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Impact of pharmacist-led educational intervention on knowledge of self-management among asthmatic patients: a prospective cohort study

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STRENGTHS AND LIMITATIONS OF THIS STUDY
⇒ Adherence to clearly defined inclusion and exclusion criteria.
⇒ A cohort study using a parallel control group for comparison.
⇒ An appropriate sample size consisting of representative asthmatic patients.
⇒ Participants were recruited only from a single centre.
⇒ Scarcity of tools to measure the asthma self-management knowledge.

INTRODUCTION
Asthma has over many years become one of the major health concerns affecting millions of people1 and is defined as a chronic, non-communicable inflammatory disorder of the airways, which affects 334 million people worldwide with an alarming prediction of an increase in 100 million more by the year 2025.1,2 Considering the most leading causes of disease which burdens society, asthma ranks 28th, causing approximately 1000 people to die every day around the globe. In addition, it ranks 16th among the leading causes of years of life lived with a disability and its prevalence is still rising in underdeveloped countries.3

Globally, asthma is becoming a growing contributor of increased morbidity and mortality and, thus, imposing a significant burden in terms of reducing productivity, not only on the patients but also on their families and healthcare systems.2 Genetic predisposition and exposure to numerous environmental substances including dust mites, pet dander, pollens as well as stress or sedentary lifestyle collectively accounts as contributing...
Factors for developing and high prevalence of poorly controlled asthma. Despite the availability of effective diagnostic and treatment strategies, asthma is still poorly controlled in the majority of patients and its incidence is on the rise. Various reasons for such a low asthma control includes either healthcare system-related issues (unaffordability or unavailability of medications) or physician-related issues (incorrect or misdiagnosis, lack of proper diagnostic facilities, insufficient time to discuss matters with the patients, absence of reassessment of inhaler technique or lack of proper follow-up measures) or patient-related issues (non-compliant behaviours due to lack of knowledge about their disease and its management). In addition to non-adherence to the proper medication regimen, lack of proper education or routine follow-up, incorrect use of inhaler and lack of inhaler technique assessment during the patient visit also play a significant role in the suboptimal control of asthma. Being a controllable disease, asthma requires a prolonged guidelines compliant therapy along with patient education about the correct use of the prescribed medications and disease self-management.

The patients’ general knowledge about asthma includes the pathophysiology of the disease, the purpose of the specific treatment regimen, recognition and management of exacerbations/disease triggers and especially, correct use of the inhaler. Self-management is defined as the ability of an individual to apply the appropriate guidelines or make informed decisions for managing their chronic conditions. This requires the efficient communication about patients’ condition with their family members, companions and healthcare professionals. Asthma self-management furthermore involves actions undertaken by the patients to monitor their disease symptoms and avoid exacerbations. The existing published literature signifies that asthma self-management is conditional on the education received by the patients since this improves their understanding of their treatment rationale and monitoring thereof and when made a part of their regular and planned care, not only improves asthma control and their quality of life but also reduces the healthcare costs by decreasing the frequency of hospital and emergency room visits and absenteeism from the work places. Variability of asthma disease (change in asthma over time) implies that exacerbations can possibly occur even if a patient’s asthma is well controlled. Therefore, patients should have the knowledge about their disease management and recognition of factors to indicate when to seek help from health professionals when confronted with such exacerbations.

Despite well-documented evidence of the positive impact of asthma self-management programmes in achieving the desired patient outcomes and reducing healthcare costs, it is unfortunately rarely implemented in routine clinical practice. Despite being the sixth most populous country in the world and harbouring a high burden of asthma patients, there remains a scarcity of published information regarding the patients’ knowledge and impact of the educational intervention about asthma self-management in Pakistan. Therefore, the current study was conducted with the objective to evaluate the knowledge of disease self-management among established asthmatic patients and the impact of an educational intervention might illustrate to address this finding.

**METHODOLOGY**

**Study setting and design**

The cohort study was carried out at the pulmonology outpatient department of the Pakistan Institute of Medical Sciences, a tertiary care hospital located in the capital territory of Islamabad Pakistan. All asthmatic patients were selected through a spirometry process and were at least 18 years old. These patients visited the study site from May to September 2019 and were willing participants by giving their written consent. Those patients who were unable to communicate adequately, had a cognitive abnormality or any other disease with asthma-related symptoms such as chronic obstructive pulmonary disease, tuberculosis or a weak heart, were excluded. The Quasi experimental design was used. Participants in the study group were arbitrarily assigned to control and treatment groups. Both groups were roughly similar in terms of sociodemographic characteristics and asthma self-management knowledge resulting from a baseline visit. The educational intervention was provided to the treatment group. The baseline patients’ sociodemographic characteristics as well as knowledge of asthma self-management were assessed via a face-to-face interview. Educational material included specifically designed pamphlets. The principal author (SSS) provided educational counselling and evaluated the inhaler technique of each patient in the treatment group at baseline and follow-up visits. All educational counselling was provided to the control group patients on follow-up visits only along with evaluating their inhaler technique. Time allocated for counselling varied according to each patients’ comprehension and previous knowledge of their condition.

