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Association between asthma self-management knowledge and asthma control in the elderly

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ABSTRACT

Background: Considerable evidence points to the importance of patient education in achieving better asthma control. However, little is known about the effect of older adults' asthma knowledge on asthma control.

Objective: To identify the relation between asthma self-management knowledge and short-term asthma control in older adults.

Methods: The study included 82 patients with asthma undergoing usual asthma care who were interviewed by the same trained allergist. At the same time, the authors conducted an asthma knowledge questionnaire, an Asthma Control Test, skin prick testing, spirometry, and evaluation of inhaler device technique. The Turkish version of the asthma knowledge questionnaire was administered to all participants in face-to-face interviews. The relation between asthma knowledge and asthma control was tested by regression analysis.

Results: The education level was below the secondary level in 79% of patients; 59% of patients were obese; and 44% of patients had mild, 41% had moderate, and 5% had severe persistent asthma. The atopy rate was 21%. The most common sensitization was to *Dermatophagoides pteronyssinus*. Fifty-two percent of patients had uncontrolled asthma; 22 patients showed proper use of the inhaler device. Forty patients (48%) had limited asthma knowledge. The main source of asthma knowledge was from physicians for 81% of patients. There was no significant association between patients' asthma knowledge and asthma control level ($P = .991$).

Conclusion: Knowledge of asthma was very low in elderly patients and usual asthma care was largely insufficient. These findings suggest that asthma education programs should be developed for older adults based on their education level and clinical asthma characteristics.

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Introduction

Globally, asthma is one of the most common chronic diseases, and it is estimated that 300 million people worldwide currently have asthma.¹ The prevalence of asthma varies among countries from 1% to 28%, and the disease affects people of all races and ethnic groups from infants to the elderly.¹ The number of people at least 60 years old is rapidly growing in developed countries; by 2030, it is estimated that this group will account for approximately 20% of the total population.² Although the prevalence of allergic diseases in older adults is believed to be rare, that of asthma has been estimated to be 6% to 10% in people at least 60 years old.²

Asthma management in the elderly follows the same steps as in younger adults.¹ However, a significant number of older people with asthma have uncontrolled asthma, which leads to increased morbidity and mortality. In a study by Tsai et al,³ patients with

asthma at least 55 years old had higher rates of hospitalization and near-fatal asthma events, longer lengths of hospital stay, and higher overall mortality than adults 18 to 54.9 years old. Fatalities also are higher in older people with asthma than in younger people: Tsai et al found that elderly subjects had 4-fold greater overall mortality. Several factors in older patients with asthma contribute to their risk of uncontrolled disease, including a lower education level and memory, coordination, hearing, visual, and neuromuscular difficulties in learning inhaler-use techniques and asthma self-management plans. Older patients with asthma also have an increased likelihood of comorbidities and polypharmacy, with possible worsening of asthma control.⁴

There is considerable evidence that patient education is very important in achieving successful asthma control.¹ Adequate asthma education is particularly important in the elderly owing to the often complex treatments involved, comorbidities, and sometimes decreased memory and cognitive functions.⁵ Inappropriate techniques in using inhaler devices constitute another problem in elderly patients with respect to uncontrolled disease.⁵ Greater asthma knowledge on the part of elderly patients with

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asthma and the proper use of inhaler devices could improve disease control. Small-scale qualitative studies have examined asthma knowledge of older adults with and without the disease.^{6,7} One large population-based survey has investigated knowledge and understanding of asthma in elderly patients with asthma.⁸ However, little is known about the asthma self-management knowledge of older adults with respect to asthma control, and no study has evaluated asthma knowledge in older Turkish adults. The aim of the present study was to identify any relation between asthma self-management knowledge and short-term asthma control in older adults.

