EFFECT OF PATIENT EDUCATION AND REGULAR PEAK EXPIRATORY FLOW MEASUREMENT ON SELF MANAGEMENT OF ASTHMA

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ABSTRACT

For better management of asthma it is essential that patients adjust their treatment according to the medical plan developed by the health care professionals. To achieve this goal, patients should assess the severity of their disease regularly. The purpose of this study was to determine the effect of regular measurement of peak expiratory flow and patient education on self management of asthma. Thirty asthmatic patients (15 as study and 15 as control group) were evaluated for a period of 2 months. Patients in the study group were given a Mini-Wright peak flow metre and instructed to measure their peak expiratory flow in the mornings and evenings daily and at the beginning and end of episodes of asthma symptoms (asthma attack). They were taught to use drugs and other self care actions to control asthma attack. Patients in the control group did not use the peak flow metre and were only instructed to assess asthma severity by subjective symptoms and self care strategies. The results showed that there were no significant differences between the two groups in peak expiratory flow, forced expiratory volume in 1 second, asthma severity score, usage of bronchodilator inhaler drugs (BD), and episodes of asthma attack at the beginning of study. However, all parameters in the study group (P<0.001 for peak expiratory flow and asthma severity score and P<0.01 for FEV1, BD use and episodes of asthma attack), and only episodes of asthma attack in the control group (P<0.001) were improved at the end of the study. These results suggest that regular PEF measurement is an effective tool for assessing episodes of asthma attack and selecting proper care actions in self management of asthma.

Keywords: Asthma, Self management, Peak expiratory flow, Education
INTRODUCTION

Patient education in asthmatics can improve patient outcome and has been recommended in several clinical guidelines for asthma (1-4). The present asthma education programme has been shown, in a 12 month follow-up, to improve quality of life, level of lung function (5) and compliance to inhaled corticosteroids (6) as well as reducing general practitioner (GP) consultation rates and absenteeism from work (7) due to asthma. Recent studies have shown considerable success when patients are given self management plans (8).

Asthma continues to be an important cause of respiratory morbidity despite the availability of effective drug treatments. The reasons for this are not fully understood but poor self care appears to play an important part (9).

Education and training of patients are the responsibilities of the doctor but can profitably be shared with specially trained health care professionals. Advice should be consistent and repeated; it may be supported by written or audiovisual material (10).

An explanation that could account for failure not only by the patient and relatives, but also by the doctor, is to assess and appreciate the severity and speed of onset of an acute attack. This results in a delay in initiating appropriate treatment. Symptoms alone are commonly used to assess the severity of an asthma attack despite the well established inadequacy of this approach. Some asthmatic patients may be asymptomatic in the presence of substantial airflow limitation; and patients with the most reactive Airways have been shown to have least symptoms during an asthma attack. These findings suggest that regular assessment of airflow obstruction by objective means is necessary for appropriate management of these patients. The measurement of peak expiratory flow (PEF) is simple, and the values correlate closely with FEV1. Patients keep their own PEF records satisfactorily after minimal tuition, and measurements can be made with vitalograph or mini wright metre, for which normal predicted values have been calculated (8).

Objective pulmonary measures, such as PEF readings, have been used successfully to improve the prediction of asthma episodes within a 12-hour period. Few studies have looked at issuing peak flow metres to patients for day to day use in management of their asthma. Studies have highlighted the fact that up to a fifth of patients are unable to gauge the severity of their lung function. A peak flow metre would seem to be invaluable to such patients (9).

PEF reflects the degree of airflow obstruction. The values obtained with this device are used in a variety of ways, such as identifying downward trends, suggesting increased airflow obstruction. Changes in PEF provide and objective method of detecting the need for increased doses of bronchodilators or corticosteroids or to warn patients of the need to seek health care and professional advice (11).

The effects of using the peak flow metre (a form of self-information or physiologic feedback) for self-care behaviour are not fully understood. Therefore, in the present study the effect of regular PEF measurement and education of asthmatic patients on self-management was studied.

MATERIALS AND METHODS

The study area was the city of Mashhad which has a moderate number of factories and a less heavy traffic, and located in the north east of Iran. Thirty asthmatic patients were recruited from the asthma Clinic, Ghaem Medical Center, Mashhad University of Medical Sciences. All patients had the following criteria: (1) previously diagnosed asthma by a physician and having two or more of the following symptoms: recurrent wheeze, recurrent cough or tightness at rest; wheeze, cough or tightness during night or early morning; wheeze or cough during exercise (2) having FEV1 and PEF less than 80% of the predicted values (3) had no history or symptoms of cardiovascular or other respiratory diseases that required treatment (excluding the common cold). The protocol was approved by the Ethical Committee of our institution, and each subject gave an informed consent. The study was carried out during summer and spring 2000.

