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ORIGINAL ARTICLE

Clinical Profile, Co-Morbidities and Health Related Quality of Life in Pediatric Patients with Allergic Rhinitis and Asthma

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Abstract: *Background:* Co-existence of allergic rhinitis (AR) and bronchial asthma (BA) is well known. We planned to study the clinical profile of patients with AR & BA, the associated co-morbidities and the effect of AR &/ or BA on health related quality of life (HRQOL) in Pediatric patients. *Methods:* Patients attending the Pediatric out-patients department and Pediatric Chest Clinic of tertiary care center were enrolled. The sample size included 100 subjects with BA & AR (Group 1) with control groups of 60 asthmatic children (Group 2) & 40 children suffering from AR (Group 3). The patients were subjected to a questionnaire & a through physical examination and the details were recorded in a pre-designed proforma. General medical, environmental, occupational, personal & family history was procured along with examination of respiratory system. The standard heath related quality of life (HRQOL) parameters were studied. *Findings:* The study was conducted over a period of 13 months (February 2004 to March 2005). 200 patients between ages of 3 to 15 years (mean 7.95 years) were enrolled (100 patients with BA and AR- group 1, 60 patients with asthma alone- group 2 and 40 patients with AR alone- group 3. Dust, smoke, outdoor dust, holi festival, winter season, exercise, and smoking by father were important exacerbating factors in all the three groups. Additionally, diwali festival and family history of asthma were important in Group 2 (BA); while pollen, weeds, diwali festival and family history of allergic rhinitis were important causes of exacerbation in group 3 (AR). Cough was commonly seen in all three groups. Wheezing, sneezing, itching throat, rhinorrhea, watering, altered taste, and nasal block was common in patients in group 1 while wheezing was important symptom in patients in group 2 (BA). Sneezing, itching throat, rhinorrhea, watering, altered taste, and nasal block were common symptoms in patients in group 3 (AR). Conjunctivitis, pharyngitis, and post-nasal drip were common co-morbidities seen in groups 1 and 3. Deviated nasal septum and inferior turbinate hypertrophy were commonly seen in group 1, narrow nasal valve in group 2 (BA) and allergic shiners, darrier's line, deviated nasal septum and inferior turbinate hypertrophy were common in group 3 (AR). Sensation, emotion and cognition were affected in groups 1 and 3 while mobility and self-care remained unaffected in all three groups. *Conclusions:* Dust and smoke were the commonest trigger factor in all the three study groups. Family history is important in patients with asthma and AR. Wheezing was the commonest symptom in groups 1 and 2 while sneezing was predominant in groups 3 and 1. Pharyngitis was the commonest co-morbid association. Deviated nasal septum and inferior turbinate hypertrophy were commonly seen in group 1 and 3; while allergic shiners and darrier's line were additional in group 3 (AR). Sensation, emotion and cognition were affected in groups 1 and 3.

Key Words: Asthma, Allergy, Rhinitis, Co-morbidities, Triggers, Quality of life

Introduction

Asthma or Bronchial asthma (BA) is one of the commonest chronic disease with increasing prevalence up-to almost 30% of Pediatric population [1]. Allergic Rhinitis (AR) is one of the chief reasons for visiting a primary care physician, it adversely affects work, productivity and school performance and limits socialization. AR is associated with variety of co-morbid conditions including asthma, pharyngitis, conjunctivitis, eczema, sinusitis, otitis media, nasal polyposis, obstructive sleep apnea, speech impairment, lower respiratory tract infection, and reduced quality of life [2-4]. Co-existence of AR and asthma is well-known. 32-58% of patients with rhinitis have asthma; patients with AR have 3-fold greater risk of development of asthma [2]. Apart from being associated epidemiologically (similar genetic background and triggered by similar provoking factors), AR & asthma are associated anatomically, physiologically, immunopathologically and their response to therapeutic intervention; thus the term "Allergic Rhinobronchitis" or "United Airways" and "One Airway- One disease". There is a paucity of medical literature on Pediatric AR and asthma from India and other developing countries. Hence, we planned this study to systematically determine the clinical profile and quality of life of patients with AR and asthma.