**Data collection tools**

A purpose developed data collection form was used to obtain the patients’ sociodemographic characteristics from their medical records and in one-on-one interviews with the patient. In order to evaluate a patients’ knowledge about what self-management of asthma meant, the principal investigator administered ASMQ forms to the patients.

The ASMQ contained 16 multiple-choice questions about preventive measures, use of inhalers, medications and peak flow metres. Tool scores were calculated by giving one point to each preferred response. For generating raw ASMQ scores, all answers were summed up and transformed to a score ranging between 0 and 100. Higher transformed scores on ASMQ signified a higher knowledge about self-management of asthma. Two questions related to the peak flow metres
Table 1 Sociodemographics of study participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Categories</th>
<th>CG</th>
<th>TG</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>39.46±13.5</td>
<td>39.70±13.99</td>
<td>0.892</td>
<td></td>
</tr>
<tr>
<td>Age categories</td>
<td>18–35</td>
<td>27</td>
<td>32</td>
<td>0.881</td>
</tr>
<tr>
<td></td>
<td>36–55</td>
<td>54</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;56</td>
<td>39</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>61</td>
<td>75</td>
<td>0.068</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>59</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>75</td>
<td>66</td>
<td>0.597</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>45</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>Not working</td>
<td>61</td>
<td>53</td>
<td>0.827</td>
</tr>
<tr>
<td>(ISO categories)</td>
<td>Blue collar worker</td>
<td>25</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White collar worker</td>
<td>34</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Educational</td>
<td>Illiterate</td>
<td>20</td>
<td>24</td>
<td>0.870</td>
</tr>
<tr>
<td>Status</td>
<td>Primary</td>
<td>36</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>37</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Graduate</td>
<td>27</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Family history</td>
<td>Asthma</td>
<td>30</td>
<td>26</td>
<td>0.846</td>
</tr>
<tr>
<td></td>
<td>Allergy</td>
<td>22</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>30</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>38</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Smoking status</td>
<td>Ex-smokers</td>
<td>22</td>
<td>27</td>
<td>0.927</td>
</tr>
<tr>
<td></td>
<td>Current-smokers</td>
<td>33</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Never-smoke</td>
<td>65</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Disease duration</td>
<td>≤2</td>
<td>47</td>
<td>51</td>
<td>0.978</td>
</tr>
<tr>
<td>Categories (years.)</td>
<td>2–5</td>
<td>45</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;5</td>
<td>28</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

CG, Control Group; ISO, International Standard Classification of Occupations; TG, Treatment Group.
Figure 2 illustrates that question 7 (the holding of breath after use of an inhaler for several seconds) has the highest percentage of correct answers, that is, 47.9%. Only 32.1% of the participants knew that asthma is an incurable disease, which emphasises the need for a comprehensive patients’ education about the regular uptake of medications to achieve disease control. Item 9 (patients’ increased need for maintenance medicines in case he/she is using more rescue medications than are prescribed) was frequently answered to be unknown (47.1%).

Figure 3 illustrates the distribution of the raw ASMQ score at baseline. 0–14 is the total possible range with higher scores resulting in higher ASMQ transformed scores and, thus, indicating a better asthma self-management knowledge. This underlying distribution of ASMQ raw scores indicates a poor disease management knowledge among the study participants.

**DISCUSSION**

To the best of our knowledge, this is probably the first study conducted in Pakistan to assess the patient’s self-management knowledge of their asthma condition and the impact of an educational intervention might have to manage this condition. The findings of the current study signify that at the baseline visit, the majority of the study participants (83.3%) were poorly educated about the self-management of asthma, and their knowledge was significantly improved after an educational intervention. Likewise, findings regarding the patients’ poor knowledge about asthma self-management have been reported by studies conducted elsewhere. For example, a study conducted by Nguyen et al in Vietnam reported a poor knowledge with a mean raw ASMQ score of 4.3 which equates to the transformed score of 30. Similarly, another observational study conducted in the Kingdom of Saudi Arabia reported an average ASMQ score of 3.5 (3.5/14). The format of both of these studies was similar to that of the present study after the two items related to the peak flow metre were similarly removed. Likewise, a study conducted in Sri Lanka reported that only 34% of the patients were knowledgeable about their disease and medications.

A multicentre study in China reported a low level of disease awareness among the parents of asthmatic children. Another study illustrated that 62.7% of asthmatics have poor, 12% have good and only 25.3% possess an adequate knowledge of their condition. Similar studies showed that although the patients have a positive attitude towards the disease, their specific disease knowledge was low. In our study, the proportion of patients (16.7%) who correctly answered more than 50% of the questions was greater than that reported by Al et al (4%) but similar to that reported by Nguyen et al (16.5%).

