Original Article

Value of past clinical history in differentiating bronchial asthma from COPD in male smokers presenting with SOB and fixed airway obstruction

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ABSTRACT

Objective: Differentiating asthma from chronic obstructive pulmonary disease (COPD) is difficult. Steroid trial may be of help but has several pitfalls. The present study aims to assess the value of past clinical profile of asthma and its differential diagnosis from COPD in male smokers and thereby to formulate clinical parameters to diagnose bronchial asthma in such patients. **Patients and Methods:** Male smokers who reported at the Respiratory Medicine Department of the National Institute of Medical Sciences (NIMS) Hospital, Jaipur, (India), with shortness of breath (SOB) and showing less than 12% postbronchodilator bronchial reversibility (BR) on spirometry were recruited. These patients were given oral prednisolone 1 mg/kg for two weeks. Post steroid (PS) spirometry was performed to ascertain BR. The past clinical history was recorded and analyzed to determine if it is of any use in differentiating asthma from COPD. **Result:** Out of 104 patients, four were lost to follow up, 52 were diagnosed as bronchial asthma, and the remaining 48 as COPD. It was revealed that past history of (H/O) seasonal variation, wheezing, eye allergy, nasal allergy, dust allergy, skin allergy, and family H/O asthma/allergy were positive in 50, 40, 34, 30, 18, 14, and 12 asthma patients as compared to 10, 8, 2, 4, 6, 0, and 0 in 48 COPD patients ($P < 0.001$). The odds ratio (OR) for diagnosing asthma was highest for the presence of any other two symptoms/variables, besides SOB, in the past (OR = 275, $P < 0.0001$). **Conclusion:** Past clinical history is of immense value in differentiating asthma from COPD in male smokers presenting with SOB and fixed airway obstruction.

KEY WORDS: Asthma, chronic obstructive pulmonary disease, smoker

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INTRODUCTION

Tobacco smoke, an established risk factor for chronic obstructive pulmonary disease (COPD), is now being increasingly incriminated in the pathogenesis of bronchial asthma also. In most developed countries, ~25% of adults with asthma are current cigarette smokers.[1] Such asthma patients often present with shortness of breath (SOB) and cough, with or without sputum production, and a fixed or partially reversible airflow obstruction, a clinical scenario that is similar to COPD.[2] Even the typical pathological characterization of asthma is lost in smokers. As a result, these patients are being treated with therapies that target both asthma and COPD rather than one of these diseases, resulting in poor outcome.

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Traditionally, steroid trial has been used to differentiate asthma and COPD. In steroid trial, fixed airflow limitation is considered as diagnostic of COPD but a positive response to steroid trial favors the diagnosis of asthma.[3] Steroid trial, however, has certain drawbacks i.e., many of these patients are lost to follow up, the results of steroid trial are not 100% specific, and undesirable side effects of oral steroids are common even during the short course of steroids[4] thus limiting its usefulness in differentiating asthma from COPD.

It is widely accepted that asthma and COPD pursue a different natural history. Therefore, it was hypothesized that the past clinical history may typically continue to guide the diagnosis of asthma in smokers who are now presenting with a clinicophysiological scenario similar to that of COPD, in spite of the smoke-related alterations.

The current study aims to analyze the value of past history, more particularly the history of respiratory and nonrespiratory allergies, in distinguishing smoker asthma patients from COPD. No such study has ever been done in the past to the best of our knowledge.

PATIENTS AND METHODS

The intake of patients for the study started in July 2012 and ended in Aug 2013, comprising all male smoker patients above the age of 18 years who presented with SOB at the outpatient section of the Department of Respiratory Medicine. The protocol of the study was approved by the Scientific Committee, National Institute Medical Sciences, Jaipur (India) vide its order number 02, dated 18.08.2012.

These initially recruited patients were clinically reevaluated with regard to symptoms, smoking history, and physical findings and then subjected to routine investigations, namely, sputum smear examination by Ziehl-Nelson method, blood examination for hemoglobin, total leukocyte count (TLC), differential leukocyte count, total eosinophil count (TEC), fasting sugar, liver function tests, human immunodeficiency virus antibodies; urine for complete examination and electrocardiography. Patients having disease/s other than asthma/COPD and those having coexisting hypertension, diabetes mellitus, and cardiac, hepatic or renal diseases were excluded. The remaining patients were subjected to spirometry (RMS Helios 401). Bronchial reversibility (BR) was assessed by repeating spirometry, 15 min postinhalation of bronchodilator (B, 200 μg salbutamol) with the help of a jet nebulizer. Percentage reversibility was calculated as:-

$$\%BR = \text{Post B } FEV_1 - \text{Pre B } FEV_1 / \text{Pre B } FEV_1 \times 100$$

Reversible airway obstruction was defined as >12% increase in Forced Expiratory Volume in 1 second (FEV1) (or FEV1/forced vital capacity (FVC)), postbronchodilator (B).[5]

