



Epidemiology of asthma

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Purpose of review

This article reports the findings of recently published research articles and Centers for Disease Control (CDC) data on the epidemiology of asthma. Numerous otolaryngologic diseases are associated with asthma, such as allergic rhinitis, chronic rhinosinusitis, and obstructive sleep apnea. In addition, asthma causes a significant health burden and its prevalence is increasing.

Recent findings

Currently, 8.4% of persons in the United States have asthma as compared with 4.3% of the population worldwide, and both numbers are on the rise. The average annual asthma prevalence is higher in children (9.5%) than adults (7.7%). The prevalence of asthma is higher in black persons than white persons, and the ethnicity most affected is the Puerto Rican population. Asthma prevalence increases with each successive lower poverty level group. There are interesting relationships between asthma and certain otolaryngologic diseases. The impact of asthma on both morbidity and mortality is particularly noteworthy.

Summary

The prevalence of asthma is increasing both domestically and globally. The impact is most significant in the minority and lower socioeconomic populations. Future research should work to elucidate the reasons for this increase in asthma and promote better access to care for persons across all ethnic and socioeconomic classes.

Keywords

asthma, asthma children, asthma minorities, asthma prevalence, epidemiology

INTRODUCTION

Epidemiologic data have shown that over the last few decades, the prevalence of asthma has increased both domestically and globally [1,2]. Therefore, it is no surprise that asthma has become not only a major national health issue, but also a significant global health issue. This review aims to present the most recent statistics and epidemiologic data concerning the domestic and global prevalence, age, race/ethnicity, sex, and socioeconomic classes associated with asthma. The trends in asthma epidemiology as well as the substantial health burden of this disease process are also discussed. A specific focus on the impact of asthma in otolaryngologic disease is presented.

TEXT OF REVIEW

Domestic impact

The most recent Centers for Disease Control (CDC) asthma epidemiology statistics were published in 2012 for the 2001–2010 decade. A major finding was that the number of persons with asthma

increased 2.9% each year, with 20.3 million persons carrying a diagnosis of asthma in 2001 and 25.7 million persons having this diagnosis in 2010 [1]. This national surveillance report estimated asthma prevalence in the United States population to be 8.4% in 2010. This is a dramatic increase from reported asthma prevalence in past years, with prior CDC reports documenting the prevalence of asthma in the United States as 3.0% in 1970 [3,4] and 5.5% in 1996 [5]. The most up-to-date statistics can be found on the CDC website, where they provide an early release of data from their January–March 2015 National Health Interview Survey, citing that 8.2% of persons of all ages in the United States currently have asthma [6].

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KEY POINTS

- The domestic prevalence of asthma increased 2.9% each year from 2001 to 2010 (20.3 million persons in the United States had asthma in 2001 as compared with 25.7 million in 2010); the global prevalence of asthma is approximately 300 million people or 4.3% of the worldwide population and is also on the rise.
- Current asthma prevalence is higher in black persons (11.2%) than in white persons (7.7%), and is highest in the Puerto Rican population (17.0%) and lowest in the Mexican-American population (3.9%).
- There is a male predominance in the diagnosis of asthma prior to puberty, but a higher prevalence in females in adulthood, as well as more severe cases of asthma in women than in men.
- Asthma prevalence has been shown to be higher with each successive lower poverty level group, and disparities exist with asthma diagnosis and treatment based on race, ethnicity, and income.
- Data regarding quality of life issues, morbidity, and mortality for people with asthma are astounding, with 3404 deaths from asthma in 2010 alone.

Global impact

Asthma is a nonreportable disease. Therefore, it is difficult to determine its global prevalence since differences exist in regards to diagnostic protocols and access to healthcare. Furthermore, many asthma patients may be undiagnosed, as a recent study from Russia demonstrated that 6.9% of adults answering a questionnaire reported an asthma diagnosis, but 25.7% of the same population reported asthma symptoms [7[•]]. According to Croisant's epidemiology section in the textbook *Heterogeneity in Asthma* published in 2014, approximately 300 million people or 4.3% of the world's population suffer from asthma [8^{••}]. A recent study from Italy has confirmed that asthma is on the rise in countries outside of the United States, as they showed an increase in asthma prevalence in Italy from 3.4 to 7.2% over an approximately 25 year study period [9^{••}]. The Global Initiative for Asthma estimates that there will be an additional 100 million people with asthma by the year 2025 [2].

