

Prevalence of Asthma, Eczema and Allergic Rhinitis Symptoms in School Children of Kathmandu Valley: Results of a Questionnaire Survey

Sharma AK¹, Thapa SB², Basnet S³

Abstract

Introduction: Asthma is the most common chronic disease in children. This study was performed to determine the prevalence of asthma, eczema and allergic rhino-conjunctivitis symptoms in school children of Kathmandu.

Material and Methods: This questionnaire-based survey was conducted from December 2009 to August 2010 in 13 schools of Kathmandu among children aged six to seven years and 13 to 14 years based on questions adapted from International Study on Asthma and Allergies in Children (ISAAC) and translated into Nepali. Data were analysed using SPSS and prevalence of self-reported asthma-like symptoms, eczema and allergic rhinitis were assessed.

Results: The questionnaire was distributed to 8269 children with a response rate of 68.54%. About 7.5% replied positively for "ever wheezed" (8.1% in older and 6.4% in young children) and 5.2% reported, "current wheeze" (4.2% in younger and 5.8% in older children). Boys had more frequent wheezing than girls in both age groups ($p < 0.05$). More children had nocturnal cough not associated with cold or chest infection (16.0%) and exercise-induced symptoms (9.4%). The overall prevalence of eczema was 6.2%; younger children (7.2%) reporting symptoms more commonly than older children (5.6%). The reported prevalence of allergic rhinitis was 28.2% (31.2% in older as compared to 22.9% in younger children). Allergic symptoms like "current wheeze", "eczema" and "allergic rhinitis" were frequently reported together.

Conclusion: Asthma, eczema and allergic rhinitis are common in school children of Kathmandu. A multi-centre study across all ecological zones in both rural and urban settings including video questionnaire will more accurately estimate asthma prevalence and its trends in school children of Nepal.

Key words: asthma, allergic rhinitis, allergic rhino-conjunctivitis, eczema, ISAAC

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Introduction

Asthma is the most common chronic disease in children.¹ About 235 million people in the world currently suffer from asthma and most deaths related to asthma occur in low and lower middle

income countries.¹ Although mortality is low¹, asthma accounts for 1.1% of the overall global estimate of all-cause "Disability-adjusted life years" (DALYs)/100,000.¹ Children with asthma miss school more frequently than their peers¹ impairing learning. Childhood asthma has a much larger social and economic burden in developing countries.² Prevalence of asthma is increasing in many regions of the world³⁻⁵ and this trend has shown a strong relationship with environmental pollution, deteriorating air quality and population density.

Ever since the International Study of Asthma and Allergies in Childhood (ISAAC) developed simple methods for measuring the prevalence of childhood asthma, allergic rhinitis and atopic eczema allowing international comparisons,⁴ several national and regional asthma prevalence rates have been published and continually updated to demonstrate the changing trends in asthma epidemiology.³⁻⁵ Eczema and allergic rhinitis are common associations with asthma in children and relate together with a common pathophysiological process.⁶ The reported prevalence of 'current asthma' at 1.5% in Nepal is the lowest among the Asian countries.⁷ This contrasts with a high prevalence of asthma (up to 36.8%) reported in some western countries.⁵ Published literature has reported a variable prevalence of asthma-like symptoms from as low as 1.5% to as high as 16.3% in different geographic locations in Nepal.^{7,8} However, studies on the prevalence of asthma and other associated/co-morbid allergic disorders in Nepalese children remain limited. A study evaluating the effects of air pollution reported allergic rhinitis like symptoms in about 10% of surveyed children using ISAAC questionnaire.⁸ A community-based study reported that skin disorders are common (20.1% of the surveyed population) and eczema was the most common dermatosis (28.1%) diagnosed.⁹

The rate of asthma increases as communities adopt western lifestyles and become urbanised. Kathmandu is rapidly urbanising with a high level of pollution¹⁰ and is therefore at risk of a rapid increase in asthma prevalence paralleled by other allergic disorders. A previous study on adolescent schoolchildren in Kathmandu using ISAAC questionnaire had reported 8.1% prevalence of current wheeze.¹¹ Secular trends in asthma epidemiology around the world suggest that prevalence of asthma is increasing.³ It is therefore important to periodically update this data to document the changing prevalence of asthma in parallel with urbanisation. This study aims to assess the prevalence of asthma, allergic rhinitis and eczema symptoms in school children based on ISAAC written questionnaires in Kathmandu

Material And Methods

We conducted a questionnaire survey based on ISAAC methodology between December 2009 and August 2010 in 13 schools in Kathmandu. School children of six to seven years and 13-14 years were targeted for the study following ISAAC protocol. Grades with the highest proportion of children in the target age groups were selected for the survey.

