

## ORIGINAL ARTICLE

# Association of common comorbidities with asthma in children: a cross-sectional study

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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 5 and 15 years. A cross-sectional study was carried out in a tertiary care hospital of western Rajasthan. A set of 23 questions were offered to the children with asthma and/or their parents and their responses were noted manually. A total of 95 children (74 male) were enrolled, allergic rhinitis (AR) was documented in 72 (75%) followed by psychological disturbance in 68 (71%), snoring in 47 (49.5%), gastro-esophageal reflux disease (GERD) in 44 (46.3%), atopic dermatitis in 26 (27.3%), and sinusitis in 19 (20%) children. There was no statistical significant association observed between asthma comorbidities and gender. Allergic rhinitis was the most common comorbidity in children with asthma followed by psychological disturbance, GER, and snoring. Both boys and girls had similar prevalence of asthma comorbidities.

## 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 apnea, 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 association of common comorbidities with asthma in children. The primary objective of the present study was to determine the association of common

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comorbidities with asthma in children from the Indian population.

## MATERIALS AND METHODS

This study was carried out in Pediatrics Chest Clinic in a tertiary care hospital of western Rajasthan from 1<sup>st</sup> June 2017 to 31<sup>st</sup> August 2017. The study was approved by the Institutional Ethics Committee. A written informed consent was also taken from parents of asthmatic children before their participation. The inclusion criteria were children from 5 to 15 years of age with a physician diagnosed cases of asthma and who was on regular controller therapy and also willing to participate in the study. The exclusion criteria were children with acute asthma exacerbation, with known congenital anomalies of lungs, airway, and cardiovascular system and refusal to give consent.

A questionnaire was prepared based on common signs and symptoms of asthma comorbidities in children, which consist of 23 questions. The questionnaire was given to the parents and their children and the same was explained to them in their mother language and their response was noted on the space provided on the proforma. Other demographic information namely, antenatal and developmental history, anthropometry, nutritional status, and family history were also noted. Peak expiratory flow rate (PEFR) were measured as part of routine follow-up evaluation.

## Data analysis

The information was entered in to Microsoft® Excel worksheet and then data were analyzed with Stata® 13 software (Stata Corp, College Station TX). 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 95 children with a mean age of 9.5 years were enrolled in this study. Out of them, 74 (77.1%) were males and 21 (22.1%) were females. Their mean weight, height, and body mass index (BMI) was 27.4 ( $\pm$ 11.6) kg, 130.8 ( $\pm$ 22.7) cm, and 15.1 ( $\pm$ 2.6) kg/m<sup>2</sup>, respectively. Other demographic variables are summarized in Table 1.

Allergic rhinitis was present in 72 (75%) of the enrolled children followed by psychological disturbance in the 68 (71%), snoring in 47 (49.5%), gastro-esophageal reflux disease (GERD) in 44 (46.3%), atopic dermatitis in 26 (27.3%), allergic sinusitis in 19 (20%), and food allergy in 10 (10.5%) children. The detailed frequency of comorbidities, age and gender wise are described in Table 2. There was no statistically significant difference in prevalence of asthma comorbidities between boys and girls.

**Table 1.** Demographic details of enrolled children (N = 95).

Demographic variables	Frequency N (%)	Age group (years)	
		5–10 (N = 58) N (%)	10–15 (N = 37) N (%)
Gender			
Male	74 (77.9)	46 (79.3)	28 (75.7)
Female	21 (22.1)	12 (20.7)	9 (24.3)
Weight (kg)*	27.4 (11.6)	21.2 (6.3)	36.9 (11.6)
Height (cm)*	130.8 (22.7)	118.4 (18.7)	150.6 (12)
BMI (kg/m <sup>2</sup> ) *	15.1 (2.6)	14.4 (2.2)	15.9 (3.0)
PEFR value (L/minute)*	182 (82)	150 (52)	227 (98)
Family history of atopy	61 (64.2)	35 (60.3)	25 (67.6)

\*Values are as Mean ( $\pm$  SD).

PEFR, peak expiratory flow rate; BMI, body mass index.

**Table 2.** Association of common comorbidities with asthma in children (N = 95).

Comorbidities	Frequency N (%)	Gender N (%)			Age group (years) N (%)		
		Male N (%)	Female N (%)	p-value	5–10	10–15	p-value
Allergic rhinitis	72 (75.8)	56 (58.9)	16 (16.8)	0.9	40 (42.1)	32 (33.7)	0.5
Psychosocial disturbance	68 (71.6)	50 (52.6)	18 (18.9)	0.1	40 (42.1)	28 (29.5)	0.4
Snoring	47 (49.5)	34 (35.8)	13 (13.7)	0.2	28 (29.5)	19 (20.0)	0.8
Gastro-esophageal reflux (GER)	44 (46.3)	33 (34.7)	11 (11.6)	0.5	21 (21.1)	23 (24.2)	0.02
Atopic dermatitis	26 (27.4)	20 (21.1)	6 (6.3)	0.8	17 (17.9)	9 (9.5)	0.6
Sinusitis	19 (20.0)	14 (14.7)	5 (5.3)	0.6	10 (10.5)	9 (9.5)	0.4
Food allergy	10 (10.5)	8 (8.4)	2 (2.1)	0.8	7 (7.4)	3 (3.2)	0.7

## 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 Thar desert, Western Rajasthan 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, 71% of the children have had some features of psychosocial disturbance. A study from Brazil had shown that 35% of the children with asthma had clinical behavior 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 belong 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 49% of the children in this study had symptoms of snoring. Ramagopal 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 46% 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, 27% 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 have had asthma. Chronic inflammation of sinonasal mucosa has a direct correlation with small airway hyperactivity and asthma control. In the present study 20% 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 have had sinusitis [14].

In this study, we did not observe statistically significant influence of gender on the prevalence of various asthma comorbidities. 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 9.5 years, the transition phase of the sex shift.

### Strength and limitation

The present study will add to the existing knowledge in prevalence of common asthma comorbidities in children from India. Limitations of this study include lack of validation of questionnaire, convenience sampling, no *a priori* sample size calculation, and a disproportionate male to female ratio. We were also not able to measure the impact of treatment of comorbidities on asthma control and exacerbation, which might be possible in long term follow up. We used PEFR 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, GERD and snoring. There was no significant association of gender with asthma comorbidities.

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### CONFLICT OF INTERESTS

None.

### FUNDING

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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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