Study of prevalence of bronchial asthma, allergic rhinitis and atopy in the school children of 6-12 years of age in Tumakuru city

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Abstract

Background: Asthma is one of the most common chronic disease affecting children. The recent rise in prevalence of asthma was associated with environmental pollution, urbanization, and the change in demography. The present study was undertaken to determine the prevalence of asthma in Tumakuru urban school children and to study its association with different epidemiological factors. Our study is a questionnaire-based study [International Study of Asthma and Allergies in Childhood (ISAAC)-Questionnaire] carried out in four randomly selected rural schools of Tumakuru district.

Material and Methods: The questionnaires were distributed among 2031 children and asked to return on next day. These questionnaires were given standard scores to diagnose asthma. Other epidemiological factors were also recorded in the questionnaire and studied. The statistical analysis was done using MSTAT software. Chi-square test was used to get the p-value. A p-value of <0.05 was considered significant.

Results: Prevalence of asthma in our study was 3.1% (n=63). We found significant association between asthma prevalence and family history of allergic disorders and high socio economic status. Conclusions: In the present study, the prevalence of bronchial asthma was 3.1%, Allergic rhinitis was 5.7% and Atopy was 1.1% in school children of Tumakuru city in the age group of 6-12 years.

Keywords: Allergic Rhinitis; Atopy; Passive Smoking; School Children.

Introduction

Asthma is a serious health problem throughout the world, affecting people of all ages. Childhood bronchial asthma is a chronic disease with an increasing prevalence. It has also increased the number of preventable hospital emergency visits and admissions. Apart from being the leading cause of hospitalization for children, it is also one of the most important chronic conditions causing elementary school absenteeism [1]. Childhood bronchial asthma has multifactor causation. Geographical location, environmental, racial, as well as factors related to behaviour and lifestyle are found to be associated with the disease. Its impact on the family and childhood is considerable due to the chronic nature of the disease. 300 million people are suffering from asthma. The WHO has estimated that 15 million disability-adjusted life years (DALYs) are lost annually due to asthma, representing 1% of the total global disease burden. Studies revealed low prevalence rates (2–4%) in Asian countries (especially China and India) and high prevalence rates (15–20%) in the United Kingdom, Canada, Australia and New Zealand [2].

Asthma is usually associated with other allergic disorders. Allergy is a systemic inflammatory phenomenon leading to many diseases that affect various tissues or organs, resulting especially in atopic dermatitis, allergic rhinitis, asthma, and food allergy [3]. Asthma rates are low in India, although there is some recent evidence says true prevalence is higher than previously thought. This co-morbidity has been attributed to a common mechanism of altered immunologic mechanisms favouring a systemic response of type 2 helper T cell cytokines to environmental allergens [4].

There are several epidemiological studies available but comparisons among these studies are often limited by lack of precise and universally accepted definition and differences in methodologies used. A standardized protocol has been developed by the International Study of Asthma and Allergies in Childhood (ISAAC) Committee that comprises a standardized written questionnaire for children. Jenkins et al. [5] in a population-based study reported that questionnaire based survey had higher sensitivity, specificity, positive predictive value and Youden's index which is the best single measure of validity. This method is cheap, widely acceptable and convenient requiring no special equipment [6]. Only a few epidemiological studies have been carried out in our country to study the prevalence of asthma because of large population, variable population density, climates, pollution and lifestyle [7]. Newer studies are required from various parts of the country to know the diversity in prevalence of asthma. Hence this study was undertaken to know the epidemiology of asthma in Tumakuru city.

Materials and Methods

The present study is undertaken among school going children of Tumakuru city. Schools of Tumakuru city were identified for the study using random tables. All school children in the age group of 6-12 years were included irrespective of their religion, ethnicity and

culture. It is a questionnaire-based (ISAAC guidelines) study which is provided in both Kannada and English. The students were educated on asthma with presentation of short movie of childhood asthma and a lecture on asthma causes, clinical picture, diagnosis, treatment & self-management plans followed by explanation in detail about the contents of the questionnaire. This was followed by complete general physical and systemic examination of the children. Questionnaire were distributed to all the students and asked to show their parents and fill up with appropriate answers and return it to their class teachers on the next day.

Along with questionnaire-based on ISAAC guidelines various factors that may influence the prevalence of asthma, such as family history of allergic disorders, socio-economic status, exposure to passive smoking, type of cooking fuel used and presence of other allergic disorder were also included in the questionnaire. The socio-economic status of the children were determined on the basis of monthly income in accordance to the cumulative square root value method [8] and divided into three groups: low socio-economic group (income less than Rs.7035/month), middle socio-economic group (income Rs.7036-12,493/month) and high socio-economic group (income more than Rs.12,493/month). Passive smoking [9] was defined by exposure to smoking by either of the parents. The ISAAC questionnaire format was given standard scoring system as suggested by Sole et al. [10]. In the 6-9 years age group, a global cut-off score of more than or equal to five and for the age group of 10-12; the cut-off score was six or more, was the criteria for diagnosing asthma. The statistical analysis was done using MSTAT software. Chi-square test was used to get the p-value. A p-value of <0.05 was considered significant.

