

The rising trend of asthma prevalence in urban school children of Jaipur: A questionnaire based study

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Abstract

Objective: The objective of this study is to assess the current prevalence of asthma and other allergies in urban school children of Jaipur and further to assess the increasing trend.

Materials and Methods: A cross-sectional study was conducted among 2925 urban school children (5–15 years) of Jaipur using a modified school-based-allergy and asthma screening questionnaire.

Results: Among 2925 children screened, 24% (702) were labeled as probable asthmatics of which 18.2% (532) were diagnosed to have asthma, and only 6.2% had previously diagnosed asthma by physician.

Conclusion: The current prevalence of asthma is 18.2% which is on a rapidly rising trend and despite its high prevalence; the disease still remains highly underdiagnosed in children.

Keywords: Bronchial asthma, children, prevalence

Introduction



Globally, the prevalence of asthma and allergy in children has been an increasing problem in the last few decades. It is not only just a public health problem for developed countries but also in developing countries.^[1] The International Study of Asthma and Allergies in Childhood (ISAAC)

study showed wide variations in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema. The highest prevalence (>20%) was generally observed in Latin America, Australia, Europe, North America, and South Africa. The lowest prevalence (<5%) was observed in the Indian subcontinent, Asia-Pacific, the Eastern Mediterranean, and Northern and Eastern Europe.^[2] Differences between countries may be due to factors such as lifestyle, dietary habits, socioeconomic differences, difference of awareness, and environmental factors.^[3]

Various studies from India have reported a prevalence of asthma varying from 3.5% to 29.5%.^[4] Our own data in 2008 showed the prevalence of asthma in urban school children of Jaipur as 7.59%.^[5] The asthma epidemic of the last few decades may have peaked; however, some studies suggest that the prevalence of asthma has decreased in developed countries in the last few years whereas some studies suggest continuing increase in the prevalence.^[6] Poor outdoor air quality, exposure to indoor allergens, and a stressful life have been associated with increase in the prevalence of asthma and allergic rhinoconjunctivitis.^[7] This increasing trend is particularly seen in urban areas contributed by increasing road traffic, air pollution, and environmental tobacco smoke.^[8]

India is a country with many cities undergoing rapid urbanization and increased awareness; hence, we expect a tremendous increase in the prevalence of asthma and other allergies, especially in urban areas as we experience in our clinical practice. Hence, we conducted this study to know the current prevalence of asthma and to assess whether there is an increase over the past 5 years.

Materials and Methods



Study design and setting

A cross-sectional study was conducted in 2016 in six urban schools of Jaipur.

Study procedures

Six schools in urban areas of Jaipur were randomly selected after taking prior permission from the principal of respective schools to conduct the study. Children between 5 and 15 years of age of either sex were enrolled in this study. Before the study, an asthma awareness program was conducted in each school which included a short 20 min movie in Hindi that provided children and their guardians with an illustrative example of signs and symptoms of asthma, followed by an interactive session between the authors and the children.

A modified school-based allergy and asthma screening questionnaire^[9] was used which has two forms: a parent questionnaire (PQ) and a student questionnaire (SQ). SQ was filled by the students above 10 years of age, and PQ was filled by the parents of children below 10 years of age. This instrument was originally designed in English. A Hindi translation was done which was translated back to English to ensure reliability and validity. Some minor modifications were made, and a few questions related to the severity of asthma and other allergies and family history of allergies were added.

Tools

Modified school-based allergy and asthma screening questionnaire.^[9] This instrument is a reliable, validated, and sensitive tool for allergy and asthma screening purpose. This questionnaire was