Patients and Methods

We planned to study the clinical profile of patients with AR & BA, the associated co-morbidities and the effect of AR &/ or BA on health related quality of life (HRQOL) in Pediatric patients (3 to 15 years). Patients attending the Pediatric out-patients department and Pediatric Chest Clinic of tertiary care teaching center of KEM Hospital were enrolled. The sample size included 100 subjects with BA & AR (Group 1) with control groups of 60 asthmatic children (Group 2) & 40 children suffering from AR (Group 3). We included patients with clinically confirmed bronchial asthma (BA) in accordance with GINA 2003 guidelines [1]. Patients below 3 years or more than 15 years, those not willing to be a part of study and mentally subnormal children not able to answer the requisite questionnaire were not included. The study was commenced after a written notification of approval for the study from the "Ethics committee for Research on Human subjects" of the institution. A written, informed consent from parent of each subject was obtained. The patients were subjected to a questionnaire & a through physical examination and the details were recorded in a pre-designed proforma. General medical, environmental, occupational, personal & family history was procured along with examination of respiratory system & nose (including anterior rhinoscopy). Evaluation & classification asthma was done using standard GINA 2003 guidelines & peak expiratory flow measurements. The standard heath related quality of life (HRQOL) parameters were studied (Sensation, Mobility, Emotion, Cognition and Self-care).

Results

The study was conducted over a period of 13 months from February 2004 to March 2005. A total of 200 patients between ages of 3 to 15 years (mean 7.95 years, SD 8.21) were enrolled [100 patients with bronchial asthma and allergic rhinitis (BA and

AR)- group 1, 60 patients with asthma (BA) alone- group 2 and 40 patients with allergic rhinitis (AR) alone- group 3]. Amongst those with AR alone, 30 subjects had intermittent AR while 10 had persistent AR. Mean ages of presentation of the three groups were 7.48 (SD 3.08), 8.75 (SD 14.22) and 7.9 (SD 3.46) years for groups 1, 2 and 3 respectively. There was no statistical difference in ages of the study groups (ANOVA test). The age of onset for AR was mean of 3.52 years (SD 2.17). There was no statistical difference between group 1 (3.33 years, SD 2.12) and group 3 (3.52 years, SD 2.17) as regards the age of onset of AR (unpaired T- test). There was no difference in the groups as regards the sex of the patients (70, 39 and 25 males in groups 1, 2 and 3 respectively, Pearson chi- square test). The effect of various trigger factors/ associations on the various groups of patients is summarized in Table 1.

Table 1: Effect of various trigger factors/ associations on the various groups of patients

Trigger factors		Group 1 (n=100)	Group 2 (n=60)	Group 3 (n=40)	Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Dust	No.	78	56	32	166
	%	78.00%	93.30%	80.00%	83.00%
Smoke	No.	76	40	34	150
	%	76.00%	66.70%	85.00%	75.00%
Fungus	No.	9	2	0	11
	%	9.00%	3.30%	0.00%	5.50%
Food	No.	19	13	3	35
	%	19.00%	21.70%	7.50%	17.50%
Cat Dander	No.	23	7	9	39
	%	23.00%	11.70%	22.50%	19.50%
Dog dander	No.	20	21	10	51
	%	20.00%	35.00%	25.00%	25.50%
Pigeon Dander	No.	19	0	1	20
	%	19.00%	0.00%	2.50%	10.00%
Pollen (Outdoor allergens)	No.	36	20	21	77
	%	36.00%	33.30%	52.50%	38.50%
Weeds (Outdoor allergens)	No.	19	16	16	51
	%	19.00%	26.70%	40.00%	25.50%
Dust (Outdoor allergens)	No.	89	52	39	180
	%	89.00%	86.70%	97.50%	90.00%
Diwali festival	No.	29	33	27	89
	%	29.00%	55.00%	67.50%	44.50%
Holi festival	No.	51	31	22	104
	%	51.00%	51.70%	55.00%	52.00%

