

Pediatric Asthma: Prevalence and Socio-Cultural Factors Affecting Asthma Management in a Rural Area of Northern Karnataka

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Abstract

Context: Asthma prevalence and severity is increasing among Indian children. There is the paucity of data on pediatric asthma in rural India and treatment received by asthmatics is not up-to-standard treatment guidelines. **Aim:** The aim is to estimate asthma prevalence and factors influencing access to standard asthmatic care among 5–15 years aged children. **Settings and Design:** Cross-sectional study conducted in rural north-Karnataka for 1 year. **Subjects and Methods:** The International Study of Asthma and Allergies in Childhood questionnaire was administered to participants followed by clinical examination. A child was considered as asthmatic if there was affirmative response to: (a) History of wheeze in the past 12 months, (b) Physician diagnosed/ever asthma, (c) history of taking inhaled/oral bronchodilators. **Statistical Analysis:** All characteristics were summarized descriptively. **Results:** Prevalence of Current-wheeze, Ever-asthma, and wheeze on exertion were 4%, 2%, and 3.7%, respectively. About 63.9% of asthmatics had severe-asthma and 44.4% reported severe attack of wheezing limiting speech. About 89% of current-wheezers used only oral medications for wheeze/asthma, 50% did not take medicines as per doctors' advice. None availed regular follow-up. Financial constraints and ignorance were major reasons cited. **Conclusions:** Illiteracy, poverty, lack of proper guidelines, and non-availability of inhalational medications have affected treatment adherence resulting in severe asthma.

Keywords: Barriers to asthma care, current wheeze, ever asthma, ever wheeze, prevalence and management of childhood asthma, social determinants of asthma

INTRODUCTION

Pediatric asthma has emerged as a major public health problem. When uncontrolled, asthma may seriously impact patient's quality of life and even mortality if untreated.^[1]

The present global asthma magnitude (300million) is expected to increase at alarming rates by the year 2025 to 400 million.^[1-3] Even though India has lesser asthma prevalence rates (5%–15%) compared to European countries (>20%), disease is less often recognized, under-treated and more severe (>40% cases).^[1-4] Severe asthmatics are more in number in rural (3.6 lakh) than urban India (1.6 lakh). Ignorance, lack of adequate treatment facilities, and high health-care costs that have eventually perpetuated poverty in asthma/allergic-disorder affected families.^[1,4,5] There is a need for integrated approach for asthma management at primary

health care levels.^[1] Indian studies on pediatric asthma are fragmented, either hospital or school based, with methodology differences.^[6] Hence, population-based epidemiological studies adopting standard methodology are needed to develop national policy.^[6]

This study was conducted with the aim and objectives to estimate the prevalence of Bronchial Asthma among

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5–15 years aged children residing in Ukkali village and assess factors influencing access to standard asthmatic care.

SUBJECTS AND METHODS

This cross-sectional study was conducted in Ukkali, the rural field practice area of Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapura, for 1 year (March 1, 2014–February 28, 2015). The study was undertaken after obtaining clearance from the institutional ethics committee. Complete enumeration of all children of 5–15 years age group, who were residents of the village was done and those willing to participate and whose parents/guardians gave informed consent were included in the study. Known cases of pulmonary tuberculosis, pneumonia, rheumatic heart disease and children with visible chest deformities due to congenital heart diseases were excluded from the study. House-to-house visit of entire village was done. Children of 5–15 years age-group were identified. After explaining the purpose of the study, assent from the child and informed consent from child's mother/primary caregiver were obtained.

A validated International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire was the study instrument.^[7,8] Questionnaire consisted of information on sociodemographic profile, ISAAC core questionnaire for asthma, supplementary questionnaires for additional respiratory illnesses and questionnaire on asthma risk factors. Information on the history of taking inhaled or oral bronchodilators was included. (According to the epidemiological definition of asthma by Jindal *et al.*, in India).^[2] A questionnaire on barriers to access standard asthma treatment was added. Questionnaire was pilot tested and necessary changes in “household and sociodemographic questionnaire” and “questionnaire on barriers for standard asthma care” were incorporated before start of the actual study. Children interviewed in the pilot study were excluded from the final analysis.

