



To study the burden of asthma and its comorbid factors among respiratory tract infection in paediatric population

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Abstract

Asthma is a common chronic respiratory disease in children. The diagnosis of asthma in children may be associated with other comorbidities, which may influence the disease in several ways, including optimal asthma control. The main objective of this study was to determine the association of common comorbidities with asthma in children between 1 and 18 years. A cross-sectional study was carried out in a medical college of Himachal Pradesh. A set of questions based on GINA guidelines were offered to the children with asthma or their parents and their responses were noted manually. A total of 200 children (107 males) were enrolled, out of which 38 (19%) children had asthma. Boys had higher prevalence of asthma comorbidities as compared to girls. Among asthmatic children, allergic rhinitis (AR) was documented in 24 (63.1%) followed by psychological disturbance in 20 (52.6%), sinusitis in 14 (36.8%) snoring in 14 (36.8%), gastro-oesophageal reflux disease (GERD) in 7(18.4%), and atopic dermatitis in 7 (18.4%). The statistical significant association was observed between asthma comorbidities and gender in allergic rhinitis and psychological disturbances.

Keywords: Asthma, comorbidity, peak expiratory flow rate

Introduction

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation ¹. The diagnosis of asthma is often associated with one or more of comorbidities, namely, allergic rhinitis, sinusitis, atopic dermatitis, gastroesophageal reflux, food allergy, obesity, obstructive sleep apnoea, and psychological disturbance

². These comorbidities can influence the childhood asthma in several ways; however, the exact mechanism how they interact with asthma is still not well known ^{3,4}.

The prevalence of different comorbidities in childhood asthma is variable. It is considered that 20%-50% of patients with allergic rhinitis have asthma and more than 80% of patients with asthma have allergic rhinitis. The prevalence of other comorbidities varies from study to study and also with geographical areas ^{5,6}.

Although several western studies are available on comorbidity in asthma, especially in the adult population, most of the studies are mainly restricted to the allergic rhinitis as a comorbidity. There is scarcity of studies on the burden of asthma and their comorbidities in children especially in northern part of hilly region of India.

Materials and Methods

This study was carried out in Paediatrics department of Maharishi Markandeshwar Medical College of Solan Himachal Pradesh from 1st April 2023 to 30th June 2023. The study was approved by the Institutional Ethics Committee. A written informed consent was also taken from parents of children before their participation. The inclusion criteria were Paediatric population between 1 year to 18 years of age with symptoms of respiratory tract infection. The exclusion criteria were 1st episode of respiratory tract infection, parents who refuse to give consent and Children with known congenital lung or Cardiovascular or Gastrointestinal anomaly. A questionnaire was prepared based on GINA guidelines related to common signs and symptoms of asthma and its comorbidities in children. After the pilot study, the questionnaire was given to the parents and their children and the same was explained to them in their mother language and their responses were noted. Other demographic information namely, anthropometry, nutritional status, family history, pet ownership and smoke exposure were also noted. Peak expiratory flow rate (PEFR) was measured as a part of routine follow-up evaluation.

Data analysis

The information was entered in to Microsoft® Excel worksheet and then data was analysed with SPSS software. The results were presented in the form of frequencies and percentages where applicable. Continuous variables were presented in mean and standard deviation. Chi square test was applied for qualitative variables. In this study, p value < 0.05 was considered as statistically significant.

Results

A total of 200 children with a mean age of 5.1 years were enrolled in this study. Out of them, 107 (53.5%) were males and 93 (46.5%) were females. Their mean weight and height was 18.6 (±8.6) kg and 104.8 (±19.5) cm, respectively. Other demographic variables are summarized in Table. Allergic rhinitis was present in 24 (63.1%) of the enrolled children followed by psychological disturbance in the 20 (52.6%), allergic

sinusitis 14 (36.8%), snoring in 14 (36.8%), gastro-esophageal reflux disease (GERD) in 7 (18.4%), atopic dermatitis in 7 (18.4%), and food allergy in 4 (10.5%) children. The detailed frequency of comorbidities, age and gender wise are described in Table. There was statistically significant difference in prevalence of asthma comorbidities between boys and girls in allergic rhinitis and psychosocial disturbance.

Baseline characteristics of study subject

| | |
|-------------|--------------|
| Mean age | 5.1(3.2)* |
| Mean weight | 18.6(18.6)* |
| Mean height | 104.8(19.5)* |

*Mean (SD)

| | |
|---------|------------|
| Males | 107(53.5)* |
| Females | 93(46.5)* |

*N(%)

Nutritional status of study subjects

| | |
|---------------|------------|
| Normal weight | 115(57.5)* |
| Underweight | 54(27)* |
| Overweight | 17(27)* |
| Obese | 14(7)* |

*N(%)

Course of the disease

| | |
|-------------------------------------|---------------------|
| Mean Age at 1st symptom | 3.82(2.7)* |
| Previous history of hospitalization | 56(28) [#] |
| Previous history of nebulization | 60(30) [#] |

*Mean (SD) & [#]N (%)

PEFR Values

| | Mean | 6-11 yrs | 12-18 yrs | P-value |
|-------------------|----------|----------|-----------|---------|
| Mean PEFR (L/min) | 196(28)* | 164(25)* | 241(32)* | 0.0001 |

*Mean (SD)

Overall incidence of respiratory infection

| Respiratory infection | Frequency |
|-----------------------|------------|
| URTI | 75(37.5)* |
| LRTI | 125(62.5)* |

N(%)