Domestic vs. global impact

A 2014 study by Iqbal and colleagues [10[•]] demonstrated that the prevalence of asthma is higher in the United States than in other countries, and even more interesting is that higher asthma rates were noted in those people who have lived in the United States for 10 years or more compared with those who

have lived in the United States for less than 10 years. As stated above, the global prevalence of doctor-diagnosed asthma is 4.3%, but this number varies between countries. Notably, a very high rate of doctor-diagnosed asthma is reported in Australia at 21.0% [11]. Interestingly, within developed countries, such as Australia, asthma is more common among the economically disadvantaged, yet in developing countries an asthma diagnosis is more common among the higher class. This topic of socioeconomic status as it relates to asthma will be further discussed later in this article.

Impact on age

In terms of age, 18.7 million of the 25.7 million persons with asthma in the United States in 2010 were adults (with 3.1 million being age 65 or older), and 7.0 million were children [1]. Similarly, the National Health Interview Survey reported that 6.7 million or 9% of children ages 0–17 years in the United States had asthma in 2007, with a lifetime prevalence as high as 13% [12]. The global prevalence of pediatric asthma is reported to be approximately 14%, and similarly to the adult group, is rising [13]. In fact, from 2008–2010, the average annual asthma prevalence was higher in children aged 0–17 years (9.5%) than in adults aged 18 and over (7.7%) [1]. A recent study of school children in Poland (ages 7–10 years) showed an increase in asthma prevalence from 3.4% in 1993 to 12.6% in 2014 [14[•]].

Impact on race and ethnicity

The breakdown of race and ethnicity in asthma was reported by the CDC in 2002 with the following results: a 7.6% prevalence in the non-Hispanic White population, 9.3% in the Black population, 2.9% in the Asian population, 1.3% in the Native Hawaiian/Pacific Islander population, 11.6% in the American Indian/Alaska Native population, 5.0% in the Hispanic population, 15.6% in the Multiracial (non-Hispanic) population, and 7.2% in the Other (non-Hispanic) population [15].

More current numbers indicate that 19.1 million persons with asthma in 2010 were white and 4.7 million were black, and current asthma prevalence was higher in black persons (11.2%) than in white persons (7.7%) [1]. In terms of ethnicity from the 2008 to 2010 time period, Hispanic and Puerto Rican persons had a higher asthma prevalence (16.1%) as compared with Mexican persons (5.4%) [1]. Other data corroborate these findings by demonstrating the highest asthma prevalence in the Puerto Rican population (17.0%) and the lowest

prevalence in the Mexican-American population (3.9%) [16]. Looking at the CDC's early release statistics from January–March 2015, for children under 15 years of age, the sex-adjusted prevalence of asthma was higher among non-Hispanic black children (17.7%) than among Hispanic children (6.8%) and non-Hispanic white children (6.9%); and for people over 15 years of age, the sex-adjusted prevalence of asthma was 7.4% for Hispanic persons, 8.1% for non-Hispanic white persons, and 9.9% for non-Hispanic black persons [6^{***}].

It is also important to note that disparities exist with asthma diagnosis and treatment based on race, ethnicity, and income. For example, blacks had a higher rate of emergency department visits for asthma, more hospitalizations per 100 persons with asthma, and a higher asthma death rate per 1000 persons with asthma as compared with whites from 2007–2009 [17]. A higher prevalence of asthma morbidity and mortality in black and Latino children living in low socioeconomic societies vs. whites has also been demonstrated, with possible reasons for this disparity being poorer access to treatment and a high allergen environment related to their housing conditions [18].

Impact on gender

In terms of gender, studies have shown a male predominance in the diagnosis of asthma prior to puberty, but a higher prevalence in females in adulthood, as well as more severe cases of asthma in women than in men [19]. The CDC statistics for the period of 2008–2010 corroborate these findings, reporting that asthma prevalence was higher in females (9.2%) than in males (7.0%), and also demonstrating a difference in males vs. females by age group [1]. For example, boys (0–17 years) had a higher prevalence than girls (11.1% compared with 7.8%) and men (≥ 18 years) had a lower prevalence than women (5.7% compared with 9.7%) [1]. Again referring to the CDC's early release statistics from January–March 2015, the prevalence of asthma was higher among females than males for persons age 35 and older [6^{***}]. Furthermore, males 35 years of age and older were less likely to have asthma than males under 15 years of age, whereas females 35 years of age and older were more likely to have asthma than females under 15 years of age [6^{***}].