Household and sociodemographic questionnaire, ISAAC core and supplementary questionnaire were administered to all children in the presence of their mother/primary caregiver. For children <10 years age, information was elicited primarily from their mother/caregiver. Information regarding Sociodemographic profile of family and history of asthma was collected from mothers/caregivers in the presence of child.

A child was considered to be suffering from asthma if the mother/caregiver of the child gave an affirmative response to any of the following symptoms: (a) History of wheeze or whistling in the child in the past 12 months/current wheeze. (b) Child ever had asthma/known case of physician-diagnosed asthma. (c) History of taking inhaled or oral bronchodilators.^[2,5,8] Clinical examination of all children was done, and prescription/treatment documents were noted to minimize recall and respondent bias. Definitions: (a) Ever wheeze: Children who suffered from episodes of wheeze at any time in the past. (b) Current wheeze: Children who suffered from episodes of wheeze in the past 12 months. (c)

Ever-asthma/physician-diagnosed asthma: Children who were diagnosed to be suffering from asthma either by history or by available doctor prescription at any time in the past.^[5,7,8] (d) Children with symptoms of severe asthma were current-wheezers who in the past 12 months, had more than or equal to 4 attacks of wheeze, or more than or equal to 1 night/week sleep disturbance from wheeze, or wheeze affecting speech.^[5] Information regarding asthma management and barriers for standard asthma care among current-wheezers was collected from both children and their care-givers and verified with prescription forms/treatment details.

Statistical analysis

Data were compiled in Microsoft excel worksheet and analyzed using the Statistical Package for the Social Sciences version 16 (SPSS Inc., SPSS for Windows, Chicago, USA). All characteristics were summarized descriptively. For continuous variables, summary statistics of N, mean, standard deviation about the arithmetic mean were used. For categorical data, frequency and percentage were used.

RESULTS

Most of the children belonged to agrarian families (44%) that were of joint type (61%) with average size of 7 ± 2 members. About 70% of children belonged to the Hindu religion. 66% of families had medium Standard of Living Index. 51% of participant children's mothers were illiterate. A 50.3% of children were male and 49.7% were female. A majority of children (73%) were of birth order ≤ 2 . A 35.4% of children were studying in primary school (1st–4th standard) and 15% were going to anganwadi/preschools. 26% of children were exposed to tobacco smoke exposure at home.

Prevalence rates of ever-wheeze, current-wheeze and ever-asthma were found to be 4.6%, 4%, and 2%, respectively. Prevalence rates of wheeze on exertion and dry cough at night apart from cough associated with cold/chest infection were 3.7% and 2.2%, respectively. Medication use for the treatment of breathlessness was found among 3.5% [Table 1]. A higher percentage of current-wheezers (63.9%) suffered from severe grade asthma symptoms and 44.4% of them reported severe attack of wheeze limiting speech.^[5]

According to the ISAAC definition of symptoms of severe asthma, 63.9% of current-wheezers suffered from severe grade asthma symptoms and 44.4% reported severe attack of wheeze limiting speech.^[9] Among asthmatic children (current wheezers $n = 36$), a 47% had 1–3 asthmatic attacks, 42% had 4–12 attacks and 11% had >12 attacks in the past 1 year. Higher percentage of 65% of asthmatics had ≥ 1 nights' sleep disturbance per week due to wheezing in the past 1 year.

Prevalence of current wheeze was higher among children belonging to Joint type families (77.8%) and with medium standard of living index (SLI) (58.3%). Prevalence of current wheeze was higher among males (72.2%), among “5 to <9 years age” group (58.3%) and among children of

illiterate mothers (75%). These associations were found to be statistically significant. Prevalence of ever asthma was higher among children belonging to low SLI families (55.6%). Prevalence of ever asthma was higher among children of illiterate mothers (83.3%). These associations were found to be statistically significant [Table 2].

