

Prevalence and Risk Factors of Asthma and Wheeze in School-going Children in Lucknow, North India

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Objective: To assess the prevalence of asthma and wheeze and factors associated with it in children aged 6-7 and 13-14 years. **Method:** School based, prospective survey using self/parental reporting of occurrence of asthma or wheeze on pre-designed questionnaire. **Results:** Out of 112 schools, 17 and 15 schools were randomly selected for recruitment of subjects in age group 6-7 and 13-14 years, respectively. Prevalence of asthma and wheeze reported were 2.3% and 6.2%, respectively, in age group 6-7 years and 3.3% and 7.8%, respectively, in age group 13-14 years. On the basis of adjusted odds ratio, risk factors for wheeze /asthma were tertiary education of mother, antibiotic use in the first year of life, eating pasta or fast-food or meat once or more/week and exercise once or more/week while the protective factors were intake of vegetables once or more and fruits thrice or more per week. In univariate analysis, breastfeeding was also found to be protective. **Conclusion:** Promotion of rational use of antibiotic in first year of life, avoidance of fast food and promotion of breastfeeding and intake of fruits and vegetables may reduce the risk of asthma/wheeze and should be encouraged.

Key words: Asthma, Risk factors, School-going children, Urban, Wheeze.

ASTHMA is one of the common chronic childhood illnesses(1). An increasing prevalence and severity of asthma has been reported worldwide(2). Indian studies are limited regarding asthma in children. Recent report shows wide variation (4-19%) in the prevalence of asthma in school-going children from different geographic areas in India(3). There has been an increase in mortality as well, particularly in younger age groups(4). Environmental factors, including increasing exposure to pollution, allergies, environmental tobacco smoke and sedentary life style have been identified as risk factors

for asthma (5).

The current study was conducted as a part of multi-country ISAAC- III (Inter-national study of Asthma and Allergy in Childhood). The aim of multicentric collaboration was to investigate role of possible modifiable environmental factors that may ultimately lead to a reduction in the personal burden of these diseases in India as well as other participating countries. This study was conducted to assess the prevalence of asthma and wheeze and factors associated with it in children aged 6-7 and 13-14 years.

Subjects and Methods

All schools in Lucknow urban area were listed and by random draw 20 were selected for the study. Selected schools were spread all over the city. After obtaining consent from school authorities, all children in eligible age range were invited for participation. Age was determined by consulting school records. Those children whose parents gave written informed consent were included. ISAAC screening questionnaire in Hindi and English(3), as applicable, was used. There were questions to find out the presence of asthma and wheeze and collect information on potential risk factors associated with asthma/wheeze. The risk factors included in the study were eating habits, environmental exposures (traffic pollution, parental smoking, cooking fuels, proximity to pets), breastfeeding, lifestyle like TV watching and exercise, antibiotic and paracetamol use in first year of life and parental education. The questionnaire was distributed to children in the school after explaining each question. There were 49 questions in questionnaire for children aged 6-7 years. There were 39 questions in questionnaire for children aged 13-14 years. They completed the questionnaire themselves in school and returned it on the same day. Project staff measured the weight of children in kilograms.

Sample size

A fixed sample size of 3000 was taken for children in both age categories. This sample size was sufficient to detect a minimum prevalence of wheeze or asthma of 2% with a precision of 2% for a confidence level of 95%. Therefore, recruitment were stopped after enrolment of required sample size.

Data Analysis

Data was entered in customized Epi Info program provided by ISAAC international data center. For each group prevalence of asthma and wheeze and its 95% confidence

interval was calculated. Crude odds ratio (OR) with 95% confidence interval was calculated to assess univariate association of individual risk factors with wheeze ever or asthma ever. Multivariate analysis was done using unconditional logistic regression to evaluate the independent effect of factors which had univariate association with wheeze and asthma, and adjusted odds ratio with their 95% confidence interval is reported. For data analysis SPSS statistical software was used.

Results

The present study was carried out from July 2001-March 2002. From listed schools in Lucknow urban area (n = 112), 20 were randomly selected for inclusion. However, from 17 schools, 13 privately and 4 government funded, and 15 schools, 12 privately and 3 government funded, adequate numbers of children in 6-7 years and 13-14 years age categories, respectively, were selected. Mean number of children per school in the 6-7 years age was 176.5 (SD: 196.4, range 7-585) and in 13-14 years was 200 (SD: 202.4, range 41-869).

A total of 3000 children were enrolled each in age groups 6-7 and 13-14 years. In the age group 6-7 years, out of 3000 children 1780 (59.33%) were boys and 1220 (40.66%) were girls. Out of 3000 children in 13-14 year age group, there were 1440 (48.1%) boys and 1560 (52%) girls. In the age group 6-7 years mean age (years) was 6.71 (SD = 0.45) and mean weight (kg) was 20.65 (SD = 4.42). In the age group 13-14 years mean age (years) was 13.34 (SD = 0.47) and mean weight (kg) was 39.91 (SD = 8.74). Age and weight were not associated with wheeze or asthma (data not shown)

Prevalence of reported asthma was 2.3% (95% CI 1.78-2.82) and 3.3% (95% CI 2.68-

3.92) in the children of age group 6-7 and 13-14 years, respectively. Prevalence of reported wheeze ever was 6.2% (95% CI 5.35-7.05) and 7.8% (95% CI 6.86-8.74) in the age group 6-7 and 13-14 years, respectively. Among wheezers, asthma was reported in 25.13% and 20.51% in the age group 6-7 and 13-14 years, respectively.

