

Original Research Article

Allergic Rhinitis and Bronchial Asthma Comorbidity: A Cross Sectional Questionnaire Study in Children (6-18 Years) of Urban and Rural Jaipur (India)

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ABSTRACT

Introduction: Asthma and Allergic Rhinitis co-morbidity refers to the association between asthma and allergic rhinitis. This is due to their pathophysiological, epidemiological, and clinical similarities.

Aims and Objectives: To determine association of Allergic Rhinitis and Bronchial Asthma as co-morbidity and the difference in prevalence in rural and urban school going children in Jaipur.

Material & Method: Cross sectional questionnaire based observational study. Study group included school going children chosen randomly from 13 schools of urban & rural area Aged 6-18 years. The data were drawn on the basis of a validated standard questionnaire.

Results: Out of 5002 children, prevalence of the Allergic Rhinitis and Asthma were 24.31% and 18.63% respectively and as co-morbidity in 11.34 %. Out of them, 35.70% and 25.33% children suffered from Allergic rhinitis and Asthma in rural, as compared to 16.62% and 14.10% urban population respectively.

Conclusion: It was found that the prevalence of both Allergic Rhinitis & Asthma are showing a significant increase in last few years. These respiratory allergic diseases are more common in rural area and existing as co-morbidity in a significant proportion of children demanding a comprehensive strategic approach to deal with them.

Keywords: Allergic Rhinitis, Asthma, co-morbidity.

Introduction

Allergic Rhinitis is an inflammatory disorder of the nasal mucosa characterized by nasal congestion, rhinorrhea, itching & often

accompanied by sneezing & conjunctival irritation. The prevalence of allergic rhinitis has been estimated to be between 15-20%. Older children have a higher prevalence of allergic

rhinitis than younger ones, with a peak occurring in children aged 13 to 14 yrs.

Asthma is a chronic inflammatory disease of airways defined by more than three episodes of airflow obstruction, clinically evident as wheezing, cough, breathlessness and chest tightness with Airflow limitation, Airway hyper responsiveness and Airway inflammation. An increased prevalence and severity of asthma has been reported worldwide. It is estimated that there may be additional 100 million people with asthma by 2025¹. Prevalence of asthma worldwide vary considerably, being less common in developing countries (1-6%) whereas in developed countries it is more prevalent ranging from (7-20%)².

Asthma and allergic rhinitis (AR) co-morbidity refers to the association between asthma and allergic rhinitis. This is due to their physiopathological, epidemiological, and clinical similarities. It is well known that patients with AR have changes in the bronchial mucosa despite the absence of asthma symptoms. Alternatively, patients with asthma have eosinophilic infiltrates in nasal mucosa despite the absence of AR symptoms. The Fact that, asthma and AR are manifestations of the same inflammatory disease affecting the entire airway is further suggested by the clinical improvement of asthma when AR is treated.

Epidemiologically, there have been reports – mostly in ambulatory-based studies – showing high prevalence rates of AR in asthmatic patients³, with rates varying between 30-90%. However, population-based studies on the prevalence rates of asthma/AR co-morbidity are still scarce.

Aims and Objectives of the study were to know the prevalence and to determine association of Allergic Rhinitis and Bronchial Asthma as co-morbidity in rural and urban school children of Jaipur District.

Material and Methods

Study design: Cross sectional questionnaire based observational study'

Study site: Department of Paediatrics, SMS Medical College, Jaipur, India.

Study Population: School going children (6-18 year), from 13 schools of urban & rural areas of Jaipur district chosen randomly.

Sample size: 5002children.

Inclusion Criteria: All children 6-18 years from the selected schools willing to participate in our study (parents in case of younger children).

Exclusion Criteria: Age <6yrs &>18yrs, craniofacial anomaly, history of recurrent cough with fever, not growing well, any structural anomaly of nose, history of local abusive drug inhalation, history of any local surgery, history of any head trauma with nasal discharge and history of smoking.

Questionnaire: Pre designed validated questionnaire⁴ containing various questions pertaining to asthma and allergic rhinitis were distributed. Students and parents were explained by researcher in detail regarding the questions and how to fill the questionnaire. Questionnaires were filled by parents in case of 6-10 years and by students themselves in children above 10 years. We had different questionnaires for parents and students. The student questionnaire contained 9 questions while the parent questionnaire contained 10 questions. Questions 1 to 7 were related to asthma; we assigned a "1" for each "sometimes" or "a lot" response and add the scores. The total score 3 or more for any student was considered to have the asthma diagnosis. Questions 8 and 9 were related to allergic conjunctivitis and allergic rhinitis respectively and we assigned a "1" for each "sometimes" or "a lot" response and added the scores. A total score 1 or more was considered to have allergic rhinitis.