Trigger factors		Group 1 (n=100)	Group 2 (n=60)	Group 3 (n=40)	Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Winter Season	No.	51	32	22	105
	%	51.00%	53.30%	55.00%	52.50%
Spring Season	No.	27	14	12	53
	%	27.00%	23.30%	30.00%	26.50%
Monsoon Season	No.	24	16	12	52
	%	24.00%	26.70%	30.00%	26.00%
Insect Allergy	No.	11	5	8	24
	%	11.00%	8.30%	20.00%	12.00%
Exercise	No.	59	42	32	133
	%	59.00%	70.00%	80.00%	66.50%
Cows milk allergy	No.	23	6	0	29
	%	23.00%	10.00%	0.00%	14.50%
Smoking among Parents: Father	No.	59	47	24	130
	%	59.00%	78.30%	60.00%	65.00%
Smoking among Parents: Mother	No.	3	0	2	5
	%	3.00%	0.00%	5.00%	2.50%
Smoking among both Parents	No.	3	1	0	4
	%	3.00%	1.70%	0.00%	2.00%
Family History of Asthma	No.	27	33	4	64
	%	27.00%	55.00%	10.00%	32.00%
Family History of Allergic Rhinitis	No.	30	12	23	65
	%	30.00%	20.00%	57.50%	32.50%
Family History of Eczema	No.	15	3	2	20
	%	15.00%	5.00%	5.00%	10.00%
Family History of Atopic Dermatitis	No.	14	3	3	20
	%	14.00%	5.00%	7.50%	10.00%
Family History of Urticaria	No.	11	0	0	11
	%	11.00%	0.00%	0.00%	5.50%
Family History of Food Allergy	No.	23	10	0	33
	%	23.00%	16.70%	0.00%	16.50%

Dust, smoke, outdoor dust, holi festival, winter season, exercise, and smoking by father were important exacerbating factors in all the three groups. Additionally diwali festival and family history of asthma were important in Group 2 (BA) while pollen, weeds, diwali festival and family history of allergic rhinitis were important causes of exacerbation in group 3 (AR). Table 2 presents the various symptoms seen in the three groups. Cough was commonly seen in all three groups. Wheezing, sneezing, itching throat, rhinorrhea, watering, altered taste, and nasal block was common in patients in group 1 while wheezing was important symptom in patients in group 2 (BA). Sneezing, itching throat, rhinorrhea, watering, altered taste, and nasal block

Table 2: Symptoms seen in the three study groups

Range Of Symptoms		Group 1	Group 2	Group 3	Total
		B.Asthma+A.Rhinitis (n=100)	B.Asthma (n=60)	A.Rhinitis (n=40)	
Cough	No.	88	60	20	168
	%	88.00%	100.00%	50.00%	84.00%
Wheezing	No.	91	57	14	162
	%	91.00%	95.00%	35.00%	81.00%
Sneezing	No.	87	5	40	132
	%	87.00%	8.30%	100.00%	66.00%
Itching Throat	No.	52	20	35	107
	%	52.00%	33.30%	87.50%	53.50%
Rhinorrhea	No.	78	4	40	122
	%	78.00%	6.70%	100.00%	61.00%
Watering	No.	45	2	25	72
	%	45.00%	3.30%	62.50%	36.00%
Altered Taste	No.	41	2	26	69
	%	41.00%	3.30%	65.00%	34.50%
Snoring	No.	9	0	0	9
	%	9.00%	0.00%	0.00%	4.50%
Daytime Sleep	No.	19	8	3	30
	%	19.00%	13.30%	7.50%	15.00%
Nasal Block	No.	49	0	22	71
	%	49.00%	0.00%	55.00%	35.50%

were common in patients with group 3 (AR). School absenteeism was not significantly different in the three groups (Pearson chi-square test). Table 3 enlists the various co-morbidities seen in the study groups. Conjunctivitis, pharyngitis, and post-nasal drip were commonly seen in groups 1 and 3.