Impact on socioeconomic status

Asthma prevalence has been shown to be higher with each successive lower poverty level group [1]. From 2001–2010, asthma was more prevalent among persons with a family income less than

100% of the federal poverty threshold level (11.2%). This is compared with 8.7% for persons with incomes 100–200% of the poverty level, and 7.3% for persons with incomes at least 200% of the poverty level [17]. A recent study evaluated asthma prevalence in inner-city vs. noninner-city United States children, and found that the prevalence of current asthma was 12.9% in inner-city and 10.6% in noninner-city areas. After adjusting for race/ethnicity, region, age, and sex, it was found that this difference was not significant. However, black race, Puerto Rican ethnicity, and lower household income were independent risk factors for asthma rather than living in an inner-city area [20^{*}].

Impact on otolaryngologic diseases

There are interesting relationships between asthma and other otolaryngologic diseases that also affect the airway, such as allergy rhinitis, chronic sinusitis with nasal polyposis, obstructive sleep apnea (OSA), and gastroesophageal reflux disease. In adult asthmatics, the prevalence of allergy rhinitis is as high as 80% [21] and the prevalence of chronic sinusitis with nasal polyposis is as high as 65% [22^{*}]. Conversely, asthma prevalence is as high as 40% in allergy rhinitis patients [21] and as high as 35.1% in patients with OSA [23]. In a recent study by Madama and colleagues [24^{*}], OSA was diagnosed in 57.4% of adults with asthma who underwent a sleep study, a number that is higher than the percentage of OSA in the general population. Lastly, asthma patients are three times more likely to have gastroesophageal reflux disease, and 64% of asthma patients have improvement in asthma symptoms with reflux treatment [25].

Asthma trends

The epidemiological trends of asthma are as follows: asthma prevalence has increased at a rate of 1.4% per year in the pediatric population (0–17 years) and at a rate of 2.1% per year in the adult population (18 years and older). Current asthma prevalence has increased at a yearly rate of 1.8% for both males and females. Trends in race include a yearly rate increase of 1.4% among the white population and a yearly rate increase of 3.2% among the black population; whereas trends in ethnicity include a yearly rate increase of 3.2% among Hispanic persons (7.2% of the population in 2010) and a yearly rate increase of 1.9% among non-Hispanic persons (8.7% of the population in 2010) [1]. A recent study by Yoo *et al.* [26^{*}] demonstrated a nationwide increase in asthma prevalence of 1.2-fold in the outpatient setting and 1.3-fold in the inpatient setting over a 9-year period.

Impact on geographic region

There are also differences in asthma prevalence by geographic region. From 2008–2010, it was highest in the Northeast (8.8%), followed by the Midwest (8.7%), the West (8.0%), and then the South (7.6%). Asthma prevalence did not differ between metropolitan and nonmetropolitan areas [1], but a recent study by Lundback and colleagues [27[•]] reports an increase in asthma associated with urbanization, especially among young people living in urban areas of lower level income countries.

Health burden

Data regarding quality of life issues, morbidity, and mortality for people with asthma are astounding. A National Health Statistics Report published in 2011 accounted 1.75 million emergency department visits for asthma exacerbations and 456 000 asthma-related hospitalizations in the year 2007 [28]. In 2008, 10.5 million school days and 14.2 million work days were missed because of asthma, which is an average of four missed school days for children and five missed work days for adults [28,29]. A recent burden of childhood disease analysis was performed, which showed that asthma and allergies were the most prevalent childhood diseases. However, these diseases were associated with the least amount of burden compared with other childhood diseases such as cerebral palsy [30[•]]. The overall number of deaths because of asthma in 2010 alone was 3404 [29].

CONCLUSION

Asthma is a significant domestic and global health issue that is currently on the rise, especially in lower socioeconomic classes with less access to appropriate healthcare. With current data predicting a continued rise in the future, the health burden of this disease process is even more concerning. Future research should focus on elucidating the reasons for this continued increase in asthma prevalence and work to promote better access to preventive education and healthcare treatment across all ethnic and socioeconomic classes.

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Conflicts of interest

There are no conflicts of interest.

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- of special interest
- of outstanding interest

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