Qualitative data were expressed in form of percentage and proportion. Quantitative data were expressed in mean and standard deviation scale. Difference and proportion in various groups i.e. sex, rural/urban were measured by chi square test. Difference in means of age was measured by unpaired t-test. The level of significance was kept 95% for all statistical analysis.

Results

The study included 3053(61.04%) male and 1949(38.96%) female children, majority of them belonged to upper middle socioeconomic status (61.28%) group. Out of 5002 children, 2985 (59.68%) were from urban and divided in to 4 age groups (table 1).

Our study shows the overall occurrence of bronchial Asthma to be (932/5002) 18.63%. The prevalence of BA is increasing with age i.e. 7.52% (6-9 yrs), 14.99% (10-13yrs), 22.50% (14-16yrs) and 24.59% (17-18yrs) which is statistically significant.

The prevalence of Allergic Rhinitis and Asthma were 24.31% and 18.63% respectively. The prevalence of Allergic Rhinitis and Asthma showed an increasing trend as the age increases. The prevalence of Allergic Rhinitis was more in rural population as compared to urban (35.70% V/s 16.62%) and similar with the prevalence of Asthma (25.33% Vs 14.10%) as shown in table 2 and figure.

46.63% of Allergic Rhinitis children were found to have concomitant Asthma while 60.40% Asthmatic children had Allergic Rhinitis. The prevalence of Allergic Rhinitis and Asthma as co morbidity was present in 11.34 % children.

Table 1- Demographic characteristics of study population and prevalence of comorbidity

| | |
|---------------------------------|--------------------------------------|
| Total | 5002 |
| Male | 3053(61.04%) Mean age = 14.39 ± 2.63 |
| Female | 1949(38.96%) Mean age =14.63 ± 2.65 |
| Age groups: | |
| 6-9 years | 612 children (12.24%) |
| 10-13 years | 1541 children (30.81%) |
| 14-16 years | 2182 children (42.62%) |
| 17-18 years | 667 children (13.33%) |
| Urban | 2985(59.68%) |
| Rural | 2017(40.32%) |
| Prevalence of bronchial asthma | 932 (18.63%) |
| Prevalence of allergic rhinitis | 1216 (24.31%) |
| Prevalence of cases having both | 567/5002 (11.34%) |
| Allergic Rhinitis having BA | 567/1216 (46.63%) |
| BA having AR | 567/932 (60.84%) |

Table 2 Association of Residence with Bronchial Asthma & Allergic Rhinitis

| Area | Bronchial Asthma | | | Allergic Rhinitis (AR) | | |
|---------------------------------------|------------------|------------------|--|------------------------|------------------|------------------|
| | Yes | No | Total | Yes | No | Total |
| Rural | 511 (25.33%) | 1506 (74.67%) | 2017 (40.32%) | 720 (35.70%) | 1297 (64.30%) | 2017 (40.32%) |
| Urban | 421 (14.10%) | 2564 (85.90%) | 2985 (59.68%) | 496 (16.61%) | 2489 (83.39%) | 2985 (59.68%) |
| Total | 932 (18.63%) | 4070 (81.37%) | 5002 (100%) | 1216 (24.31%) | 3786 (75.69%) | 5002 (100%) |
| $\chi^2 = 100.14$ d.f.= 1 P < .001 HS | | | $\chi^2 = 238.142$ d.f.= 1 P < .001 HS | | | |

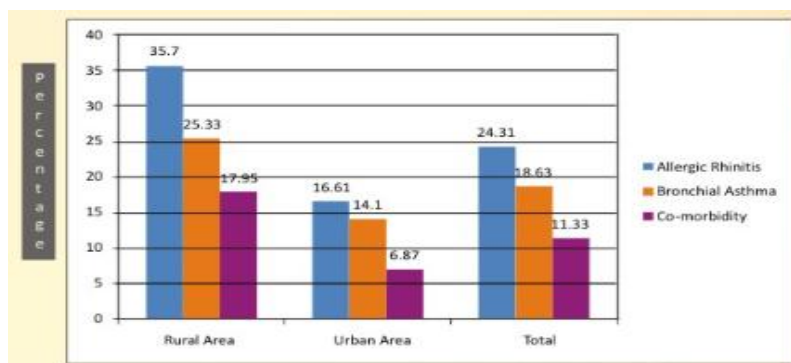


Figure showing prevalence of BA, AC and comorbidities in rural versus urban in percentage

Discussion

B.S. Sharma et al⁵ in a cross sectional survey of 3321 school going children (5-15 years) using modified ISAAC questionnaire in Jaipur city showed 7.59% children to have asthma (2008-2009). Sandeep Salvi et al⁶ in their study in 15,500 school children from Pune and Nagpur showed the prevalence of bronchial asthma 5.7% in age group of 6-7 years and 4.26% in age group of 13-14 years in Nagpur. The prevalence of bronchial asthma was 6.55% in age group of 6-7 years and 1.89% in age group of 13-14 years in Pune. The increased prevalence rate in our study is in agreement with the fact that the overall prevalence of BA is increasing in last few years.

