Effect of patient education and standard treatment guidelines on asthma control: an intervention trial

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Background: Denial of having a chronic condition, poor knowledge of the disease process and lack of adherence to standard treatment are often considered to be important factors that increase morbidity in asthma. We evaluated the effect of standard treatment guidelines and asthma education programme on asthma control among patients enrolled from a referral health facility of Delhi in India.

Methods: Fifty patients who visited the health facility first time for treatment of asthma were enrolled after confirming the diagnosis of asthma by symptoms and reversible spirometry. Patients were interviewed at baseline using three researcher-administered questionnaires - quality of asthma management questionnaire, asthma control questionnaire (ACQ) and asthma knowledge questionnaire (AKQ). All patients were given pharmacotherapy according to standard treatment guidelines. In addition, every alternate patient was also given a face-to-face educational intervention. Patients were followed up at 2, 4, 8 and 12 weeks. The ACQ was used at each visit, and AKQ was reassessed at the twelfth week. The paired t test was used to detect significant changes in various domains of asthma control.

Results: The knowledge of asthma among patients and the care provided by previous health-care providers were found to be poor at baseline assessment. The application of standard treatment guidelines improved asthma control by the second week and the changes became significant by the fourth week, which persisted till the twelfth week (p <0.0001). Educational intervention led to improvements in knowledge in several domains. Improvements in asthma symptoms began earlier among those who had additional educational intervention.

Conclusions: Standard treatment guidelines and asthma education improved asthma control.

Key words: Asthma, knowledge, intervention trial, patient education, quality of care.

Introduction

Asthma is an important public health problem worldwide on account of its prevalence, its under-recognition, inadequate pharmacotherapy and self-management by patients. There is evidence to suggest that denial of having a chronic condition, poor knowledge of the disease process, medication use, and poor self-management are frequent reasons for increased morbidity in asthma. These issues are particularly relevant in respect of primary care, through which most asthma cases...
are managed. Moreover, the issue of not managing asthma in the community according to well established standard treatment guidelines (STG) with inhalation therapy and self-management programme in developing countries is more worrisome.

The earlier studies conducted in India revealed nonavailability of essential asthma medicines in the public sector of many states, unaffordable inhalation medicines in the private sector for majority of the population, suboptimal knowledge of primary care physicians, and poor asthma management at primary care level. Asthma education is considered an essential component of asthma management. It is necessary to help patients gain the motivation, skills and confidence to control their asthma. The cost of treatment of uncontrolled asthma and severe asthma is huge. Interventions are needed for optimum management of asthma, especially in low-income countries and underprivileged families. Hence, there was a pressing need for conducting an intervention study to provide evidence for the impact of standard treatment guidelines and patient education on the treatment outcome in asthmatic patients. We have conducted a controlled trial of standard treatment guidelines and asthma education programme among adults with asthma.

Methods

Study design and settings

This interventional study was conducted during the period from March 2006 to December 2006 at the Out-Patient Department (OPD) of the V. P. Chest Institute, Delhi, a tertiary care referral public hospital in India. The study was approved by the Institutional Ethics Committee. Informed consent was obtained from patients.

Study population

Patients aged 18 years and older who presented to the chest clinic for the first time with history suggestive of asthma were included. Patients were enrolled on two OPD days per week from the clinic of one of the investigators. After clinical evaluation, the diagnosis of bronchial asthma was confirmed, based on symptoms and reversible spirometry, as per the Global Initiative for Asthma (GINA) guidelines. Patients with an acute exacerbation of asthma and those with another concurrent respiratory disease or any systemic disease were excluded. A total of 50 patients were enrolled for the study. The sample size for each intervention group was calculated to have 80% power of detecting a significant difference in the mean score of two groups – one who used inhalers and the other who did not use inhaler.