Schools were randomly selected with students in both primary (Classes one and two) and middle school (Classes seven and eight) sections. We selected both government and private schools that had more than 500 students enrolled in their program. Each school was invited to take part after orientation of the school staffs. Authorities of all 13 schools approached by investigators agreed to participate. Collectively there were 3015 and 5314 children registered in class one and two and class seven and eight respectively.

Questionnaires were distributed to all children of classes one and two to target children six to seven years of age and all children in classes seven and eight to target children 13-14 years of age with help of class teachers. An information leaflet outlining study objectives and procedures was also sent to parents. The school teachers informed the parents that their consent was implied if the students returned the questionnaires.

Parents of the younger children were requested to fill out the questionnaire. Older children were asked to fill out the questionnaire themselves with help of parents when required. Parents and children were given a week to complete and return; if not returned in a week, students were reminded to return them in another three days. Students who were absent on the day of distribution of questionnaire were missed.

Questions were adapted from the ISAAC phase one manual.^{12,13} We used only the written questionnaire. The original questionnaire was translated into Nepali, field-tested, revised and validated in 50 children previously diagnosed with asthma before the final survey.

Sample size was calculated to meet the primary study objective of determining asthma prevalence in school children. The estimated sample size was calculated based on the prevalence of asthma in previous studies in Nepal (1.5-6%) using ISAAC methodology.^{7,14} The sample size of 3743 was calculated for a confidence interval of 99% for estimated prevalence of around 6%. Data were analysed using SPSS (Ver:11.5). In case of inconsistent response between the stem and its branch questions, the response was not discarded¹⁵ and the data analysed as such. The chi-squared test was used

to assess the association between categorical variables. P-value < 0.05 was considered to be significant.

Asthma, eczema and allergic rhinitis symptoms were defined as positive response to:

- Current wheeze: "Have you/your child had wheezing or whistling in the chest in the last 12 months?"¹⁵
- Severe wheeze: "Have you/your child had wheezing or whistling in the chest in the last 12 months?" and one of "four or more attacks of wheeze" or "sleep been disturbed due to wheezing on average once or more per week" or "had wheezing severe enough to limit speech to only one or two words at a time between breaths".¹⁵
- Rhinitis/Rhino conjunctivitis: "In the past 12 months, have you had a problem with sneezing, or a runny, or a blocked nose when you did not have a cold or the flu? If yes: in the past 12 months, has this nose problem been accompanied by itchy-watery eyes?"¹⁵
- Current Eczema: "Have you ever had an itchy rash which was coming and going for at least six months? And if yes: Have you had this itchy rash at any time in the last 12 months? And if yes: Has this

itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears, or eyes?"¹⁶

The study approval was granted by Institutional review committee, Institute of Medicine.

Results

The target population of children in these schools was estimated at 8400 children. Questionnaires were distributed to 2974 children of class one and two and 5295 children of class seven and eight (total 8269 children). The response rate was 67.92% (2020) in classes one and two and 68.89% (3648) in classes seven and eight. Two hundred and seventy-nine questionnaires received back were excluded from analyses because they were incompletely answered or children fell out of the target ages. We finally analysed 5389 responses; 3462 in older and 1927 in younger age groups. The mean age of children (± 2 SD) in classes one and two and classes seven and eight were 7.12 ± 0.90 years (range five to nine years) and 13.26 ± 0.85 years (range 12-15 years) respectively. There were more girls (51.2%) than boys (48.8%) respondents.

Table 1: Self-reported symptoms of asthma, eczema and allergic rhino-conjunctivitis