Treatment for asthma was taken from ayurvedic doctors (58.3%) and/or allopathic doctors (50.0%). 89% of asthmatic children were reportedly using medications for wheeze/asthma in the past 1 year. All were oral medications, which were used only during wheeze exacerbations. Salbutamol tablets and cough syrups were the most common medications used (39.0%). More frequent medical consultations were taken by asthmatics in the past 1 year (38.9% of children took 4–12 consultations, 16.7% took more than 12 consultations). School absenteeism due to asthma was high with 42% of asthmatic children missing >10 days of school in the past 1 year due to asthma [Table 3].

Medication advice from the doctor was reportedly not followed by 50% of asthmatics. Lack of money to access care (31%)

was the reason for not adhering to treatment advice. Other reason cited was the lack of proper guidelines given by treating doctors (19%). None of the asthmatics were taken for regular treatment and follow-up of asthma. Reasons for this were lack of guidelines for follow-up (72%), financial constraints (25%), and ignorance (19.4%). A 2.8% of patients also informed that they were not provided prescription form. None of the asthmatic children used inhalational medications. Reasons cited were not being advised by the doctor (94%), financial constraints (11%), and lack of awareness (8.3%) [Table 4].

DISCUSSION

Epidemiological studies of pediatric asthma in India lack uniformity in study methodology, disease definition, age group of the study population, and lack of validated and standardized questionnaire. This has led to limitations in the comparability of prevalence estimates among the community-based studies, both at national and international levels.^[6] The greatest challenge in field-questionnaire based studies is to correctly identify asthmatics. The present study used standardized and validated questionnaire of ISAAC phases 2 and 3 and included all children aged 5-15 years, to capture the spectrum of asthma-related symptoms in this age group.^[7,8] We interviewed both children and their mothers/primary caregivers and substantiated the diagnosis with subsequent clinical examination to reduce respondent and recall bias.

In recent decades, asthma prevalence has increased globally not only due to genetic background but also due to the wide range of environmental risk factors composite of modern-lifestyle.^[9] This globalization and industrialization have also increased the asthma burden in terms of disease severity and complexity, even in less affluent countries that previously presented with lower disease prevalence.^[5,9]

Table 1: Prevalence of asthma symptoms among children

| Respiratory symptoms | Frequency (n=908), n (%) |
|---|--------------------------|
| Prevalence of ever wheeze | 42 (4.6) |
| Prevalence of current wheeze | 36 (4.0) |
| Prevalence of ever asthma/physician diagnosed asthma | 18 (2.0) |
| Wheeze on exertion/exercise in past 12 months | 34 (3.7) |
| Presence of dry cough at night apart from cough associated with cold or chest infection | 20 (2.2) |
| Used medication for treatment of breathlessness | 32 (3.5) |

Table 2: Association of Current Wheeze and Ever-asthma with socio-demographic variables

| Sociodemographic variables (n) N=908 | Current-wheeze, n (%) N=36 | Chi square and P value | Ever Asthma, n (%) N=18 | Chi square and P value |
|---------------------------------------|----------------------------|---------------------------------|-------------------------|---------------------------------|
| Sex of child | | | | |
| Male (457) | 26 (5.7%) | $\chi^2 = 7.186$ $p < 0.05$ | 12 (2.6%) | $\chi^2 = 1.35$ $p = 0.24$ |
| Female (451) | 10 (2.2%) | | 6 (1.3%) | |
| Age-group of the child | | | | |
| 5-< 9 years (330) | 21 (6.4%) | $\chi^2 = 7.75$ $p < 0.05$ | 10 (3.0%) | |
| 9-< 13 years (314) | 8 (2.5%) | | 4 (1.3%) | |
| 13-≤ 15 years (263) | 7 (2.7%) | | 4 (1.5%) | |
| Type of family | | | | |
| Nuclear (350) | 8 (2.3%) | $\chi^2 = 4.217$ $p < 0.05$ | 4 (1.1%) | |
| Joint (558) | 28 (5.0%) | | 14 (2.5%) | |
| Standard of living index | | | | |
| Low (116) | 15 (12.9%) | $\chi^2 = 32.760$ $p < 0.05$ | 10 (8.6%) | $\chi^2 = 31.492$ $p < 0.05$ |
| Medium (600) | 21 (3.5%) | | 8 (1.3%) | |
| High (192) | 0 (0) | | 0 (0) | |
| Literacy of mother/primary care-giver | | | | |
| Illiterate (467) | 27 (5.8%) | $\chi^2 = 8.336$ $p < 0.05$ | 15 (3.2%) | $\chi^2 = 7.482$ $p < 0.05$ |
| Literate (441) | 9 (2.0%) | | 3 (0.7%) | |