Baseline data on quality of treatment

After confirmation of asthma, information data on quality of treatment received by patients previously was collected by a questionnaire based on the GINA guidelines for asthma management. It contained questions in four domains – information about the health care provider; diagnosis and assessment of severity; treatment; and patient education. Subject responses were structured (multiple-choice or yes/no). None of the enrolled patients had attended any type of asthma education programme.

Intervention

All patients were treated by a chest physician (SKC) according to standard treatment guidelines (STG) prescribed by The Global Initiative for Asthma (GINA) and inhalation therapy was prescribed to all of them. The correct technique of inhalation was
demonstrated to all patients by a staff attached to the physician in the outpatient department as part of the standard treatment guideline followed in the hospital. Out of the above-mentioned intervention group, who were given therapy according to STG, alternate patients were allocated to an additional intervention, i.e. one session of face-to-face asthma education programme. Educational sessions were conducted by one of the authors (AK) with each patient individually. The sessions were designed to be interactive and personalized. They were based on the treatment and self-management guidelines suggested by GINA. The sessions included: (i) a 20-minute interactive lecture with visual aids outlining the physiology of airway narrowing in asthma and trigger factors; (ii) a 20-minute discussion on medications, their action and side-effects, emphasizing the advantages of inhaled corticosteroids for treatment of asthma; (iii) display of peak flow metre, spacer, meter-dose inhaler and rota inhaler; (iv) interaction with patients to address any of their questions, concerns, fears and beliefs. However, educational messages were not reinforced at any of the follow-up visits.

**Questionnaires**

The following two questionnaires were administered to all patients at the baseline (week 0):

The Asthma Control Questionnaire (ACQ) is a standardized, widely available and validated instrument with strong evaluative and discriminative properties to measure asthma control in patients. The questionnaire in local language (Hindi version) was used. The ACQ has a total of seven questions that include the six highest scoring symptoms with one question about daily rescue therapy use (β₂ agonist) and FEV₁% predicted normal. Patients are asked to recall how their asthma has been during the previous week and how did they respond to the symptom and bronchodilator use. The responses were on a 7-point scale (0=no impairment, 6= maximum impairment). The ACQ is able to identify the adequacy of asthma control in individual patients. In general, patients with a score below 1.0 will have adequately controlled asthma and above 1.0 will not have well controlled asthma. However, there is a grey area between 0.75 and 1.25 where patients are on the borderline of adequate control.

The five symptom-scoring questions asked are: average number of times a patient is woken up by asthma during the night; asthma symptoms at the time of waking up; limitation in performing activities; shortness of breath, and wheezing, and the sixth question is about how many puffs of short-acting bronchodilator (rescue therapy) were taken during the previous week.

The Asthma knowledge questionnaire was developed in both English and Hindi (local language) to obtain information about different aspects of the disease that a patient is expected to have for making him/her an active partner in self-management. The Hindi version of the questionnaire was used in this study. It contains 28 questions, divided into the following six domains – etiology (3 questions); path-physiology (3 questions); symptoms and assessment of severity (8 questions); medication (8 questions); prevention (4 questions); and natural history (2 questions). Responses were scored on a categorical scale where 0 represented ‘no knowledge/no response’ and 1 represented adequate knowledge.

The asthma knowledge questionnaire was developed on the basis of the GINA guidelines. There is no “gold standard” for knowledge and therefore only content validity is relevant. The
content of knowledge a patient is expected to have served as the basis for development of the questionnaire. Repeatability was tested by re-administration on another occasion and by comparing the two sets of responses.

**Follow-up**

Patients were instructed to come for follow-up visits at week 2, 4, 8 and 12. The asthma control questionnaire and pulmonary function tests were administered at each follow-up visit whereas re-testing of asthma knowledge (AKQ) was performed after three months (twelfth week). Subjects were not told initially that they would be administered asthma knowledge questionnaire at their twelfth week visit. The data collector was not provided with the subject’s pre-intervention asthma knowledge results.

Of the 50 subjects who met the inclusion criteria, 12 patients had an irregular follow-up. They were excluded from the study at the time of analysis. Out of the 12 dropped-out patients, 7 never came for any follow-up visit, 4 patients dropped out at 4 weeks and one patient dropped out at 8 weeks.