administered in four diverse communities and validated against standardized clinical assessments; hence, it is a broadly generalizable tool. Both PQ and SQ types of the questionnaire, use a similar Likert response scales consisting of total 17 items each. Questions 1–10 are related to asthma symptoms; questions 11, 12, and 13 are related to symptoms suggestive of other allergies of eyes, allergic rhinitis, and skin allergies, respectively, and questions 14–17 are related to physician-diagnosed asthma/allergies. In addition, questions related to severity of asthma are included such as day symptoms limiting physical activity, night symptoms disturbing sleep, and school absenteeism. Thus, the modified form of this questionnaire includes all the questions related to symptoms/severity of asthma and other allergies almost similar to ISAAC questionnaire. In addition to this, we also added question related to school absenteeism. For all the questions, “0” was assigned for each “never,” “1” was assigned for each “sometimes” and “A” for lot “ response.” For questions 1–10, the score was added, if it is ≥ 3 , it was considered significant, and child was further evaluated for asthma. A total score of 3 has an estimated sensitivity of 80% and specificity of 70% according to the clinical predictability of the questionnaire in a validation study. For questions 11–13, if score is ≥ 1 , it is to be considered significant, and the child needs to be further evaluated for other allergies. Here, a total score of 1 has an estimated sensitivity of 81% and specificity of 42% according to the clinical predictability of the questionnaire in a validation study.

All those who had a score of ≥ 3 were considered to be probable asthmatics. They were further evaluated by a senior consultant through a detailed history, examination, peak expiratory flow rate (pre- and post-bronchodilation), spirometry, absolute eosinophil count, and bronchodilator reversibility, for further confirmation of diagnosis. Thus, we evaluated the children who actually had asthma among the probable asthmatics. These children were labeled as asthmatics after they had a significant treatment response.

Statistical analysis

Preliminary analysis was descriptive expressed as means (SD), medians (range), proportions and frequencies. Univariate analysis was carried out for associated factors to test the differences between proportions. The $P < 0.05$ was taken as statistically significant.

Ethical approval

The study was approved by the Institute's ethical committee.

Results

In our study, a total of 3377 questionnaires were distributed, of which 2971 were returned (response rate 88%), of these 98.4% questionnaires were fully filled. Thus, finally 2925 questionnaires were evaluated; among these 56.4% were boys and 43.6% were girls with a mean age of 10.06 (± 2.46) years. The majority (61.9%) of children was in age group of 10–15 years and the rest (38.1%) was in 5–10 years. The family history of asthma was present in 11.2% students, and 13.6% had family history of other allergies such as allergic rhinitis/eczema.

The prevalence and comparison of various symptoms related to asthma and its severity are given in [Table 1](#).

Asthma-related variables	Prevalence, n (%) 2016	Prevalence, n (%) 2008 ^[5]
Noisy/whistling (wheezing) sound during breathing ever	567 (19.4)	271 (12.2)
Recurrent cough/noisy breathing (wheeze) in the past 12 months (≥ 4 times/year)	398 (13.6)	177 (8.4)
Daytime symptoms limiting physical activity ^{*,†}	514 (17.6)	281 (12.6)
Night symptoms disturbing sleep ^{†,‡}	312 (10.7)	110 (4.9)
School absenteeism [‡]	222 (7.6)	-
Physician-diagnosed asthma	181 (6.2)	118 (5.3)
Family history of asthma	328 (11.2)	242 (10.9)
Family history of other allergies	398 (13.6)	70 (3.1)
Symptoms of recurrent itchy, watery eyes	547 (18.7)	-
Symptoms of recurrent running/stuffy nose	784 (26.8)	-
Symptoms of recurrent itchy skin rashes	462 (15.8)	-

*Chest tightness or coughing after running, climbing stairs, or playing sports, [†]Wake up at night coughing or due to breathing difficulty, [‡]Symptoms suggesting severe asthma

Table 1: Prevalence and comparison of symptoms related to asthma and its severity in the study population (n=2925)

A total of 702 of the 2925 children screened had score of ≥ 3 and were labeled as probable asthmatics (24%), and after detailed evaluation, 18.2% were diagnosed to have asthma. It is very important to note that only 6.2% children in our study were previously diagnosed to have asthma by physicians whereas 12.9% students were taking some form of medicines for other allergies.