Table 3: Pattern of asthma management among current wheezers (n=36)

| Characteristic | Frequency (n=36), n (%) |
|--|-------------------------|
| Used any medication for wheezing or asthma in past 12 months | 32 (88.9) |
| Type of medication | |
| Oral | 36 (100) |
| Inhalational | Nil |
| List of allopathic medicines used* | |
| Salbutamol, cough syrups | 14 (38.9) |
| Prednisolone | 1 (2.8) |
| Antibiotics | 10 (27.8) |
| Cetirizine/levo-cetirizine | 3 (8.3) |
| Montelukast-mast cell inhibitor | 3 (8.3) |
| Theophylline | 3 (8.3) |
| Time of usage of asthma medication | |
| Only during episodes of wheeze exacerbation | 36 (100) |
| Regularly (everyday for atleast 2 months of year) | Nil |
| Details of health personnel consulted for asthma in past 12 months | |
| Frequency of consultation | |
| 1-3 visits | 13 (36.1) |
| 4-12 visits | 14 (38.9) |
| >12 visits | 6 (16.7) |
| None | 3 (8.3) |
| Type of health personnel consulted for wheezy episode* | |
| Ayurvedic doctor | 21 (58.3) |
| Allopathic doctor | 18 (50.0) |
| Nonqualified practitioners | 3 (8.3) |
| Not gone to any doctor | 3 (8.3) |
| Emergency department/naturopathy/unani/naati/homeopathy doctor | Nil |
| Number of school days missed due to wheezing or asthma | |
| None | 5 (13.9) |
| 1-5 days | 4 (11.1) |
| 6-10 days | 10 (27.8) |
| >10 days | 15 (41.7) |
| Not applicable, as child has not started to go to school | 2 (5.6) |

*Multiple responses

In the present study, a majority of 63% of families were in below the poverty line and 51% of mothers/primary caregivers were illiterate. Similar poverty rates but higher literacy levels among mothers were documented in the study conducted in coastal Karnataka.^[10]

Overall asthma prevalence in our study done in rural area of northern Karnataka was 4% among 5–15 years aged

children. Similar findings are found in studies conducted in rural areas of Karnataka, Ludhiana and rural area around Delhi (2.6%–4.5%).^[11,12] Whereas 4% prevalence of our study is lesser compared to studies conducted in rural areas of Manipal (10.3%) and Kanpur (9.5%).^[10,12] This 4% prevalence of asthma is also lesser compared to urban Indian prevalence (12.5%–16.7%).^[11,13-15] Reasons for lower prevalence rates compared to urban areas may be due to lesser environmental pollution, the protective farming effect associated with close contact to livestock, use of unpasteurized milk and increased endotoxin exposure.^[11,16,17] Industrialization, rising population in urban areas due to migration of villagers in search of jobs and high levels of vehicle emissions leading to increased air pollution and life-style changes are found to be correlated for increasing prevalence of respiratory allergies in urban areas.^[11,16,17]