The study population was randomly divided into control and study groups, each consisting of 15 patients. The control group consisted of 7 males and 8 females with mean age of 20 years. The study group consisted of 10 males and 5 females with
mean age of 23 years. All patients were under asthma treatment which included corticosteroid inhaler.

Pulmonary function tests were measured in both groups both at the beginning and at the end of study using a spirometer with a pneumotachograph sensor (Model ST90, Fukuda Sangyo Co., Ltd. Japan). All tests were carried out between 10.00 and 17.00 hours. Lung function tests were performed three times in each subject with an acceptable technique. The highest level for forced expiratory volume in one second (FEV1) and peak expiratory flow (PEF) was taken independently from the three curves.

All patients were instructed to use their inhaler correctly. In addition they were educated to avoid using or exposing themselves to exacerbated factors. They were also instructed to count their asthma attacks/week (attack of asthma symptoms) through the study and asthma severity score according to Table 1. They were also asked to count their frequency of using bronchodilator inhaler/day. Each patient of the study group was given predicted value of PEF, a mini peak flow metre and was instructed how to use it by a trained nurse. They were asked to measure their PEF in the mornings and evenings and at the beginning and end of chest tightness.

They were also instructed to use their relief medication immediately if their PEF decreased more than 70% of their baseline value. Both groups were studied for a 2 month period.

**Data analysis**

The data of FEV1, PEF, asthma severity score, number of bronchodilator inhaler drug usages/day, and the number of asthma attacks/week were expressed as mean±SD. The values of FEV1, and PEF, asthma severity score, number of bronchodilator inhaler drug usages/day, and the number of asthma attacks/week were compared between the two groups at the beginning of the study using unpaired "t" test and between the beginning and the end of the study in each group using paired "t" test. Significance was accepted at P<0.05.

**RESULTS**

There was no significant difference in the age of subjects between control and study group. There were also no significant differences in PEF, FEV1, asthma severity score, usage of bronchodilator inhaler drugs, and episodes of asthma attacks/week at the beginning of the study between 2 groups.

<table>
<thead>
<tr>
<th>Table 1. The criteria for asthma severity score</th>
<th>Frequency</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Night wheezing</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sleeping well with a little wheezing</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Waking once at night</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Waking most of night</td>
<td>3</td>
</tr>
<tr>
<td>Night cough</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sleeping well with a little cough</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Waking once at night</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Waking most of night</td>
<td>3</td>
</tr>
<tr>
<td>Exercise cough and wheezing</td>
<td>No existence during strong exercise</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Existence only during strong exercise</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Existence during climbing stairs</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Existence during ordinary activity</td>
<td>3</td>
</tr>
<tr>
<td>Day time cough and wheezing</td>
<td>No existence</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Once a day</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Two or more times a day</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Affecting day time activity</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total score</strong></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>
Patient education and PEF on asthma

In the study group the value of FEV₁, at the end of the study (95.2±13.7%) was significantly greater than that at the beginning of the study (89.6±17.9%, P<0.01). The values of PEF at the end of the study (108.3±19.0%) were also significantly greater than the values at the beginning of the study (89.7±17.5%, P<0.001) in this group. However, there were no significant differences in the values of FEV₁, and PEF between the beginning and the end of the study in the control group (Table 2, Fig 1a).

Asthma severity score and bronchodilator usage on the last day, number of asthma attacks during the last week of study were significantly reduced compared to those at the first week in study group (P<0.001 for asthma severity score, and P<0.01 for the number of asthma attacks and bronchodilator usage). The number of asthma attacks during the last week of the study in the control group was also significantly reduced compared to that of the first week (P<0.001). However, there was no significant difference in asthma severity score and bronchodilator usage between the first and last day of study period in the control group (Table 2, Fig 1b).

DISCUSSION

The results of the present study indicated an important influence of education and regular PEF measurement on self-management of asthma. Although all parameters, including values of FEV₁, PEF, asthma severity score, asthma symptom attacks/week, and bronchodilatory inhaler usage at the beginning of the study, were similar in the two groups, all parameters were improved at the end of a 2-month period in the study group. The improvement of objective criteria, including FEV₁, and PEF in the study group, is more important and clearly supports the effect of education and regular PEF measurement on self-management of this disease. In the control group only the number of asthma symptom attacks/week was improved at the end of the study. The improvement of number of the asthma attacks/week in the control group may result from little education in this group, such as patient education for the avoidance of exacerbating factors and the correct method of usage of inhaler drugs. Another explanation for improvement of the number of asthma attacks in the control group is that the number of asthma attacks is the most subjective criteria in this study. Therefore, improvement of asthma attack may be due to subjective counting by patients.

