

HOW THE DISCREPANCY BETWEEN SYMPTOMS AND PEAK EXPIRATORY FLOW RATE INFLUENCES EVALUATION OF ASTHMA SEVERITY

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Background: Recent asthma guidelines recommend the assessment of severity levels based on the most severe symptoms and peak expiratory flow rate (PEFR). Discrepancies are frequently encountered in the use of these variables in determining the severity levels of asthmatics. The objective of this study was to determine the difference in asthma severity levels as assessed by either symptoms alone or by PEFR alone, as compared with the assessment by the asthma guidelines.

Patients and Methods: Severity levels that were determined by recent asthma guidelines for 60 asthmatic patients were reassessed, based on symptoms alone and PEFR alone. They were compared for any significant differences to the asthma guidelines.

Results: Asthmatics were aged between 15 and 70 (mean 34) years, and 63.8% were females. Severity levels by symptoms alone were different from the guidelines in 27 cases (45%). Of these, 89% showed a tendency toward higher severity levels. Severity levels by PEFR alone were different in only three cases (5%). In both comparisons, differences of severity levels were significant ($P < 0.0001$), but assessment by symptoms alone showed more deviation ($\chi^2 = 162.1$) than PEFR alone ($\chi^2 = 73.1$).

Conclusion: The study documented significant discrepancies in asthma severity assessed by symptoms alone and PEFR alone, when compared to the recent asthma guidelines. Severity assessed by symptoms alone showed lower levels, and the use of PEFR tended to categorize some asthmatics into a more severe level.

Ann Saudi Med 1999;19(5):420-423.

Key Words: Asthma severity, bronchial asthma, peak expiratory flow rate (PEFR).

Asthma is a chronic respiratory illness that affects 5%-20% of the world's population.^{1,2} In Saudi Arabia, asthma has been found in 10%-17% of schoolchildren, but its prevalence in adults has not yet been established.^{3,4} Despite this wide prevalence, golden standard parameters for the assessment of asthma are still lacking. Currently, asthma diagnosis relies mainly on history of reversible respiratory symptoms supplemented by variability of airway obstruction assessed by peak expiratory flow rate (PEFR).^{2,5} Recent asthma guidelines strongly recommended the use of such objective parameters for the assessment of severity, so that appropriate anti-asthma therapy could be initiated.^{2,6}

Unfortunately, history-taking in asthmatics depends on patients' memory recall, which is a known problem in any clinical assessment. Similarly, PEFR is greatly influenced by diverse subjective factors.⁵⁻⁸ Moreover, some patients' symptoms outweigh their PEFR measurement, for example, those with severe coughing but with normal

PEFR, or conversely those with minimal symptoms and very low PEFR. Hence, difficulties do arise when choosing the most suitable severity group for each case.^{2,6} This is not only related to the discrepancy among the severity assessment by symptoms versus PEFR measurement, but also due to the variability of different asthma symptoms.

Currently, most asthma management guidelines recommend that patients be categorized into the more severe clinical group.^{2,6} The question in such cases is which of the above clinical parameters reflects the actual severity level. Needless to say, incorrect assessment of clinical severity of asthmatics may lead to misjudgement of the physicians in delivering the appropriate management. Therefore, this study was conducted to explore the discrepancy in asthma severity by symptoms alone or PEFR alone, versus recent asthma guidelines that depend on the most severe among symptoms and PEFR.

Patients and Methods

This prospective study was carried out at King Abdulaziz University Hospital (KAUH) in Jeddah, Saudi Arabia. Adult non-smoking asthmatics were sequentially selected from the asthma clinic. Their asthma diagnosis was based on symptoms score and PEFR adopted from the

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Accepted for publication 7 July 1999. Received 1 August 1998.

latest guidelines for asthma diagnosis and management, and published recently by the National Asthma Education and Prevention Program (NAEPP) Expert Panel Report-2.⁶ PEFR variability was not reliable in this study due to the difficulty in patient compliance, as seen in other reports.⁹