Table 3: Co-morbidities seen in the three study groups

Associated Co-morbidities		Group 1 (n=100)	Group 2 (n=60)	Group 3 (n=40)	Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Conjunctivitis	No.	45	2	25	72
	%	45.00%	3.30%	62.50%	36.00%
Pharyngitis	No.	52	20	35	107
	%	52.00%	33.30%	87.50%	53.50%
Post-nasal Drip	No.	52	20	35	107
	%	52.00%	33.30%	87.50%	53.50%
Sinusitis	No.	36	11	14	61
	%	36.00%	18.30%	35.00%	30.50%
Asthma	No.	100	60	0	157
	%	100.00%	100.00%	0.00%	78.50%

Associated Co-morbidities		Group 1 (n=100)	Group 2 (n=60)	Group 3 (n=40)	Total
		B.Asthma+A. Rhinitis	B.Asthma	A.Rhinitis	
Eczema	No.	19	10	2	31
	%	19.00%	16.70%	5.00%	15.50%
Otitis Media	No.	12	0	6	18
	%	12.00%	0.00%	15.00%	9.00%
Obstructive Sleep Apnea	No.	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%
Speech impairment	No.	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%
Hypernasality	No.	12	0	6	18
	%	12.00%	0.00%	15.00%	9.00%
Failure to thrive	No.	1	0	0	1
	%	1.00%	0.00%	0.00%	0.50%

The examination findings in the study subjects are presented in Table 4. Deviated nasal septum and inferior turbinate hypertrophy were commonly seen in group 1, narrow nasal valve in group 2 (BA) and allergic shiners, darriers line, deviated nasal septum and inferior turbinate hypertrophy were common in group 3 (AR).

Table 4: Examination findings in the study subjects

Examination findings		Group 1 (n=100)	Group 2 (n=60)	Group 3 (n=40)	Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Allergic Shiners	No.	37	0	17	54
	%	37.00%	0.00%	42.50%	27.00%
Darrier's Line	No.	37	0	17	54
	%	37.00%	0.00%	42.50%	27.00%
Dental Malocclusion	No.	19	3	9	31
	%	19.00%	5.00%	22.50%	15.50%
Allergic Gape	No.	19	3	9	31
	%	19.00%	5.00%	22.50%	15.50%
Deviated Nasal Septum	No.	54	0	24	78
	%	54.00%	0.00%	60.00%	39.00%
Nasal Polyps	No.	0	0	0	0
	%	0.00%	0.00%	0.00%	0.00%
Narrow Nasal Valve	No.	0	1	2	3
	%	0.00%	1.66%	5.00%	1.50%
Inferior Turbinate Hypertrophy	No.	54	0	24	78
	%	54.00%	0.00%	60.00%	39.00%

The HRQOL parameters affected in the study population are given in Table 5. Sensation, emotion and cognition were affected in groups 1 and 3 while mobility and self-care remained unaffected in all three groups.

Table 5: HRQOL parameters affected in the study population

Sensation		Groups			Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Mild	No.	78	4	40	122
	%	78.00%	6.70%	100.00%	61.00%
Moderate	No.	0	2	0	2
	%	0.00%	3.30%	0.00%	1.00%
Severe	No.	2	1	0	3
	%	2.00%	1.70%	0.00%	1.50%
No	No.	20	53	0	73
	%	20.00%	88.30%	0.00%	36.50%
Total	No.	100	60	40	200
	%	100.00%	100.00%	100.00%	100.00%
Pearson Chi-square applied between-	Value	df	P-value	Difference is-	
BA+AR v/s BA:	78.967	3	5.11E-17	Significant	
BA+AR v/s AR:	10.441	2	0.005	Significant	
BA v/s AR:	84.848	3	2.80E-18	Significant	

