



Clinical challenges in elderly asthma

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SUMMARY

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Introduction: Understanding the difference of elderly asthma is essential to provide better healthcare for this vulnerable population. The aim of this study was to evaluate the differences between young and elderly asthma patients.

Materials and Methods: This real-life study was designed as a cross-sectional analysis. All data collected with structured web based asthma program. In sum, 373 (89.9%) young asthma (YA, age < 65) and 42 (10.1%) elderly asthma (EA, age ≥ 65) patients followed at least one year and compared statistically.

Results: Cough is found higher in EA ($p < 0.01$) despite lower smoking rate in EA ($p < 0.001$). Allergic rhinitis and allergic conjunctivitis were more common in YA ($p < 0.05$, $p < 0.01$) which is consistent with higher allergy rate in YA ($p < 0.05$). On the other hand, diabetes and hypertension were determined significantly higher in EA ($p < 0.01$, $p < 0.01$). 52.4% of EA patients were found to have low diffusion capacity ($DLCO < 80\%$). Although EA patients use combined therapies with inhaled corticosteroids and long acting beta agonists more than YA patients ($p < 0.01$), both emergency room visit (ERV) and hospitalization ratios are founded significantly higher in EA ($p < 0.001$, $p < 0.001$).

Conclusion: EA patients were presented with cough in general. They possess an increased risk of hypertension, diabetes and low levels of diffusion capacity. ERV and hospitalization ratios have founded higher despite higher usage of combined therapies.

Key words: Asthma; elderly; epidemiology

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ÖZET

Yaşlı astımında klinik zorluklar

Giriş: Yaşlı astımının farklarını anlamak, bu hastalara daha iyi bir sağlık hizmeti sunmak için esas oluşturmaktadır. Bu çalışmanın amacı genç ve yaşlı astım hastaları arasındaki klinik farklılıklarını ortaya koymaktır.

Materyal ve Metod: Bu gerçek hayat çalışması, kesitsel bir analiz olarak tasarlandı. Tüm veriler internet tabanlı yapılandırılmış astım programı aracılığıyla toplandı. Toplamda en az bir yıl takip edilen 373 (%89.9) genç astım (GA, yaşı < 65) ve 42 (%10.1) yaşlı astım (YA, yaşı ≥ 65) hastasının demografik, klinik, fonksiyonel parametreleri ve tedavileri istatistiksel olarak karşılaştırıldı.

Bulgular: YA olgularındaki daha düşük sigara kullanımı oranlarına ($p < 0.001$) rağmen, öksürük YA olgularında daha sık gözlendi ($p < 0.01$). Allerjik rinit ve allerjik konjunktivit, gençlerdeki daha yüksek allerji sıklığı ($p < 0.05$) ile örtüsen bir biçimde, GA olgularında daha sık gözlendi ($p < 0.05$, $p < 0.01$). Öte yandan, diyabet ve hipertansiyon YA hastalarında belirgin olarak yüksek saptandı ($p < 0.01$, $p < 0.01$). YA olgularının %52.4'ünün düşük difüzyon kapasitesine ($DLCO < \%80$) sahip olduğu görüldü. YA hastalarınca daha çok inhale kortikosteroid ve uzun etkili betaagonist içeren kombinasyon tedavisi kullanılmıştır ($p < 0.01$) rağmen, Acil Servis ziyaretleri ve hastane yataş oranları YA olgularında daha yüksek gözlendi ($p < 0.001$, $p < 0.001$).

Sonuç: YA olgularının daha fazla kronik öksürük ile başvuru olduğu, hipertansiyon, diyabet ve düşük difüzyon kapasitesi seviyesi açısından yüksek risk taşıdığı gözlendi. Kombine tedavilerin daha çok kullanımına rağmen, Acil Servis ziyaretleri ve hastane yataş oranları daha yüksek saptandı.

Anahtar kelimeler: Astım; yaşı; epidemiyoloji

INTRODUCTION

Asthma in elderly is associated with a lower quality of life and considerable morbidity when compared with those who do not have asthma symptoms (1). Asthma prevalence in the elderly patients is difficult to determine because of underdiagnosis due to patient under-reporting of asthma symptoms or of misdiagnosis as chronic obstructive pulmonary disease (COPD) (1). Atopic diseases are often not considered in older patients and asthma in elderly is often confused with COPD, a common misdiagnosis that is related to old age and disability (2). Similarly, older people with asthma tend to attribute their breathlessness to their aging process and often do not perceive that they are slowing down or decreasing their activities because of their disease (3). Alterations in the perception of airway obstruction due to aging often lead to underestimation of the disease severity and thus the delay in seeking advice (3). In particular, asthma and COPD both overlap and converge in older people (4). This concurrence, together with absence of precise diagnostic methods, makes diagnosis complex (4).

