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ORIGINAL ARTICLE

Prevalence and Risk Factors for Asthma Among Pre-School Children in Jayanagar, Bangalore

P P Maiya[1], C N Raghunath[1], M R Shan[1]*

1 Department of Pediatrics, Sagar Hospital, Tilak Nagar, Bangalore

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* **Corresponding author**.

mails2dr.shan@gmail.com

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Abstract

Background: Over the last several decades, the prevalence OF asthma has increased rapidly despite considerable improvements in our management and pharmacopeia to treat asthma. Childhood asthma seems more prevalent in modern metropolitan locales and affluent nations. This study is aimed at determining the prevalence of asthma and its risk factors among preschool children in Jayanagar, Bangalore. **Methodology:** A cross sectional study of randomly selected 4 preschools in Jayanagar, Bangalore over a period of 18 months were assessed using the international study of asthma and allergies in childhood (Isaac) questionnaire. A total of 197 preschool children in the age group 3 to 5 years were studied, of which 92 students from schools of heavy traffic area [group a] and another 105 children from preschools away from traffic zone [group b]. The statistically significant risk factors for asthma were analyzed by chi square test and p- value to study the association and the differences between the outcome measures and selected demographic variables. **Results:** The prevalence of asthma in preschool children was found to be 10.15%. Both groups (a and b) show almost the same prevalence (10.8 and 9.5%). There was significant association between asthma symptoms and family history of asthma, pet's exposure, residential overcrowding, and history of eczema. Exclusive breast feeding during initial 6 months of child's life was found to lower the risk of asthma symptoms. The study was also able to classify the children into GINA wheezing phenotypes (time trend-based classification and symptom-based classification). **Conclusion:** The global variations in the prevalence of asthma is due to the different risk factors in different geographical locations. Intervention on exposure to avoidable risk factors can reduce the burden of disease at the community level.

Keywords: Asthma; Preschool; Prevalence; Risk Factors

Introduction

Asthma is a chronic inflammatory condition of the lung airways leading to episodic airflow obstruction. The international study of asthma and allergies in childhood (Isaac) has studied the prevalence of childhood asthma and the risk factors associated with it in more than 100 countries using a standardized study methodology[(1)].

Isaac studies have shown that asthma prevalence is far higher in industrialized and western countries as compared to developing countries such as Asia and Africa. In 2003 the Isaac study in the urban city of Pune reported the prevalence of wheeze in the last 12 months to be 2.9% in school children aged 6-7 and 13-14[(2)]. However, there are very few community-based studies on the prevalence of asthma in Indian preschool children. A community based cross sectional study among 3–6-year-old children was conducted in Udupi taluk, Karnataka between february- july 2013 reported a prevalence of 9.2%[(3)]. The label "asthma" for wheezing symptoms in this age group has important consequences both for the parents and for the treatment strategies that should be applied.

Two main wheezing phenotypes were proposed by Gina (Global Initiative for Asthma):

- Symptom based classification: this was based on whether the child had only episodic wheeze (wheezing during discrete time periods, often in association with URTI, with symptoms absent between episodes) or multiple trigger wheeze (episodic wheezing with symptoms also occurring between these episode , e.g. during sleep or with triggers such as activity, laughing or crying).
- Time trend- based classification: this system was initially based on retrospective analysis of data from a cohort study. It included transient wheeze (symptoms began and ended before the age of 3 years); persistent wheeze (symptoms began before 3 years and continued beyond the age of 6 years), and late-onset wheeze (symptoms began after the age of 3 years).

Evidence from this study may help policymakers and program managers to further plan targeted interventions to address the issue of asthma among preschool children.

Methodology

After obtaining permission from the institutional ethics committee, and prior permission from the principals of the preschools to allow their students to participate in the study, informed consent was obtained from parents/ guardians, and eligible children as per the criteria were registered. This cross-sectional study was conducted in 4 preschools in Jayanagar, Bangalore between january 2021 to june 2022. A total of 197 preschool children in the age group 3 to 5 years were studied, 84 children were boys and 113 were girls. 92 students from schools of heavy traffic area [group a] and another 105 children from preschools away from traffic zone [group b].

A pre-validated questionnaire in lines of Isaac was used to assess the risk factors associated with asthma. This tool has been validated worldwide and has been used to determine asthma prevalence in more than two million children, so far. An additional set of questions that detected the information on potential risk factors associated with asthma were also added. These included environmental exposures (students' residency close to busy roads, parental smoking, type of cooking fuels, pets at home) and breastfeeding during first 6 months of life, flu vaccination, overcrowding. The parents of study children were given a written information sheet that explained the purpose of the study and invited to complete the questionnaire after they gave their written informed consent.

Inclusion criteria

Preschool children aged 3 to 5 years will be randomly selected from preschools in Jayanagar, Bangalore. The preschools are broadly divided into those near busy roadside where there is heavy traffic and those away from road side.