Symptoms	Number (Percentage, %) of children reporting the symptom			
	Class 1 and 2 (6-7-year-old) N = 1927	Class 7 and 8 (13-14-year-old) N=3462	p	Overall N = 5389
Ever wheezed	125 (8.1)	N = 3462	0.012	407 (7.5)
Wheezing in last 12 months	81 (4.2)	201 (5.8)	0.002	282 (5.2)
Wheezing during exercise	59 (3.0)	448 (12.9)	0.000	507 (9.4)
Nocturnal cough not associated with cold or a chest infection	362 (18.7)	503 (14.5)	0.000	865 (16.0)
More than 3 episodes of wheezing in last 12 months	16 (0.85)	38 (1.1)	0.1	54 (1.0)
Nocturnal awakening of one or more nights per week due to wheezing	5 (0.25)	11 (0.31)	0.001	16 (0.29)
Speech limitation to one or two words due to wheezing during the last 12 months	14 (0.72)	52 (1.5)	0.96	66 (1.22)
Physician diagnosed asthma	28 (1.4)	34 (0.98)	0.2	62 (1.1)
Had itchy rash coming and going away for six months	211 (10.35)	347 (10.95)	0.17	558 (10.02)
Had such itchy rash within last 12 months	184 (9.5)	275 (7.9)	0.027	459 (8.5)
Rash affecting the eczema specific regions	139 (7.2)	196 (5.6)	0.003	335 (6.2)
Physician diagnosed eczema	46 (2.3)	47 (1.3)	0.00	93 (1.7)
Ever had sneezing or blocked or runny nose apart from flu or cold	443 (22.9)	1081 (31.2)	0.013	1524 (28.2)
Sneezing or blocked or a runny nose apart from flu or a cold in last 12 months	375 (19.4)	887 (25.6)	0.00	1262 (23.4)
Presence of itchy or watery eyes associated with the nose problem in last 12 months	101 (5.2)	351 (10.2)	0.00	455 (8.4)
Physician diagnosed allergic rhinitis	41 (2.1)	61 (1.7)	0.07	102 (1.8)

Table 2: Gender differences in self-reported symptoms of asthma, eczema and allergic rhinoconjunctivitis

Symptoms	Number (Percentage, %) of children reporting the symptom		p
	Boys N=2631	Girls N=2758	
Ever wheezed	237 (9.0)	170 (6.1)	0.000
Wheezing in last 12 months	169 (6.4)	113 (4.0)	0.000
Wheezing during exercise	283 (10.7)	224 (8.1)	0.001
Nocturnal cough not associated with cold or a chest infection	440 (16.7)	425 (15.4)	0.181
Had itchy rash coming and going away in last 12 months affecting eczema specific regions	186 (7.0)	149 (5.4)	0.018
Sneezing or blocked or a runny nose apart from flu or a cold in last 12 months	669 (25.4)	593 (21.5)	0.000

Table 3: Gender adjusted odds ratio for other allergic symptoms in presence of category of such symptoms

Allergy symptoms	Likelihood of another symptom	Odds ratio	95% CI
Asthma symptoms	Ever had eczema	3.89	2.95-5.13
	Allergic rhinitis symptoms	5.25	4.57-6.03
Current wheeze	Ever had eczema	2.84	1.87-4.32
	Allergic rhinitis symptoms	4.54	3.52-5.85
Exercise-induced wheeze	Ever had eczema	3.07	2.20-4.28
	Allergic rhinitis symptoms	4.75	3.92-5.77
Nocturnal cough	Ever had eczema	3.66	2.75-4.87
	Allergic rhinitis symptoms	4.80	4.12-5.60
Allergic rhinoconjunctivitis	Ever had eczema	3.79	2.80-5.12
	Asthma symptoms	5.82	4.89-6.93

Self-reported symptoms of asthma, allergic rhinoconjunctivitis and eczema were common in children of

both age groups and are presented in Table 1. Older children reported current wheeze, exercise-induced symptoms, allergic rhinitis, and rhinoconjunctivitis symptoms more commonly. Parents of younger children reported more nocturnal cough than wheezing ever. Frequent wheezing (four or more times in a year) was reported by a small proportion of participants. Only a small number of participants had been diagnosed by physicians to have asthma, eczema or allergic rhinitis.

Gender differences were also observed with more boys reporting the symptoms related to asthma, eczema and allergic rhinitis as outlined in Table 2. Self-reported symptoms of asthma, allergic rhinitis and eczema were more commonly reported together; table 3 presents this relationship between different allergic symptoms as a gender-adjusted odds ratio.

Discussion

Asthma is one of the most common chronic diseases of childhood. In this questionnaire survey of school children of Kathmandu to assess the prevalence of asthma, allergic rhinitis and eczema symptoms based on ISAAC written questionnaire, current wheeze, current eczema, and rhinoconjunctivitis symptoms were reported by 5.2%, 6.2% and 28.2% of respondents respectively. Boys reported these symptoms more frequently than girls and very few children had previously been diagnosed by physicians.

