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Abstract

Background: It is important to understand the factors associated with seasonal asthma attacks among children so we can evaluate them appropriately.

Aim: The study examined the seasonal variation of asthma-related emergency department visits by children in Istanbul.

Methods: This descriptive study examined all paediatric patients with asthma who visited the paediatric emergency department of a tertiary hospital in Istanbul, Türkiye, between January 2017 and December 2022. Asthma diagnosis was based on physical examination and clinical history of the patients and asthma-related visits during winter, spring, summer, and autumn were considered repeated measurements. Data analysis was done using SPSS 25.0.

Results: Visits by asthmatic children to the emergency department constituted 4.9% of all visits. Some 56.9% of the asthmatic children were male and 43.1% were female. Asthma-related emergency department visits were 10.4% in 2017 and 3.6% in 2022. Visits to paediatric emergency departments due to asthma decreased from 19 685 in 2017 to 7485 in 2022. Between 2017 and 2022, children aged 0–5 years represented the highest proportion of visits (64–72.8%). Asthmatic children aged 0–5 years and 6–11 years were admitted to the hospital mostly in January (13.5%, 13.5%) and December (12.8%, 14.0%). In the age group 12–18 years, the visits occurred mostly in January (11.9%) and March (11.2%).

Conclusion: The frequency and number of asthma-related visits to the paediatric emergency department decreased over the 6-year period of this study. There were increases in visits in October, November, December, and January, and decreases in June, July and August.

Keywords: asthma, children, paediatrics, emergency department, seasonal pattern, Türkiye

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Introduction

Asthma is one of the most common chronic diseases of childhood (1), and the number of cases is increasing worldwide (2). According to the US Centers for Disease Control and Prevention data, 1 out of every 12 children in the United States is diagnosed with asthma, and half of the children with asthma experience an asthma attack at least once a year (3).

In the Republic of Türkiye, the frequency of physician-diagnosed asthma in children varies between 0.7% and 21.2% (4). Asthma attacks in children may require an emergency department visit or hospitalization; and can lead to absenteeism from school, reduced quality of life, and serious social and economic burdens (5). For these reasons, childhood asthma is an important public health concern (6).

The main clinical findings related to asthma are symptoms such as cough, wheezing, shortness of breath and chest pain (5). Disease-related complaints usually begin in the pre-school period,

under the age of 5 years (7). Generally, in this age group, especially between birth and 3 years of age, symptoms are triggered by viral infections rather than allergic causes (8). During this early age period, 75% of children experience a second asthma attack within 3 years of diagnosis (9).

In children aged 7–11 years, asthma symptoms are triggered mostly by allergic reactions (8). Since viral infections are less common in this age group, hospital visits are also less common (10). Remission of asthma symptoms can be seen among children over 12 years of age. Among adolescents, the percentage of clinical remission and remissions confirmed by spirometry have been reported as 36% and 33%, respectively (11).

Asthma attacks can occur at any time of year. Many studies have reported that asthma attacks vary seasonally and occur commonly during autumn and rarely during summer (12,13). In one study, the number of paediatric patients who visited the emergency department with asthma increased between September and November by double the annual average; whereas the number of visits between June and August decreased by 45% (14). In another study, asthma attacks among children under 6 years of age peaked during the autumn and winter months, which are the infectious seasons; whereas among school-age children and adolescents, peaks were observed during 2 different periods: early autumn and the spring pollen season (15).

In terms of asthma control, it is necessary to determine the frequency of asthma attacks among children and to evaluate whether there is any change based on age group. Examining the seasonal variation of asthma attacks among children can facilitate the evaluation of factors that may be associated with the attacks. For this reason, this study examined seasonal variations and yearly changes in asthma-related emergency department visits by children.

Methodology

Study design and patients

All paediatric patients with asthma who visited the paediatric emergency department of a tertiary hospital in Istanbul between January 2017 and December 2022 were included in this descriptive study. The time of visit, age at diagnosis and gender of the patients were evaluated retrospectively. Ages were presented in years.