Tables I and II shows association of various risk factors with wheeze and asthma in children of age group 6-7 and 13-14 years, respectively.

Discussion

There was a low prevalence of asthma (2.3% - 3.3%) in the children surveyed in Lucknow, North India. A higher prevalence

TABLE I—Association of Various Risk Factors with Wheeze and Asthma in Children of Age Group 6-7 Years.

Risk factors (N)	Present n	Present %	Absent n	Absent %	Crude OR	95% CI %	Adjusted OR	95% CI OR
For wheeze								
Breastfed (2471)	150	6.1	2321	93.9	0.59	0.38-0.92	0.62	0.37-1.03
Tertiary education of mother (1908)	142	7.3	1766	92.7	1.61	1.126-2.301	1.62	1.003-2.636
Antibiotic use in first year of life (1492)	142	9.5	1350	90.5	4.03	2.68-6.05	3.06	1.92-4.88
For asthma								
Pasta or noodle eaten at least once/week (492)	23	4.7	469	95.3	2.58	1.33-4.99	2.99	1.43-6.26

OR - Odds Ratio; CI - Confidence interval.

TABLE II—Association of Various Risk Factors with Wheeze and Asthma in Children of Age Group 13-14 Years.

Risk factors (N)	Present n	Present %	Absent n	Absent %	Crude OR	95% CI OR	Adjusted OR	95% CI OR
For wheeze								
*Meat (700)	83	11.8	617	88.2	1.73	1.287-2.334	1.64	1.19-2.26
*Vegetables (2682)	217	8.1	2465	91.9	0.488	0.266-0.894	.46	0.23-0.92
**Fruits (2118)	162	7.6	1956	92.4	0.73	.541-.987	0.66	0.46-0.94
*Exercise (1176)	125	10.6	1051	89.4	1.838	1.38-2.43	1.77	1.28-2.43
For asthma								
*Fast food (n = 1578)	70	4.3	1508	95.7	2.89	1.40-5.96		

OR-Odds Ratio; CI-Confidence interval.

*taken once or more times/ week; **taken three or more times/ week.

Key Messages

- There is a wide inter-city difference in prevalence of asthma in India.
- Risk factors for wheeze /asthma were tertiary education of mother, antibiotic use in the first year of life, eating pasta or fast-food or meat and exercise.
- Protective factors were intake of vegetables and fruits and breastfeeding.

of wheeze was reported as compared to asthma among children from both age categories. Reported prevalence of asthma in rural children from Ludhiana(6) and Punjab(7) was 2.6% and 1% respectively, which are very similar to our study. Our findings differ from that reported from Bangalore(8) which showed 9% and 29.5% prevalence of asthma in 1979 and 1999 respectively, and urban Delhi(9) which showed prevalence of asthma 11.6%. Rise in prevalence over time in Bangalore has been associated with environmental pollution, urbanisation and change in demography of the city(8). These factors may be responsible for inter-city variation in the prevalence of asthma and our study is not designed to depict inter-city differences.

Among those who reported ever wheezers almost one fourth reported asthma. The rest of children with reported wheeze may have either misclassified wheeze or had episodes of lung infection with bronchospasm or attack of asthma without recurrence. A study done in urban and rural children in Tamil Nadu in the age group 6-12 years showed prevalence of wheeze 18%(10). ISAAC phase I reported 12 month prevalence of symptoms of wheeze ranging from 4.1-32.1% with lowest rates in India, Indonesia, Iran and Malaysia and highest rates in Australia, Brazil, Costa Rica, New Zealand and Panama in the age group 6-7 years(11). For 13-14 year age group, 12 month prevalence of symptoms of wheeze

ranged from 2.1-4.4% in Albania, China, Greece, Georgia, Indonesia, Romania and Russia to 29.1-32.2% in Australia, New Zealand, Ireland and UK(11).

Since this was a cross-sectional survey, we cannot establish causal association of various risk factors with asthma. However, various risk factors for wheeze and asthma have been identified. One of them is tertiary education of mother. Since there is no plausible direct link of maternal education with asthma, there are likely to be unmeasured confounders associated with life-style. Our findings are in contrast to study by Celedon, *et al.*(12) from Costa Rica, which showed that low parental education was a significant risk factor for asthma.

Antibiotic use in the first year of life has also been identified as a risk factor for asthma. Antibiotics are used for various childhood illnesses, most of which are accompanied by fever. It is likely that some of these may be viral respiratory infections, which can predispose to airway hyper-sensitivity in later life.

Consumption of pasta, noodles and the like, fast-food and meat increased the risk of asthma/wheeze. A small proportion of children aged 6-7 years gave history of consumption of pasta and the like foods (16.4%). Since eating these types of food is not currently universal and found in specific families there may be factors confounding this association.

It is known that exercise also increased the risk of asthma/wheeze. Exercise is also known to provoke asthma attack. Exercise was found to be a risk factor for wheezing in 13-14 years of age group. However, causal relationship of exercise with wheeze could not be established in our study. Exercise induced bronchospasm has been reported in urban and rural school going children from Ghana(13). Paramesh(8) also reported the same finding from India.

In univariate analysis, breastfeeding was found to be protective in our study which was similar to other studies(14). Our findings suggest that eating vegetables and fruits were protective for wheeze in 13-14 years age group. Unlike us, Paramesh(8) found fruits to be a risk factor.

Our study is a school-based survey with an appropriate sample size to detect small prevalence of asthma and wheeze. As this is a questionnaire based study, there may be difference in comprehension of questions by the respondents and possible misclassification of exposures as well as symptoms of asthma and wheeze.

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