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Original Research Article

Impact of obesity and allergic rhinitis on childhood asthma

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ABSTRACT

Background: Bronchial asthma has varied presentations in children and its global prevalence is increasing in children. Asthma is associated with various risk factors and comorbidities. The objective of the study was to assess the severity, level of control of asthma in children without comorbidities, with obesity and allergic rhinitis.
Methods: An observational study was conducted in 150 children aged 5-15 years diagnosed to have asthma as per GINA (Global initiative for asthma) guidelines 2019, who are being followed up in the department of pediatrics in asthma clinic in RRMCH. Parents were interviewed and the following data collected like demography, allergy history, treatment history, comorbidities, family history of atopy. Detailed clinical examination was performed including anthropometry-weight, height and BMI recording. Pulmonary function tests was done in all children.
Results: Out of 110 children without comorbidities, 108 (98.2%) had well controlled, 2 (1.8%) had partly controlled, 0 had uncontrolled. Out of 19 children with obesity, 5 (26.3%) had well controlled, 9 (47.4%) had partly controlled, 5 (26.3%) had uncontrolled. Out of 15 children with allergic rhinitis, 6 (40%) had well controlled, 8 (53.3%) had partly controlled, 1 (6.7%) had uncontrolled. With a p value of 0.001, it is statistically significant.
Conclusions: Our study shows severity of asthma increases in children having comorbidities like obesity and allergic rhinitis when compared with children without comorbidities with a significant association. Our study also shows that children having comorbidities like obesity and allergic rhinitis have poor level of asthma control when compared with children without comorbidities with a significant association.

Keywords: Asthma, GINA, Asthma control, Obesity, Allergic rhinitis

INTRODUCTION

Bronchial asthma is a heterogeneous disease characterized by chronic airway inflammation, it is defined by history of various respiratory symptoms such as wheeze, shortness of breath, cough and chest tightness that may vary over time and intensity with variable, expiratory airflow limitation.[1,2] The estimated global prevalence of asthma is 200 million with a mortality of around 0.2 million per year. Although the prevalence is more in developed countries, the developing countries have higher total burden of the disease due to differences in population.[1-5]

Asthma is associated with various comorbidities out of which allergic rhinitis and obesity are the most common.[2] An estimated 10.4% of children aged 3-17 years were identified as having current asthma. Compared to children without asthma, children with asthma had higher prevalence of allergic rhinitis; prevalence difference (PD): 30.5%; 95% CI: 26.6, 34.4, eczema or skin allergies (PD: 14.1%; 95% CI: 10.7, 17.5).[3] Being overweight or obese is a risk factor for childhood asthma and wheeze, particularly in girls. In addition, lack of fitness and reduction in lung volume due to abdominal fat may contribute to dyspnea. Obesity is known to be associated with increased inflammatory phenotypes and airway may be the target of systemic inflammation.[4]

Most patients with asthma, either allergic or non-allergic, have concurrent rhinitis, and 10-40% of patients with allergic rhinitis have asthma. Evidence-based guidelines (allergic rhinitis in asthma, ARIA) recommend intranasal corticosteroids for treatment of allergic rhinitis.[2] Asthma control is determined by the interaction between the patient's genetic background, underlying disease processes, the treatment that they are taking, environment, and psychosocial factors.[6] Lung function is an important part of the assessment of future risk; it should be measured at the start of treatment, after 3-6 months of treatment (to identify the patient's personal best), and periodically thereafter for ongoing risk assessment. Comorbidities can contribute to symptoms and poor quality of life, and leading to poor asthma control. The objective of the study was to assess the severity, level of control of asthma in children without comorbidities, with obesity and allergic rhinitis.

METHODS

Study design and subjects

This was a hospital based observational study of asthmatic children between the ages of 5 years and 15 years presenting in asthma clinic, department of pediatrics in Rajarajeswari medical college and hospital between January 2020 to June 2021. A total of 150 children were taken into study.