After adjusting for comorbidities, older adults aged ≥ 65 years had a four-fold increase in overall mortality compared with younger ones aged 18-64 years (5). Despite high rates of prevalence, morbidity, and costs in elderly asthmatic patients, the elderly asthma population has been excluded from most studies; therefore, there is a paucity of knowledge about elderly asthmatic patients (6). The goals of asthma therapy in

elderly asthmatic patients are the same as those in younger ones: achieving good asthma control status and minimizing the future risk of exacerbation (7). Considering burden of elderly asthma in healthcare, further understanding of elderly asthma seems to be needed for better management. The main goal of this study was to reveal clinically challenging differences in elderly asthma patients compared to asthma patients who are relatively younger. Actually, asthma diagnosis in older people is not so different from diagnosing it in younger people however there are several factors in elderly patients that contribute to lack of controlling disease course effectively.

In this study, young asthma patients (YA) and elderly asthma patients (EA) were followed for at least one year to evaluate problems such as symptoms, risk factors, co-morbidities, pulmonary function tests, therapies, inhaler device usage, asthma control, emergency room visits, and hospitalization ratios.

MATERIALS and METHODS

Study Design

This real-life study was conducted as a cross-sectional analysis in Pulmonary Medicine Asthma Outpatient Clinic. The study protocol was approved by the Institutional Ethics Committee (Institutional Ethics Committee approval date 01.11.2016 Number A-21). All data collected by our asthma outpatient web-based program during the period from the November 2015 to November 2017 are included to our study.

Patients

All of our patients have been diagnosed by pulmonary medicine physician according to GINA 2016-17 guidelines; a clinical history of symptoms compatible with asthma and reversibility of bronchial obstruction, as measured by spirometry and defined as a post bronchodilator or after inhaled steroid therapy change in FEV₁ (forced expiratory volume in one second) of 12% and 200 mL (7). We have selected patients for our study based on inclusion criteria and omitted patients based on exclusion criteria, respectively. Our inclusion criteria requires, patients older than 17, diagnosed and treated as an asthmatic by attending physician, no flare up last month and lastly followed at least one year by our web based asthma program. We excluded asthma patients with pregnancy and other pulmonary diseases. Patients over 65 years old but diagnosed before 65 (long standing asthma) are not included in the study.

Procedures and Measures

A "Case Report Form for Asthma" and a web-based data entry via Microsoft Access 2013 were prepared in 2014 by the department based on symptoms, habits, pulmonary functions, risk factors, comorbidities, therapies, inhaler device usage, control indexes, emergency room visits and hospitalization ratios.

Spirometry and carbon monoxide lung diffusion capacity measurements have been conducted by experienced respiratory therapists according to American Thoracic Society (ATS)/European Respiratory Society (ERS) guideline criteria (8). 186 (49.9%) YA patients didn't have diffusion capacity measurement. Turkish version of Asthma Control Test (ACT) is used to determine asthma control in outpatient settings (9). The last ACT data of the one year followed patient was noted.

All patients had chest X-Ray to determine other lung diseases. Patients with DLCO < 70% or eosinophilia > 10% had computed tomography of the lung to eliminate other lung diseases. Minimal mosaic attenuation, bronchial dilatation and bronchial wall thickness are attributed as asthma finding in the computed tomography of the thorax.

All eligible patients were followed at least during one year, divided into two different groups as young asthma (YA, age < 65) and elderly asthma (EA, age ≥ 65) based on their age at the time of the asthma diagnosis.

Statistical Analysis

All clinical data in this study were statistically analyzed with the IBM-SPSS (The Statistical Package for Social Sciences). The patient demographics and disease characteristics are presented under descriptive statistics. Student's t test was used to compare the means between two groups. The Chi-square test was used to compare proportions between two groups. Fisher's Exact test and the Mantel-Haenszel Chi-Square test were used to compare proportions between two groups when the number of cases was low and when the variable to be compared was ordinal, respectively. The data are expressed as the mean ± SD or as the percentage (%). p value less than 0.05 ($p < 0.05$) is used to indicate significance.

