

Prevalence of bronchial asthma and factors associated with it among higher secondary school children in Ernakulam district, Kerala, Southern India

Jishnu Sathees Lalu¹, P. S. Rakesh¹, K. Leelamoni¹

¹Department of Community Medicine, Amrita Institute of Medical Sciences, Amrita Vishwa Vidyapeetham, Kochi, Kerala, India

ABSTRACT

Context: Bronchial asthma is one of the leading causes of hospitalization and cause of frequent absenteeism among children and adolescents. Studies reporting the prevalence of bronchial asthma among adolescents from India are limited and the available studies report wide geographic variations in the prevalence of bronchial asthma. **Aims:** The current study was aimed to estimate the prevalence of bronchial asthma among higher secondary school children and to identify various factors associated with it in Ernakulam district, Kerala, Southern India. **Settings and Design:** The study was conducted in Ernakulam district, the industrial capital of Kerala. A school-based cross-sectional study was conducted. **Subjects and Methods:** Data were collected from 629 students from 4 randomly selected higher secondary schools using a structured questionnaire. Section on details of respiratory symptoms was adapted from International Union Against Tuberculosis and Lung Disease bronchial symptoms questionnaire. **Statistical Analysis Used:** Descriptive statistics was done with frequencies and percentages and confidence intervals (CIs) were calculated. Univariate and multivariate analysis was done for factors associated with bronchial asthma generating odds ratios (ORs) and 95% CIs. **Results:** A total of 629 students participated in this study. The prevalence of bronchial asthma was estimated to be 9.9% (95% CI = 7.53%–12.27%). Students residing in a rural area (adjusted OR = 1.95, 95% CI = 1.10–3.46) having family history of bronchial asthma (adjusted OR = 2.84, 95% CI = 1.57–5.11) and usual exposure to friend's smoke (adjusted OR = 2.16, 95% CI = 1.17–3.97) were significantly associated with bronchial asthma. **Conclusions:** The prevalence of bronchial asthma was higher among higher secondary school students of Ernakulam district. Considering high prevalence and its contributions to morbidity and mortality, a comprehensive program to tackle the issue of chronic respiratory diseases may be needed. The issue of active and passive smoking at schools exists and need to be resolved.

Keywords: Adolescents, bronchial asthma, chronic respiratory diseases, second-hand smoke, smoking

Introduction

Lung diseases are one of the leading causes of death in developing countries.^[1] Around 15% of all disability adjusted life years lost in Southeast Asia were due to lower respiratory infection, tuberculosis (TB), chronic obstructive pulmonary disease, and bronchial asthma.^[2] The overall general prevalence of asthma is increasing worldwide, and it is estimated to add 100

million more asthmatic patients by the year 2025.^[3,4] Bronchial asthma is one of the leading causes of hospitalization and causes of frequent absenteeism among children and adolescents.^[5,6]

In India, there are currently more than 15 million people living with asthma.^[7] A large multicentric study done in India, to estimate the prevalence of chronic respiratory diseases reported wide variations in the prevalence of bronchial asthma among different cities ranging from 0.37% in Secunderabad to 4.45% in Thiruvananthapuram (Kerala).^[8] The prevalence

Address for correspondence: Dr. Jishnu Sathees Lalu, Department of Community Medicine, Amrita Institute of Medical Sciences, Amrita Vishwa Vidyapeetham, Kochi, Kerala, India.
E-mail: jisbbb87@gmail.com

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rate from Thiruvananthapuram was very high as compared to results from all other cities. A systematic review to estimate the prevalence of chronic respiratory diseases in India points to the limited number of community-based studies from India.^[9] Factors such as family history, exposure to allergens, having pets at home, occupational exposure to chemicals and smoke, recurrent respiratory tract infections, and exposure to tobacco smoke including second-hand smoke are identified risk factors for bronchial asthma.^[10]

The Government of Kerala state had implemented a pilot project of the World Health Organization (WHO) recommended practical approach to lung health strategy, with an intention to further strengthen the health system and to improve the quality of diagnosis, treatment, and management of common chronic respiratory illnesses in primary health-care settings.^[11,12] The Government of Kerala is developing state-specific targets and action plan for attaining health-related Sustainable Development Goals and has a plan to scale up public health programs for chronic respiratory disease management. The current study was aimed to estimate the prevalence of bronchial asthma among higher secondary school children and to identify various factors associated with it in Ernakulam district, Kerala. Evidence from this study may help policymakers and program managers to further plan targeted interventions to address the issue of bronchial asthma among adolescent school children.