Behl RK et al⁷ in the study in school going children (n=1136) of Simla showed prevalence of asthma 2.3%. The difference in the prevalence rate is probably because of the difference in the geographical area (high altitude).

Susan Redline et al⁴ conducted a study in 190 USA children (7-13 years) and showed the prevalence of asthma was 9.3%. H Yuksel et al⁸ in a study from Turkey showed that Asthma was present in 14.7% of the children older than 3 years of age. The increased prevalence rate in our study as compared to these studies from the western world is in agreement with the fact that the overall prevalence of BA is increasing across the globe in last few years.

In present study the prevalence of BA in the rural area was 25.33% (511/2017), statistically significant higher as compared to the urban area 14.10% (421/2985). Jain A et al⁹ in a cross-sectional community based study conducted by interview of parents of randomly selected 559 children [6-15years] of rural area of the South India showed prevalence of bronchial asthma to be 10.3% and R. Prasad¹⁰ in their study in rural children (5-14years) of Lucknow (n=758) showed the prevalence of asthma to be 7.7%. The increased prevalence rate in our study as compared to this study is also indicative that the overall prevalence of BA is increasing equally in rural areas also during last few years. S.N. Gaur et

al¹¹ in a study of adults showed the prevalence of asthma among rural, urban city and urban slum population of Delhi to be 13.34%, 7.9% and 11.92%, respectively, which was in agreement with our study observation. The possible explanation for the increased prevalence of BA in rural area could be more use of bio fuel (cow dung, wood) for domestic cooking, smoking parents and presence of more outdoor allergens.

Our study shows the overall occurrence of Allergic Rhinitis to be (1216/5002) 24.31%. The prevalence of AR is increasing with age i.e. 10.46% (6-9 yrs), 18.17% (10-13yrs), 29.79% (14-16yrs) and 33.28% (17-18yrs). The prevalence of AR is higher in rural area 35.70% (720/1216) as compared to Urban area 16.61% (496/1216) which is statistically significant. Abhishek Saini et al (2012)¹² showed the prevalence of Allergic Rhinitis (AR) in school going children 4-18 years (n=1572) in urban area of Jaipur City, Rajasthan to be 33.52%. The difference in observations with our study is probably because of their small size of study group and only limited to urban area. Sandeep Salvi et al⁶ in a study of Prevalence of asthma and allergic diseases in 15,500 school children from Pune and Nagpur showed the prevalence of allergic rhinitis 9.51% in age group of 6-7 years and 12.72% in age group of 13-14 years in Nagpur. The prevalence of allergic rhinitis was 14.78% in age group of 6-7 years and 8.92% in age group of 13-14 years in Pune. The increased prevalence rate in our study is again in agreement with the fact that the overall prevalence of AR is also increasing in different age group also during last few years.

Our study shows that Allergic Rhinitis children suffer from Asthma in 46.63% (567/1216) cases. Kohei Yamauchi et al¹³ from Japan conducted a questionnaire based study on children with AR (n=3945) and reported that 49% of AR patients showed BA symptoms and 35% of them were diagnosed with BA. H Yuksel et al⁸ in a study from Turkey showed that Asthma was significantly more common in children with

rhinitis (31.5% vs 11.8%; $P < .01$; odds ratio [OR], 3.45). These observations are in concurrence with our observations.

Our study shows that 567 out of 932 (60.40%) Asthmatic children also suffer from Allergic Rhinitis. Yamauchi K et al¹³ conducted study among the patients with childhood BA (n=3283), and observed that 60% asthmatic were diagnosed with AR. Maio S et al¹⁴ studied 995 asthmatic patients in Italy, of which 60.6% had concomitant allergic rhinitis (R+A), 39.4% had asthma alone. The findings of above studies are in concurrence with the observations of our study. Ibáñez MD et al¹⁵ from Spain reported that association between asthma and rhinitis was significantly higher in children than in adults (44.9% vs 35.5%; $P < .05$). The difference in the observations of above studies could be because of different sample population.