For comparability with scientific literature, the age-specific prevalence for 6–7 years and 13–14 years age-groups were calculated. Accordingly, prevalence rates among 6–7-years age-group were 6.1% (Ever-wheeze), 4.9% (current-wheeze) and 3% (ever-asthma) and among 13–14 year age-group were 5.9% (ever-wheeze), 4.6% (current-wheeze), and 2.6% (ever-asthma) [Figure 1]. Ever-wheeze prevalence (6.1%) is comparable with studies done in Lucknow and rural areas of North India.^[15,18] Although study's prevalence of current-wheeze and ever-asthma is lower, the percentage of current-wheezers suffering from severe asthma (63.9%) was higher when compared to ISAAC phase-3 findings for the Indian subcontinent (40.1%–48.2%).^[5] The percentage of current-wheezers who suffered from 4 to 12 attacks in the past 12 months (42%) of our study is higher compared to findings of studies done by Jain *et al.* (3.8%) and Chakravarthy *et al.* (23%).^[3,19] Reasons for such higher prevalence of severe asthma symptoms in our study may be due to over-reporting of symptoms or lack of knowledge among patients/care-givers regarding long-term care for asthma in rural areas, as documented by Thompson *et al.*^[3]

Timing, pattern of asthma treatment, and barriers to access standard asthma management were explored in our study. Asthma management is affected by many socio-cultural factors like lack of knowledge and adherence to long-term treatment and beliefs.^[9,20,21] Our study found that about half of asthmatics consulted allopathic/ayurvedic medical professionals, whereas 8.3% consulted non-qualified practitioners. All asthmatic children were taken to doctors only during wheeze/asthma episodes and mostly used oral medications (90%). None were taken for regular follow-ups and no one used inhalational medicines [Table 3]. Main reasons reported for such irregular follow-up/non-usage of inhalers were: (a) not being advised by the doctor, (b) financial constraints, and (c) ignorance. A similar pattern of oral medication use, non-usage of prophylactic treatment are documented in studies done by Watson *et al.*, and Thompson *et al.*^[3,22] Multi-centric studies in India have documented that inhalational medications were not prescribed by doctors because public health sectors were not providing

Table 4: Barriers to access standard asthma treatment and management current Wheezers (n=36)

| Variable | Frequency (n=36), n (%) |
|--|----------------------------|
| Number of children not taking medicines as per prescription and advice of doctor, during the wheeze episodes | 18 (50) |
| Reasons for not taking medicines as per prescription* | |
| Lack of money to access care | 11 (30.6) |
| Lack of proper guidelines by the doctor | 7 (19.4) |
| Regular treatment not necessary | 5 (13.9) |
| Frustration towards prolonged treatment | 4 (11.1) |
| Lack of motivation to continue long term care | 2 (5.6) |
| Unavailability of the drugs | 1 (2.8) |
| Lack of accessibility of health care services | 1 (2.8) |
| Others-single mother, no time to go to hospital | 1 (2.8) |
| Others-child is reluctant to take medicines | 1 (2.8) |
| Number of children taken to doctor for regular follow-up of asthma | Nil |
| Reasons for not taking children to doctor for regular follow-up of asthma* | |
| Doctors did not advice | 26 (72.2) |
| Financial reasons (cannot afford to purchase medicines) | 9 (25) |
| Not necessary | 7 (19.4) |
| No prescription given | 1 (2.8) |
| Unavailability of drugs | 1 (2.8) |
| Others-first time diagnosed as asthmatic-3 months back | 1 (2.8) |
| Number of children using inhaler for treatment of asthma | Nil |
| Reasons for not using inhaler/rotahaler for treatment of asthma* | |
| Doctors did not advice | 34 (94.4) |
| No prescription given | 5 (13.9) |
| Financial reasons (cannot afford) | 4 (11.1) |
| Not necessary | 3 (8.3) |
| Others-not diagnosed to be asthmatic | 1 (2.8) |

*Multiple responses possible

beclomethasone and salbutamol inhalers.^[20,23,24] A study in Delhi found that there was inadequate knowledge about asthma treatment among general practitioners.^[25] Widespread concern and fear of inhaled steroids among asthmatics and their tendency to associate their treatment characteristics and safety profiles with those of systemic steroids have caused hindrance in promoting adherence to inhalational medicines.^[3]

