Assessing Asthma Control using Asthma Control Test and Spirometry

Mrinal A. Raikar[1], Sweta Da Silva Pereira[2]

ABSTRACT

Introduction: The goal of asthma treatment is to obtain and maintain a good control of symptoms. The focus of asthma control is now shifting to an assessment and treatment approach. This study aimed at assessing asthma control using ACT scores and to determine its relationship with lung function parameters among persons with asthma in the Department of respiratory medicine.

Material and methods: It was a cross-sectional study. The study included 66 patients with bronchial asthma proved by bronchodilator reversibility and was conducted over a period of two years. The ACT was administered to assess the control of asthma. Spirometric test was done in patients using a portable spirometer.

Results: As per Asthma control test 80% had well controlled asthma while 20% had uncontrolled asthma. As per analysis with spirometer (FEV1) 68% had uncontrolled asthma while 32% had asthma under control. The Pearson correlation coefficient in the relationship between ACT and FEV1 (% predicted value) was 0.5., with moderate correlation between ACT and spirometry. The intra-class correlation the η (eta) value was found to be >0.011 which was not significant.

Conclusion: Our study showed that the results of the asthma control test did not match with the results of spirometric analysis. Thus, FEVI by itself is not a reliable tool measuring of asthma control. ACT is a simple method that addresses multiple clinical dimensions of control that are relevant to the well – being of the patient and provides a quantitative assessment of asthma control.

Keywords: Asthma Treatment, Lung Function, Bronchodilator Reversibility, Obesity

INTRODUCTION

An estimated 300 million people worldwide suffer from asthma, with an expected increase by another 100 million by the year 2025.[1] It poses a major and detrimental health and economic burden.[2] International guidelines indicate that the principal goal of asthma management is to obtain control and reduce the risk of exacerbations.[3] Asthma control refers to the control of disease manifestations both in terms of symptoms and laboratory investigations.[4] Poor assessment of asthma control is a major cause of suboptimal asthma management globally so the focus is now changing to an assessment and treatment approach based on control. Although no comprehensive tool exists to identify and demarcate asthma control, some instruments have been developed, tested and validated over the last several years to measure control.[5-8] Some of these tools are the Juniper Asthma Control Questionnaire (ACQ)[6], Asthma Control Scoring System (ACSS)[7] and the Asthma Control Test (ACT).[8]

The Asthma Control Test was developed by Nathan et al[9] and it is a validated tool for assessing asthma control while Spirometry is known to be a basic tool for assessing asthma control.

In this study, asthma control test was used to assess asthma control and the findings were corrected with spirometric analysis to evaluate the validity and reliability of asthma control test as a short, simple, patient – based tool for indentifying patients with poorly controlled asthma.

MATERIAL AND METHODS

This study was conducted over a period of two years, in the Department of Respiratory Medicine, in a tertiary care teaching hospital at Goa. It was a cross sectional analytical study. Persons with asthma were recruited consecutively into the study. Sixty six patients 12 years and above and diagnosed to have asthma, proved by bronchodilator reversibility were included in the study. Smokers and ex- smokers were excluded from the study. Data was collected on a structured proforma designed for the study. Ethical approval was taken from the Institutional Ethical Committee. Informed consent was taken from all subjects.

The asthma Control Test was applied to patients 12 years of age or older with diagnosis of asthma, attending an asthma clinic.

Each of the five questions of ACT was explained to the patients before the completion of the questionnaire. A total of 25 points indicates complete control, from 20 to 24 points good control and less than 20 points out of control. Subsequently a spirometric test was done in every patient using a portable spirometer. The asthma control test was used to clinically evaluate asthma control in the study subjects taking part in this study and compared the correlation with spirometric analysis of lung function.

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS version (10). Continuous variables were expressed as means ± standard deviation and categorical variables as percentages. The Correlation between levels of asthma control by ACT scores and lung function parameters were assessed using Pearson's linear correlation co-efficient, P-value of <0.05 was considered significant.

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RESULTS

A total of 66 patents of confirmed bronchial asthma proved by bronchodilator reversibility were included in the study. Out of these 66 subjects, 44 were inducted for analysis with spirometry (pre – bronchodilator FEV1) and asthma control test. The reason for this being that 22 patients were not prescribed short acting inhaled beta-2 agonists as reliever medication and hence could not be assessed with the asthma control test.

The percentage of female patients in the study sample was found to be 74% as compared to males which was 26%. Maximum number of patients with bronchial asthma in age group of 41-50 years were females and in the age group of 21-30 years age group were males. The mean age of the sample was 41.21 years (±13.97).

33% of the total number of patients were overweight i.e. obese in this study of which 4% had uncontrolled asthma as per asthma control test and 34% had uncontrolled asthma as per spirometric analysis. The mean value for BMI was 21.98 (±4. 08).

77% of the patients were able to afford the prescribed medication whereas 23% of the patients could not afford the treatment.