Inclusion criteria

Inclusion criteria were all children aged between 5 years to 15 years diagnosed to have asthma as per GINA guidelines 2019, who were being followed up in the department of pediatrics in asthma clinic.

Exclusion criteria

Exclusion criteria were children of age <5 years, children with asthma having comorbidities other than obesity and allergic rhinitis, children with congenital cardiac and lung abnormalities, neurologically impaired children.

Data collection

Subjects that satisfied the inclusion criteria were recruited into the study. Parents were interviewed and the following data was collected: demography, age, gender, religion, consanguinity, residence, type of family, parents' education, occupation and income. Birth history maternal smoking during pregnancy, birth order, gestational age, birth weight, breast feeding. Allergy history allergy to dust/food, allergic rhinitis/dermatitis. Asthma symptoms and treatment history; age of onset, previous hospitalization, number of visits to doctor for asthma in last year, number of school days missed due to asthma attacks, past use of inhaled corticosteroids, day/night time frequency, perceived severity, level of control, comorbidities in asthma, family history; atopy, asthma, allergic disorders. Detailed clinical examination was performed including anthropometry; weight, height and BMI recording. FVC (forced vital capacity), FEV1 (forced expiratory volume in first second), FEV1/FVC was assessed by spirometry using the device Spirolab III ver 3.7. Children were considered to have allergic rhinitis who had symptoms like nasal congestion, rhinorrhea and itching, sneezing, conjunctival inflammation. Children were considered to be obese if BMI >30 (>95th percentile).[2] Written informed consent was obtained from the parents and caregivers of the children and assent was sought from children of sufficient age. The data obtained were treated with utmost confidentiality.

Statistical analysis

SPSS (statistical package for social sciences) version 20 (IBM SPASS statistics IBM corp. released 2011) was used to perform the statistical analysis. Data was entered in the excel spread sheet. Descriptive statistics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables. Inferential statistics like Chi square test was applied to find the association between co-morbidities like obesity, allergic rhinitis and asthma severity, level of asthma control. The level of significance is set at 0.05.

RESULTS

Asthmatic children without comorbidities and with comorbidities were assessed. Children with comorbidities other than allergic rhinitis and obesity were excluded from the study. Out of 150 children 144 were included in study, that is, asthmatic children without comorbidities (n=110), with obesity (n=19) and with allergic rhinitis (n=15). 66.67% of children in our study belonged to age group of 5 to 10 years while 33.33% belonged to age group of 11-15 years with mean age at diagnosis of 6 years. The demographic and clinical details of the children are mentioned in (Table 1). Pulmonary function testing was done in all children to get FEV1, FEV1/FVC. Mean FEV1, FEV1/FVC for asthmatic children without comorbidities, with obesity and allergic rhinitis is given in (Table 2). Asthma severity in children without co-morbidities, with obesity and allergic rhinitis is shown in (Table 3). Our study shows severity of asthma increases in children having comorbidities like obesity and allergic rhinitis when compared with children with no comorbidities, with p value of 0.048, which is statistically significant. Level of asthma control in children without co-morbidities, with obesity and allergic rhinitis is shown in (Table 4). Out of 110 children without comorbidities, 108 (98.2%) had well controlled, 2 (1.8%) had partly controlled, 0 had uncontrolled. Out of 19 children with obesity, 5 (26.3%) had well controlled, 9 (47.4%) had partly controlled, 5 (26.3%) had uncontrolled. Out of 15 children with allergic rhinitis, 6 (40%) had well controlled, 8 (53.3%) had partly controlled, 1 (6.7%) had uncontrolled. With a p value of 0.001, it is statistically significant.

Table 1: Demographic and clinical data of asthma in children without co-morbidities, with obesity and allergic rhinitis.

