

Prevalence of Respiratory Diseases According to Spirometry Findings Among Patients Attending the Spirometry Department of Dhulikhel Hospital

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ABSTRACT

Background

Spirometry is a standard test for screening and evaluation of patients with symptoms of cough and shortness of breath. Despite its easy availability, low cost and ease of performance it has not been widely used in clinical practice in Nepal.

Objective

To assess the prevalence of respiratory diseases in a regional referral centre in patients referred for spirometry.

Method

This is a descriptive cross-sectional study including patients referred for spirometry to the spirometry unit of Dhulikhel Hospital, Kathmandu University Hospital from 2014 July to 2015 October. The spirometry findings of the patients fulfilling the criteria of American Thoracic Society/European Respiratory Society (ATS/ERS) guidelines were analyzed and categorized as normal, having obstructive lung diseases including chronic obstructive pulmonary disease (COPD) and bronchial asthma or restrictive lung disease. Data were analyzed using SPSS 20.0 software.

Result

Out of 821 patients, 755 patients (92%) fulfilled ATS/ERS criteria for satisfactory spirometry. The prevalence of COPD was 31.4%, bronchial asthma 24.2% and restrictive lung disease 8.1%. The mean age of patients diagnosed with COPD was 57.8±10.8 years; bronchial asthma 44.3±16.2 years; and restrictive lung disease 44.6±21.5 years. Both COPD and bronchial asthma were common in females. About twenty two percent of the COPD patients were non-smokers and 86.3% of these were females. The most common symptoms for referral was cough and shortness of breath: these symptoms were more likely to be associated with abnormal spirometry findings.

Conclusion

Spirometry is a crucial preliminary test for evaluation of patients with respiratory symptoms. It should be used more frequently to help stratify patients for appropriate treatment.

KEY WORDS

Bronchial asthma, chronic obstructive pulmonary disease, spirometry

INTRODUCTION

Spirometry is a simple method for assessing lung function. In many countries spirometry is regarded as a standard test for the evaluation and screening of patients presenting with cough and shortness of breath but its use is infrequent in Nepal especially in primary care setup.

Spirometry is considered as the gold standard method for the measurement of lung function by Global Initiative of Chronic Obstructive Lung Diseases (GOLD) guidelines.¹ According to British Thoracic Society (BTS) guidelines for bronchial asthma, spirometry is also preferable to measurement of peak expiratory flow because it allows clear identification of airway obstruction and results are less dependent on effort by the patient.²

Despite its easy availability, ease of performance and low cost, spirometry has not been as used as frequently as it probably should be in Nepal. Instead, the diagnosis of respiratory diseases like COPD, bronchial asthma and some restrictive lung diseases is made on clinical grounds which are less reliable if lung function testing or other investigations are not performed.³ Although respiratory diseases in general, and COPD in particular, are highly prevalent, patients only develop symptoms after there has been a significant loss of lung function, often to 50 or 60% of the predicted value and even then the diagnosis cannot be reliably made from the history and physical examination.^{1,4} Early detection of these diseases with spirometry is essential to start appropriate treatment, to help decrease the associated morbidity and mortality, and to minimize the unnecessary use of treatment such as bronchodilators.

METHODS

This was a descriptive cross-sectional study including all the patients referred to the spirometry unit of Dhulikhel Hospital, Kathmandu University Hospital from July 2014 to October 2015. Spirometry was performed using a MIR Spirolab III machine (Italy). The spirometry findings of the patients fulfilling the criteria of ATS/ERS guidelines were analyzed and were categorized as normal or having obstructive lung diseases including COPD or bronchial asthma, or restrictive lung diseases.⁵ COPD was defined as Forced Expiratory Volume in first second and Forced Vital Capacity (FEV_1/FVC) ratio less than 70% predicted without significant bronchodilation, defined as less than 12% or 200 ml increase in Forced Expiratory Volume in first second (FEV_{15}) half an hour after 400 mcg of Salbutamol inhalation. The degree of obstruction was categorized as mild if $FEV_1 \geq 80\%$, moderate if FEV_1 is 50 to 79%, severe if FEV_1 is 30 to 49% and very severe if $FEV_1 < 30\%$ of the predicted values. These categories define GOLD stage I-IV disease respectively using the 'old' GOLD criteria.¹ Bronchial asthma was defined as $FEV_1/FVC < 70\%$ with significant bronchodilation defined as $\geq 12\%$ and ≥ 200 ml increase in FEV_1 half an hour after 400 mcg of Salbutamol inhalation.

The demographic profile of the patients including age, sex and occupation, referral symptoms for spirometry and association of abnormal spirometry findings with smoking history was also evaluated. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) 20.0 software for windows. This study was approved by the institutional review committee of Dhulikhel hospital, Kathmandu University hospital.

RESULTS

Out of 821 patients attending the spirometry unit of Dhulikhel hospital from July 2014 to October 2015, 755 (92%) patients fulfilled the ATS/ERS criteria for spirometry and were included in the study. Forty percent of the patients fulfilling the criteria were male and 60% were female. Sixty four percent of the patients had abnormal spirometry findings. After medical review COPD was the most prevalent diagnosis accounting for 31.4% of patients with satisfactory spirometry followed by bronchial asthma (24.2%) and restrictive lung disease (8.1%).