Mobility		Groups			Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Mild	No.	2	0	0	2
	%	2.00%	0.00%	0.00%	1.00%
Moderate	No.	9	1	0	10
	%	9.00%	1.70%	0.00%	5.00%
Severe	No.	1	0	0	1
	%	1.00%	0.00%	0.00%	0.50%
No	No.	88	59	40	187
	%	88.00%	98.30%	100.00%	93.50%
Total	No.	100	60	40	200
	%	100.00%	100.00%	100.00%	100.00%

Pearson Chi-square applied between-	Value	df	P-value	Difference is-
BA+AR v/s BA:	5.462	3	0.141	Not Significant
BA+AR v/s AR:	5.250	3	0.154	Not Significant
BA v/s AR:	0.673	1	0.412	Not Significant

Emotion		Groups			Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Mild	No.	49	0	22	71
	%	49.00%	0.00%	55.00%	35.50%
Moderate	No.	0	1	0	1
	%	0.00%	1.70%	0.00%	0.50%
Severe	No.	0	1	0	1
	%	0.00%	1.70%	0.00%	0.50%
No	No.	51	58	18	127
	%	51.00%	96.70%	45.00%	63.50%
Total	No.	100	60	40	200
	%	100.00%	100.00%	100.00%	100.00%

Pearson Chi-square applied between-	Value	df	P-value	Difference is-
BA+AR v/s BA:	44.213	3	1.36E-09	Significant
BA+AR v/s AR:	0.412	1	0.521	Not Significant
BA v/s AR:	42.763	3	2.76E-09	Significant

Cognition		Groups			Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Mild	No.	78	4	40	122
	%	78.00%	6.70%	100.00%	61.00%
Moderate	No.	0	1	0	1
	%	0.00%	1.70%	0.00%	0.50%

No	No.	22	55	0	77
	%	22.00%	91.70%	0.00%	38.50%
Total	No.	100	60	40	200
	%	100.00%	100.00%	100.00%	100.00%
Pearson Chi-square applied between-	Value	df	P-value	Difference is-	
BA+AR v/s BA:	76.718	2	2.19E-17	Significant	
BA+AR v/s AR:	10.441	1	0.001	Significant	
BA v/s AR:	84.848	2	3.76E-19	Significant	

Self-care		Groups			Total
		B.Asthma+A.Rhinitis	B.Asthma	A.Rhinitis	
Mild	No.	6	0	0	6
	%	6.00%	0.00%	0.00%	3.00%
Severe	No.	1	0	0	1
	%	1.00%	0.00%	0.00%	0.50%
No	No.	93	60	40	193
	%	93.00%	100.00%	100.00%	96.50%
Total	No.	100	60	40	200
	%	100.00%	100.00%	100.00%	100.00%
Pearson Chi-square applied between-	Value	df	P-value	Difference is-	
BA+AR v/s BA:	4.392	2	0.111	Not Significant	
BA+AR v/s AR:	2.947	2	0.229	Not Significant	

Discussion

AR presents with various varied symptoms in pediatric patients: cough, sneezing, nasal pruritus, nasal congestion, sore throats, hilatosis, respiratory distress in infants, hypernasality and behavioral problems [2]. Our study confirms that cough is an important symptom in all the three groups. Wheezing, sneezing, itching throat, rhinorrhea, watering, altered taste, and nasal block was common in patients with AR with BA while wheezing was important symptom in patients with asthma. Sneezing, itching throat, rhinorrhea, watering, altered taste, and nasal block were common in patients with AR alone in the present study.