RESULTS

Data of 415 patients was collected for this study with 373 YA patients (89.9%) and 42 EA (10.1%) patients. Female to male ratio was 68.9/31.1 (%) for YA and 83.3/16.7 (%) for EA. The mean ages were 41.5 ± 10.2 years and 69.8 ± 4.8 years in the younger and elderly groups.

Symptoms

In this paper we have questioned most common asthma symptoms such as cough, wheezing, dyspnea and chest tightness in both young and elderly asthmatic population. We have found that there is a significant difference in cough symptom between two populations.

Elderly patients (88.1%) present with cough more frequently than younger patients (68.6%) according to reported data by patients ($p < 0.001$).

Cough is also present as most common asthma symptom in elderly patient with 88.1%. However we have found no statistically meaningful distinction for wheezing, dyspnea or chest tightness. Wheezing is present in 53.4% of young and 50% of elderly. Dyspnea is present in 70.8% of young and 78.6% of elderly. Chest tightness is present in 65.7% of young and 66.7% of elderly.

The duration of asthma symptoms in YA group is 25.6 ± 17.9 years, in EA is 4.9 ± 3.5 years ($p < 0.001$).

Smoking History

We have found that elderly patients (2.4%) smoke less than younger patients (13.1%) ($p < 0.001$). Analyzing patients for their ex-smoking status or



Table 1. Pulmonary function test measurements

	Young asthma (YA)	Elderly asthma (EA)
FVC (L)	3.27 ± 1.3	2.28 ± 1**
FVC (%)	96.2 ± 17.5	93 ± 16.4**
FEV ₁ (L)	2.34 ± 1	1.49 ± 0.6**
FEV ₁ (%)	81.6 ± 19.8	72.4 ± 11**
FEF ₂₅₋₇₅ (L/s)	0.57 ± 1.08	1.25 ± 1.68**
FEF ₂₅₋₇₅ (%)	64.2 ± 26	43 ± 16.7**
Reversibility (%)	16.8 ± 15.9	11.6 ± 6.3
DLCO predicted < 80% Patients (N%)	11.2%	52.4%***

** p< 0.01.
*** p< 0.001.
FVC: Forced vital capacity, DLCO: Diffusion lung capacity for carbon monoxide.

non-smoking status have not brought out any remarkable information. It is shown that 19.3% of YA patients and 16.7% of EA patients were ex-smoker and 67.6% of YA patients and 81% of EA patients were non-smoker.

Risk Factors

While questioning well-known risk factors for asthma, we did not find any significant difference between young and elder population. 18.4% of YA and 19.4% of EA patients have described parental history of asthma. Any allergy with history and positive prick test was present in 49.3% of YA and 34.7% of EA. Body mass index assessments (mean ± SD) were 26.2 ± 5.8 for YA and 29 ± 3.6 in EA (p< 0.01). Pet sensitivity is found in 12.7% of YA and 9.5% of EA. NSAID hypersensitivity is found in 6.8% of YA and 7.2% of EA (p> 0.05). Carpet covering floor is present in 1.1% of YA whereas it is found in none of EA (p> 0.05). Using stove for home heating is described in 6.6% of YA and 2.4% of EA (p> 0.05). Indoor mold is reported in 14% of YA and 11.9% of EA (p> 0.05). Outdoor pollution is described in 33.3% of YA and 31.9% of EA (p> 0.05). Patients occupations were very different in groups to classify, but only 9 patients 2.4% noted as occupationnal or occupation exacerbated asthma in YA group. None in EA group was noted as occupationnal or occupation exacerbated asthma.

Comorbidities

Comorbidities influence disease course and help to recognize allergic component of asthma. Generally speaking, allergic diseases are more common in younger population. Allergic dermatitis is present in

11.5% of YA and 11.9% of EA. 30% of YA and 11.9% of EA have allergic conjunctivitis diagnosis (p< 0.01). Rhinosinusitis is present in 58.2% of YA and 44.4% of EA (p< 0.05). Gastroesophageal reflux disease (GERD) is described in 48.6% of YA and 46.5% of EA. Diabetes mellitus and hypertension contributes reduced life quality in asthma, especially when uncontrolled long course is present. We have found that 2.8% of YA and 12.2% of EA have diabetes mellitus and 15.5% of YA and 22.9% of EA have hypertension.