Among the children found to have asthma, 57% were boys, and 43% were girls and the prevalence was higher (71.7% vs. 28.3%, $P < 0.002$) in older age group (10–15 years) as compared to children in 5–10 years age group. More than half of the (56.4%) children with asthma also had associated allergic rhinitis, 30.2% had recurrent and itchy skin, and 40.3% had recurrent, watery, and itchy eyes ($P < 0.01$). The family history of asthma and other atopy was seen in 38.7% and 46.9% of probable asthmatics ($P < 0.004$) [Figure 1].

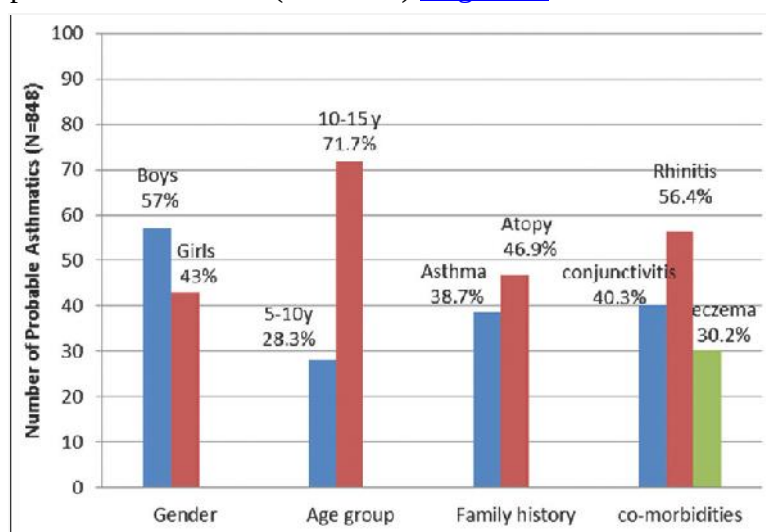


Figure 1: Clinical profile of asthmatics in the study

The prevalence of asthma in 5–15 years urban school children in the current study is 18.2% which is remarkably high as compared to 7.59% reported in our own study in the year 2008 from similar study population.^[5] However, physician-diagnosed asthma was 6.2% which is quite similar to previous data which highlights the fact that despite the rising prevalence, asthma still remains underdiagnosed. Gupta *et al.* suggested that underdiagnosis and maltreatment of asthma was a result of both, poor compliance and socioeconomic conditions of patients along with poor knowledge, attitude, and practice of pediatricians in Jaipur.^[10]

Singh and Singh^[11] in a study conducted in Jaipur during third phase of ISAAC in 2012, revealed that the prevalence of wheeze in the past 12 months was 5.43% and 5.37% and prevalence of severe asthma was 3.42% and 2.89% in 6–7 and 13–14 years of age group, respectively. Whereas our study shows quite a higher prevalence of 13.6% of recurrent wheeze in the past 12 months, and symptoms suggestive of severe asthma, i.e., school absenteeism, night symptoms disturbing sleep, and daytime symptoms limiting physical activity was 7.6%, 10.7%, and 17.6%, respectively, which was also quite high as compared to the former study. This indicates a steep rise in the prevalence of asthma and allergies in past 5 years.

Numerous studies conducted in other urban cities of India also show an increasing prevalence of asthma similar to our study. A study on 20,000 children below 18 years of age from 1979 to 1999 in Bengaluru showed asthma prevalence increasing from 9% to 29.5%. Children from heavy traffic region and low socioeconomic population had the highest prevalence of 31.14% and children from low traffic area school had lowest prevalence of 11.15% ($P < 0.001$).^[4] A study conducted in Mysore, South India in children aged 6–14 years revealed the prevalence of asthma as 17.14% and allergic rhinitis as 21.29%. The corresponding prevalence in 1998, 2003, and 2008 for asthma was 4%, 6%, and 9% and allergic rhinitis was 6%, 9%, and 13%, respectively. The increasing trend observed over 1998–2008 showed a steeper increase over the past 5 years similar to our study.^[12]