As seen from our analysis, one must look for the other associations in patients with AR and / or asthma. Thus, treatment of AR and AR with asthma requires multidisclipinary approach (involving pediatric allergists, otolaryngologists, respiratory pediatricians, dermatologists, ophthalmologists, etc) [2]. Though, mechanisms such as nasobronchial reflex, rhinovirus adhesion theory, postnasal drip, and migration of sensitized T cells have been proposed to explain the allergy-asthma link it is appears that AR probably exacerbates asthma and treatment of AR should be a must in optimizing treatment of asthma [2]. Guerra et al have shown that rhinitis is an independent risk for adult-onset asthma (both atopic & non-atopic subjects) [5]. Rhinosinusitis is common in patients with asthma and asthma patients need to be evaluated for sinusitis and treated for the same, as sinusitis can be a possible inducible factor for bronchial hyperresponsiveness [15-16]. Conjunctivitis, pharyngitis, and post-nasal drip were commonly seen in patients with AR and those with AR and asthma in our study. Deviated nasal septum and inferior turbinate hypertrophy were commonly seen in patients with AR and asthma in our study. Also allergic shiners, darrier's line, deviated nasal septum and inferior turbinate hypertrophy were commonly noted in patients with AR alone. One of the aims of treatment of patients with rhinitis should be improvement of the quality of life and our study suggests significant impairment of the same in patients with AR [3]. We found that sensation, emotion and cognition were affected in patients with AR with/ or without asthma; while mobility and self care remained unaffected in all the three groups. It has been recommended that clinicians should incorporate the quality of life parameters in clinical assessment of patients with rhinitis [3]. The common problems in patients with AR can be included under following domains- sleep problems, non-nasal symptoms, nasal symptoms, practical problems, activity limitations & emotional problems and there exist many instruments for assessments of HRQOL in patients with AR[3-4]. Similarly there exist other instruments for studying affection of HRQL in pediatric and adult patients with asthma [6-12]. Though we have not selected the specific tools available to study AR and asthma, affection of quality of life has still been proven in the study. Also it requires special experience and skills in interpretation of the HRQOL data [3,13]. Treatment of AR should also demonstrate improvement in quality of life parameters and rational comparisons of various treatment modalities is thus possible [4]. The ISAAC study has shown worldwide variation in the prevalence of asthma, allergic rhinoconjunctivitis, and atopic eczema [14]. Highest prevalence of asthma was noted from the UK, New Zealand, Australia, Republic of Ireland, followed by the Americas; but the lowest prevalence was seen in Eastern Europe, Indonesia, China, Taiwan, India, etc [14]. Also large variations were seen within the same country in India, Italy, Ethiopia, and Spain [14]. It is difficult to plan intervention strategies for these allergic disorders without such valuable epidemiological data. Allergens like house dust mite, cat allergen, dog allergen, indoor mould spores, etc. play an important role in initiation and persistence of asthma [17]. We showed that dust, smoke, outdoor dust, holi festival, winter season, exercise, and smoking by father were important exacerbating factors in all the three groups. Additionally, diwali festival and family history of asthma were important in patients with asthma alone while pollen, weeds, diwali festival & family history of allergic rhinitis were important causes of exacerbation in patients with AR alone.

Conclusions

Dust and smoke were the commonest trigger factor in all the three study groups. Family history is important in patients with asthma and AR. Wheezing was the commonest symptom in groups 1 and 2 while sneezing was predominant in groups 3 and 1. Pharyngitis was the commonest co-morbid association. Conjunctivitis, pharyngitis, and post-nasal drip were commonly seen in groups 1 and 3. Deviated nasal septum and inferior turbinate hypertrophy were commonly seen in group 1; while allergic shiners, darrier's line, deviated nasal septum and inferior turbinate hypertrophy were common in group 3 (AR). Sensation, emotion and cognition were affected in groups 1 and 3 while mobility and self-care remained unaffected in all three groups.

Limitations

The history of allergen exposure could not be corroborated with allergen testing in the present study. Also therapeutic efficacy/ effect of steroids/ bronchodilators on the quality of life parameters was not determined.

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