Our study shows Asthma and Allergic Rhinitis as comorbidities in (567/5002) 11.34% cases. Andrade CR et al³ Conducted a study among 3083 adolescent children (13-14 years) in Brazil. The prevalence of asthma and AR co-morbidity was 8.4% in their study. Hong S et al¹⁶ from Seol (S. Korea) conducted a study in the 31,201 children studied; they found that the percentage of subjects with, both asthma and allergic rhinitis was 4.7%. H Yuksel et al⁸ in a study from Turkey showed that 4.7% had asthma along with rhinitis. The above studies also confirm the association of both the conditions as comorbidities in a significant proportion of patients. The low rate of association in these studies as compared to us could be attributed to difference in social and geographical characteristics.

Conclusion

It was found that the prevalence of both AR & Asthma are showing a significant increase in last few years posing a significant morbidity burden on the society. These allergic diseases are existing as co morbidities in a significant proportion of children demanding a comprehensive strategic approach to deal with them. As it is a first study of

its kind conducted in children in Jaipur District with adequate study population, hence it may serve as a base line study for future comparison and much larger studies are welcome to make generalization of data.

Conflicts of Interest: There was no competing interests for any of the authors.

Bibliography

1. Bousquet J, Bousquet PJ, Godard P, Daures J-P. The public health implications of asthma. Bulletin of the World Health Organization. 2005;83(7):548-54.
2. Beasley R. International pattern of the prevalence of pediatric asthma : The ISAAC program : The pediatric clinics of North America, 50 (2003), 539-553.
3. Andrade CR et al. Asthma and allergic rhinitis co-morbidity: a cross-sectional questionnaire study on adolescents aged 13-14 years, Primary Care Respiratory Journal; 17(4)225-6
4. Redline S et al. Development and validation of school-based asthma and allergy screening questionnaires in a 4-city study. Ann Allergy Asthma Immunol. 2004; 93: 36-48.
5. Sharma BS et al. Prevalence of Asthma in Urban School Children in Jaipur, Rajasthan. Indian Pediatrics. 2012;49: 835-36.
6. Salvi S et al. Prevalence of asthma and allergic diseases in 15,500 school children from Pune and Nagpur (ISAAC study) Presented at National Pulmonary Congress, 2003, Coimbatore.<http://www.crfindia.com/index.php?q=node/19>.
7. Behl RK et al. Prevalence of bronchial asthma in school children of 6-13 years of age in Shimla city. Indian J Chest Dis Allied Sci. 2010 Jul-Sep; 52(3):145-8.
8. Yuksel H et al. Prevalence and Comorbidity of Allergic Eczema, Rhinitis,

- and Asthma in a City in Western Turkey. *J Investig Allergol Clin Immunol* 2008; Vol. 18(1): 31-35.
9. Jain A et al. Prevalence of bronchial asthma in rural Indian children: a cross sectional study from South India. *Indian J Pediatr.* 2010 Jan; 77(1):31-5. doi: 10.1007/s12098-009-0308-6. Epub 2010 Jan 20.
 10. Prasad R et al. The prevalence of asthma in rural children in 5-14 years of age. *Indian J Allergy Asthma Immunol.* 2007;21(1): 15-18.
 11. Gaur SN et al. Prevalence of bronchial asthma and allergic rhinitis among urban and rural adult population of Delhi Indian *J Allergy Asthma Immunol* 2006; 20(2) : 90-97.
 12. Saini et al. Rhinitis, sinusitis and ocular disease – 2085. Prevalence of allergic rhinitis in urban school children, Jaipur City, India. *World Allergy Organization Journal* 2013 6(Suppl 1):P164.
 13. Yamauchi K et al. Analysis of the Comorbidity of Bronchial Asthma and Allergic Rhinitis by Questionnaire in 10,009 Patients. *Allergology International.* 2009;58:55-61.
 14. Maio S et al. Impact of Asthma and Comorbid Allergic Rhinitis on Quality of Life and Control in Patients of Italian General Practitioners. *Journal of Asthma;* October 2012, 49(8)854-61 (doi:10.3109/02770903.2012.716471).
 15. Ibáñez MD et al. Rhinitis and its Association With Asthma in Patients Under 14 Years of Age Treated in Allergy Departments in Spain: *J Investig Allergol Clin Immunol* 2010; Vol. 20(5): 402-406.
 16. Hong S et al. The Prevalence of Atopic Dermatitis, Asthma, and Allergic Rhinitis and the Comorbidity of Allergic Diseases in Children. *Environmental Health and Toxicology* 2012;27:e2012006.