Lack of adherence to prescribed treatment was seen in nearly half of asthmatics in our study. Financial constraints (31%), lack of proper guidelines by the doctor (19%), frustration, and lack of motivation to continue long-term care were the most common reasons cited by patients' mothers/care-givers [Table 4]. Majority of 41.7% of asthmatics reportedly missed >10 days and 27.8% missed 6–10 days of school in the past 1 year due to asthma. Similar results of higher frequency of

asthma exacerbations, the lowest level of controlled asthmatics and high percentage of asthmatics missing school with the longest average absences are found in studies conducted elsewhere.^[3]

Our study findings showed that treatment received by asthmatics did not meet recommended standard guidelines.^[26] The benefit of anti-asthma medications to the community is dependent on their availability and affordability, lack of which would result in non-adherence to treatment.^[23,27-29] In our study, the financial constraint was main reason cited for irregular follow-ups, lack of adherence, and inability to buy medications. Similar results are found elsewhere.^[22-24] Beclomethasone, salbutamol, and budesonide are essential inhalational medications in the National List of Essential Medicines of India, but studies have documented lack of availability of them in the public health sector.^[23,30]

In our study, ignorance regarding disease and its management among mothers/primary caregivers (14%) was a barrier in accessing standard asthma care. Similar results are documented elsewhere.^[19,23] Although asthma patients' and family members' education is a vital arm in effective asthma management, none of mothers/primary caregivers of asthmatic children reported to be provided with educational material about asthma or a written plan to manage asthma in an event of worsening condition by treating doctors. Similar results are found in the study done in Delhi.^[19,23,26]

CONCLUSIONS

The present study adds information to the existing limited data on childhood asthma prevalence in rural India. Although the overall childhood asthma prevalence in our study is comparable with other studies done in rural areas, a higher percentage of severe asthma was documented. Poverty, illiteracy and rural residence, leading to lack of access to asthma health-care were major social determinants observed in this study. These, combined with lack of proper advice by health-care personnel to asthmatic children and their caregivers regarding asthma care and use of inhalational medication, as evident in the study are the areas which need to be addressed in the programmes and policies related to childhood asthma care.

Recommendation

Community-based health education sessions to create awareness about asthma and allergic disorders and focussed health education sessions for asthmatic children and their caregivers about asthma management need to be provided at the primary health-care level. Efforts are also needed to promote cost-effective measures of treatment by promoting and providing affordable drugs and inhalational medications at primary and secondary health-care set-ups.

Limitation of the study

- We administered the ISAAC questionnaire developed for 6–7 years of age and 13–14 years of age group children and used for children aged 5–15 years of age

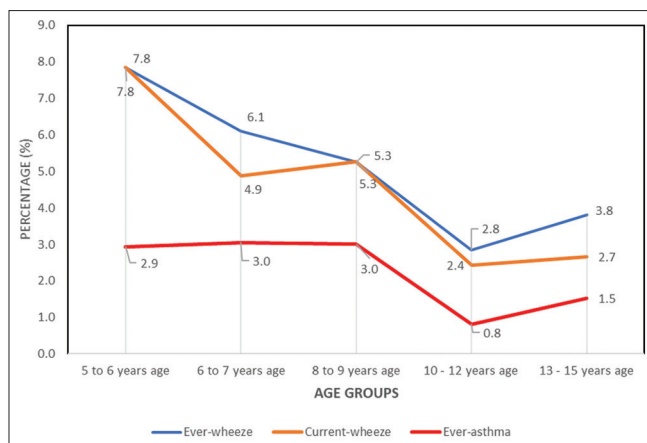


Figure 1: Age-specific prevalence rates of ever-wheeze, current-wheeze and ever-asthma

- We could not perform spirometry or lung function tests due to feasibility constraints in the rural areas.

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Conflicts of interest

There are no conflicts of interest.

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