Pulmonary Function Tests and Asthma Control

In this study we have reviewed forced vital capacity (FVC), forced expiratory volume in one second (FEV₁), FEV₁/FVC ratio, forced expiratory flow at 25-75 (FEF₂₅₋₇₅), bronchodilator reversibility and diffusing capacity of the lung for carbon monoxide (DLCO) results. The high percentage of EA patients with DLCO < %80 of predicted value with 52.4% was unexpected result of the study. Asthma control test (ACT) (5-25) results were 14.6 ± 5.2 in YA and 18 ± 6.5 in EA. Only 32% of the YA and 34% of the EA have ACT ≥ 20. Full data of pulmonary function test measurements is available as Table 1.

Medications and Inhaler Device Usage

Inhaled corticosteroids (ICS) are mainstay treatment of asthma along with long acting beta agonists (LABA) in all ages. We have compared final therapies and appropriate inhaler device usage between young and elder population. The results indicated that elderly patients use combined therapies (ICS + LABA) more than younger patients. It is shown that 60.1% of YA and 83.3% of EA are on combined therapy (p< 0.01).

Using ICS as single therapy is reported in 22.4% of YA and 16.9% of EA. Other anti-asthmatics are used in 32.2% of YA and 35.6% of EA. We have asked to patients to show their inhaler device usage to assess proper usage of inhalers and found that 83.7% of YA and 79.4% of EA use their inhaler device truly.

Emergency Room Visits and Hospitalization

Emergency room visits (ERV) and hospitalization ratios are analyzed based on 2016-2017 year hospital records. It is found that elderly patients have visited emergency rooms and been hospitalized more than younger patients. 26.4% of EA and 14.1% of YA have visited emergency room at least once and 15.1% of EA and 6% of YA were found to be hospitalized ($p < 0.001$).

DISCUSSION

The aim of this study was to compare asthma features and management between young and elderly asthmatics to address challenging points in EA. As the population is aging, EA will present a greater future management issue. Therefore, it is imperative that research efforts focus on characterization of EA to enhance diagnostic and treatment strategies for this vulnerable population (10).

Demographics and Symptoms

In this study, we have found that asthma is more common in females, regardless of the age which is concurrent with the study done by Kynck et al (11).

Our data suggests that cough is more common in elderly; however considering multifactorial etiology it may not be a fully objective finding to show severity. Chest imaging and review of medication lists may be very helpful in distinguishing these other causes of cough from the cough due to asthma (12).

On the other hand, elderly people smoke less than younger people according to our data and Çakmakçı Karadoğan D et al. data (13). This is not concurrent with higher cough frequency and lower asthma control in elderly. We could not evaluate second-hand smoking factor in this study; therefore a more comprehensive assessment about smoking status might be needed.

Risk Factors and Comorbidities

PARFAIT Study demonstrated a lot of risk factors for adult asthma (14). Comparing well-known risk factors for asthma between YA and EA did not point out

any significant risk factor difference. Comorbidities in asthma worsen disease severity and Quality of Life (QOL) in all individuals (15). Atopy related comorbidities such as allergic conjunctivitis, rhinosinusitis found more common in YA. Clearly, it favors ATS workshop report that describes atopy as less common in elderly (10). In contrast, diabetes mellitus and hypertension is more common in EA, respectively.

GERD increases with age, likely due to age-associated reductions in lower esophageal sphincter pressure, and this may contribute to asthma exacerbations (16,17). We detected GERD with similar percentages in YA and EA.

Non steroid anti-inflammatory drug hypersensitivity is one of the risk factors for asthma was found similar in elderly and young asthma groups (13). In our study this rate was not different in two groups. Occupation is an other risk factor of asthma exacerbation but as the working time occupation of the retired EA group was not noted for every patient, only 2.4% evaluated as occupational or occupation exacerbated asthma in YA group.

Pulmonary Function Tests

Spirometry is the key to diagnose asthma objectively in all ages and parameters evaluated requires age appropriate consideration. Spirometry may also help to understand aging related changes better, thus pathophysiology of asthma in elderly. Different measurements between YA and EA did not provide data for clinical implementation. Nevertheless, it is still essential to diagnose and follow up asthmatics without doubt. Bronchodilator reversibility of the two groups were similar ($p < 0.05$). Elderly asthma reversibility have already demonstrated in other studies (10, 12). FEF_{25-75} attributed as small airway disease parameter was decreased in our study like FEV_1 and FVC. We think this decrease is do to aging lung as mentioned by Bowdish DMW (18). Percentage of patients with whose predicted DLCO (DLCO predicted %) less than 80%, was higher in the elderly (52.4%) compared to young group (11.2%); and without fixed airflow obstruction pattern this was a surprising finding that is not previously reported. Tamada et al. demonstrated that half of the patients with fixed airflow obstruction in elderly asthma show coexisting COPD components when assessed by DLCO predicted % and high resolution computed tomography (19). Phenotyping EA patients based on spirometry differences may be one of the future proj-