**Analysis**

The outcome measure included change in the domains of asthma knowledge and asthma control (from baseline to twelfth week follow-up visit). Data were entered using MS Office Excel and all statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS) 12. The change (from baseline to twelfth-week assessment) in asthma control and asthma knowledge was evaluated by using the paired t test. The difference between the two groups was assessed by using student’s t test for independent samples.

**Results**

Out of the 38 patients who had completed follow-up, 20 were men and 18 women. Of these patients, 18 had mild, 13 had moderate and 7 had severe persistent asthma.

**Quality of treatment at baseline**

As shown in Table 1, the majority (74%) patients had consulted more than one doctor before visiting the referral chest clinic and 61% had no idea about their doctor’s qualification. Only 25 (66%) patients were informed by their doctors that they were suffering from asthma; of these, only 10 (26%) were told about the severity of their disease. The lung function test and peak flow measurement were performed in only few (10%) patients.

Only 42% patients were prescribed inhaling therapy. Of these 16 patients, who were prescribed inhaling therapy, 56% (9 patients) and 50% (8 patients) respectively, were not told about the type of medicine in the inhalers and the purpose of inhalation. Up to 30% patients revealed that they had learnt about the use of inhalers from the package insert, other patients or clinical staff other than their doctor.

None of the subjects were provided with any educational material about the disease process. Only 24% recalled having been given information regarding the early signs of worsening of asthma. Very few (10%) were given verbal instructions to manage asthma in the event of a worsening condition. Only one patient had any objective means of assessing his asthma as he was advised to use a peak flow metre at home. Up to 58% patients revealed that they were not given any instructions regarding the preventive measures to lessen the symptoms of asthma.
At baseline, the quality of treatment was similar in the two groups (STG vs STG + additional education). All four patients who were aware of peak flow metre were in the STG group.

**Effects of intervention**

Two interventions were carried out in the study: (i) all patients were treated according to standard treatment (GINA) guidelines, and (ii) in addition, basic education was imparted to half the patients. The effect of education was studied on asthma control and asthma knowledge till the twelfth week follow-up.

**Asthma knowledge**

Table 2 shows the effect of interventions on various domains of asthma knowledge after 12 weeks of follow-up. Significant improvement in knowledge occurred in most knowledge domains. The domains that showed improvement in both intervention groups were patho-physiology, symptoms and severity of asthma, and prevention. However, patients who were given face-to-face educational intervention also showed improvement in medication. The improvement in the knowledge of patho-physiology was statistically greater in the educational group.

### Table 1: Asthma treatment quality at baseline

<table>
<thead>
<tr>
<th>Previous treatment</th>
<th>N=38 n (%)</th>
</tr>
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<tbody>
<tr>
<td>More than 1 doctor consulted</td>
<td>28(73.6)</td>
</tr>
<tr>
<td>Knew doctor’s qualification</td>
<td>23(60.5)</td>
</tr>
<tr>
<td>Doctor informed about diagnosis</td>
<td>25(65.7)</td>
</tr>
<tr>
<td>Informed about severity of disease</td>
<td>10(26.4)</td>
</tr>
<tr>
<td>Lung function test done</td>
<td>4(10.5)</td>
</tr>
<tr>
<td>Peak flow meter assessment done</td>
<td>4(10.5)</td>
</tr>
<tr>
<td>Prescribed inhaler</td>
<td>16(42.1)</td>
</tr>
<tr>
<td>Aware of the name of inhalers</td>
<td>7(18.4)</td>
</tr>
<tr>
<td>Purpose of each inhalation explained</td>
<td>8(21.1)</td>
</tr>
<tr>
<td>Preventive measure to lessen the symptoms explained</td>
<td>16(42.1)</td>
</tr>
<tr>
<td>Written plan given to manage the disease</td>
<td>2(5.2)</td>
</tr>
<tr>
<td>Information provided regarding early signs of worsening of asthma care</td>
<td>9(23.6)</td>
</tr>
<tr>
<td>Measures to be taken if symptoms increase explained</td>
<td>4(10.5)</td>
</tr>
<tr>
<td>Advised to use peak flow meter at home</td>
<td>1(2.6)</td>
</tr>
<tr>
<td>Provided any educational material about the disease</td>
<td>0(0)</td>
</tr>
</tbody>
</table>
patients were prescribed any inhalers and only a few were actually aware that they were taking any β₂-agonists. Throughout the study period the average score for rescue therapy remained less than one, i.e. adequate asthma control in all patients. The FEV₁% predicted value did not change significantly in both groups during the study period.