Table 1. Prevalence of respiratory diseases according to Spirometry (n=755)

Disease	Prevalence
COPD	237 (31.4%)
Asthma	183 (24.2%)
Restrictive diseases	61 (8.1%)

Table 2. Demographic profile of patients with abnormal Spirometry (n = 755)

	Obstruction		Restriction
	COPD	Asthma	
Gender			
Male	101 (13.4%)	83 (11.0%)	22 (2.9%)
Female	136 (18.0%)	100 (13.2%)	39 (5.2%)
Age Group			
10-30	0 (0%)	41 (5.4%)	21 (2.8%)
31-50	46 (6.1%)	72 (9.5%)	12 (1.6%)
51-70	159 (21.1%)	65 (8.6%)	20 (2.6%)
71-90	32 (4.2%)	5 (0.7%)	8 (1.1%)
Occupation			
Farmer	88 (11.7%)	47 (6.2%)	10 (1.3%)
Service	8 (1.1%)	24 (3.2%)	3 (0.4%)
Household	134 (17.7%)	83 (11.0%)	28 (3.7%)
Business	7 (0.9%)	8 (1.1%)	3 (0.4%)
Student	0 (0%)	21 (2.8%)	17 (2.2%)

The majority of the COPD and bronchial asthma cases were female, with the mean age for COPD being 58.7 ± 10.8 years, bronchial asthma being 44.3 ± 16.2 years and restrictive lung disease 44.6 ± 21.5 years. Whilst the majority of the

COPD patients were smokers interestingly 21.5% were non-smokers. Most of the COPD patients were in GOLD stages II and III. Patients with a history of smoking were more likely to produce abnormal spirometry findings than non-smokers. The most common symptom for referral to produce abnormal spirometry findings was cough with shortness of breath, cough alone being the least likely symptom to produce the same.

DISCUSSION

Table 3. Referral symptoms for Spirometry (n=755)

Referral Symptoms	Normal	COPD	Asthma	Restrictive disease	Total
Shortness of breath	85 (11.2%)	31 (4.1%)	22 (2.9%)	13 (1.7%)	151 (20.0%)
Cough	137 (18.1%)	16 (2.1%)	12 (1.6%)	10 (1.3%)	175 (23.2%)
Shortness of breath and Cough	47 (6.2%)	190 (25.2%)	148 (19.6%)	24 (3.2%)	409 (54.2%)
Pre-operative evaluation	5 (0.7%)	0 (0%)	1 (0.1%)	14 (1.8%)	20 (2.6%)

Table 4. GOLD staging of the patients with COPD

GOLD Staging	No. of Patients	Percentage
Stage I	52	21.9
Stage II	100	42.2
Stage III	67	28.3
Stage IV	18	7.6

Table 5. Association between smoking history and abnormal Spirometry findings

Disease	Smoker	Non smoker	P- value	Odds ratio	95% CI interval
COPD	186 (78.5%)	51 (21.5%)	<0.0001	10.427	6.912 – 15.729
Asthma	79 (43.2%)	104 (56.8%)	<0.0001	2.171	1.458 – 3.234
Restrictive disease	29 (47.5%)	32 (52.5%)	0.001	2.591	1.464 – 4.584

Odds ration derived by comparing the numbers of smokers and non-smokers in each diagnostic category with the population with normal spirometry. P-value calculated by chi-square test.

Our study shows that 92% of the patients referred to the spirometry department were able to perform spirometry properly fulfilling the ATS/ERS guidelines which is comparable to data from other countries seen in other international studies.^{6,7} This finding shows spirometry can be easily performed with a comparable acceptability rate in our population when proper instructions are given. Sixty four percent of the patients had abnormal spirometry reports; however 36% of patients had normal spirometry despite having respiratory symptoms which shows that

diagnosing respiratory diseases such as COPD in Nepal only on the basis of clinical symptoms is not always reliable and can potentially lead to inappropriate treatment.

COPD was the most prevalent disease according to the spirometry reports. Smoking is an established risk factor for COPD: however we found that 21.5% of the COPD patients in our study were non-smokers which was higher than 3 to 11% observed by the Burden of Obstructive Lung Diseases report.⁸ We also found that majority of the non-smokers with diagnosis of COPD were female (86.3%). Both these findings suggest that apart from smoking and outdoor pollution, indoor exposure of smoke from biomass fuel is likely to be a major risk factor of COPD in the developing countries like Nepal. The majority of COPD patients presented were in the GOLD stage II and III. We therefore suggest a high degree of suspicion is needed from the clinician in order to increase the use of spirometry to help detect COPD at an earlier stage in order to start early interventions and to try and slow the progression of the disease.

The prevalence of bronchial asthma defined as significant bronchodilation in patients referred for spirometry was 24.2% which was similar to the findings of the study done by Neopane et al. in 2006.⁹ This suggests that bronchial asthma is not an uncommon disease in Nepal. The mean age of the patients was 44.3±16.2 years. The observed age range of asthmatic individuals was older than that seen in many international studies although this might be due to the small number of patients referred for spirometry in the age group 10 to 30. The commonest age group of patients found to have restrictive lung disease in this study was 10 to 30 years and 50 to 70 years: many of these cases of the age group 10 to 30 were referred for pre-operative evaluation for kyphoscoliosis correction.

CONCLUSION

The majority of patients can perform spirometry to internationally accepted standards. The high prevalence of respiratory disease in those referred with symptoms suggests spirometry should be used more frequently in patient evaluation. In addition, the small number of patients with early stage COPD (GOLD stage I) suggests there may be a case for screening for early disease in the primary care setting to identify patients before their disease is severe enough for them to attend hospital. On the other hand, not all patients with respiratory symptoms have abnormal spirometry, and hence further assessment of such patients might prevent inappropriate treatment being commenced. Overall, this study highlights the value of spirometry in the assessment of patients with respiratory symptoms, and provides evidence this test should be more widely used in Nepal.

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