On administering the Asthma control test, it was found that 80% subjects had well controlled asthma while 20% subjects had uncontrolled asthma. The mean value for Asthma control test was 20.886 (+ 2.191) as shown in Table-1.

Based on spirometric analysis (FEV1), 68% of the patients had uncontrolled asthma while 32% had asthma under control. The mean value for FEV1 was 72% (+0.123), as presented in Table-2.

The Pearson correlation coefficient in the relationship between Asthma Control Test and FEV1 (%Predicted Value) was +0.5. This suggests that a moderate degree of correlation between ACT and spirometry as depicted in Table-3.

The intra – class correlation value η (eta) was found to be <0.011.The correlation between the Asthma Control Test and pulmonary function tests was not significant as illustrated in Table-4.

Level of control	Poor control	Good control	Complete control
Total number	9	35	0
Percentage	20%	80%	0
Based on the asthma control test 80% subjects had well controlled asthma while 20% subjects had uncontrolled asthma. The mean value for asthma control test was 20.886 (+ 2. 191).			

Table-1: Level of control as per asthma control test

Level of control as per spirometry	Uncontrolled	Controlled
Total number	29	15
Percentage	68%	32%
Based on spirometric analysis (fev1) 68% patients had uncontrolled asthma while 32% had asthma under control. The mean value for fev1 was 72% (+0.123)		

Table-2: Level of control as per spirometric analysis

		Q1	Fev1
Q1	Pearson correlation	1	.500**
	Sig. (2 – Tailed)		.001
	N	44	44
Fevi	Pearson correlation	.500**	1
	Sig. (2 – Tailed)	.001	
	N	44	44
The pearson correlation coefficient in the relationship between asthma control test and fevi (% predicted value) was +0.5. This suggests that a moderate degree of correlation between act and spirometry			

Table-3: Correlations between act and spirometry

DISCUSSION

A total of 66 patents of confirmed bronchial asthma were included in the study. Out of these 66 subjects, 44 were inducted for analysis with spirometry (pre – bronchodilator fev1) and asthma control test. The reason for this being that 22 of the patients were not prescribed short acting inhaled beta-2 agonists as reliever medication and hence could not be assessed with the asthma control test.

The percentage of female patients with asthma was 74% as compared to males which was 26%. These findings are consistent with those of Jumbo Johnbull et al[10], where in females constituted 38(58.5%) of the study subjects while 27 (41.5%) were males. International Asthma Patient Insight Research (INSPIRE) study by Partridge et al[11] also found bronchial asthma to be commoner among the females 38 (58.5%). Mbatchou Ngahane Bertrand Hugoet al[12], in their study reported 81 (33.3%) to be male while 162 (66.7%) were females.

In this study assessment of the level of asthma control was done using two parameters: Patients were evaluated using the asthma control test which is a 5-point questionnaire and pulmonary function test using a portable spirometer. Based on the questionnaire patients were classified as having complete control of their asthma (score of 25 points),

	Intra-class Correlation[a]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	Df1	Df2	Sig
Single Measures	.011[b]	-.014	.057	1.427	38	38	.139
Average Measures	.021[c]	-.028	.108	1.427	38	38	.139
The intra – class correlation value η (eta) was found to be <0.011.The correlation between the Asthma Control Test and pulmonary function tests was not significant.							

Table-4: Intra-class correlation coefficient

well controlled asthma (score of 20 – 24 points) or poorly controlled asthma (score of 19 or less). A portable spirometer was used to classify patients as having asthma under control (FEV 1 80% predicted or above) or uncontrolled asthma (FEV 1 less than 80% predicted).

33% of the patients were classified as overweight or obese. Out of these, 2 (4%) patients had uncontrolled asthma as per asthma control test, whereas 15 (34%) of these patients had uncontrolled asthma as per spirometric analysis.

Although obesity is a recognized risk factor for some medical illnesses evidence suggests that obesity may also contribute to or even cause asthma. Its has been observed that asthma prevalence is increased in obese persons. When obese asthma patients lose weight, there is a decrease in asthma symptoms and severity. Increased abdominal and chest wall mass in obese people may be causing the lower functional residual capacity. Since lung volume is a major determinant of airway diameter, it is possible that these changes in residual capacity allow smooth airway muscles to shorten excessively when activated. While weight loss improves lung function, it does not affect airway responsivness.[13] This is consistent with the hypothesis that obesity plays a role in irreversible airway remodeling. Chronic low level systemic inflammation is present in obese persons – even in the absence of an inflammatory trigger.[13]

We found that out of the 66 subjects analyzed 18 subjects had history suggestive of allergic rhinitis accounting for 27% of the total number of cases. In our study the prevalence of allergic rhinitis was elicited based on the three cardinal symptoms in nasal reactions which are sneezing, obstruction and mucous discharge.