Table 2. Differences in values of EFV₁, PEF, asthma severity score, asthma attack, and bronchodilator inhaler usage between the beginning and the end of the study in control and study group

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control group</th>
<th>Study group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning</td>
<td>End</td>
</tr>
<tr>
<td>FEV₁</td>
<td>90.0±26.3%</td>
<td>88.5±20.6%</td>
</tr>
<tr>
<td>PEF</td>
<td>85.5±23.9%</td>
<td>83.0±18.0%</td>
</tr>
<tr>
<td>Asthma severity</td>
<td>5.46±3.04</td>
<td>5.00±3.33</td>
</tr>
<tr>
<td>Asthma attack</td>
<td>5.26±5.06</td>
<td>2.50±3.09</td>
</tr>
<tr>
<td>Bronchodilator usage</td>
<td>4.23±2.92</td>
<td>3.91±3.14</td>
</tr>
</tbody>
</table>

Values are presented as mean±SEM. Significance of differences between the beginning and the end of the study; NS: nonsignificant difference, *: P<0.01, **: P<0.001. Significance of differences between two groups at the beginning of the study; ns: nonsignificant difference.
Fig 1. Values (Mean±SD) of FEV₁, PEF (a), asthma severity score, and number of asthma attacks/week (b) at the beginning (light filled bar) and at the end (medium filled bar) of the study in both groups of patients and the statistical differences between the beginning and the end of the study. NS: nonsignificant difference, *: P<0.01, **: P<0.001.
The results of this study are in agreement with those of several previous studies demonstrating the influence of patient education and regular PEF measurement in self-management of asthma. Taplin and Creer, in children with asthma, found an approximately 3-fold increase over the base rate in predicting asthma from PEF data collected in the natural home environment. Computations of the probability of asthma throughout a range of PEF values in each of 25 asthmatic children led to about a 5-fold increase in the predictability of episodes.

Another study with very similar methods to the present study, showed that regular measurement of PEF resulted in a significant reduction of medication usage in the experimental group compared to the control group. Charlton et al. also showed that regular PEF measurement and education of asthmatic patients about symptoms led to improvement of disease management. In their study there was a significant reduction in medical consultation, and usage of steroid and bronchodilator drugs in studied patients. Beasley et al. also showed that routine measurement of PEF in association with a self management plan appeared to be effective in reducing symptoms of asthma and improving lung function tests. In addition the results of another study suggested that the prediction of asthma symptoms might be enhanced by PEF measurement.

In conclusion, the results of this study suggest that regular PEF measurement and patient education are important factors in self-management of asthma which result in improvement of disease management.

REFERENCES
Book Review

Immunodeficiency Disorders In Iran
Edited by: Abolhassan Farhoudi
Shayan Nemoodar publishing co-2002, Tehran, Iran.
ISBN 964-7526-09-1

The authors in this book discuss mainly the primary immunodeficiency disorders (PID) which have been so far diagnosed in Iran. About 440 cases of these disorders have been registered in this country. The Department of Clinical Immunology and Allergy in Children Medical Center, where professor Farhoudi is the head of the Department, is the clinic where cases of Immunodeficiencies are referred to for diagnosis and therapy. That is why the majority of the chapters of this book have been written by pediatricians and specialists from this department. The above-mentioned center is a teaching hospital affiliated to the Faculty of Medicine, Tehran University of Medical Sciences. However, there are also chapters in this book contributed by specialists from other universities in Iran as well as by specialists from North America (USA & Canada).

The first 3 chapters of this book deal with a general description and assessment of PID. Various aspects of some disorders are then discussed in detail, each in one chapter. These disorders include: common variable Immunodeficiency, IgA deficiency and Ataxia-Telangiectasia, X-linked Hyper-IgM syndrome, Hyper IgE syndrome, X-Linked Immunodeficiencies and combined Immunodeficiencies. Phagocytic defects are dealt with in one chapter and one chapter has also been devoted to complement deficiency. Immunological aspects of Cystic Fibrosis, a disorder affecting the innate system of immunity in the respiratory tract has also been discussed in this book. There are additional 6 chapters which do not introduce a particular immunodeficiency rather complications, such as infections, allergy and respiratory problems in these patients. The last chapter of this book, chapter 18, entitled HIV immunopathogenesis: the role of cytokines. This chapter does not focus on PID, but provides a general discussion on various aspects of this viral infection and the role of cytokines in general.

Overall, the authors of each chapter provide a clear and comprehensible account on contemporary knowledge on PID. Clinical features, laboratory assessment, therapy and management for each disorder are discussed authoritatively. Each chapter is concluded with selected references. An alphabetical index has not been included at the end of this book which, I hope, will be amended in the second edition of the book. The book will undoubtedly become a valuable source on PID for immunologists, pediatricians and postgraduates in these fields as well as students and specialists in infectious diseases.

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