ects for researchers. The patients display features of both asthma and COPD are labeled as ACO (Asthma COPD Overlap) (7). A lot of study demonstrated that the mean age of ACO patients is higher than asthma, they have both asthma finding like reversibility, positive prick test, rhinosinusitis comorbidity and COPD finding like low pulmonary function, low diffusion capacity, fixed airway obstruction (7,20). If ACO and EA patients group characteristics did not followed at least one or two years it can be a confusion for the clinicians. Especially unattended low diffusion capacity finding for EA group must be tested with ACO and healthy volunteers in future studies.

Asthma Control and Medications

Compared to younger adults, a significant number of older individuals with asthma have poorly controlled asthma, which can lead to increased numbers of prescriptions of asthma medications, hospitalizations, and deaths (4,13,21). Among our patients, combined therapy (ICS + LABA) usage is more common in EA. On the contrary, ERV and hospitalization ratios are higher in EA. This data is coherent with the results of an analysis of a large nationwide U.S. database for emergency department (ED) visits and hospitalizations between 2006 and 2008, published by Tsai et al. (5). Poorer outcomes in EA despite more advanced treatments suggest that further focus on EA management strategy is required. Another issue with medications is polypharmacy which is way more common in elderly due to their comorbidities, respectively. It has been documented that polypharmacy is a predictor of hospitalization, emergency department visit, and mortality in the elderly (22). Reviewing all medications carefully at every appointment might be beneficial in elderly in order to assess any change in drug efficacy and drug interactions.

Emergency Room Visits (ERV) and Hospitalization

ERV and hospitalization ratios are reliable indicators of poor control in both YA and EA. In an adjusted analysis, the use of inhaled corticosteroids was associated with an 8% (95% CI, -2%-17%) relative reduction in the combined rate of recurrent hospitalization for asthma or all-cause mortality, compared to those who did not use these medications (23).

Considering our results with higher ERV and hospitalization ratios for EA despite higher rates of ICS + LABA treatment, controlling asthma in elderly might

require more comprehensive assessment including comorbidities; rather than just focusing on ICS treatment. Although we have no identified the exact origin of ERV and hospitalization in this study, infection was the main trigger for deterioration. A prospective study by Beasley et al. showed that viral respiratory infections may cause exacerbations of asthma in adults, which can be severe (24). Although influenza vaccination is recommended for all patients with asthma, it is underutilized in the elderly patient with asthma (25,26). It is clear that elderly people are more vulnerable to infections including viral in origin, therefore more frequent and patient tailored follow-ups that assess immunity and vaccination status of patients is beneficial in elderly for better control. Another cause of high ERV might be low adherence to treatment but it was not well documented in our files and there are conflicting results of the adherence in the elderly in different studies (27,28). Phenotyping elderly asthmatics may be different than whole asthma patients in our country, demonstrated in PHENOTURK Study (29).

Limitations

The study is designed as a cross-sectional analysis for collecting real-life data; therefore we were not able to challenge our findings. The number of patients followed during at least one year was relatively low for elderly group. Poor documentation of adherence to treatment, a key element in asthma control, might be another limitation for this study. Additionally, our results that reflect patients from one tertiary university hospital does not take secondary and primary care patients into account.

CONCLUSION

To put it briefly, EA patients were presented with cough generally in spite of their lower smoking frequency. Classical atopy relationship with asthma was not typical for EA, unlike YA. However elderly patients have an increased risk of diabetes mellitus and hypertension. Half of the EA patients showed low diffusion capacity. Finally, although they use more advanced treatments such as combined therapies, clinical outcomes were poorer according to ERV and hospitalization ratios. Considering all, a more patient-tailored approach along with further research to shed light on EA is necessary to provide better healthcare.

CONFLICT of INTEREST

The authors reported no conflict of interest related to this article.

AUTHORSHIP CONTRIBUTIONS

Concept/Design: All of authors.

Analysis/Interpretation: All of authors.

Data Acquisition: All of authors.

Writing: All of authors.

Critical Revision: All of authors.

Final Approval: All of authors.

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