Original Research Article

Evaluation of Bronchial Asthma Prevalence among School-Aged Children: An Observational Study

Nutan Bala[1], Renu Kumari[2], Sheela Kumari[3]

[1]Tutor, Department of Physiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India

[2]Tutor, Department of Physiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India

[3]Professor and HOD, Department of Physiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India

Abstract

Aim: Evaluation of Bronchial Asthma prevalence among school-aged children in the state of Bihar.

Material and Methods: This study was conducted in the Department of Physiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga Bihar, India from January 2019 to December 2019. The questionnaires were distributed to all children in the school in age group 6 to 12 years whose parents had given consent to participate in the study. Children with other chronic respiratory diseases than asthma and those who refused to give consent to participate were excluded from the study. The modified ISAAC questionnaire was filled by parents and returned to class teacher. In age group of 6-9 years, a global cut-off score of more than 5 and for age group 10- 12 years, the cut-off score was 6 or more used as criteria for diagnosis of asthma as suggested by Naik et al

Results: The overall prevalence of asthma observed is 4.75% (43/904) with higher prevalence in boys (5.55%) as compared to girls (3.75%), further the prevalence starts declining at age of 11 years or above. Family history of asthma was positive in 12.62% (114/904) children and prevalence of asthma was much higher in children with positive history of asthma (26.31%) and prevalence is much higher, if both parents had asthma (45%) while it is much lower in whom there is no family history of asthma (0.51%). The socioeconomic analysis has shown that family history as well as prevalence of asthma is higher in children belonging to upper and upper middle class as compared to those belong to lower middle and upper lower class and similarly prevalence of asthma is also higher in upper and upper middle-class group. Out of various symptoms analysed more than 3 attacks of wheezing during last 12 months, appearance of wheezing or cough during or after exercise, sleep disturbance due to nocturnal wheeze, and speech limitation between breaths are usually indicative of asthma (sensitivity 87.8-100%) while occasional wheezing and nocturnal cough are fewer specific symptoms.

Conclusion: The present study was carried out in the school going children of 4 different schools located in the different areas of Laheriasarai, Bihar city with different socioeconomic background. The overall prevalence of bronchial asthma in school going children of Laheriasarai, Bihar city is 4.75%. The prevalence of asthma starts declining at the age of 11 years and above. The prevalence of asthma is higher among boys, upper and upper middle socioeconomic class, and with positive family or parenteral history of bronchial asthma.

Keywords: Bronchial Asthma, School-aged children, Bihar

Introduction

Bronchial asthma is a chronic inflammatory disorder of the airways characterized by episodes of wheezing, breathlessness, chest tightness, and coughing. It is a significant public health issue worldwide, particularly among school-going children, due to its impact on their physical health, academic performance, and overall quality of life. [1] The prevalence of asthma in children has been increasing globally, with variations observed across different regions and populations . This rise can be attributed to multiple factors including urbanization, environmental pollutants, lifestyle changes, and genetic predisposition. [2] Asthma in children often manifests with symptoms that can interfere with daily activities, including school attendance and participation in sports, leading to considerable psychosocial stress. One of the critical aspects of managing asthma in children is the identification and control of triggers that can provoke asthmatic episodes. [3] Common triggers include allergens

(such as pollen, dust mites, and animal dander), respiratory infections, physical exercise, cold air, and exposure to tobacco smoke . Effective management strategies often involve a combination of pharmacological treatments, such as inhaled corticosteroids and bronchodilators, and non-pharmacological approaches like environmental control and patient education. [4] Despite the availability of effective treatments, asthma control in children remains suboptimal in many cases. This can be due to factors such as lack of adherence to medication, insufficient education about the disease, and socio-economic barriers. [5,6] School-based asthma management programs have shown promise in improving asthma control among children. These programs typically include components such as training for school staff, asthma education for children and parents, and the provision of asthma action plans .

Material and Methods

This study was conducted in the Department of Physiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga ,Bihar, India from January 2019 to December 2019. the questionnaires were distributed to all children in the school in age group 6 to 12 years whose parents had given consent to participate in the study. Children with other chronic respiratory diseases than asthma and those who refused to give consent to participate were excluded from the study. The modified ISAAC questionnaire was filled by parents and returned to class teacher. In age group of 6-9 years, a global cut-off score of more than 5 and for age group 10- 12 years, the cut-off score was 6 or more used as criteria for diagnosis of asthma as suggested by Naik et al.[7] The data obtained was recorded and entered into

Microsoft excel sheet. The categorical data was expressed and comparison done by using ANNOVA test.