Demographic data, history of asthma and of other allergic diseases was obtained from the studied cases. All patients had routine general and respiratory physical examination. In each case, the best of three trials of PEFR was obtained, using the Wright peak flow meter. These were carried out during the clinic visit between 9:30 a.m. and 12:00 noon. Because of the direct effect on the PEFR, those using inhaled bronchodilators (salbutamol, fenoterol) less than four hours before conducting the PEFR, or those on long-acting bronchodilators (salmeterol) were excluded.¹⁰ Additionally, those who had other medical illnesses or were using sodium nedocromil, theophylline, higher doses of an inhaled steroid, or other steroid-containing medications, were excluded from the study due to their possible effect on PEFR.¹¹

The severity level of each asthmatic was categorized in three groups based on the assessment by: 1) symptoms only; 2) the best percentage of the PEFR of the patient's predicted value alone; or 3) the most severe symptoms and PEFR, as recommended by the latest NAEPP guidelines.^{2,4,6} As normal predicted PEFR values are not yet established in relation to our population, they were derived from a Caucasian population study.¹² Asthma severity levels were categorized into four clinical groups—mild intermittent, mild persistent, moderate persistent, and severe persistent. To rule out other medical conditions, complete blood count and chest x-ray were done on all cases.

Data were entered into a personal computer. Frequency tables, correlation analysis and analysis of variance by the chi-square test were performed by using SPSS statistical program (version 7.5).

Results

Sixty cases out of 78 adult asthmatics met the inclusion criteria. Their ages ranged between 15 and 70 years, with a mean of 34 years (SD=13.7). Females comprised 68.3% of the group and Saudi nationals constituted 65% of studied cases. Fifty-eight percent of cases involved a history of association with other common allergic diseases (Table 1).

In all groups, moderate persistent type of asthma showed predominance in the levels of asthma severity, as shown in Table 2. Comparing severity levels, there was a significant difference in severity assessed by the symptoms alone group versus the NAEPP group in 27 cases (45%). Of those, there was a tendency toward higher levels of asthma severity in 89%, as shown in Table 3. Comparing asthma severity levels by PEFR alone to those by the NAEPP, the difference in severity levels was evident only in three cases (5%).

By using the chi-square test, differences of severity levels in both groups were statistically significant ($P<0.0001$), but this difference was more when the severity was assessed by symptoms alone (χ^2 value=73.1) versus PEFR (χ^2 value=162.1). Additionally, linearity association was less when severity was assessed by symptoms alone (χ^2 for linearity=31.6) versus PEFR (χ^2 for linearity=54.5).

Discussion

This work sought to explore the clinical parameters (symptoms and PEFR) that are commonly used for the assessment of asthma and how it can lead to discrepancy in the severity level of asthmatics. Recent asthma guidelines (NAEPP) recommend that severity should be based on the highest severity level assessed by symptoms and PEFR.

Interestingly, this study has documented a significant difference in severity levels assessed by symptoms alone in 45% of asthmatics compared to severity by the recent guidelines (NAEPP). In most of these cases (89%), the use of PEFR led to higher levels of severity. Additionally, but to a lesser extent, comparing asthma severity levels by PEFR alone to those by the NAEPP showed a significant difference in only 5% of cases. These findings indicate that severity levels based on symptoms alone were more different than those based on PEFR, compared to severity levels by NAEPP, and that PEFR used either alone or

TABLE 1. General characteristics of studied asthma cases (age range 15-70 years).

Asthma cases	Number (%)
Associated allergic diseases	
Food allergy	1 (1.7)
Allergic rhinitis	35 (58.3)
Atopic dermatitis	4 (6.7)
Atopic conjunctivitis	3 (5.0)
No association	25 (41.7)
Sex	
Male	19 (31.7)
Female	41 (68.3)
Total number of patients	60 (100)

TABLE 2. Number of cases among different severity groups.

Severity level	Symptoms # of cases (%)	PEFR # of cases (%)	NAEPP # of cases (%)
Mild intermittent	5 (8.3)	3 (5.0)	3 (5.0)
Mild persistent	24 (40.0)	13 (21.7)	10 (16.7)
Moderate persistent	26 (44.3)	31 (51.7)	34 (56.7)
Severe persistent	4 (8.3)	13 (21.7)	13 (21.7)

TABLE 3. Comparing asthma severity levels among different groups to those by NAEPP.