Methods

Study Patients

The authors identified patients diagnosed with asthma who were admitted to their allergy outpatient clinic from September 1, 2013 to April 1, 2014. Inclusion criteria were an age of at least 60 years; physician-diagnosed asthma; patients who had been taking controller asthma medications regularly for at least 6 months; nonsmokers or ex-smokers with at least 1-year cessation and fewer than 10 pack-years of smoking history; and patients who had physician-managed usual asthma care. Patients who had at least 1 serious or uncontrolled accompanying comorbid condition, such as heart failure, hemiplegia, malignant tumors, and moderate or severe liver or kidney failure, were excluded. Also excluded were patients who had acute asthma attacks and patients with dementia or any psychiatric disorder, such as depression. Selected patients were interviewed by the same trained allergist, and all procedures (questionnaires, skin prick testing, and spirometry) were conducted at the same time. The study was approved by the local ethic committee of Medeniyet University (Istanbul, Turkey), and written informed consent was obtained from all study participants.

Definitions

Asthma was diagnosed according to criteria of the Global Strategy for Asthma Management and Prevention by the Global Initiative for Asthma.¹ Other allergic diseases (food allergy, urticaria, contact dermatitis, atopic dermatitis or eczema, hymenoptera venom allergy, drug hypersensitivity, and allergic rhinitis) were diagnosed by an allergist based on medical history, which included the results of additional tests (eg, specific IgE or food or drug provocation testing), if justified. The baseline questionnaire included questions about demographic details (age, sex, employment, and basal body mass index [BMI]), education level (inability to read and write, primary educational level, secondary educational level, or university level), clinical features (predominant symptoms, age at onset, duration of disease, and disease severity), family history of atopy, smoking status (ex-smoker, current smoker, or nonsmoker), and concomitant chronic diseases. The diagnosis of concomitant diseases was made based on the patients' reports and was verified with the available medical records. The level of asthma control was established according to Global Initiative for Asthma guidelines¹ and assessed using the Asthma Control Test (ACT).⁹

Spirometry and Skin Prick Tests

Spirometry was carried out according to European Respiratory Society standards using a Spirolab III MIR (Medical International Research, Rome, Italy) spirometer.¹⁰ The skin prick test panel (Alyostal ST-IR, Stallergenes SA, Antony, France) included the following allergens: *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, grass mixture, tree mixture, cat, dog, *Alternaria alternata*, *Aspergillus fumigatus*, and *Blattella germanica*. Skin prick testing was performed according to recommendations of the American Academy of Allergy, Asthma and Immunology. Histamine

and saline were used as positive and negative controls, respectively. The resulting wheals were measured after 15 minutes, and a mean wheal diameter of at least 3 mm was accepted as a positive reaction.¹¹ Atopy was diagnosed in the presence of at least 1 positive skin test reaction.

Asthma Knowledge Questionnaire

The authors developed an asthma knowledge questionnaire based on previous examples in the literature. It focused on 5 content areas (asthma pathophysiology; roles of medications; skill with the inhaler, spacer, holding chamber, and self-monitoring; environmental control measures; and when and how to take rescue actions) identified by the National Asthma Education and Prevention Program.¹² Two independent certified translators translated the questionnaire from English to Turkish. During the process, they were blinded to each other's work. Two allergists examined the Turkish translations and selected 1 of the translated texts. That text was compared with the original text by another independent observer, and back translation was carried out by a third translator with no previous knowledge of the original document. The final version was tested with 202 patients with asthma and then validated (data not published). This Turkish version of the asthma knowledge questionnaire was administered to all participants in the present study by a trained allergist in face-to-face interviews.

This validated questionnaire included 24 questions to determine asthma knowledge; each had "true" and "false" options. The option of "I don't know" was added to rate the lack of knowledge. A correct answer was scored as 1; an "I don't know" response or wrong answer was scored as 0. Fewer than 50% correct answers (total score <12 points) indicated limited knowledge. One separate question was added to the questionnaire to determine the participants' source of asthma knowledge: "Which of the following is the best source for you to obtain information easily about asthma?" The possible responses were the Internet; a physician; other health professionals; newspapers; television; other patients; friends or neighbors; and relatives.

Checklist to Assess Inhaler Techniques

All patients were previously educated on inhaler technique. A checklist was used to assess inhaler techniques for metered dose and dry powder inhalers. A trained allergist examined each of these steps, and a score of 1 was given for each correct step and a score of 0 was given for each wrong step. The inhaler technique score was determined as the number of steps performed correctly, and a total score was calculated by summing all the correct steps.