Results

The questionnaires were distributed among 2031 children and asked to return on next day. 1930 children (95%) of them returned the questionnaire.

All the epidemiological factors are depicted in Table 1.

Table 1: Epidemiological factors affecting asthma prevalence

Factors	Asthma		Total	$\chi 2$	p-value
	Absent	Present			
Sex					
Male	1114	38(3.3%)	1152	0.01069	0.918
Female	753	25(2.9%	778		
Age in Year					
6-9yrs	1073	39(3.5%)	1112	0.4904	0.484
10-12yrs	794	24(2.9%)	818		
Family History of allergic disorders					
Absent	1842	18(0.96%)	1860	856.5	<0.0000001
Present	25	45(64%)	70		
Socio economic status					
Upper	322	22(6.39%)	344		
Middle	507	17(3.24%)	524	14.07	0.00087
Lower	1038	24(2.25%)	1062		
Exposure to smoking					
Absent	1088	32(2.8%)	1120	1.401	0.2372
Present	779	31(3.8%)	810		
Type of fuel used for cooking					
LPG	1762	58(3.18%)	1820		
Kerosene	85	3(3.40%)	88	2.406	0.3003
Fire wood	20	2(10%)	22		

Out of the total 1930 students who responded, 1152 (59.6%) were males and 778 (40.4%) were females. On the basis of ISAAC scoring, 63 (3.1%) were found to be the cases of asthma. Out of the total 1152 males, 38 (3.3%) were positive for asthma while among the 778 females, 25 (2.9%) were positive for asthma. Prevalence of asthma is slightly more in male compared to Female but not statistically significant. ($\chi 2$- 0.01069, p-value-0.918).

This group was divided into age groups of 6-9 years and 10-12 years and analysed. This showed 39 children had asthma in 6-9 age group and 24 had asthma in 10-12 age group. The difference of prevalence of asthma in these two groups was not statistically significant (χ2-0.4904, p-value-0.484). When it comes to individual age group, the highest number of children were of 9 years of age, (13/270; 4.81%) and the least number of children were in the age group of six years (7/282; 2.48%). We noted more cases of asthma in the age group of 8 and 9 years. Which accounted for 36.5%. Age distribution and asthma prevalence is depicted in Figure. 1.

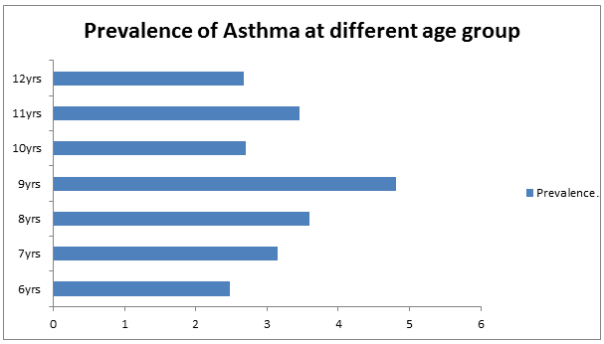

Fig. 1: Prevalence of asthma at different age group in percentage

Among 1860 children with absent family history of allergic disorders we found asthma in only 18 children (0.96%). And among 70 children with family history of asthma, we found 45(64%) children suffering from asthma. The association of prevalence of asthma and family history was statistically significant. (χ2-856.5.p-value-<0.0000001.

The association of socio-economic status of children showed 1062 (55%) in the low socio-economic group, 524 (27.2%) in the middle-income group, and 344 (17.8%) in the high-income group. The study revealed 22(6.39%) children who belongs to upper class family and 17(3.24%) belongs to middle class and 24(2.25%) belongs to lower class family. Our study revealed statistically significant difference in prevalence of asthma in upper class group.(χ2-14.07.p-value-<0.00087).

In our study 1120(58%) were exposed to passive smoking, out of which 32 (3.8%) were found to have asthma. In the remaining 810 (42%) children who were not exposed to tobacco smoke, 31 (2.8%) were found to have asthma. However, the association between passive smoking and asthma was not statistically significant (χ2-1.401.p-value-<0.2372).

Our study on type of fuel used for cooking at their houses revealed 1820 were using LPG, 88 were using kerosene and 22 were using fire wood. The prevalence among these three groups were 58 (3.1%), 3 (3.4%) and 2 (9.1%) respectively. Though the prevalence in firewood group appears significant study on larger number of subjects were required to come to conclusion. The association of prevalence of Asthma with cooking fuel was not statistically significant. (χ2-2.406 p-value-<0.3003).