Parameters	Total (n=144)	Asthma without comorbidities (n=110)	Asthma with obesity (n=19)	Asthma with allergic rhinitis (n=15)
	N (%)	N (%)	N (%)	N (%)
Gender				
Male	89 (61.8)	68 (61.8)	12 (63.15)	9 (60)
Females	55 (38.2)	42 (38.2)	7 (36.85)	6 (40)
Age (years)				
5-10	96 (66.67)	74 (67.27)	11 (57.9)	11 (73.33)
11-15	48 (33.33)	36 (32.73)	8 (42.1)	4 (26.67)
Residential status				
Urban	78 (54.1)	62 (56.36)	11 (57.9)	5 (33.34)
Rural	66 (45.9)	48 (43.64)	8 (42.1)	10 (66.66)
SES*				
Lower middle	100 (69.4)	73 (66.36)	13 (68.42)	14 (93.3)
Upper lower	44 (30.6)	37 (33.64)	6 (31.58)	1 (6.7)
Family H/O atopy				
Father	23 (15.9)	10 (9)	7 (36.84)	6 (40)
Mother	17 (11.8)	9 (8.1)	4 (21)	4 (26.67)
Number of exacerbations	38 (26.3)	24 (21.8)	9 (47.36)	5 (33.3)

Table 2: Mean FEV1 and FEV1/FVC of asthmatic children without co-morbidities, with obesity and allergic rhinitis.

Co-morbidities		N	Minimum (%)	Maximum (%)	Mean (%)	SD (%)
Nil	FEV1	110	80	101	90.7	5.0
	FEV1/FVC	110	75	99	89.7	4.7
Obesity	FEV1	19	72	94	83	6.95
	FEV1/FVC	19	65	90	77.5	7.92
Allergic rhinitis	FEV1	15	74	96	85	7.38
	FEV1/FVC	15	68	92	80	6.69

Table 3: Cross tabulation of asthma severity in children without co-morbidities, with obesity and allergic rhinitis.

Co-morbidities		Asthma severity				Total
		Intermittent asthma	Mild persistent asthma	Moderate persistent asthma	Severe persistent asthma	
Nil	Count	18	60	30	2	110
	%	16.36	54.54	27.27	1.8	100.0
Obesity	Count	2	8	6	3	19
	%	10.5	42.1	31.6	15.8	100.0
Allergic rhinitis	Count	1	8	5	1	15
	%	6.7	53.3	33.3	6.7	100.0
Total	Count	21	76	41	6	144
	%	14.5	52.77	28.47	4.1	100.0

Chi-square value- 32.85, p value-0.048

DISCUSSION

The study was conducted in 150 children between 5 years to 15 years of age, presenting with an acute history of cough and rapid respiration or difficulty in breathing.

Children diagnosed to have asthma as per GINA guidelines 2019, who were being followed up in the department of paediatrics in asthma clinic were enrolled in the study. Children with comorbidities other than allergic rhinitis and obesity were excluded from the study. Therefore, out of 150 children 144 were included in study.

Table 4: Cross tabulation of level of asthma control in children without co-morbidities, with obesity and allergic rhinitis.

Level of asthma control		Co-morbidities			Total
		Nil	Obesity	Allergic rhinitis	
Partly controlled	Count	2	9	8	19
	%	10.5	47.3	42.2	100.0
Uncontrolled	Count	0	5	1	6
	%	0.0	83.3	16.7	100.0
Well controlled	Count	108	5	6	119
	%	90.7	4.2	5.1	100.0
Total	Count	110	19	15	144
	%	76.3	13.2	10.5	100.0