Statistical Analysis

Descriptive statistics were used to describe continuous variables. The χ^2 test was used to compare categorical variables. The study population consisted of patients with asthma who were at least 60 years old. The independent variable was more knowledge of asthma, defined as a score of at least 50% correct answers to the questions on the asthma knowledge questionnaire. The control was limited asthma knowledge and the outcome (dependent variable) was asthma control, defined as an ACT score of at least 20. The relation between asthma knowledge score and ACT score was investigated using regression analysis. Logistic regression was performed to investigate the effect of dichotomous independent variables (age, sex, BMI, education level, asthma severity, asthma duration, and inhaler technique score) on the selected dependent variables (asthma knowledge score and ACT score). The Student *t* test was used to compare 2 independent, normally distributed variables. Statistical significance was set at .05. Analysis was

conducted using MedCalc 12.7.7 statistical software (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2013).

Results

This cross-sectional analysis included 82 subjects (76 women and 6 men) with a mean age of 65.4 ± 6.2 years. This group had a lower level of education. Seventy-nine percent of patients has less than a secondary educational level. The mean BMI of the patients was 30.7 ± 5.2 kg/m²; 59% of patients were obese. Nonsmokers accounted for 80% of patients; 20% were ex-smokers. The age at asthma onset was 51.8 ± 16.6 years; the mean duration of asthma was 13.7 ± 15.4 years. Rhinitis, atopic dermatitis or eczema, urticaria, drug allergy, bee venom allergy, and food allergy were present in 68.3%, 1.2%, 6.1%, 22%, 2.4%, and 6.1% of patients, respectively. Family histories of perennial rhinitis and asthma were reported in 4.9% and 30.5% of participants, respectively. A summary of the demographic and clinical features of the patients is presented in Table 1.

Thirty-six patients (44%) had mild, 34 (41%) had moderate, and 12 (5%) had severe persistent asthma. In all, 59 patients (71.9%) had rhinitis plus asthma; of those patients, 1 had intermittent, 28 had mild persistent, and 30 had moderate to severe persistent rhinitis. The atopy rate was 21%. The most common sensitization was due to *D pteronyssinus* (44.4%), followed by *B germanica* (27.7%), *A fumigatus* (27.7%), *D farinae* (22.2%), and grass mix (11.1%). All but 3 patients had multi-aeroallergen sensitization. The mean ACT score was 18.7. During admission to the outpatient clinic, 52% of patients had uncontrolled asthma. Inhaled corticosteroids were being taken by 36 patients; the others were receiving only oral montelukast sodium monotherapy. All patients had a prescription for a rescue inhaler. The mean inhaler technique score was 5.39 ± 1.47 . Of these patients, 40 (48.7%) showed proper inhaler device use.

Forty patients (48%) had limited asthma knowledge. The mean asthma knowledge score was 11.2 ± 4 . There was no significant association among age, sex, BMI, patient education level, presence of any additional allergic disease, family history of atopy, asthma duration, inhaler technique score, and ACT score. Statistical analysis showed that asthma severity had a significant effect on asthma control ($P = .034$). Patients with mild persistent asthma had a 7-fold higher incidence of controlled disease than those with moderate to severe asthma. There was no statistically significant association between asthma control level and patients' asthma knowledge ($P = .991$). Three factor scores were extracted from the asthma knowledge questionnaire: "asthma facts," "using an inhaler," and "environmental control." There was no association between any factor score and asthma control level (Table 2). There was no significant relation between skin prick test results and level of asthma knowledge (Table 3). Twenty-four patients (29%) had hypertension and 3 of them were using β -blockers. The β -blocker use did not have any effect on asthma control ($P = .92$). The presence of at least 1 additional disorder did not have any effect on asthma control ($P = .875$) or asthma knowledge ($P = .436$). The main source of asthma knowledge was from physicians, the Internet, relatives, and television for 67 patients (81%), 10 patients (12%), 4 patients (0.04%), and 1 patient (0.01%), respectively.