In contrast to our study, many studies done in urban cities of India also showed lower prevalence of asthma and allergies. This could be attributed to difference in awareness and other environmental and climatic factors. A study conducted by Gaur *et al.* suggested the prevalence of asthma and rhinitis in total adult population of Delhi to be 11.03% and 11.69%, respectively. The prevalence of asthma was more (13.34%) in rural adults than urban slum (11.92%) and urban city (7.9%) population.^[13] According to Behl *et al.*, asthma prevalence was as low as 2.3% in school children of Shimla aged 6–13 years.^[14] Similarly, the prevalence of ever asthma (2007) was 2.4% in a population study of all age groups conducted at four major centers in India.^[15] The prevalence of asthma and wheeze reported were 3.3% and 7.8%, respectively, in a study conducted at Lucknow (2004), in the age group 13–14 years.^[16] Prevalence of asthma was 5.3%, and 4.2% had an episode of asthma during the past 1 year in children of age group 12–16 years in urban Puducherry. Here, prevalence was similar in both sexes, but younger age group and those with a family history of asthma had a higher prevalence.^[17] Gupta *et al.*, in a study on 9090 adolescent school children in Chandigarh observed a very low prevalence of asthma as 2.6% in males and 1.9% in females.^[18]

Many studies have also shown that the prevalence of asthma is more in urban areas compared to rural areas.^{[4],[12]} A study conducted in 2000 rural school children from Haryana identified the prevalence of bronchial asthma as just 2%.^[19] Similar study in rural schools of Karnataka showed the prevalence of ever wheezers as 8.4% and current wheezers as 5.2%. The wheezing was more prevalent in males and 10–12 age group.^[20]

A recent review analysis of 15 epidemiological studies showed that the mean prevalence of asthma among children was 7.24% with a range of 2.6% to 12.3%. It also showed that childhood asthma in 13–14 age group was lower than in the younger children (6–7 years). This was in contrast to our study which showed childhood asthma more prevalent in 10–15 age group as compared to 5–10 age group. Urban and male predominance was observed with wide interregional variation. ^[21]

The prevalence of asthma varies in different countries globally. Both the World Health survey (2012) ^[22] and Phase 3 of ISAAC study showed that the developed countries had high prevalence in Phase I which showed decreases in Phase III whereas the developing countries had low prevalence and showed an increase gradually. However, countries like India, which had very low prevalence in phase I had a little increase in Phase III, i.e., 0.02% per year in 13–14 age group, and 0.06% per year in 6–7 years age group ^[23] Increased prevalence in developing countries has been associated with urbanization, smoking, and exposure to secondhand smoke.

Thus, our study provides valuable information on rapidly rising burden of asthma on the pediatric population as measured by asthma prevalence in the past decade. Limitations of our study are that of any epidemiological study would be. Changing environmental exposure and rapid urbanization could be one of the strong reasons for this increasing trend, ^[24] which is further supported by the study conducted by Singh and Singh ^[11] indicating that asthma prevalence in school going children of Jaipur was significantly associated with environmental tobacco smoke and traffic pollution in 6–7 and 13–14 years age group, respectively. Another possible explanation is increasing awareness of asthma among both parents and health professionals which was further enhanced by the awareness and health program conducted by us in each school, which is a major strength of our study. This helped us to reduce the confounding associated with lack of symptom recognition and awareness about the disease.

Hence, the prevalence of bronchial asthma and other allergies in children of urban India are increasing at a faster rate than expected. Most of the studies in children have shown a prevalence of 10%–15% as per the WHO, 2006 ^[1] which is almost a decade ago. However, yes, there has been lack of studies in past 5 years showing such high prevalence in an urban city like Jaipur, and this is what our study wants to emphasize on a steep rise of asthma prevalence in a city undergoing rapid urbanization. This would add up to the burden for both children and their families in terms of increased economic burden, school absenteeism, increased morbidity, and mortality. Hence, there is an urgent need for more research in this field to further assess the risk factors of the disease so that adequate measures can be taken to control and treat the high burden of asthma.

Conclusion



The current prevalence of childhood asthma in Jaipur city is 18.2% which is on a rapidly rising trend, but despite its high prevalence physician diagnosed asthma remains just 6.2%.

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Conflicts of interest

There are no conflicts of interest.

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