Results

The 1500 students were given the questionnaire proforma consisting of 13 items and out of them 904 questionnaires were returned, thus the response rate is 60.2% (Table 1). There are 504 boys and 400 girls of various age groups ranging from 6 to 12 years with almost similar gender distribution (Table 2). The overall prevalence of asthma observed is 4.75% (43/904) with higher prevalence in boys (5.55%) as compared to girls (3.75%), further the prevalence starts declining at age of 11 years or above. Family history of asthma was positive in 12.62% (114/904) children and prevalence of asthma was much higher in children with positive history of asthma (26.31%) and prevalence is much higher, if both parents had asthma (45%) while it is much lower in whom there is no family history of asthma (0.51%) (Table 3). The socioeconomic analysis has shown that family history as well as prevalence of asthma is higher in children belonging to upper and upper middle class as compared to those belong to lower middle and upper lower class and similarly prevalence of asthma is also higher in upper and upper middle-class group (Table 4). Out of various symptoms analysed more than 3 attacks of wheezing during last 12 months, appearance of wheezing or cough during or after exercise, sleep disturbance due to nocturnal wheeze, and speech limitation between breaths are usually indicative of asthma (sensitivity 87.8-100%) while occasional wheezing and nocturnal cough are fewer specific symptoms (Table 5).

Table 1: Response rate among different schools.

Schools	No. of questionnaires given	No. of questionnaires received	Response rate (%)
DPS	508	259	51
MMPS	402	195	48.5
Vidhya Niketan	100	94	94
CPS	490	356	72.65
Total	1500	904	60.23

Table 2: Age wise distribution and prevalence of asthma in different genders.

	Boys			Girls			Total		
Age (Years)	N	Asthma		N	Asthma		N	Asthma	
		N	%		N	%		N	%
6	41	2	4.88	36	2	5.55	77	4	5.20
7	57	3	5.2	45	3	6.67	102	6	5.89
8	116	8	6.9	82	3	3.66	198	11	5.55
9	103	6	5.82	81	2	2.47	184	8	4.34
10	101	7	6.9	84	4	4.76	185	11	5.95
11	52	1	1.92	44	1	2.27	96	2	2.08
12	34	1	2.94	28	-	-	62	1	1.61
Total	504	28	5.55	400	15	3.75	904	43	4.75

Table 3: Relation of heredity with bronchial asthma.

History of asthma	Present, (n=904)		Bronchial asthma, (n=43)	
	N	%	N	%
Family history positive	114	12.62	30	26.31
Both parents' asthmatic	20	2.22	9	45
No history	790	85.17	4	0.51

Table 4: Prevalence of asthma with family history among different socioeconomic status.

Socio- economic status	Total no. of children, (n=904)	Presence of family history of asthma, (n=114) (%)	Prevalence of bronchial asthma, n (%)
Upper class	167	35 (20.95)	12 (7.18)
Upper middle class	210	52 (24.76)	15 (7.14)
Lower middle class	248	21 (8.5)	12 (4.84)
Upper lower class	199	6 (3.01)	4 (2.01)
Lower class	56	0	0

Table 5: Relation of clinical symptoms with prevalence of asthma.

	Positive, (n=904)	Bronchial asthma, (n=43) (%)	
Symptoms	N	N	%
Child ever had wheezing in past	103	43	41.74
No. of wheezing attacks			
Less than 3	67	34	50.74
More than 3	9	9	100
Disturbance of sleep due to wheezing in past 12 months (night per week)			
<1	43	34	79.06
>1	9	9	100
Speech limitation severe enough to only 1 or 2 words at a time between breaths	33	29	87.8
Ever had asthma	3	3	100
Child's chest sounded wheezy during or after exercise in past 12 months	43	41	95.34
Nocturnal cough in past 12 months	141	41	29.07