We found 65% (n=41) of these asthmatics had Allergic Rhinitis and 22.2% (n=14) had history of atopy. Overall prevalence of Allergic Rhinitis was 5.76% (n=117) and Atopy was 1.13% (n=23). Among allergic rhinitis cases prevalence of asthma was 35% (41/117).

Discussion

Our study shows prevalence of asthma in Tumakuru city is 3.1 percent. Our study is in consistent with study done by Behl et al. in Shimla [11]. The proportion of Indian school children suffering from bronchial asthma has increased to more than double in the last 10 years and has reached its highest level ever. There was a low prevalence of bronchial asthma (2.3-3.3%) in the children surveyed in Lucknow, North India, but in urban Delhi the prevalence of bronchial asthma was 11.6% [12]. The prevalence of bronchial asthma in children from rural areas of Ludhiana and Punjab was 2.6% and 1%, respectively. A study from Bangalore showed 9% and 29.5% prevalence of bronchial asthma during the years 1979 and 1999, respectively. The rise in prevalence over time in Bangalore has been associated with environmental pollution, urbanization, and the change in demography of the city. These factors might be responsible for inter-city variation in the prevalence of childhood bronchial asthma.

Our study shows more prevalence of asthma in male (3.3%) compared to female (2.9%). Many asthma prevalence studies done across the globe have reported a male predominance of the disease. According to Anuradha et al. in 2011, males (71.66%) outnumbered females (28.33%) [13]. According to Kumar et al., the prevalence of bronchial asthma in school girls in Delhi was found to be 8.78% [14]. The prevalence of asthma is nearly twice in boys than girls before the age of 14 [15]. As a child gets older, the difference between the sexes narrows and by adulthood the prevalence of asthma is greater in women than in men. It may be explained as lung size is smaller in male than female at the time of birth and in childhood but larger in adulthood [16]. Another study from the New Zealand showed higher rates of sensitivity to indoor allergens among males aged 13 years than their female counterparts as assessed by the skin prick test [17].

In our study, we found statistically significant association between the presence of family history of allergic disorders and the prevalence of asthma. There were 70 students gave family history of asthma, out of which 45 (64.2%) had asthma and 1850 students who did not had family history of asthma, 18 (0.9%) were found to have asthma (p<0.001). Sibbald et al. showed that when both parents had asthma, 80% children developed the disease, compared to 40% of children when one parent had asthma and when no parent had asthma, only

10% children developed asthma [18]. Maternal influence is probably more than paternal influence, particularly in children less than five years of age possibly due to trans-placental transfer of allergens or cytokines to the fetus [19].

The association between prevalence of asthma and high socio-economic status was statistically significant in our study. Our finding is supported by the studies of Jain et al. and Prasad et al. [20]. A study from Singapore found the prevalence of parent-reported asthma to be greater among subjects of higher socioeconomic status [21]. However, Georgy et al. in a study of prevalence and socio-economic associations of asthma and allergic rhinitis in Egypt among 11-15 years old children found a higher prevalence and increased severity of asthma symptoms in children of lower socioeconomic groups [22].

Many studies have reported a significant association of asthma and exposure to smoking, our study did not show the significant association between exposure to smoking and asthma ($p>0.05$). Exposure to tobacco smoking both prenatally and after birth is associated with measurable harmful effects including greater risk of developing asthma‐like symptoms in early childhood. However, evidence of the increased risk of allergic diseases is uncertain [23,24]. It is possible that due to stigma, many children and parents did not report smoking. The association with cooking fuel was not found to be significant in our study; we noticed high prevalence of asthma in subjects using coal as a fuel, limitation being small no of sample in this group.

We found 65% (n=41) of these asthmatics had allergic rhinitis and 22.2% (n=14) had history of atopy suggesting a strong possibility of children suffering from other allergic manifestations to develop asthma. Overall prevalence of Allergic Rhinitis was 5.76% (n=117) and Atopy was 1.13% (n=23). Among Allergic Rhinitis cases prevalence of asthma was 35% (41/117). Similar studies showed 38% of rhinitis patients have been reported to have asthma and 78% of asthmatics have rhinitis [25], and 44.9% of children with eczema have been found to have asthma Children with eczema have been reported to have asthma or rhinitis frequently, at rates as high as 34.1% and 57.6%, respectively [26].

Conclusions

In the present study, the prevalence of bronchial asthma was 3.1%, Allergic rhinitis was 5.7% and Atopy was 1.1% in school children of Tumakuru city in the age group of 6-12 years. Various epidemiological factors like Family history of Asthma, High socio economic status, presence of other allergic disorder were significantly associated with prevalence of asthma. Our study will be the reference for prevalence of asthma in Tumakuru city and any changes from baseline prevalence over time can be monitored.

Conflicts of interest: None declared

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