The International Classification of Diseases, 10th Revision (ICD-10) code J45.00 and its subcodes were accepted for inclusion of asthma patients. No exclusion criteria for the study was defined. All patients with related ICD codes were included. The diagnosis of asthma in children

who visited the emergency department was made by the physician based on the physical examination and clinical history of each patient. Acute asthma attack was treated in the emergency department. Afterwards, patients were referred to paediatric outpatient clinics for follow-up, further investigation and to arrange prophylactic treatment.

Statistical evaluation

The SPSS for Windows 25.0 programme was used for statistical analysis and data entry. In the study, median, minimum and maximum values, numbers (n) and percentages (%) were used for descriptive data. The percentages of visits to the emergency department were presented with graphics.

Asthma-related visits during winter, spring, summer and autumn in the Republic of Türkiye were considered as repeated measurements. Visit percentages were converted into decimals in the form of ratios. Since the normal distribution was not observed, the Friedman test was used for the statistical analyses of the seasonal change of asthma-related visits to the paediatric emergency department. A P value of

Ethics
Approval for the study was granted by the ethics

committee of the relevant institution on 24 November 2022 (number: 351). Since data was obtained retrospectively from the hospital records without communicating with the patients, the informed consent form was not necessary.

Results

In our study, 1 087 174 patients were admitted to the paediatric emergency department between January 2017 and December 2022. Of those admitted for asthma, 56.9% were male and 43.1% were female. The median age was 3 years (0–17 years).

In the six-year period between 2017 and 2022, the numbers of visits to the paediatric emergency department for all causes were 188 883, 198 460, 212 240, 106 447, 171 962 and 209 182, respectively. Within this period, visits to the paediatric emergency department due to asthma accounted for 4.9% of all visits (n=52 810).

Between 2017 and 2022, the rates of visits to the paediatric emergency department due to

asthma were 10.4%, 6.7%, 3.8%, 1.9%, 1.3% and 3.6% for each year, respectively. While the number of visits to the paediatric emergency department due to asthma was 19 685 in 2017, this figure decreased to 7485 in 2022 (see Table 1).

The age groups of asthmatic children who visited the emergency department for each year was evaluated (see Figure 1). Of the visits in 2017, 72.8% (n=14 334) were 0–5 years old, 19.4% (n=3815) were 6–11 years old and 7.8% (n=1536) were 12–18 years old. Of the visits in 2018, 69.5% (n=9314) were 0–5 years old, 20.3% (n=2719) were 6–11 years old and 10.2% (n=1362) were 12–18 years old. In 2019, these percentages were 68.7% (n=5484), 20.2% (n=1608) and 11.1% (n=885), respectively. The percentages in 2020 were 64.0% (n=1308), 17.9% (n=366) and 18.1% (n=369), respectively. In 2021, these percentages were 70.3% (n=1565), 16.6% (n=369) and 13.1% (n=291), respectively. In 2022, 72.7% (n=5445) of asthma patients were 0–5 years old, 18.2% (n=1359) were 6–11 years old and 9.1% (n=681) were 12–18 years old.

In all months, the highest rates of visit were in the 0–5 years age group, whereas the lowest rates of visit were in the 12–18 years age group. In March–May among all visits, those of patients aged 0–5 years decreased, whereas those of patients aged 12–18 years and 6–11 years increased (see Figure 2).

The changes in visits to the emergency department due to asthma, by month over a 6-year period, were evaluated by age group (see Figure 3). For patients aged 0–5 years, the highest number of visits was in December and January, with 13.5% for each of these months; and the lowest numbers were in July and August (4.5% and 4.9%, respectively). Among patients aged 6–11 years, the highest numbers of visits were in December and January (14.0% and 12.8%, respectively); and the lowest numbers were in July and August (3.5% and 3.8% in July and August, respectively). In patients aged 12–18 years, the highest numbers of visits were in January and March (11.9% and 11.2%, respectively); and the lowest numbers were in June, July and August (5.3%, 5.9% and 5.3%, respectively).