This was a low figure compared to international estimates148 while a study done previously also showed a low prevalence of allergic rhinitis among asthma patients was 64%.

Asthma and rhinitis have traditionally been considered 2 different nosological entities, affecting the lower and upper airways, respectively. Recent pathophysiological findings, however, have identified both disorders as manifestations of the chronic inflammatory respiratory syndrome of the common airways, or united airways disease.[14] Thus, allergic rhinitis or asthma cannot be confined to a specific site, but should be considered a disorder of the whole respiratory tract. Between 20% and 50% of patients with allergic rhinitis have asthma, and 30% to 90% of patients and asthma have concomitant rhinitis.[14] The simultaneous presentation of rhinitis may be a predisposing risk factor for both the development of asthma.[15] The frequent coexistence of asthma and rhinitis means that the presence and severity of allergic rhinitis should be assessed in every patient with asthma. Furthermore, adequate management of both disease is essential to achieve optimal therapeutic outcomes.

Of the 66 subjects analyzed we found that 51 subjects were able to afford their medications and 15 subjects were not affording. Thus 77% patients were able to afford their medications while 23% were not able to do so. These results suggests that lower socio-economic status, is associated with worse asthma control, in adult asthmatics independent of disease severity. Results are consistent with previous studies linking lower SES to worse asthma in adults, and add asthma to the list of chronic disease affected by individual- level socio- economic status.[16,17]

Socioeconomic status (SES) has been linked to various health outcomes, with lower SES being associated with higher rates of morbidity and mortality from several chronic diseases, chronic obstructive pulmonary disease, and diabetes. However, SES may be particularly relevant to asthma due to pathways by which it could adversely impact asthma outcomes. At the individual level (e.g., education attainment, income), asthmatics of lower SES may have higher exposures to indoor (e.g., cockroaches, tobacco smoke) and outdoor (e.g., urban pollution, allergens) and tend to use less inhaled corticosteroids, thus increasing risk for acute asthma exacerbations.[16] Though the SES-asthma link has been established in children and in adults[17], less is known about associations between individual-level SES and asthma in adults.

In the analysis it was found that 9 subjects (20%) of asthma patients had poorly controlled asthma, 35 subjects (80%) had well controlled asthma as per asthma control test and none of the patients had complete control of asthma as per asthma control test. These findings do not corroborate with those of Jumbo Johnbull et al[10] whoreported that only 24(37%) of the subjects had well-controlled asthma as per the ACT. Similar findings were reported by Mendoza et al[18] using the ACT in a hospital-based study in found that only 28% of the respondents had well controlled asthma. The Reality of Asthma Control (TRAC) study by FitzGerald et al[19], using the Canadian Asthma Consensus guidelines showed that only 47% of respondents had controlled asthma.Similar observations were made in the Asthma Insight and Reality in Europe (AIRE) by Rabe et al[20] and International Asthma Patient Insight Research (INSPIRE) study by Partridge et al.[11]

As per spirometric analysis 29 subjects (68%) had uncontrolled asthma and 15 subjects had their asthma under control. The pearsons correlation coefficient in the relationship between ACT and FEV1 (% predicted value) was 0.5. This suggests that a moderate degree of correlation between ACT and spirometry exists when different percentiles of fev1 are used for comparison.

The Intra-class correlation value η (eta) was found to be <0.011. Hence the correlation between the Asthma Control Test and pulmonary function tests was not significant. This is in accordance with the findings reported by Jumbo Johnbull et al.[10] These findings have been highlighted by several studies by Green et al[21]; Reznik et al[22]; and Osborne et al.[23] The poor correlation may be partly due to the lack of specificity of asthma symptoms and to differences in the magnitude and time course of the response to treatment.[24] Symptoms and lung function parameters represent different domains of asthma and they correlate poorly over time in individual patients, so both need to be monitored by clinicians assessing asthma control in clinical practice.[25,26]

However, study done by Mendoza et al[18], showed a

significant correlation between FEV1 and ACT scores. This significant correlation probably was a result of the fact that the sample size was higher and it was cohort prospective study which followed up the subjects over time as contrasted to the index study which took cross sectional look at lung Function variables and ACT scores.S.P. Chalise et al[27] also reported significant positive correlations between C-ACT score and fev1 at enrollment (r=0.772) (p<0.001),three months (r=0.815) (p<0.001) and at six months follow-up (r=0.908) (p<0.001).

Limitations

The drawback of this study is that it is a hospital-based study and the findings cannot be extrapolated to the general population. A community-based study would have added value to the findings. There is therefore need for a large multicenter study to assess asthma control using Asthma Control Test in our environment.

CONCLUSION

In conclusion, the present study showed that asthma is poorly controlled among 68% of the study subjects. It also showed that lung function parameters correlate poorly with Asthma Control Test (ACT) scores. These findings highlight the importance of control-based approach to management and the importance of a multi-dimensional strategy in the evaluation of persons with asthma.

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