COPD which ranked 6th in 1990s will become the 3rd leading cause of death worldwide by 2020.⁴ More than 3 million people die from disease every year. In Pakistan the estimated COPD mortality rate is 71 deaths per 100,000 population, the 4th highest rate among the 25 most populous nations in the world.⁵

The identification of risk factors is an important step towards developing strategy for prevention and treatment of any disease. Tobacco smoking causes 80% to 90% of COPD cases. Smokers are more than ten times as likely to die from COPD than non-smokers. Chemicals found in tobacco smoke

stimulate inflammation in the lungs, leading to destruction of the alveoli and narrowing of the airways. COPD is rarely found below the age of 40. Lung function deteriorates with age. Ageing may therefore increase the susceptibility for the development of COPD and its exacerbations.⁶

However although smoking is the best studied COPD risk factor it is not the only one and there is consistent evidence from epidemiological studies that non smokers may develop chronic airflow obstruction.⁷ Of the many inhalation exposures that may be encountered over a lifetime, only tobacco smoke⁸ and occupational dust are known to cause COPD on their own. Tobacco smoke and occupational exposure also appear to act additively to increase the risk of developing COPD.⁹ Cigarette smokers have a high prevalence of respiratory symptoms and lung function abnormalities, a great annual rate of decline in FEV1 and greater mortality than non smokers.¹⁰ Passive exposure to cigarette smoke may also contribute to COPD by increasing lungs' total burden of inhaled particles and gases.¹¹ The role of gender in determining COPD risk remains unclear. Studies from developed countries show that the prevalence of disease is now almost equal in men and women.¹² There is evidence that the risk of developing COPD is inversely related to socioeconomic status.¹³ COPD is costly disease with both direct cost (value of health care resources devoted to diagnosis and medical management) and indirect cost (monetary consequences of disability, missed work, premature mortality).¹⁴

This study was designed to determine the factors leading to the development of COPD and conducted with a view that disease can be prevented in the community by eliminating the risk factors. As COPD is a disabling disease and 4th leading cause of death so by preventing it we can reduce significant socioeconomic burden nationally and globally.

Objectives of Study

To determine the factors associated with COPD.

Material & Methods

This case control study was conducted in Jinnah Hospital Lahore. Cases were patients of COPD from Pulmonology Department and controls were patients without COPD from medical wards of the same hospital. Sample size was calculated using statistical software Stat Calc in Epi Info version 3.5.1. Taking 1:1 case control ratio the calculated sample size was 44 cases and 44 controls. Non probability purposive sampling technique was used for selection of cases and controls. The data

collection tool was designed consisting of three portions, questionnaire (consisting of variables), checklist (for recording of clinical observations) and spirometry. The diagnostic criteria for COPD was based on spirometric values i.e. FEV1 less than 80% of predicted and FEV1/FVC ratio less than 70% of predicted. For cases, after taking consent, the clinical examination was carried out and chest X-ray was examined and if all were suggestive of COPD then spirometry was performed. If spirometry values were diagnostic then the patient was enrolled in the study as a case. For the control group, patients who reported in the medical wards of Jinnah Hospital Lahore were selected. After history, clinical examination, chest Xray & spirometry, if all findings were not suggestive of COPD then they were enrolled in study as controls. Data was entered in computer using epi data version 3.0. After cleaning the data was analysed using Epi Info version 3.5.1. Frequency tables were generated for categorical data, measures of central tendency were calculated for continuous data. Inference was generated using chi square for categorical data and odds ratio at 95% confidence interval was a cut off point. Multi-variate logistic regression model was generated using backward elimination method to rule out the effect of confounding factors.

Results

Out of 44 respondents of case group, 19 (43%) were up to 55 years old and 25 (57%) were above 55 years. Among control group 13 (29%) were up to 55 yrs and 31 (71%) respondents were above 55 yrs. There was no difference in educational status of case and control groups. 15 (34.09%) were literate among cases and 14 (31.82%) were literate among controls.

Out of 44 cases 32 (73%) were smokers whereas among controls only 10 (23%) were smokers.

It is known that urban population is more at risk of developing COPD. In this context respondents were asked about their residence. 28 (64%) cases were living in urban localities whereas only 25 (57%) controls were residents of urban area.

Regarding exposure to industrial pollution, results revealed that 6 (14%) cases were exposed to industrial pollution and only 1 (2%) control was exposed.

Five (11.36%) cases had family history of COPD while 1 (2%) control had a family history of COPD (**table 1**).

Among the risk factors, smoking and age had a strong association with development of COPD. Chi-square test was applied to see the association. For smoking, p value was 0.0000024274. After univariate analysis the

odd's ratio was 9.0667 at 95% confidence interval (3.4434-23.8734). Multiple logistic regression was applied to adjust for the confounding effect of other factors. In final model after adjustment, odd's ratio came out to be 9.1065 at 95% confidence interval (3.0086-27.5633), thus indicating more strong association of smoking with COPD.