The changes in number of asthma-related emergency visits according to month between 2017 and 2022 were evaluated (see Figure 4). In general, there were increases in visits in October, November, December and January; and decreases in June, July and August. However in 2020, while the visits were mostly seen in January and February, visits were fewest in April, May and June.

The statistical significance of the seasonal variation of asthma-related visits to the paediatric

emergency department was analysed with the total rates of visits in 4 seasons (winter, spring, summer and autumn). The decrease in asthma-related visits in the summer months was found to be statistically significant (P=0.009).

Discussion

This study examined the seasonal variation of children's asthma-related visits to the emergency department and the frequency of these visits by age group and year.

Visits to the paediatric emergency department due to asthma between 2017 and 2022 constituted 4.9% of all visits. Both the number of such asthma-related visits and the ratio to all visits decreased in general over the years. An increase was observed only in 2022 compared to 2020 and 2021; however, the percentages of visits to the emergency department due to asthma remained lower than in 2019, which was before the COVID-19 pandemic. The reason for this can be interpreted as a decrease in the rates of upper and lower respiratory tract viral infections among children and a decrease in asthma attacks triggered by infection due to the measures taken during the pandemic.

In one study, asthma-related hospital visits of paediatric patients decreased by 44% in 2020–2021 compared to 2019–2020. However, in the same study, the percentage of visits with a diagnosis of asthma among the total number of visits increased from 5.96% to 14% (16). In a study conducted in Nigeria, the percentage of paediatric emergency visits due to asthma decreased over a five-year period, from 3.6% in 2014 to 1.7% in 2018 (17). In another study, the number of patients admitted to the paediatric emergency department for asthma increased between 2007 and 2012 (14).

The differences in study results may be due to exposure to air pollutants in different settlements, environmental allergens, such as pollen, sociocultural and economic differences, and differences in the health systems of different countries that may affect emergency department visits.

With the exception of 2020, more than two-thirds of the patients were 0–5 years old, while the lowest percentage of visits was observed in patients aged 12–18 years. In 2020, while the 0–5 age group visited paediatric emergency departments to a large extent, the percentage of visits by children aged 12–18 years was slightly higher than those aged 6–11 years. Similarly, in the literature, 63.5% of children who visited the emergency department with asthma were aged 0–5 years (18).

In another study, the majority of children who visited the emergency department due to asthma were aged 1–4 years (41.6%), whereas those aged 12–16 years were the least likely to visit (10.9%) (17). Similarly, in a single-centre study in Italy, 76.1% of the patients who visited the paediatric emergency department for asthma were under the age of 6 years (15).

Asthmatic children aged 0–5 years and those aged 6–11 years visited the emergency department mostly in January and December; whereas children aged 12–18 years were admitted mostly in January and March. The fewest visits were seen in the summer months across all age groups. A similar study also reported that paediatric emergency visits related to asthma were fewest in the summer months for all ages.

In the same study, while asthma-related emergency department visits among children under 6 years of age were frequently seen in the autumn and winter months, for school-aged children and adolescents, visits were frequently seen in early autumn and April–May (15). While asthma symptoms are mostly triggered by respiratory tract infections in preschool children, for older children they are triggered by allergens and climate changes (8).

In our study, the increase in asthma-related visits in December and January is probably due to the increase in the frequency of respiratory tract infections during the winter months. The increase in March seen among older children may be due to exposure to seasonal allergens, such as pollen, triggering asthma symptoms.

In general, asthma-related emergency department visits increased in October, November, December and January, and decreased in June, July and August. In 2020, while visits occurred mostly in January and February, the lowest rates were observed in April, May and June. A similar study reported that asthma-related visits to paediatric emergency departments decreased with the COVID-19 outbreak (19).

Personal protective measures, such as hand-washing, use of masks, and physical and social distancing, were taken to prevent the spread of the COVID-19 virus (20). Since such measures can also protect against other viral respiratory infections, the decrease in asthma-related emergency department visits in April, May and June 2020 may be attributed to the decrease in asthma cases triggered by viral infections (21).