Subjects and Methods

Ernakulam district is the industrial capital of Kerala state situated on the coast of the Arabian Sea, with a population of 3.2 million. Adolescents constitute 15% of the population. More than 50% of the populations reside in urban areas. Primary school enrollment rate was nearly 100%.^[13]

Taking the prevalence of asthma among adolescents in a study conducted in Trivandrum as 5%,^[8] with 95% confidence, 80% power, and an absolute precision of 2, sample size was calculated to be 475. Multistage random sampling was done. The list of all higher secondary schools was obtained and stratified as urban and rural schools. Two schools each from urban and rural was randomly chosen using a random table. All children in higher secondary division of the selected schools were included in the study.

Data collection was done during May 2016. A structured questionnaire was prepared based on literature review, expert opinion, and group consensus. It included sociodemographic characteristics, details respiratory symptoms, details of active and passive smoking, and indoor air pollution. Questions regarding asthma were adopted from the International Union against TB and Lung Diseases (IUATLDs) questionnaire.^[14] Section on details of respiratory symptoms was adapted from IUATLD bronchial symptoms questionnaire. Section on active and passive smoking was adapted from Global Youth Tobacco Survey

questionnaire.^[15] The questionnaire was translated to regional language and back-translated to check for consistency. It was pilot tested before use. The unlinked anonymous questionnaire was administered in groups. Each question was read out by one of the investigators in regional language and doubts clarified. The purpose of the study was explained and confidentiality was ensured.

Permission was obtained from head of schools. Verbal informed consent was taken from students and they were given option not to fill the questionnaire if they are not willing. The data were entered and analyzed using (SPSS Inc. Released 2005. SPSS for Windows, Version 15.0. Chicago, SPSS Inc.) version 15 for Microsoft windows. A diagnosis of bronchial asthma was made if the person answers “yes” to any of the questions a or b and “yes” to any of the questions c, d, or e.

- Have you ever experienced wheezing (without cold) or whistling sound from the chest during last 12 months?
- During last 12 months, have you ever woken up in the morning with a feeling of tight chest or breathlessness?
- Have your doctor ever told you that you are suffering from asthma?
- Have you ever had an attack of asthma in last 12 months?
- Have you ever taken any inhaler, rotahaler, or nebulization or oral pills for breathlessness?

Descriptive statistics was done with frequencies and percentages and confidence intervals (CIs) were calculated. Univariate analysis was done for factors associated with bronchial asthma calculating odds ratios (ORs) and 95% CIs. Variables with $P < 0.2$ were entered into a backward conditional logistic regression model and adjusted ORs were calculated.

Results

A total of 629 students participated in this study. Among them, 56.1% were males. Of them, 54.8% were residing at a rural location. Among the study participants, 93.9% of them lived in pucca houses. The sociodemographic characteristics of the participants were given in Table 1.

The prevalence of bronchial asthma was estimated to be 9.9% (95% CI = 7.53%–12.27%). Among the study participants, 34 (5.4%) were told by a doctor that they had asthma and 26 (4.1%) were currently receiving treatment for asthma.

Details of univariate analysis for factors associated with bronchial asthma were shown in Table 2. Among participants residing in rural area, 12.2% had asthma while the figure was same for 7.1% from those belonged to urban areas ($P = 0.031$). Of them who reported that their friends used to smoke in their presence, 15.3% had asthma while 8.6% of those who reported not being exposed to friend's smoke had asthma ($P = 0.032$). In the study, 18.6% of those who reported a family history of asthma had asthma and the association was statistically significant ($P < 0.01$).