Discussion

Although asthma self-management education decreases hospitalization and emergency department visits, few studies have assessed the level of asthma knowledge in the elderly.^{6–8} A significant number of older patients with asthma have uncontrolled asthma,³ and resource limitations make it difficult for clinicians to provide comprehensive educational programs for elderly patients with asthma. The present study found that older patients with asthma had limited asthma self-management knowledge and

Table 1

Demographic and clinical features of the patients

Variables	n (%)	Mean $\pm$ SD	Range (minimum–maximum)
Sex			
Female	76 (92.7)		
Male	6 (7.3)		
Education level			
Unable to read and write	20 (24.7)		
Primary educational level	44 (54.3)		
Secondary educational level	8 (9.9)		
University level	9 (11.1)		
Occupation			
Never worked before	52 (63.4)		
Worked before and retired now	30 (36.6)		
BMI (kg/m ²)		30.7 ± 5.2	19.5–44.4
<25	13 (15)		
25–30	20 (24)		
>30	49 (59)		
Asthma duration (y)		13.7 ± 15.4	1–55
Mean age at onset of asthma (y)		51.8 ± 16.6	5–82
<18	5 (6.1)		
≥ 18	77 (93.9)		
Severity of asthma			
Mild	36 (44)		
Moderate	34 (41)		
Severe	12 (5)		
Additional allergic diseases			
Rhinitis	56 (68.3)		
Atopic dermatitis or eczema	1 (1.2)		
Urticaria	5 (6.1)		
Drug allergy	18 (22)		
Food allergy	5 (6.1)		
Bee venom allergy	2 (2.4)		
Familial atopy			
Perennial rhinitis	4 (4.9)		
Asthma	25 (30.5)		
FVC (%-mL)	78.3 ± 18.8	$2,071.3 \pm 581.8$	(30.7–118) (700–3,950)
FEV ₁ (%-mL)	75.5 ± 21.2	$1,617.1 \pm 533.1$	(33.0–116) (570–2,940)
PEF (%-mL)	69.1 ± 22.7	$2,658.8 \pm 1,567.9$	(29.4–116.9) (750–9,850)
ACT score		18.7	7–25
<20	43 (52)		
≥ 20	39 (48)		

Abbreviations: ACT, Asthma Control Test; BMI, body mass index; FEV₁, force expiratory volume in 1 second; FVC, forced vital capacity; PEF, peak expiratory flow.

worse asthma control and showed improper use of the inhaler device. Educational level in these elderly patients was low; they did not use the Internet for asthma education, and the only source of asthma knowledge for such patients was physician-managed usual asthma care.

Evers et al⁸ investigated asthma knowledge and perceptions in 4,066 Australian adults at least 55 years old with and without diagnosed asthma. Evers et al⁸ found that adults with diagnosed asthma had greater asthma knowledge than undiagnosed individuals and older adults reported low susceptibility to developing asthma. No investigation has determined asthma knowledge in older Turkish adults. Yıldız et al¹³ undertook a questionnaire survey of 6,000 people in rural areas and 6,000 in urban areas of Turkey;

Table 2

Relation between ACT score and level of asthma knowledge of "asthma facts," "using an inhaler," and "environmental control"

Power factor	Asthma facts (questions 1–8)	Using an inhaler (questions 8–16)	Environmental control (questions 16–24)
ACT score	–0.80	–0.132	0.155
P value	.476	.239	.164

Abbreviation: ACT, Asthma Control Test.

Table 3
Relation between skin prick test results and level of asthma knowledge

ACT score	Asthma facts (questions 1–8)	Using an inhaler (questions 8–16)	Environmental control (questions 16–24)	Total score
SPT (+)	–0.58	–0.116	0.088	–0.062
P value	.649	.362	.487	.624
SPT (–)	–0.233	0.193	0.182	–0.101
P value	.352	.443	.469	.691

Abbreviations: (+), positive reaction; (–), negative reaction; ACT, Asthma Control Test; SPT, skin prick test.

