



Study of Correlation between Visual Analogue Scale and Peak Expiratory Flow Rate Measurement to Assess Severity of Bronchial Asthma

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Abstract

Bronchial asthma is a chronic inflammatory disorder of the airways. Asthma patient experiences symptoms like cough, dyspnea, wheeze, chest tightness. Dyspnea is often used as a marker of severity of asthma. The severity of bronchial asthma is best judged by spirometry using parameters like FEV1 and PEFr. In rural areas spirometry assessment is difficult because of limited access to medical facilities, lack of or interrupted supply of electricity, unavailability of trained technician and poverty. Visual analogue scale (VAS) is a tool used to help a person to rate the intensity of certain feelings & sensations. Severity of dyspnea can be assessed by visual analogue scale. After explaining study and taking written informed consent, 100 bronchial asthma patients having age more than 18 years were selected randomly. We divided the patients in three groups according to FEV1 as mild, moderate and severe. VAS chart was handed over to patients. Each patient was asked to mark in the chart according to his/her dyspnea. PEFr was measured immediately after recording of VAS using mini peak flow meter. At each instance three recordings were taken with thirty seconds interval & best reading was used for analysis.

All mild, moderate and severe asthma groups showed strongly significant correlation between visual analogue scale and PEFr (Pearson $r = -0.8472$). There was strong correlation between visual analogue scale and FEV1 (Pearson $r = -0.7157$) in asthma patients. This study also showed strong correlation between PEFr and FEV1 in moderate and severe groups of asthma patients. We conclude that visual analogue scale can be used to assess severity of bronchial asthma except in poor perceivers of symptoms.

Keywords: Visual analogue scale (VAS), PEFr.

Introduction

Bronchial asthma is a chronic inflammatory airway disorder. Global prevalence of bronchial asthma ranges from 1% to 18% of the population in different countries.^{1,2} In India prevalence of bronchial asthma ranges from 1.3 % to 3.9 % in adults & 1.9% to 12.8 % in children. Bronchial

asthma is slightly higher in rural areas than urban.²

The severity of bronchial asthma is best assessed by spirometry and it is the preferred investigation. But in rural areas it is difficult to perform spirometry repeatedly for assessing the severity of asthma because of poverty, limited access to

medical facilities, lack or interrupted supply of electricity, unavailability of trained technician.

Bronchial asthma severity can be assessed by other methods like IUATLD, ISAAC questionnaire, physical examination but these are not accurate.² Always there is some mismatch between real life breathlessness & lung functions. Peak expiratory flow rate is one of the most widely used objective measures of bronchial obstruction. But PEFr is not free from errors because it is effort dependent. This measurement does not take into account the subjective wellbeing of the patient.

Asthmatic patient experiences symptoms like dyspnea, cough, wheeze, chest tightness.^{3,4} Dyspnea is often used as a marker of asthma severity, although a wide variation in dyspnea perception is associated with bronchoconstriction in asthmatic patients.⁵ Visual analogue scale is a tool used to help a person to rate the intensity of certain feelings & sensations.⁶ Dyspnea can be assessed by visual analogue scale. So this study was aimed to assess severity of bronchial asthma by rating dyspnea on visual analogue scale. We did correlation between visual analogue scale (VAS) with peak expiratory flow rate (PEFR) in mild, moderate and severe bronchial asthma groups.

Material & Methods⁷

The present study was undertaken at the Department of Respiratory Medicine Apollo Hospitals, Chennai, India after institutional ethics committee approval. The study was done during period extending from March 2009 to February 2011.

The diagnosis of bronchial asthma was established on the basis of history, physical examination and

reversible airflow obstruction on spirometer. (>12% increase in FEV1 after inhaled bronchodilator).

Bronchial asthmatic patients visiting our outpatient department of Respiratory Medicine were screened according to inclusion exclusion criteria. Detailed clinical examination & past history was taken.

After explaining study and taking written informed consent, 100 bronchial asthma patients having age more than 18 years were selected randomly. All smokers, patients with pulmonary tuberculosis, cardiac diseases and interstitial lung diseases were excluded from the study. In our study, we used visual analogue scale of '10'cm in length, on which scaling is done from '0'cm to '10'cm. '0' cm means no breathlessness & '10' cm means maximum breathlessness. Visual analogue scale chart was handed over to patients. Each patient was asked to mark in the chart according to his/her dyspnea. PEFr was measured immediately after recording of VAS using mini peak flow meter. At each instance three recordings were taken with thirty seconds interval & best reading was used for analysis. The patients were divided into mild, moderate and severe groups according to GINA guidelines.⁸

Statistics

Statistical analysis was done using the statistical software SPSS version 10.0. Correlation of VAS with both PEFr and FEV1 was done by using Pearson's correlation coefficient. Comparison of VAS, PEFr and FEV1 among mild, moderate and severe groups was done by ANOVA. P-value \leq 0.05 was considered significant.