All the patients who showed fixed airway obstruction (post B FEV_1/FVC ratio less than 70% with less than 12% reversibility of FEV_1), except those who were unwilling to remain under follow up, were finally recruited in this study. These patients were interviewed in detail with regard to the presence of a symptom/group of symptoms or a variable, suggestive of respiratory and nonrespiratory allergies in the past i.e., wheeze, chest tightness, seasonal variation, dust allergy, eye allergy (redness, itching, watering), nasal allergy (running nose, nasal stuffiness, sneezing) or skin allergy (rashes, itching, eczema) in self or in his family members. The patients were then put on oral prednisolone (1 mg/kg body weight) for 14 days but were asked not to use any bronchodilator or inhaled steroid during this period. After two weeks, spirometry was repeated to reassess poststeroid (PS) $FEV_1$and FEV_1/FVC). Those having reversible airflow obstruction were diagnosed as bronchial asthma and the remaining, with nonreversible airflow obstruction, as COPD.[3]

All continuous variables were analyzed as the mean ± SD and compared using student's *t* test. Chi-square test was used to compare the noncontinuous variables. A two-sided *P* value less than 0.05 was considered statistically significant. Variables whose correlation coefficient were less than 0.800 were also tested on SPSS version 17.0 program for Windows (SPSS Inc., Chicago, IL, USA) for multivariate analysis.

Observations

A total of 104 patients could be recruited during the study period. Out of these, four patients did not present themselves for follow up and were excluded. This left 100 patients for analysis. PS, 52 (out of the 100 patients) were diagnosed as bronchial asthma and the remaining 48 as COPD. Table 1 summarizes the basic parameters of these patients. Although there was no difference in the mean age of the patients, symptoms, TLC, and pre and post B FEV_1 and FEV_1/FVC ratio in the two groups ($P > 0.05$), the mean body mass index (BMI), TEC, and mean FVC were significantly higher in the asthma group ($P < 0.05$).

Table 2 shows the correlation between different symptoms/variables in the past history in the two groups. A positive past history of skin allergy in self or family history

Table 1: Basic parameters of the patients

Parameter	Asthma (*n*=52)	COPD (*n*=48)	*T*-value/X^2	*P* value
Age (years)	48±10.4	50±8.6	1.04	1.8811
BMI	19.5±3.2	18.1±2.2	2.53	0.0132
Symptoms P	04	02	X=1.36	0.7121
C	12	14		
E	12	08		
SOB	52	48		
Smoking status Cs	26	36	X^2=6.62	0.0112
Ex	26	12		
Type of smoking Bd	17	34	X^2=17.35	0.0002
Ch	08	07		
Hk	27	07		
TLC/cmm	8803.8+2504.2	9416.6+3025.4	1.10	0.2743
TEC/cmm	320.7+96,9	236.4+46.5	5.47	0.0082
FVC	2.7+0.9	2.3+0.8	2.34	0.0183
FEV1	1.5+0.6	1.3+0.5	1.8	0.1854
FVC/FEV1	53.0+11.4	56.2+8.3	1.59	0.3481
Post B FEV1	1.5+0.7	1.3+0.5	1.63	0.2583
PS FEV1	1.7+0.7	1.4+0.5	2.44	0.0242

BMI: Body mass index, COPD: Chronic obstructive pulmonary disease, TLC: Total leukocyte count, TEC: Total eosinophil count, FVC: Forced vital capacity, FEV1: Forced Expiratory Volume in 1 second

Table 2: Distribution of patients according to positive past history of symptoms/variables suggestive of asthma

Variable in the past history	Asthma (*N*=52)	COPD (*N*=48)	OR	CI	*P* value
Wheeze	40	08	16.7	6.1-45.1	0.0000
Chest tightness	28	02	26.8	5.9-122.3	0.0002
Seasonal variation	50	12	75.0	15.8-355.8	0.0000
Dust allergy	18	06	03.7	1.3-10.3	0.0126
Eye allergy	34	02	43.4	9.4-199.9	0.0000
Nasal allergy	30	04	15.0	4.7-47.9	0.0006
Skin allergy	14	00	-		-
Family H/O asthma/allergy	12	00	-		-

CI: Confidence interval, OR: Odds ratio

of allergy/asthma was found only in asthma patients but it lacked sensitivity (26.9 and 23%, respectively). Highest odds ratio (OR) for any single variable was observed when the diagnosis of asthma was based on the positive past history of seasonal variation ($p < 0.0001$), but the OR for diagnosis of asthma was highest with the presence of any two symptoms/variables in the past history [Table 3]. The OR for diagnosis of asthma was also high with the presence of seasonal variation along with any other variable in the past history [Table 4].

As the highest OR for diagnosis of asthma was achieved with the positive history of any two variables in the past history, it was correlated to the results of steroid trial [Table 5]. The diagnostic accuracy of the diagnosis of asthma based on presence of any two symptoms/variables in the past history was 98%.