Discussion

Out of 1500 children only 904 returned the questionnaires with a response rate of 60.23%. The overall prevalence of asthma observed is 4.75%. The other studies based on ISAAC questionnaire has reported prevalence ranging from 2.3% to 18.2%. [8,9] The medium range prevalence in our study may be because of moderate pollution in Laheriasarai, Bihar city as areas with high pollution have reported higher prevalence. [10,11] The prevalence is higher among boys (5.55%) than girls (3.75%) and it is lower at the age of 11 and 12 years. Naik et al and Bhalla et al have also reported similar findings. [7,12] The prevalence of asthma is higher in upper and upper middle-class children as compared to lower middle and upper lower class, which may be explained with the help of hygiene hypothesis. [13] This study has also supported the well-known fact that heredity plays an important role in etiopathogenesis of asthma as prevalence of asthma is much higher in children who had positive family history of asthma. Out of various symptoms- more than 3 attacks of wheezing in last 12 months, wheezing or cough during or after exercise, nocturnal wheezing is more common in children with asthma. Only 3 children out of 43 asthmatics were diagnosed before study. So,40 new cases were diagnosed with a simple questionnaire-based survey, indicates the importance of such surveys.

Conclusion

The present study was carried out in the school going children of 4 different schools located in the different areas of Laheriasarai, Darbhanga ,Bihar city with different socioeconomic background. The overall prevalence of bronchial asthma in school going children of Laheriasarai, Darbhanga ,Bihar city is 4.75%. The prevalence of asthma starts declining at the age of 11 years and above. The prevalence of asthma is higher among boys, upper and upper middle socioeconomic class, and with positive family or parenteral history of bronchial asthma.

References

1. Asher, M. I., Stewart, A. W., Mallol, J., Montefort, S., Lai, C. K. W., & Aït-Khaled, N. (2010). Which population-level environmental factors are associated with asthma, rhinoconjunctivitis and eczema? Review of the Ecological Analyses of ISAAC Phase One. *Respiratory Research*, 11(1), 8. doi:10.1186/1465-9921-11-8

2. Global Initiative for Asthma. (2021). Global Strategy for Asthma Management and Prevention. Available at: https://ginasthma.org/

3. Pearce, N., Aït-Khaled, N., Beasley, R., Mallol, J., Keil, U., Mitchell, E., & Robertson, C. (2007). Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax*, 62(9), 758-766. Doi:10.1136/thx.2006.070169

4. von Mutius, E. (2009). Gene-environment interactions in asthma. *The Journal of Allergy and Clinical Immunology*, 123(1), 3-11. doi:10.1016/j.jaci.2008.10.045

5. Moonie, S. A., Sterling, D. A., Figgs, L. W., & Castro, M. (2006). The relationship between school absence, academic performance, and asthma status. *The Journal of School Health*, 76(1), 18-24. doi:10.1111/j.1746-1561.2006.00062.x

6. Naik PB, Ravikumar P. Study of prevalence of bronchial asthma in school children of 6-12 years of age in rural schools of Tumakuru district. Indian J Allergy Asthma Immunol. 2017;31:56-60.

7. Jain A, Vinod Bhat H, Acharya D. Prevalence of bronchial asthma in rural Indian children: a cross sectional study from South India. Indian J Pediatr. 2010;77(1):31-5.

8. Gupta MK, Patodia J, Chaudhary P, Kakkar M. The rising trend of asthma prevalence in urban school children of Jaipur: A questionnaire-based study. Indian J Allergy Asthma Immunol. 2018;32:10-4.

9. Zhao Y, Wang S, Lang L, Huang C, Ma W, Lin H. Ambient fine and coarse particulate matter pollution and respiratory morbidity in Dongguan, China. Environ Pollut. 2017;222:126-31.

10. Peng RD, Chang HH, Bell ML, McDermott A, Zeger SL, Samet JM et al. Coarse particulate matter air pollution and hospital admissions for cardiovascular and respiratory diseases among Medicare patients. JAMA. 2008;299:2172-9.

11. Bhalla K, Nehra D, Nanda S, Verma R, Gupta A, Mehra S. Prevalence of bronchial asthma and its associated risk factors in school-going adolescents in Tier-III North Indian City. J Family Med Prim Care 2018;7:1452-7.

12. Haahtela T, Holgate S, Pawankar R, Akdis CA, Benjaponpitak S, Caraballo L et al. The biodiversity hypothesis and allergic disease: world allergy organization position statement. World Allergy Organization J. 2013;6(1):1-8