**Discussion**

We have assessed the effectiveness of standard treatment guidelines on referred asthma patients from the community to a chest hospital in outpatient settings. The baseline assessment showed that asthma management was not done optimally by health-care providers. Our study shows that standard treatment guidelines can improve the asthma symptoms. Controlled studies also report that inhalation therapy and standard therapeutic guidelines can improve the asthma symptoms.¹⁹ All the five symptoms, i.e. average wakefulness in night due to asthma, morning wakefulness due to asthma, limitation
in doing activities, shortness of breath, and wheezing improved and their asthma was under control.\textsuperscript{16,17} The average score for need of rescue therapy was less than one at all follow-up visits, which again indicates that asthma was under control.\textsuperscript{17} We could not find improvement in FEV\textsubscript{1} value at follow-up visits. One of the reasons is that lung functions take a longer time to improve. The other important reason could be that many patients may not have adhered to their prescribed medications. We did not study the adherence of patients to therapy as that was not the aim of the study. Patients were either discontinuing the therapy or decreasing the doses when there were no symptoms or when symptoms were less troublesome. This fact was disclosed by many patients when they were probed during the follow-up visit with regard to deterioration of symptoms as compared with the previous

<table>
<thead>
<tr>
<th>Asthma Symptoms</th>
<th>Symptom score in the follow-up period: Mean (1 standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 week</td>
</tr>
<tr>
<td>(A) STG group (n=19)</td>
<td></td>
</tr>
<tr>
<td>Wakefulness at night</td>
<td>1.84(0.36)</td>
</tr>
<tr>
<td>Morning symptoms</td>
<td>2.53(0.51)</td>
</tr>
<tr>
<td>Limitation in activities</td>
<td>2.11(0.51)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>2.37(0.38)</td>
</tr>
<tr>
<td>Wheezing</td>
<td>1.95(0.47)</td>
</tr>
<tr>
<td>Need for rescue therapy</td>
<td>0.84(0.32)</td>
</tr>
<tr>
<td>FEV\textsubscript{1} %</td>
<td>3.21(0.46)</td>
</tr>
<tr>
<td>(B) STG + Education group (n=19)</td>
<td></td>
</tr>
<tr>
<td>Wakefulness at night</td>
<td>2.26(0.37)</td>
</tr>
<tr>
<td>Morning symptoms</td>
<td>2.68(0.46)</td>
</tr>
<tr>
<td>Limitation in activities</td>
<td>2.79(0.46)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>3.58(0.37)</td>
</tr>
<tr>
<td>Wheezing</td>
<td>2.79(0.44)</td>
</tr>
<tr>
<td>Need for rescue therapy</td>
<td>0.68(0.20)</td>
</tr>
<tr>
<td>FEV\textsubscript{1} %</td>
<td>2.37(0.47)</td>
</tr>
</tbody>
</table>

* p-value <0.05 for change from baseline (0 week) to 2nd, 4th, 8th and 12th week (paired t test),
# p <0.05 for difference between the two intervention groups (t-test for independent samples)
STG = Standard treatment guidelines
visit. There are reports from other parts of the world indicating the widespread nature of acute episodic disease belief for asthma.20,21 The sudden onset of asthma symptoms during an acute attack with symptom-free period in between encourages patients to believe that their disease is of acute nature without any long-term impact. Absence of symptom or improvement in breathing is the major cause for intentional interruption in inhalation of medicines in asthma.22 Non-adherence to inhalation of therapy is a very well-recognized phenomenon in asthma treatment.23 Therefore, asthma education and self-management by patient is the important component of rational treatment of asthma.4,9,13,24