DISCUSSION

There was no difference in asthma and COPD patients with respect to age, symptoms, TLC, FEV1/FVC ratio, and pre B FEV1 and post B FEV ($P > 0.05$). The mean BMI, TEC, and FVC values were marginally higher in asthma patients. More COPD patients in our study were current smokers as compared to asthma (36 V/S 26, $P < 0.011$).

Table 3: Distribution of patients according to number of symptoms/parameters in the past history

Parameter	Asthma (*n*=52)	COPD (*n*=48)	OR	CI	*P* value
Any 1	52	26	89.1	5.2-1527.6	0.0020
Any 2	50	04	275.0	48.0-1574.7	0.0000
Any 3	44	02	126.0	25.4-628.8	0.0000
Any 4	28	02	26.8	5.9-122.3	0.0000

CI: Confidence interval, OR: Odds ratio

Table 4: Distribution of patients according to positive history of seasonal variation with any other symptoms/variables S/O asthma

Seasonal variation and	Asthma (*n*=52)	COPD (*n*=48)	OR	CI	*P* value
Wheeze	37	04	27.1	8.3-88.8	0.0000
Chest tightness	26	02	23.0	5.0-104.7	0.0000
Dust allergy	16	00	-		-
Eye allergy	31	00	-		-
Nasal allergy	27	02	24.8	5.5-113.1	0.0000
Any 2	47	04	103.4	26.0-410.0	0.0000

CI: Confidence interval, OR: Odds ratio, COPD: Chronic obstructive pulmonary disease

Table 5: Correlation between steroid trial and positive history of any 2 symptoms S/O asthma in the past

Steroid trial	H/O any 2 symptoms/ variables in past		Total
	Positive	Negative	
Reversible	50	2	52
Non reversible	4	44	48
Total	54	46	100

Sensitivity 96.2%, specificity 91.7%, PPV 92.59%, NPV 95.65%, diagnostic accuracy 98%

Melbye *et al.*[6] also reported similarly. More asthma patients were predominantly hukka smokers as compared to other types of smoking, but bidi smoking was more prevalent in COPD patients. Gupta and Mangal[7] have also reported high correlation between hukka smoking and asthma diagnosis. This difference could be because of difference in quantity and/or quality of particulate matter or chemical composition of smoke generated during hukka and bidi smoking and is a subject for further research.

The natural history of asthma is known to be characterized by typical symptoms and/or allergy diathesis. Bousquet *et al.*[8] observed that wheeze, SOB, and chest tightness were common symptoms in asthma. Sistek *et al.*[9] reported 75% sensitivity for wheezing alone and 80%, for cough and chest tightness. Nystad *et al.*[10] and Zedan *et al.*[11] reported wheezing and chest tightness in majority of their asthma patients. Melbye *et al.*[6] Grossman[12] and Wallace *et al.*[13] reported coexisting asthma and allergic rhinitis in 28 - 78% of their asthmatics. Martinez[14] and Dodge *et al.*[15] reported that wheezing was common in early life in patients who developed asthma later on. Khaled *et al.*[16] reported that wheeze, eye allergy, and eczema were the three main symptoms in past history of the patients who developed asthma later on. Roorda *et al.*[17] and Reed *et al.*[18] have found positive association between asthma and family history of asthma, eczema, and allergic rhinitis. Faniran *et al.*,[19] Terreehorst *et al.*,[20] Aggarwal *et al.*[21] and Gupta and Mangal[7] reported significant association of asthma with atopy to dust. Burke *et al.*,[22] Aggarwal *et al.*[21] and Gupta and Mangal[7] reported higher prevalence of family history in bronchial asthma ranging from 2 to 26%. But none has used past history of asthma-related symptoms/variables in the differential diagnosis of asthma and COPD in smokers.

In this study, past history of wheeze (77%), chest tightness (54%), seasonal variation (96%), and/or nonrespiratory (eye, nasal, skin and/or dust) allergy were more common in asthma patients as compared to COPD. Skin allergy and family history of asthma/allergy were found only in asthma patients but it lacked sensitivity. The OR for these symptoms to differentiate asthma from COPD was 16.6 for wheeze, 26.83 for chest tightness, 75.0 for seasonal variation, 43.44 for eye allergy, 15.0 for nasal allergy, and 3.70 for dust allergy in this study. Taking a single symptom in the past history for diagnosing asthma, the highest OR was found for seasonal variation. However, when any two of the above symptoms were taken together, the OR increased to 275.0, although it was lowered to 126.5 when any three of the above symptoms were taken together because of loss of sensitivity. Diagnosis of asthma made on the basis of symptoms/variables in the past history was tested by correlating it to the results of steroid trial. The Pearson correlation coefficient was 53.6, 77.49, and 65.03 for any one, any two, and any three symptoms/variables in the past history, respectively, and the diagnostic accuracy was 98% for the presence of any two symptoms/variables. Based on this, it can be easily inferred that the presence

of any two of the asthma-related symptoms/variables in the past history is a valuable tool in differential diagnosis of asthma from COPD in smokers presenting with SOB.

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