Considering the age as risk factor, calculated p value was 0.0223. Unadjusted odd's ratio was calculated as 1.8123 at 95% confidence interval (1.7513-4.3715). After adjustment with other factors odd's ratio was calculated as 4.2315 at 95% confidence interval (1.2790-13.9992). Thus increasing age is an independent risk factor for development of COPD. The association of development of COPD and risk factors, locality and exposure to industrial pollution

was not significant. Occupational exposure in univariate analysis showed odd's ratio of 2.6000 at 95% confidence interval (0.8197-82469). After adjustment in final model odd's ratio became 2.2308 at 95% confidence interval (0.5369-9.2695). For urban residence as a risk factor for development of COPD, odd's ratio calculated was 1.3300 at 95% confidence interval (0.5649-3.1312) with the p value of 0.331716. After adjustment, odd's ratio became 2.1476 at 95% confidence interval (0.7023-6.5676). Thus urban residents have a risk of developing COPD 2.14 times more than that of rural residents.

Discussion

COPD is a progressive disease; its prevention will

Table-1: Factors among cases and controls.

Factors		Cases n=44		Controls n=44	
		Frequency	Percentage	Frequency	Percentage
Smoking	Smoker	32	73	10	23
	Non-smoker	12	27	34	77
Age	Upto 55	19	43	13	29
	55 and above	25	57	31	71
Locality	Urban	28	64	25	57
	Rural	16	36	19	43
Industrial Pollution	Exposed	06	14	01	02
	Non-exposed	38	86	43	98
Family History of COPD	Yes	05	11	01	02
	No	39	89	43	98

Table-2: Multiple logistic regression model using backward elimination procedure.

Risk Factors		Severity		P-value	Odds Ratio	
		Cases	Controls		Unadjusted	Adjusted
Smoking	Smoker	32	10	0.00000242	9.0667	9.1065
	Non-smoker	12	34			
Age	55 and above	19	13	0.0223	1.83123	4.2315
	Upto 55	25	31			
Locality	Urban	28	25	0.663118	1.3300	2.1476
	Rural	16	19			
Industrial Pollution	Exposed	06	01	0.6363	2.6000	2.2308
	Non-exposed	38	43			
Family History of COPD	Yes	05	01	0.3785	5.5128	2.6662
	No	39	43			

lead to marked reduction in disability and extensive cost of treatment. This case control study was conducted to determine the factors leading to the development of COPD. From the results it is observed that smoking and age are most strongly associated with development of COPD. These findings are consistent with the international studies. Copenhagen City Heart Study was conducted in Denmark. A cohort of 8045 people was followed for 25 years and it was observed that absolute risk of developing COPD in continuous smokers was 25%, which is larger than ever estimated.¹⁵

In a large scale cross sectional study in China a non smoker sample of 12471 people aged 40 years and above were included. COPD was prevalent in 5.2% non smokers (95%CI 4.8-5.6) confirmed on spirometry.¹⁶ Smoking cessation early in the follow up period decreased the risk of COPD substantially compared with continuous smokers.¹⁷

In our case control study the odd's ratio was calculated as 9.0666 95% CI(3.4434-23.8734) among the smokers compared with non smokers. It showed very strong strength of association between cigarette smoking and COPD. Our study population consisted of males 42-70 yrs of age compared to Copenhagen city study in which both males and females aged 30-60 years were included.

In another study carried out in West Haven city, it was seen that COPD induced death risk was doubled (adjusted odd's ratio 2.01 : 95% C I 1.60-2.54) in the participants with an age ranging between 65 to 80 yrs. The age factor seems to be related with COPD mortality. In our study age group was 40-70 yrs old males. After adjusting the effect of other confounders in final multi-variate logistic regression model, the age showed significant association with

the development of COPD (adjusted odd's ratio 4.2315 95% CI (1.2790-13.9992) p-value 0.0223). This result shows significant risk level and strength of association between age and COPD. The results of these studies are consistent with our results in which both age and smoking are significantly associated with COPD and association has become more stronger after adjustment for confounding factors by applying multivariate logistic regression.

In a study conducted in Finland the association of COPD with industrial exposure in tile industry workers was studied. After performing lung functions of the participants, it was concluded that the risk of COPD after synergistic effect of smoking and exposure to industrial pollution was increased by three folds.¹⁸ In another study over rail road workers the exposure to diesel smoke was studied in association with COPD and 2.5% increased risk of COPD mortality was found for each additional year of work relative to those in unexposed jobs. In our study the industrial pollution exposed individuals did not show association with COPD; it could be due to small sample size of 88 individuals, and as only a few industrial workers were included.¹⁹

Conclusion

Cigarette smoking and age were found to have causal relationship with COPD. It is therefore suggested that smoking cessation is the most important intervention to reduce the risk of developing COPD.

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