Table 1: Sociodemographic features of the study population (n=629)

Variables	Frequency	Percentage
Age (years)		
<17	260	41.3
≥17	369	58.7
Gender (n=626)		
Male	351	56.1
Female	275	43.9
Place of residence (n=626)		
Rural	343	54.8
Urban	283	45.2
Father's education (n=623)		
Up to 4 th standard	21	3.4
5 th -10 th standard	365	58.6
Predegree	134	21.5
Graduate	88	14.1
Postgraduate	15	2.4
Mother's education (n=625)		
Up to 4 th standard	13	2.1
5 th -10 th standard	276	44.2
Predegree	204	32.6
Graduate	114	18.2
Postgraduate	18	2.9
Type of house (n=619)		
Kutchra	38	6.1
Pucca	581	93.9
Number of members staying at house		
≤4	410	65.2
>4	219	34.8

In the final logistic regression model [Table 3], residing in a rural area (adjusted OR = 1.95, 95% CI = 1.10–3.46), family history of bronchial asthma (adjusted OR = 2.84, 95% CI = 1.57–5.11), and usual exposure to friend's smoke (adjusted OR = 2.16, 95% CI = 1.17–3.97) were significantly associated with bronchial asthma.

Discussion

The WHO recognizes asthma as a major health problem. Still, there is paucity of data on the prevalence of bronchial asthma among adolescents in India, especially Kerala state. Bronchial asthma prevalence among the late adolescent age group in the current study is 9.9%. Residing in a rural area, exposed to cigarette smoke from friends, and family history of asthma were associated with the bronchial asthma among higher secondary school children in Ernakulam district, Kerala.

The prevalence of bronchial asthma in the current study was found to be 9.9%. Chhabra *et al.* had found the prevalence of asthma in Northern India among 4–17 years old individuals as 11.6% while Qureshi *et al.* in Srinagar among 10–16 years adolescents reported it as 7.4%. A large multicentric study by Jindal *et al.* in 12 centers across India, in 2009 found a population prevalence of 3.13% and a wider geographic variation among the centers.^[8,16,17] Studies conducted in Shimla and Jaipur among 6–13 years old and 5–15 years old reported prevalence rate

of 2.3% and 6.05%, respectively. Dhabadi *et al.* in rural area of Karnataka found the prevalence of asthma among higher secondary school students as 4.9% while Agrawal *et al.* in a cross-sectional survey found that the prevalence of asthma was high among the rural residents.^[18-21] The use of different tools and methodologies used might also have contributed to the differences in the prevalence estimates.

In a study from Puducherry, the prevalence of asthma among children was significantly more among those having smoking habits in any of the family members.^[6] Studies from Chandigarh and Haryana also found out association between asthma in children and passive smoking exposure.^[7] A multicentric study conducted by Singh *et al.* in India among the age group of 6–14 years reported association between asthma and exposure to tobacco smoke and traffic pollution.^[22] The International Consultation on Environmental Tobacco Smoke (ETS) concluded that ETS exposure causes a wide variety of adverse health effects in children, including lower respiratory tract infections wheezing, initiation, and worsening of asthma.^[23] Proportion of students exposed to passive smoking from friend's smoke was reported to be 18.8% and in our study. The exposure to passive smoking status is consistent with many recent reports.^[7,8,24] Studies published before 2000 from Kerala reported a higher prevalence of passive smoking.^[25,26] The recent efforts to combat smoking habits by implementing various antitobacco legislations and campaigns by the Government of India and Kerala are praiseworthy. However, the study findings highlight that the issue of smoking and second-hand smoking still exists and needs to be resolved.^[27] The Global Adult Tobacco Survey of 2009 reported that adolescent age group is less likely screened for tobacco use.^[28] This will hamper in developing an age-specific intervention for tobacco cessation.