In another study, the percentage of visits to the paediatric emergency department due to asthma similarly decreased during the pandemic compared to the average of the previous 3 years (22). Asthma-related visits also decreased at a higher rate than visits for all causes. This suggests that the decrease in visits is not only due to the reluctance to seek care in health institutions (22).

Limitations and strengths

The evaluation of visits to the emergency department of a single health institution in our study creates a limitation in terms of generalizing the results. Since our study was of a retrospective nature, data on disease severity could not be evaluated, which is another limitation. Despite this, the large sample size and the evaluation of the visits over a long time period (6 years) strengthen the study results.

Examining the asthma-related emergency department visits by year and the changes in frequency by season and age group contribute significantly to the literature with a broad perspective on this subject.

Conclusion

In general, the percentage and number of asthma-related visits to the paediatric emergency department over a 6-year period decreased, from 10.4% in 2017 to 3.6% in 2022. Visits increased in October, November, December and January, and decreased in June, July and August. However, among patients aged 12–18 years, an increase was observed in March.

The decrease in asthma-related visits during the summer months was found to be statistically significant. We suggest for further studies that data should be analysed by statistical time series modelling to find risk factors and to forecast asthma visits.

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Conflict of interest: None declared.

Tendances saisonnières des consultations en services d'urgence d’enfants asthmatiques

Résumé

Contexte : Il est important de comprendre les facteurs associés aux crises d'asthme saisonnier chez les enfants afin de pouvoir les évaluer de façon appropriée.

Objectif : Analyser les variations saisonnières des consultations en services d'urgence d'enfants souffrant d'asthme à Istanbul.

Méthodes : La présente étude descriptive a examiné tous les patients pédiatriques atteints d'asthme qui ont consulté au service d'urgences pédiatriques d'un hôpital tertiaire d'Istanbul (Türkiye) entre janvier 2017 et décembre 2022. Le diagnostic d'asthme était basé sur l'examen physique et les antécédents cliniques des patients, et les consultations liées à cette pathologie pendant l'hiver, le printemps, l'été et l'automne ont été considérées comme des mesures répétées. L'analyse des données a été effectuée à l'aide du logiciel SPSS 25.0.

Résultats : Les consultations d'enfants asthmatiques en services d'urgence représentaient 4,9 % du nombre total de consultations. Environ 56,9 % des enfants asthmatiques étaient de sexe masculin et 43,1 % de sexe féminin. Les consultations en services d'urgence liées à l'asthme s'élevaient à 10,4 % en 2017 et à 3,6 % en 2022. Le nombre de consultations en services d'urgence pédiatriques dues à l'asthme a diminué, passant de 19 685 en 2017 à 7 485 en 2022. Entre 2017 et 2022, les enfants âgés de 0 à 5 ans représentaient la part la plus importante des

consultations (64-72,8 %). Les enfants asthmatiques âgés de 0 à 5 ans et de 6 à 11 ans étaient admis à l'hôpital principalement en janvier (13,5 %, 13,5 %) et en décembre (12,8 %, 14,0 %). Dans la tranche d'âge des 12-18 ans, les consultations survenaient principalement en janvier (11,9 %) et en mars (11,2 %).

Conclusion : La fréquence et le nombre de consultations en services d'urgences pédiatriques liées à l'asthme ont diminué au cours des six années couvertes par cette étude. Le nombre de consultations a connu une augmentation au cours des mois d'octobre, novembre, décembre et janvier, puis une diminution au cours des mois de juin, juillet

et août.

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WHO EMRO | Seasonal pattern of emergency department visits by children with asthma

تشرين الأول، ونوفمبر / تشرين الثاني، وديسمبر / كانون الأول، ويناير / كانون الثاني،
وحدثت كذلك انخفاضات في يونيو / حزيران، ويوليو / تموز، وأغسطس / آب.

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