Severity level	Symptoms # of cases (%)	PEFR # of cases (%)
Increased	24 (40.0)	3 (5.0)
Decreased	3 (5.0)	0
No change	33 (55.0)	57 (95.0)

according to NAEPP guidelines has led to the categorizing of some patients into higher levels of asthma severity. A previous work by Nakaie et al. suggested similar findings, but by using older asthma guidelines.¹³

The conflict in asthma severity levels seen in this paper is attributed, to a great extent, to the effect of PEFR on severity levels. In the literature, PEFR is well documented to be effort-dependent, and PEFR fluctuation is expected due to various factors, such as extremes of age, diurnal changes, patient education status, medications, and variability among different populations.^{2,6-8} The normal PEFR values in our population may vary from others and this variability cannot be ignored. Although PEFR use in asthma assessment is recommended by most recent guidelines, some authors documented low yield of using PEFR, and felt it was not as sensitive as a symptom diary in the outcome of acute asthma management.^{14,15} Recently, some researchers have advocated the use of forced vital volume in first second (FEV1), measured by spirometry to be somewhat more sensitive than the PEFR in assessing airway limitation.^{6,16} However, flow meters are more portable, affordable, and less time consuming.

On the other hand, subjective factors that influence obtaining a reliable history cannot be overemphasized as another explanation for this discrepancy in asthma severity levels.^{2,6} Although the discrepancy between patients' symptoms or what they feel and the decline in lung function tests has been documented in asthmatics,^{17,18} few authors showed a significant relationship between symptom scores and PEFR.¹⁹ A significant proportion of asthmatics substantially underestimates disease severity, a factor which has been linked to an increase in morbidity and mortality.²⁰ Certainly, the underestimation of clinical severity of chronic asthmatics will result in the failure of proper management by their physicians. This occurs when lower levels of anti-asthma medications are prescribed in severe cases of asthma. Recent work has suggested that current asthma symptoms reflect the current level of asthma control more than underlying disease severity, and that symptoms alone do not reflect disease severity.²¹ Recently, patients' self-perception of their asthma severity has been under evaluation.^{22,23} Conversely, if the patient were classified into a more severe asthma group, higher doses of anti-asthma medications would be prescribed for him. This not only places an extra cost on the patient's behalf, but may also lead to the exposure to unnecessary medications and their consequent side effects. Both undertreatment and overtreatment of asthmatics can account for an unnecessary misuse of health care expenditures.²⁴⁻²⁶

Because of this discrepancy in asthma evaluation, the need for a simple objective parameter for asthma assessment is a challenging requirement. Eventually, the use of such a tool may enhance the choice of proper therapy and lead to better cost savings in the management of this common illness. Currently, laboratory techniques

have been advocated to supplement the assessment of asthma severity. These include total peripheral eosinophil count (TPEC), serum eosinophil cationic protein (ECP), and serum eosinophil peroxidase (EPO).²⁷⁻³⁰ Based on recent asthma guidelines, the utmost value of these laboratory tests in severity assessment has not been achieved, and they are awaiting further exploration.

In conclusion, asthma assessment is associated with some limitations in obtaining a dependable history and PEFR measurement. This study has demonstrated that patients' asthma severity determined by symptoms alone was higher than that assessed by the latest asthma guidelines, and that the use of PEFR tends to categorize some asthmatics into a more severe level. Unfortunately, in such cases, this may lead to over- or under-treatment of asthma due to the inappropriately evaluated severity level. It is felt that achieving the optimal clinical or laboratory method for asthma assessment is a continuous challenge, which should be met as soon as possible. Until then, extra effort should be made to assess asthma severity according to the recent available asthma guidelines. A reliable objective parameter for asthma assessment is still a continuous venture.

Acknowledgements

The author acknowledges the helpful support of Dr. Waleed A. Milaat, Ph.D., from the Department of Community Medicine at KAUH, who also reviewed the manuscript.

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