We used questionnaire methods for estimating the prevalence of bronchial asthma as is done in many other similar studies. The questionnaire method of assessing prevalence could under- or over-estimate the disease condition depending on the sensitivity and specificity of the tool and definitions. The questionnaire used for this study was tested for validity and reliability by previous researchers. Reporting bias could affect the estimates. There will be considerable overlap of symptoms of bronchial asthma and frequent respiratory infections and the differentiation would be difficult. For logistic reasons, we could not use spirometer or physician diagnosis. Nicotine levels would have improved the validity. The strengths of our study were its good study design, use of a validated tool, and good sampling strategy.

Conclusion

Although India has devised a program to combat cancer, diabetes, cardiovascular disease, and stroke, none have been devised for chronic respiratory illness till date. Considering high prevalence and its contributions to morbidity and mortality, a comprehensive program to tackle chronic respiratory diseases may be considered. School health program may consider including respiratory health also as one of its components. Smoking in public places, though

Table 2: Univariate analysis for association of various factors with bronchial asthma

Variables	Bronchial asthma		χ^2	P	OR (95% CI)
	Present (%)	Absent (%)			
Age (years)					
<17	21 (8.1)	239 (91.9)	1.58	0.209	0.70 (0.44-1.22)
≥17	41 (11.1)	328 (88.9)			
Gender (n=626)					
Male	34 (9.7)	317 (90.3)	0.04	0.837	0.94 (0.55-1.60)
Female	28 (10.2)	247 (89.8)			
Place of residence (n=626)					
Rural	42 (12.2)	301 (87.8)	4.65	0.031	1.83 (1.05-3.20)
Urban	20 (7.1)	263 (92.9)			
Type of house (n=619)					
Kutchha	1 (2.6)	37 (97.4)	2.45	0.118	0.23 (0.03-1.70)
Pucca	61 (10.5)	520 (89.5)			
Pets at home					
Yes	19 (9.2)	188 (90.8)	0.16	0.689	0.89 (0.50-1.57)
No	43 (10.2)	379 (89.8)			
Usage of wood at home					
Yes	23 (8)	263 (92)	1.92	0.163	0.68 (0.39-1.17)
No	39 (11.4)	304 (88.6)			
Do any of your friends usually smoke in your presence?					
Yes	18 (15.3)	100 (84.7)	4.76	0.029	1.91 (1.05-3.44)
No	44 (8.6)	467 (91.4)			
Do family members usually smoke in your presence?					
Yes	16 (11.7)	121 (88.3)	0.65	0.419	1.28 (0.70-2.34)
No	46 (9.3)	446 (90.7)			
Family history of asthma					
Yes	21 (18.6)	92 (81.4)	11.82	<0.001	2.64 (1.49-4.68)
No	41 (7.9)	475 (92.5)			
Ever smoked					
Yes	11 (14.7)	64 (85.3)	2.17	0.136	1.69 (0.84-3.41)
No	51 (9.2)	503 (90.8)			
Current smoker					
Yes	6 (18.8)	26 (81.3)	3.001	0.083	2.23 (0.88-5.64)
No	56 (9.4)	541 (90.6)			

OR: Odds ratio; CI: Confidence interval

Table 3: Multivariate logistic regression model for factors associated with bronchial asthma

Variable	P	OR	95% CI
Location of house (rural)	0.022	1.95	1.10-3.46
Type of house (Pucca)	0.108	0.19	0.02-1.43
Usage of wood as solid fuel (yes)	0.257	0.72	0.41-1.26
Family member usually smoking at home (yes)	0.321	1.37	0.73-2.55
Family history of bronchial asthma (yes)	<0.001	2.83	1.57-5.11
Friends usually smoke in your presence (yes)	0.013	2.16	1.17-3.97

OR: Odds ratio; CI: Confidence interval

banned by legislation, needs more stringent implementation, especially in schools.

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Conflicts of interest

There are no conflicts of interest.

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