Chi-square value=99.35, p=0.001

Out of 144 children in the study, allergic rhinitis was observed in 10.4%, obesity was observed in 13.2%. Study done by Dimitrijevic et al showed 29.30% children of asthma had allergic rhinitis, 4.63 % children had eczema; eczema and allergic rhinitis at the same time in 1.94% children.[7] Study by Madhur et al reported that out of 139 children with asthma, a total of 46.04% (64/139) subjects had personal history of atopic dermatitis or allergic rhinitis or obesity.[8] Study done by Amir et al showed that out of 153 asthma children, allergic rhinitis observed in 30.7% and 5.9% had atopic dermatitis.[9] Study done by Prawin et al showed allergic rhinitis was documented in 72 (75%) children.[10] FVC, FEV1, FEV1/FVC was assessed by spirometry. It was taken between the exacerbations. In our study, out of 110 children with no comorbidities, the mean FEV1 was 90.7% with minimum value recorded 80% and mean FEV1/FVC was 89.7% with minimum value recorded 75%. Out of 19 children with obesity, the mean FEV1 was 83% with minimum value recorded 72% and mean FEV1/FVC was 77.5% with minimum value recorded 65%. Out of 15 children with allergic rhinitis, the mean FEV1 was 85% with minimum value recorded 74% and mean FEV1/FVC was 80% with minimum value recorded 68%. This was similar to study conducted by Gallucci et al which showed that pulmonary function was affected in children with asthma, also more affected in children with asthma with comorbidities.[11] In our study, children with comorbidities and without comorbidities were started on inhaler medication based on the severity of asthma.[2] 38.7% children received budesonide 100 mcg, 13.3% children received budesonide 200 mcg, 16.7% children received formoterol 6 mcg+budesonide 100 mcg, 16.7% children received formoterol 6 mcg+budesonide 200 mcg, 7.3% children received salmeterol 50 mcg+fluticasone 100 mcg, 7.3% children received salmeterol 25 mcg+fluticasone 250 mcg. Wim et al study showed that inhaled corticosteroid therapy remained the most effective prophylactic treatment of asthma.[12] Rachelefsky et al study showed that treatment with inhaled corticosteroids improves asthma control domains of impairment and risk in children.[13] In our study, 14.7% cases have intermittent asthma, 52% cases had mild persistent asthma, 28.7% cases had moderate persistent asthma, and 4.7% cases had severe persistent asthma. Leonard et al in their study have reported intermittent asthma in 6.9% of children, mild persistent in 27.9% subjects, moderate persistent in 22.4% subjects and severe persistent in 42.9% subjects.[13] Study by Balaji et al reported asthma cases were mild persistent asthma in 29% of subjects, intermittent asthma in 23%, moderate persistent in 37% cases, severe persistent asthma in 11% cases.[14] Current study showed severity of asthma increased in children having comorbidities like obesity and allergic rhinitis when compared with children without comorbidities, with p value of 0.048, which was statistically significant. Study by Rogliani et al showed comorbidities were more prevalent in severe asthma than in mild-to-moderate disease or in the general population.[15] Currently, asthma severity was assessed retrospectively from the level of treatment required to control symptoms and exacerbations. It can be assessed once the patient has been on controller treatment for several months. Asthma severity was not a static feature and may change over months or years.[2] The level of asthma control was assessed for the past 4 weeks using GINA assessment of asthma control.[2] Out of 110 children without comorbidities, 108 (98.2%) had well controlled, 2 (1.8%) had partly controlled, 0 had uncontrolled. Out of 19 children with obesity, 5 (26.3%) had well controlled, 9 (47.4%) had partly controlled, 5 (26.3%) had uncontrolled. Out of 15 children with allergic rhinitis, 6 (40%) had well controlled, 8 (53.3%) had partly controlled, 1 (6.7%) had uncontrolled. With a p value of 0.001, it is statistically significant. This was similar to study done by Sharmilee et al which showed patients who had comorbid conditions were associated with uncontrolled asthma.[16] Study done by Genova et al showed that obese asthma phenotype was characterized by additional symptoms, worse control, more frequent and severe exacerbations, reduced response to inhaled corticosteroids, and lower quality of life.[17] Study done by Tosca et al showed patients who had asthma with allergic

rhinitis were associated with poor level of asthma control.[18]