Exclusion criteria

- Age< 3yrs or >6yrs
- Preterm children
- Children who required NICU admission, ventilator or surfactant use
- Children with other respiratory illnesses like pneumonia, bronchiolitis, croup and whooping cough

The data obtained was analysed with appropriate statistical measures to estimate the prevalence. Children were classified according to wheezing phenotypes proposed by GINA. A child with symptom of wheezing or whistling in the chest in the past was considered as criteria for defining asthma. Other symptoms associated with asthma, which included numbers of attacks of wheezing, sleep and speech disturbance, and nocturnal cough, were collected.

Statistical analysis

The collected data was entered and analyzed using SPSS (statistical package for social sciences) latest version for windows. The findings were expressed in terms of proportions or percentages. Univariate analysis was carried out for associated factors to test the differences between proportions. P-value <0.05 was considered as significant.

Results

The study was carried out in 4 preschools belonging to Jayanagar locality in south Bangalore. A total of 197 preschool children studied, of which 92 students were from a preschool where heavy traffic was present [group a] and another 105 children from preschools away from the traffic zone [group b] in Jayanagar during the year 2021 to 2022. 84 children were boys and 113 were girls. These children were of age group 3 to 5 years, 39 were aged 3 years, 61 in 4 years and 97 in 5 years. 89 of the total subjects' homes where near heavy traffic area, while 108 stayed in a residential area. A total of 42 children in the study live in an overcrowded area.

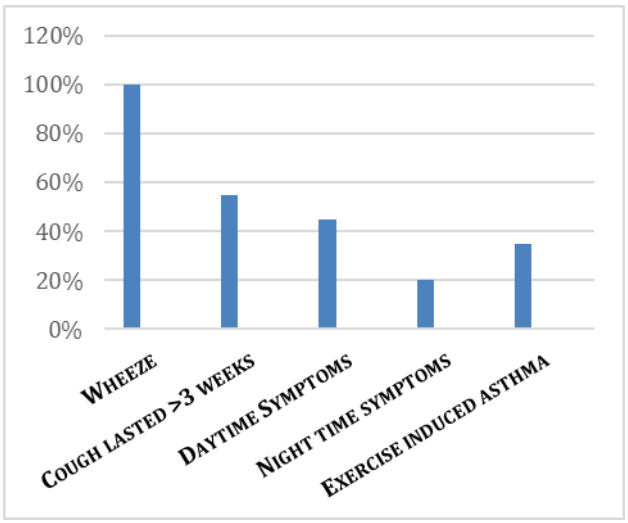

Fig 1. Graphical representation of symptomatology of children presenting with asthmatic symptoms

The prevalence of asthma in preschool children was found to be 10.15%. Both groups (a and b) show almost the same prevalence (10.8 and 9.5%). There was significant association between asthma symptoms and family history of asthma, pet's exposure, residential overcrowding, and history of eczema. Exclusive breast feeding during initial 6 months of child's life was found to lower the risk of asthma symptoms. These risk factors have influenced the development of asthma in both groups in almost same frequency. However, there was no gender predilection to asthma noted in this study.

The study was also able to classify the children into GINA wheezing phenotypes as (i) time trend-based classification: persistent wheeze in 14 (70%) and 4 (20%) had developed transient wheeze and only 2 (10%) children had symptoms after the age of 3 years suggestive of late onset wheeze. (ii) symptom based classification: 16 (80%) children had episodic wheeze and only 4 (20%) had multi trigger wheeze.

Table 1. Statistical analysis of risk factors present in 20 symptomatic patients of asthma

Factors	Pearson chi square	P value
Positive family history	78.007	0.0001*
Over crowding	7.441	0.006*
Pets exposure	12.14	0.0004*
Eczema	37.345	0.0001*
Not exclusively breastfed for first 6 months	6.56	0.01*

*p- value < 0.05 is statistically significant

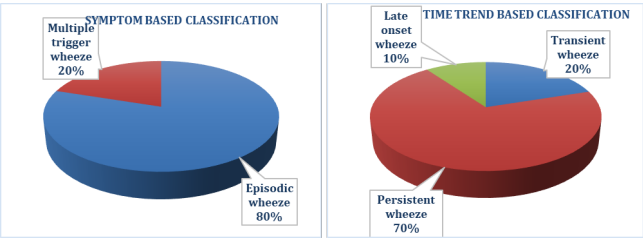

Fig 2. Pie diagram showing the type of wheezing by both symptom based and time trend based classification (GINA)

Discussion

This study used a well-standardized instrument to provide useful insights into the prevalence of asthma-associated symptoms in these areas. The international study of asthma and allergies in childhood (ISAAC) [1] investigative group has developed this standardized questionnaire for describing the prevalence of childhood asthma and allergic disease.

The overall prevalence of wheezing in this study was 10.15%, other studies done for approximately the same age group (3 to 6 years) by Anar Singh et al conducted in Udupi taluk, Karnataka reported almost similar prevalence of 9.2% [3]. Another study conducted by maria Cheragi et al in Pune, India showed a lower prevalence of 7% amongst 6- to 7-year-olds [2]. The studies conducted outside India in < 5 years age group by Habby et al [4] (in new south Wales, Australia), Nantanda et al [5] (in Kampala, Uganda) and Tootoonchi et al [6] (in south Tehran, Iran) reported a higher prevalence of asthma to be 22%, 20.8% and 21.9% respectively. These variations could be due to the difference in geographical location and methodologies used to collect data.