We assessed the effectiveness of additional asthma educational intervention among half the patients. Though we had given a brief session of basic education it showed improvement in knowledge of asthma medication. Also, the improvement in knowledge about the pathophysiology of asthma was better. The study was able to reproduce what had previously been reported by controlled studies that an educational programme can increase a patient’s knowledge of asthma.11,25,26 The knowledge scores were generally poor in our patients at the initial assessment so we could get an improvement in the scores even after one session of education. The group that was not given additional education also showed improvement in knowledge in three domains though the improvement was less than the intervention group. A similar finding was observed by other researchers — waiting in the hospital and periodic filling of questionnaires can improve asthma knowledge.27,28 Several factors could have contributed to improvement in knowledge of asthma in the group that did not receive face-to-face education session. The knowledge at baseline was very poor. None of the patients had undergone lung function test before visiting the study hospital. All patients were exposed to some education as part of their routine medical treatment in the chest hospital under the care of a respiratory physician. Moreover, all patients were instructed about how to use inhalers by staff associated with the respiratory physician in the OPD. Finally, they were asked about the asthma knowledge questionnaire at the beginning of the study. Later, at each follow-up visit patients were seen interacting with the research team for filling up of the asthma control questionnaire. These factors could have contributed to improvements in asthma knowledge in the group that was not covered by face-to-face education.

It seems that the face-to-face asthma education session increased the adherence to asthma treatment in the initial period. That is why symptoms of asthma control showed improvement earlier in patients who were given educational intervention, as compared with the other group. May be one educational session had only a brief impact that did not last long enough for any significant improvement to be observed between the two groups at the eighth and the twelfth week. This shows that reinforcement of education is important for sustained effect. An earlier study conducted in Turkey25 on asthma education has shown that significant improvement in asthma knowledge was observed after two months, but that it declined after one year. A study conducted with parents for childhood fever has shown that reinforcement education (second education) with written and pictorial material significantly improves knowledge about fever management in children.29 These studies clearly suggest that reinforcement of educational intervention is required for long-term effect. For treatment of asthma, reinforcement of education is more important because as mentioned above non-adherence to treatment because of patient’s beliefs is a
big challenge. It is reported that although, patient’s beliefs govern their attitudes towards therapy, these beliefs are not fixed and can be changed through education and negotiation.\(^{30}\) Therefore, educational intervention should be reinforced with written action plan and material in order to get sustained and optimum results.

This study had some inherent limitations, e.g. it was undertaken at one referral tertiary care-level public hospital. Thus, it may not be representative of the general practice. Moreover, patients who visited the study hospital had already visited other doctors. Hence, they were probably more motivated to control their disease. Also, the sample size of the study was small. As the baseline level, asthma control and asthma knowledge was poor, therefore, a small sample size could show significant effect of interventions on asthma knowledge and control; yet caution should be taken in generalizing the findings. Nevertheless, the findings are encouraging; therefore a larger study involving more primary-care facilities should be conducted to show the effect of standard treatment guidelines and patient education on asthma control.

To conclude, asthma management is not optimum and majority of patients are not treated with essential asthma medicines. Also, they are not imparted any asthma education. Pharmacotherapy according to standard treatment guidelines at the chest clinic significantly improved asthma symptoms. A brief educational intervention improved the understanding of patients in some important domains such as medications. Asthma education led to improvement in asthma symptoms earlier, as compared with the group that did not receive face-to-face educational intervention. It also seems that educational intervention led to better adherence to medication for a brief period of time. Reinforcement of educational intervention with written self-management programme may be required for continuous and sustained asthma control.

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