The results show a moderately high prevalence of asthma-like symptoms in school children. Regional and worldwide trends based on ISAAC surveys show that prevalence of asthma and other atopic disorders is rising.^{5,17} This may be particularly important in Kathmandu, Nepal as it has become a highly polluted city with high population density.^{10,18} Around the world, 1.7-32.2% of school children report wheezing in the last 12 months with up to 15 fold differences between countries.^{7,17} The prevalence of current wheeze (5.2%) in this study is similar to other reports from the Indian subcontinent^{7,17} but much lower than that reported in Europe.¹⁷ A study exploring the risk factors for asthma in a rural setting in 2000 school children in Nepal reported asthma symptoms in about 6% of children.¹⁴ Another study conducted in Kathmandu among 4551 schoolchildren of class seven and eight reported prevalence of current wheeze as 8.9% (95%CI: 8.0-9.7).¹¹ The prevalence of current wheeze in the current study amongst the same age group of children was comparable at 8.1%. In another study in 2330 school children from Kathmandu aged 11-17 years, designed to look at indoor environmental factors as risk factors for asthma, 135 (5.7%) children were identified as suffering from asthma symptoms.¹⁹

A higher proportion of children with other manifestations of asthma-like exercise-induced symptoms (9.4%) and nocturnal cough (16%) were observed. Similar results have been reported in Indian adolescents and Tibetan students with a higher prevalence of exercise-induced wheeze (19.9% and 7.1% respectively) and nocturnal cough (35.6% and 4.6% respectively) as compared to current wheeze (8.6% and 0.8% respectively).^{20,21}

The prevalence of asthma-like symptoms of current wheeze and exercise-induced symptoms were higher for older than younger children. Self-reported symptoms tend to be more reliable with increasing age.²² Boys reported wheezing more frequently than girls in both age groups. Asthma is described to have an inverted U shaped relationship with gender being more common in boys in childhood and just the opposite in adulthood.²³

Severe asthma-like symptoms based on severe wheeze as defined by four or more episodes of wheeze (1%) or nocturnal awakening more than once a week (0.29%) or speech limitation to one or two words in the past year (1.2%) occurred in a small number of children. The severity of asthma is difficult to assess from self-reported symptoms in contrast to a clinical scenario where the severity is assessed with objective tests of lung function.

Only a small proportion (21.9%) of children with 'current wheeze' had physician diagnosed asthma. A study in Tamil Nadu also reported that asthma-like symptoms were present in 12% of children when only 5% had asthma diagnosis.²⁴ According to a study that describes health-seeking behaviour in the Nepali population,²⁵ many of these children may not have been seen by professionals. In some of these children, the diagnosis might have been missed even by physicians.

The overall prevalence of eczema in children of all age groups was 6.2%, with slightly higher prevalence in children of class one and two (7.2%) than class seven and eight (5.6%). While large studies on eczema prevalence in Nepalese children are lacking, a point prevalence study involving 878 randomly selected people of all ages in Bara, Nepal reported that 5.6% of patients had eczema.²⁶ The worldwide eczema prevalence is highly variable; as low as 0.2% to as high as 24%.¹⁶ ISAAC questionnaire-derived prevalence of

eczema has been reported to be sufficiently precise for comparisons between populations when compared to physical examination to detect flexural eczema.

The overall prevalence of allergic rhinitis symptoms was 23.4% with a higher prevalence (25.6%) among older than younger children (19.4%). The results are comparable to reported prevalence of rhinitis with itchy-watery eyes ("rhinoconjunctivitis") varying from 0.8% to 14.9% in the 6-7-year-olds and from 1.4% to 39.7% in the 13-14-year-olds.²⁷ Only 8.0% of these children, however, reported physician-diagnosed allergic rhinitis. Repeated nasal symptoms are often considered as frequent colds and physicians are also hesitant to diagnose allergic rhinitis.²⁸ The self-reported symptom of allergic rhinitis may also be influenced by the season of survey administration.

This study has limitations. One major limitation is the low response rate. While an ideal response rate is not defined,²⁹ rates exceeding 90% are considered to be an indication of good quality for most surveys using the ISAAC guidelines. Low response rates can falsely lower the prevalence rates as children who are more frequently absent from the school are the ones likely to be missed. The study was conducted over nine months and seasonal variation in symptoms is likely to alter self-reporting by the participants. The present study used a written questionnaire only. Although written questionnaire has been proven to be largely accurate and reproducible, validity can be improved by the addition of a video questionnaire.³⁰

Conclusion

Despite some limitations, the results of this study indicate that asthma, eczema and allergic rhinitis symptoms are common in school children of Kathmandu. Boys report asthma symptoms more frequently than girls and exercise-induced cough and nocturnal cough are the most frequent symptoms in children. Eczema and allergic rhinitis were more common in children with asthma symptoms. A multi-centre study across all the ecological zones in the country is recommended to obtain a more accurate estimate of changing asthma prevalence in schoolchildren of Nepal. Future studies need to consider including video questionnaires to improve the validity of the results.

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