In Karnataka, India, a study conducted in Dakshina Kannada district of Karnataka by Narayan et al reported a lower prevalence (5.2%) among school children of 10-18 years compared to our study [7]. A study done for children in the age group of 6-15 years Jain et al, reported prevalence of wheezing to be 10.3% [8]. Another study by Kuehni et al reported higher prevalence of current wheeze (12 - 26%) for Caucasian

children aged 1-5 years residing in Leicestershire County, UK[9]. However, Volsal et al reported a lower prevalence of asthma (8.6%) in Edirne's city center, which was nearly consistent with our study[10].

Prevalence of asthma among two groups of preschools group a and b (near and away from main road) were compared in this study which showed almost similar prevalence in both groups (10.8% and 9.5% respectively). While no statistically significant association was observed for the incidence of asthma, the persistence of asthmatic symptoms in preschool children was significantly associated with traffic-related air pollution in a study conducted by Hasunuma et al in Japan[11].

According to a study by the centre for study of science, technology and policy (CSTEP) in 2019, soil and road dust accounts for 25% to 50% of harmful particulate matter (pm) in Bangalore city. The CSTEP study estimated that in 2019, around 24,600 tonnes of pm10 and 14700 tonnes of pm 2.5 were emitted from 32 locations across Bangalore city.

The prevalence of asthma was similar in each sexes in contrast to alternative studies. The present study revealed 20% children had nocturnal dry cough and 35% children reported to have exercise induced cough. However, in Kumar et al study, about 54.2% children had nocturnal dry cough[12] and a study conducted by Anar Singh et al 17% had exercise induced cough[3].

Family history of asthma was found to be an associated factor for asthma symptoms among preschool children of 3-5 years age group. Children having a family history of asthma were more likely (chi –square 78.001, p-value 0.0001) to get the disease compared to those who did not have a family history of asthma. This finding was consistent with the study by Kumar et al [odds ratio 6.639 (1.757-25.09)][12]. Nanatanda et al also reported similarly for 2-59 months children in Uganda with an odds ratio of 2.4 (1.2–4.6)[5].

Preschool children with a history of allergy such as skin allergy, atopy and eczema were also found to be at a risk of suffering from asthma symptoms. Children who had these allergies were more likely to get disease (chi square- 37.345, p-value 0.0001) compared to those who did not have an allergy. Similarly, a study done by Nanatanda et al also found history of allergy in children to be an associated factor for asthma among 2-59 months children in Uganda with an odds ratio of 2.6 (1.2– 5.4)[5].

In accordance with earlier reported studies, we found that children who were not exclusively breastfed showed a stronger association with asthma (chi square 6.56, p-value 0.01) as compared to those who were exclusively on breast milk for the first 6 months of their life. The results of this study add support to the growing body of evidence that shows that breastfeeding is likely to be protective against childhood asthma[13,14]. The mechanism of the effect of breastfeeding on asthma could be due to the immunological and nutritional benefits of human milk. Specific elements in human milk have been suggested to promote the maturation of the immune system, such as large numbers of active white cells which release biologically active chemicals into the digestive system and surrounding tissues that have the potential to influence the developing immune system. Furthermore, it has been shown that lung development is aided by a number of growth factors found in human milk.

Presence of pets at home was associated with increased prevalence of childhood asthma (chi square-12.14, p-value-0.004). A series of large-population-based epidemiologic studies have reported consistent associations between pets in the home and the risk of asthma or wheezing in children. Among these studies, Melen et al in a systematically conducted 2-year study, confirmed the importance of early cat exposure in causing allergic sensitization and development of asthma[15]. Our data also support the view that exposure to cats is associated with development of asthma in children.

The relationship between residential crowding and asthma were analyzed which showed a chi square value of 7.441 and p- value of 0.006 which is statistically significant. A positive association of asthma symptoms with crowding and cough was identified in a study conducted by Kutzora et al in 2014-2015[16].

The findings from this study have extended our knowledge of the early life determinants of asthma. We found that family history of asthma, previous history of eczema, exposure to pets and residential overcrowding do have a significant association with recent asthma, and that breastfeeding is associated with a lower risk of asthma.

Conclusion

The overall prevalence of asthma (wheezing) in preschool children was found to be 10.15%. The prevalence was almost same in children from preschools of heavy traffic area and in those away from the traffic zone. Location of homes near heavy traffic areas or residential areas didn't make any difference in the prevalence. Prevalence of asthma was higher among those children who have family history of asthma, exposure to pets, history of eczema and in children who lived in overcrowded places. Exclusive breastfeeding during initial 6 months of child's life was found to lower the risk of asthma symptoms. These risk factors have influenced the development of asthma in both groups in almost same frequency. Asthma surveillance should be strengthened and parental education regarding childhood asthma is required, so that asthma can be prevented in the subsequent generation.

Ethics approval

Ethics committee of Sagar hospitals, Tilak Nagar; dated dec 14, 2020.

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