Despite the significance of the correct use of inhaler devices, including the peak flow metre in optimal control of asthma, there have been reports of its incorrect use. We found that only 47.9% of the participants in the current study had the correct knowledge about the holding of breath after inhaling for several seconds, and 23.8% agreed with the misconception about consecutively...

**Table 2** Pre and post ASMQ categories, ASMQ raw and transformed scores in control and treatment group

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASMQ raw score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td>4.01±3.32</td>
<td>3.89±2.92</td>
<td>0.487</td>
</tr>
<tr>
<td>Treatment group</td>
<td>4.20±3.03</td>
<td>9.77±2.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>ASMQ transformed score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td>28.69±23.75</td>
<td>27.76±20.86</td>
<td>0.487</td>
</tr>
<tr>
<td>Treatment group</td>
<td>30±21.64</td>
<td>69.83±18.42</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

ASMQ, Asthma Self-Management Knowledge Questionnaire.
taking the second puff as soon as possible after the first. Only 26.3% knew that they should inhale slowly and 63% did not know about the correct use of the inhaler. This strongly suggests that there is a need for patient education through healthcare providers on the correct procedure of the inhalation technique. Lack of health education and regular follow-up visits has previously been reported as the predictors of incorrect inhaler use and poor asthma control.18 Significant improvement through education at follow-ups (p=0.000) in the inhalation technique through assessing and demonstrating the correct inhaler technique has been reported by another study.19 Therefore, healthcare providers should regularly demonstrate and re-evaluate the patients’ inhaler technique at each visit to prevent or reduce the chances for errors in the inhalation technique.5

Despite being an incurable disease, 55% of the current study group were of the opinion that it can be cured, thus equating control with cure. Similar findings regarding the patients’ misconception that asthma is curable have been reported by studies conducted in Vietnam and Saudi Arabia.5 20 Furthermore, there was a lack of knowledge about control and rescue medications; for example, 36.3% of the current study participants answered that asthma symptoms and not knowing their cause, only 23.3% answered correctly to change one’s immediate environment.

The low level of patients’ knowledge of asthma self-management found in the current study and studies conducted elsewhere emphasise the importance of educational programmes among patients with asthma. In the current study, the pharmacist administered educational intervention in the treatment group significantly increased the mean ASMQ score from 4.20/14 to 9.77/14 (transformed score 69.83/100). On the other hand, no significant increase in these scores was observed in the control group. In the current study, educational intervention increased the number of patients with >50 ASMQ score up to 89 in the treatment group. This is in agreement with the results of an intervention study in which a full version of ASMQ (all 16 items) was used. The study reported a statistically significant increase in the ASMQ score for the group of patients who received an educational intervention.19 A similar positive impact of an educational intervention on patients’ self-management knowledge of asthma, medication adherence and asthma control (60% better control and 18% well controlled) has also been reported.21

Likewise, the positive impact of patient-tailored educational interventions on knowledge about disease self-management, better disease control, treatment outcomes and patients’ health-related quality of life has been reported by studies conducted elsewhere.18 21–25 This specifically applies to the shift of modern treatment goals to early detection and prevention of exacerbations, effective strategies including either broad commitments and interactive educational sessions at different healthcare levels and a cost-effective approach for underdeveloped countries.26 27

CONCLUSION

The low level of asthma self-management knowledge and positive impact of educational intervention in reducing current knowledge gaps emphasise the need for designing and implementation of educational programmes, ongoing monitoring and regular follow-ups in such a way to fit all patient needs especially including the less educated ones. Assessment of patient’s self-management knowledge provides room for designing specific programmes aimed at the areas where knowledge deficits are evident, thus providing a cost-effective approach, which otherwise is impossible because of resource and time limitations. Moreover, regular and repeated assessment of inhaler technique, if made necessary, will optimise the therapeutic benefits and help to achieve better disease control.

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Contributors All authors (SSidraS, AmK, RA, SSadiaS, AB, NA, SMu, SME, IRG, SAR, AhK, KUS) have conceptualised and designed the study. SSidraS, RA and SSadiaS collected the data. SSidraS, AmK, SME and KUS have contributed to data acquisition and analysis. SSidraS drafted the manuscript and AmK, NA, AB, SME, SAR and AhK have reviewed the manuscript critically. IRG attended the English language used in the manuscript. All authors read and have approved the final manuscript. The study is supervised by AmK and KUS and are guarantors.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study was approved by the Bioethics Committee of Quaid-i-Azam University, Islamabad and Institutional review board of PIMS [F.1-1/2019 (EC) PIMS]. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article.

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