questions about asthma and chronic obstructive pulmonary disease were used to evaluate knowledge of asthma and chronic obstructive pulmonary disease. They found insufficient awareness of chronic obstructive pulmonary disease and asthma. The population in the present study also had limited asthma knowledge. Older individuals might be more informed than younger individuals because they could be retired and have more time to obtain information on asthma. Furthermore, they might have better knowledge on how to search for and become informed about a certain topic than younger individuals. They might have more experience of doing research online because they could have had a professional career that makes them better able to seek and obtain information. However, the present group of older Turkish patients with asthma had a lower level of education and one fourth of these patients were unable to read and write. Most of these patients were women (92%); 63% of the study population had never worked professionally. Physicians were their main source of asthma knowledge: they were not using any written materials or the Internet to obtain such knowledge. This study found that usual asthma care is insufficient for asthma education in older adults in Turkey. Although asthma awareness and self-management programs are ordinarily directed at children and their caregivers, those programs are needed by elderly patients with asthma. Ozyigit Pur et al.¹⁴ found pictorial asthma action plans to be a helpful tool for self-medication in illiterate Turkish women. A structured asthma education program should be developed for older adults based on their education level and clinical asthma characteristics.

Talreja and Baptist¹⁵ compared young patients with asthma with patients older than 65 years and found the income and education of elderly patients to be low. Compared with young adults with asthma, elderly adults with asthma were more likely to be obese, to be smokers, and to have worse short-term (symptoms within previous week; day and night symptoms during the previous 30 days; and steroid use in the previous 3 months) and long-term (asthma attack; emergency department visit; hospitalization; and activity limitations in previous year) asthma control. The present findings are in accord with those results. Baptist et al.¹⁶ compared asthma control in older adults (≥ 65 years) who had taken an asthma education course with those who had not. They did not find any differences in short- or long-term outcomes between the 2 groups. In accordance with the results of previous studies, no statistically significant association was found between asthma control level and patients' asthma knowledge. It is necessary to investigate further the effect of reproducible long-term asthma education on short- and long-term asthma control in elderly patients. Thus, more research needs to be conducted on providing comprehensive educational programs for elderly patients with asthma.

It was previously believed that older individuals generally had nonallergic asthma.¹⁷ However, recent studies have suggested that allergic sensitization in patients with asthma and at least 55 years old might be more common than previously reported.¹⁸ The atopy rate was 21% in the present study population; these patients were most commonly sensitized to *D pteronyssinus* (44.4%), followed by *B germanica* (27.7%), *A fumigatus* (27.7%), *D farinae* (22.2%), and grass

mix (11.1%). These results are similar to those of Busse et al.¹⁸ who found that sensitization to indoor allergens was more strongly associated with asthma in elderly patients. Previous studies have reported an association between sensitization to house dust mites, mold, and cockroaches and increasing incidence of asthma.^{19,20} However, sensitization to pollen was not found to be significantly associated with the presence of asthma symptoms.^{19,20} From the present results, it would appear that sensitization to house dust mites, mold, and cockroaches is an important factor in elderly patients with asthma. Sensitization to pollen also could be associated with the presence of asthma symptoms in the elderly.

The present study has several limitations. This study assessed only the effect of usual asthma care on short-term asthma control. The patients did not undertake any long-term, individualized asthma education program, and the authors did not investigate such an effect on asthma knowledge in these elderly patients. The level of asthma control was based on ACT scores alone. The lack of objective data and reliance on self-report regarding asthma control was another limitation of the study. The authors conducted a cross-sectional analysis of a small, predominantly female population, which limits the epidemiologic significance. In this study, 92% of enrolled subjects were women. This certainly could bias the results because older women most likely are busy with their families, children, and grandchildren, and they spend a great deal of their time performing household activities, including cleaning and cooking, and they might have less time to research their asthma. Further studies are needed to determine the benefits of asthma self-management programs in elderly patients.

In conclusion, this study shows that usual asthma care is largely insufficient for older patients and older adults have low rates of asthma knowledge. Based on evidence of effectiveness of asthma education in other populations, asthma education programs could be helpful in improving control in the elderly. These findings suggest that education about asthma should be developed for older adults based on their education level and clinical asthma characteristics. Older adults need to be involved in asthma education activities, and better asthma self-management education would lower the uncontrolled asthma rate in the elderly population.

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