CONCLUSION

Boys had higher incidence of asthma compared to girls in this study. 66.67% of children in our study belonged to age group of 5 to 10 years while 33.33% belonged to age group of 11-15 years with mean age at diagnosis of 6 years. In our study, allergic rhinitis was observed in 10.4%, obesity was observed in 13.2%. Our study shows severity of asthma increases in children having comorbidities like obesity and allergic rhinitis when compared with children without comorbidities with a significant association. Our study also shows that children having comorbidities like obesity and allergic rhinitis have poor level of asthma control when compared with children without comorbidities with a significant association. Comorbidities may contribute to respiratory symptoms and impaired quality of life and some contribute to poor asthma control. Active management of comorbidities is recommended because they may contribute to symptom burden, impair quality of life. Children with asthma having comorbidities must be followed up frequently and at each visit, the patient's adherence to the treatment and correct use of inhaler devices should be assessed and reviewed.

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REFERENCES

1. International Study of Asthma and Allergies in Childhood (ISAAC). Worldwide variations in the prevalence of bronchial asthma symptoms. Euro Respir J. 2012;12:315-35.
2. Global initiative for Asthma, GINA asthma guidelines 2019. Available at: https://ginasthma.org/?. Accessed on 20 October 2021.
3. Mirabelli MC, Hsu J, Gower WA. Comorbidities of asthma in U.S. children. Respir Med. 2016;116:34-40.
4. Ullmann N, Mirra V, Di Marco A, Pavone M, Porcaro F, Negro V, et al. Asthma: differential diagnosis and comorbidities. Front Pediatr. 2018;6:276.
5. Masoli M, Fabian D, Holt S, Beasley R; Global Initiative for Asthma (GINA) Program. The global burden of asthma: executive summary of the GINA Dissemination Committee report. Allergy. 2004; 59(5):469-78.
6. Taylor DR, Bateman ED, Boulet LP. A new perspective on concepts of asthma severity and control. Eur Respir J. 2008;32:545-54.
7. de Groot EP, Duiverman EJ, Brand PL. Comorbidities of asthma during childhood: possibly important, yet poorly studied. Eur Respir J. 2010;36(3):671-8.
8. Madhur CS, Bhatia SS, Sharma D. Prevalence of asthma in school children of rural areas of Kanpur, Uttar Pradesh. J Evol Mental Dent Sci. 2013;2(29): 5298-5301.
9. Amir M, Kumar S, Gupta RK. An observational study of bronchial asthma in 6-12 years school going children of Agra district. Indian J Allerg Asthma Immunol. 2015;29(2):62-6.
10. Kumar P, Singh G, Goyal JP, Khera D, Singh K. Association of common comorbidities with asthma in children: a cross-sectional study. Sudan J Paediatr. 2019;19(2):88-92. Gallucci M, Carbonara P, Pacilli AMG, di Palmo E, Ricci G, Nava S. Use of symptoms scores, spirometry, and other pulmonary function testing for asthma monitoring. Front Pediatr. 2019;7: 54.
11. van Aalderen WM, Sprikkelman AB. Inhaled corticosteroids in childhood asthma: the story continues. Eur J Pediatr. 2011;170(6):709-18.
12. Rachelefsky G. Inhaled corticosteroids and asthma control in children: assessing impairment and risk. Pediatrics. 2009;123(1):353-66.
13. 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.
14. Rogliani P, Sforza M, Calzetta L. The impact of comorbidities on severe asthma. Curr Opin Pulm Med. 2020;26(1):47-55.
15. Nyenhuis SM, Akkoyun E, Liu L, Schatz M, Casale TB. Real-World Assessment of Asthma Control and Severity in Children, Adolescents, and Adults with Asthma: Relationships to Care Settings and Comorbidities. J Allergy Clin Immunol Pract. 2020; 8(3):989-96.e1.
16. Di Genova L, Penta L, Biscarini A, Di Cara G, Esposito S. Children with Obesity and Asthma: Which Are the Best Options for Their Management? Nutrients. 2018;10(11):1634.
17. Tosca MA, Del Barba P, Licari A, Ciprandi G. Asthma and rhinitis control study group. the measurement of asthma and allergic rhinitis control in children and adolescents. Children. 2020;7(5):43.

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