Out of LRTI's Asthma is 19%

High risk for developing asthma among LRTI'S

| Under-5-wheezier N(%) | Male (N) | Females (N) | P-Value |
|-----------------------|----------|-------------|---------|
| 28(14%) | 17 | 11 | 0.02 |

Relation of Asthma & It's Co-morbidities with age

| Co-morbidities of asthma | Frequency (%) | Age (6 to 11) (N) | Age (12 to 18) (N) | p-value |
|---------------------------|---------------|-------------------|--------------------|---------|
| Family history of asthma | 17(44.7) | 10 | 7 | 0.5 |
| Pet ownership | 19(50) | 11 | 8 | 0.8 |
| Smoke exposure | 7(18.4) | 3 | 4 | 0.7 |
| Food allergy | 4(10.5) | 1 | 3 | 0.3 |
| Allergic rhinitis | 24(63.1) | 13 | 11 | 0.7 |
| Atopic dermatitis | 7(18.4) | 5 | 2 | 0.3 |
| Gastro- esophageal reflux | 7(18.4) | 4 | 3 | 0.7 |

| | | | | |
|--------------------------|----------|----|---|-----|
| Sinusitis | 14(36.8) | 7 | 7 | 1 |
| Snoring | 14(28.9) | 8 | 6 | 0.6 |
| Psychosocial disturbance | 20(52.6) | 12 | 8 | 0.4 |

Relation of Asthma & It's Co-morbidities with gender

| Co-morbidities of asthma | Frequency (%) | Male (N) | Female (N) | p-value |
|---------------------------|---------------|----------|------------|---------|
| Family history of asthma | 17(44.7) | 12 | 5 | 0.09 |
| Pet ownership | 19(50) | 14 | 5 | 0.04 |
| Smoke exposure | 7(18.4) | 4 | 3 | 0.7 |
| Food allergy | 4(10.5) | 2 | 2 | 1 |
| Allergic rhinitis | 24(63.1) | 17 | 7 | 0.04 |
| Atopic dermatitis | 7(18.4) | 5 | 2 | 0.3 |
| Gastro- esophageal reflux | 7(18.4) | 5 | 2 | 0.3 |
| Sinusitis | 14(36.8) | 10 | 4 | 0.1 |
| Snoring | 14(28.9) | 10 | 4 | 0.1 |
| Psychosocial disturbance | 20(52.6) | 15 | 5 | 0.02 |

Discussion

Asthma in children is often associated with one or more comorbid conditions. In the present study, allergic rhinitis (AR) was observed as the commonest comorbid condition. The prevalence of AR in asthma is highly variable in different studies ⁷. The possible reason for this variation could be the difference in environmental and lifestyle factors. In this study, high prevalence of AR may be due to growing air pollution in the urbanized area of Solan, Himachal Pradesh India, that leads to rapid increase in pulmonary disease ⁸. The study by Kim *et al.* ⁹ from Korea also reported high prevalence (72.6%) of AR in asthma. Psychosocial disturbance in asthmatic children as well as in their parents has been present to a variable extent. In this study, 52.6% of the children had some features of psychosocial disturbance. A study from Brazil had shown that 35% of the children with asthma had clinical behaviour problems ¹⁰. Bussing *et al.* ¹¹ showed that 43.2% of the children with asthma had

anxiety disorder. In the present study, the majority of the children with asthma belonged to rural area where belief in traditional therapy is very rampant, which may have delayed the diagnosis and also their parents have problem in acceptance of the diagnosis; hence, we observed high prevalence of psychosocial disturbance in our study. Snoring is now commonly recognized in children with asthma as an important comorbid condition. We observed that 36.8% of the children in this study had symptoms of snoring. Rama Gopal *et al.*¹² from New Jersey had also observed that 31.4% of children with snoring were having history of asthma. Gastroesophageal reflux disorder (GERD) is involved in pathogenesis as well as symptomatology of asthma. In the present study, GERD was observed in 18.4% of the children. A study by Ay *et al.*¹³ from Gaziantep, Turkey reported associated GERD in 41% of asthmatic children. Atopic dermatitis is well known risk factor as well as a comorbid condition in asthma. In this study, 18.4% of asthmatic children also had features of atopic dermatitis. Yuksel *et al.*³ from Turkey had observed that 28% of the children with eczema also had asthma. Chronic inflammation of sino-nasal mucosa has a direct correlation with small airway hyperactivity and asthma control. In the present study, 36.8% of children had signs and symptoms suggestive of sinusitis. Lombardi *et al.*¹⁴ from Tucson had also observed that 13% of the children with asthma had sinusitis¹⁴. In this study, we observed statistically significant influence of male gender in allergic rhinitis and psychosocial disturbance. According to sex shift study conducted by Keller *et al.*¹⁵, asthma comorbidity was more in males before puberty and after puberty, it was more in females. This conforms with our study results as the mean age in our study was 5.1 years and asthma comorbidities are more common in male children.

Strength and Limitation

The present study will add to the existing knowledge in prevalence of common asthma comorbidities in children especially from northern part of India. Limitations of this study include convenience sampling. The impact of treatment of comorbidities of asthma control and exacerbation was not done in the present study due to the cross sectional nature of the current study. The PEF was used instead of pulmonary function test due to feasibility constraints.

In conclusion, asthma comorbidities are quite common in children. Allergic rhinitis is the most common comorbid condition followed by psychological disturbance, sinusitis and snoring. There was significant association of gender in allergic rhinitis and psychosocial disturbance.

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Conflict of interests

None.

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Ethical approval

The study was approved by the Institutional Ethics Committee. A written informed consent was taken from parents of asthmatic children before their participation. Confidentiality was ensured at all the stages.

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