Results

Table 1: Comparison between the VAS, PEFr and FEV1 among three groups is done by ANOVA.

Subjects	Age	FEV1	PEFR	VAS
Severe (n=62)	47.89 \pm 13.73	45.03 \pm 9.302	41.87 \pm 12.84	4.984 \pm 1.996
Moderate(n=33)	42.39 \pm 14.12	68.49 \pm 5.897	56.27 \pm 15.56	3.242 \pm 1.480
Mild (n=5)	25.80 \pm 5.357	86.38 \pm 2.381	79.80 \pm 8.786	0.8000 \pm 0.8367
p-value	0.1363 ns	< 0.0001***	< 0.0001***	< 0.0001***

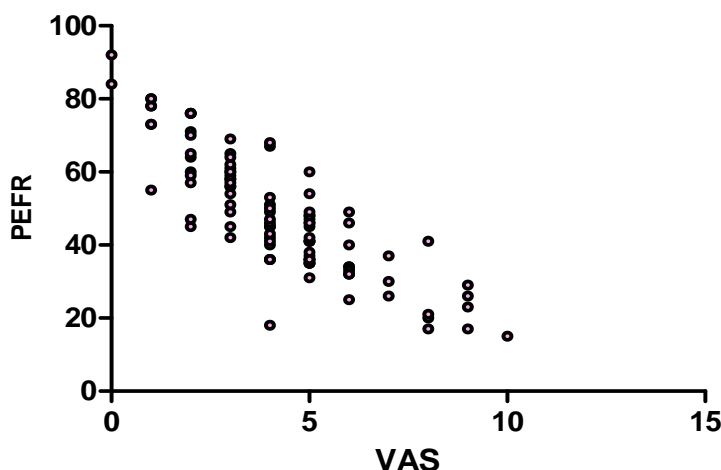
Table 2: Correlation coefficients of VAS score with PEFR and FEV1

Asthmatic groups	VAS vs PEFR	VAS vs FEV1	PEFR vs FEV1
Severe asthma (n=62)	-0.8309 ***	0.1506 ns	0.5459***
Moderate asthma (n=33)	-0.7344***	-0.4700**	0.4123*
Mild asthma (n=5)	-0.8910*	-0.1280	0.5077ns
Overall (n=100)	-0.8472***	-0.7157*	0.6933***
P value <0.05*			

Table 3: Correlation of VAS and PEFR in asthmatic patients

Number of XY Pairs	100
Pearson r	-0.8472
95% confidence interval	-0.8947 to -0.7807
P value (two-tailed)	< 0.0001
P value summary	***
Is the correlation significant? (alpha=0.05)	Yes
R squared	0.7178

Graph 1: correlation of VAS and PEFR in asthmatic patients



Discussion

All mild, moderate and severe asthma groups showed good correlation between visual analogue scale and PEFR (Pearson r = -0.8472). There was strong correlation between visual analogue scale and FEV1 in mild and moderate asthma patients. This study also showed strong correlation between PEFR and FEV1 in moderate and severe groups of asthma patients.

Gupta D et al also showed strong correlation between spirometry parameters & visual analogue scale, without any effect of educational status of patient.⁹ Guleria R et al also showed that there is correlation between lung function tests with dyspnea scale and VAS in patients with COPD¹⁰

From our results we conclude that visual analogue scale can be a used to assess severity of dyspnea in bronchial asthmatic patients except in poor perceivers of symptoms.

Application of the study

Result of this present study shows visual analogue scale can help to clinically assess the severity of bronchial asthma. In rural setting, visual analogue scale can be useful for assessing the severity of asthma as it does not require electricity, trained manpower and extra cost. Bronchial asthma is a chronic condition and it needs continuous medical care. Moderate to severe asthma patients need to take long-term anti-inflammatory drugs daily. So not only for assessing the severity, visual analogue scale can be used to evaluate and

monitor the effectiveness of treatment of asthma. The procedure is very simple, reproducible and can be completed in very less time. Nurses and paramedical staff can also do the procedure and grade the severity and can monitor the effectiveness of treatment of patient's asthma. There was no any conflict of interest.

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