

# Causal Relationship of Chronic Cough with Asthma and Upper Airway Problems in School Going Children Aged 8-12 Years.

Kalyanbrata Mandal<sup>1</sup>, Abhishek Roy<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Paediatrics, Calcutta Medical College, Kolkata

<sup>2</sup>Assistant Professor, Department of Paediatrics, R G Kar Medical College, Kolkata

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## ABSTRACT

**Background:** Chronic cough is a frequent presentation of asthma. Upper airway problems like postnasal drip syndrome, rhino sinusitis which are asthma mimickers can also present with chronic cough. Association among asthma, upper airway problems and chronic cough needs to be addressed. **Methods:** A cross-sectional study conducted in sub Himalayan Terai region of West Bengal over a period of one year, over school going children of age 8 to 12 years, selected by systemic random sampling. An American Thoracic Society Questionnaire and the Juniper Minirhinoconjunctivitis Quality of Life Questionnaire translated into Bengali and Hindi were used for assessment. **Results:** Statistically significant association was found among asthma, upper airway problems and chronic cough. **Conclusion:** Correct diagnosis of the cause behind chronic cough is mandatory for proper management.

**Keywords:** Chronic cough, Asthma, Upper airway problems.

## INTRODUCTION

Chronic cough is defined as coughing for more than four weeks duration.<sup>[1]</sup> The common causes of chronic cough are bronchial reactivity including allergic asthma, drainage from upper airways, chronic sinusitis, gastro esophageal reflux etc.<sup>[2]</sup> It is a very common practice that chronic cough in children due to respiratory cause are being treated with anti-asthma medications or antibiotics. But apart from asthma/lower respiratory tract infection, upper airway conditions like drainage from upper airways or postnasal drip syndrome, rhinosinusitis, also called as upper airway cough syndrome are also important cause of chronic cough in the children.<sup>[3]</sup> Intermittent dry coughing and/or expiratory wheezing are the most common chronic symptoms of asthma. Forced expiratory airflow measures are helpful in diagnosing and monitoring asthma and in assessing efficacy of therapy. Lung function testing is particularly helpful in children with asthma who are poor perceivers of airflow obstruction or when

physical signs of asthma do not occur until airflow obstruction is severe.<sup>[4]</sup>

The leading cause of post nasal discharge is allergic rhinitis or more appropriately, chronic rhinosinusitis.<sup>[5]</sup> Allergic rhinitis is an inflammatory disorder of the nasal mucosa characterized by nasal congestion, rhinorrhoea, itching and often accompanied by sneezing and conjunctival irritation.<sup>[6]</sup> The clinical presentation of chronic rhinosinusitis, in addition to cough, commonly involves complaints of a sensation of something dripping down the throat and nasal congestion or discharge.

With this background, a study was conducted with the aim and objective to find the association among asthma, upper airway problems and chronic cough.

## MATERIALS AND METHODS

It was a Cross-sectional study conducted in Darjeeling portion of Siliguri subdivision of sub Himalayan Terai region of West Bengal over a period of one year, from December 2012 to December 2013. Study population was school going children of age 8 to 12 years selected by systemic random sampling. Appropriate consent of the parents and ethical clearance were obtained prior to the study.

An American Thoracic Society Questionnaire and the Juniper Minirhinoconjunctivitis Quality of Life

### Name & Address of Corresponding Author

Dr. Abhishek Roy  
Address: 42A,  
Vidyasagar Sarani,  
Garfa,  
Kolkata-700078

Questionnaire translated into Bengali and Hindi were used for assessment. The American Thoracic Society questionnaire and the Juniper Minirhinoconjunctivitis questionnaire are well-validated questionnaires and have been used in many different settings across the world in order to define respiratory morbidity in children in various community settings.<sup>[7,8]</sup> The parents of all the selected children were given American Thoracic Society questionnaire. According to ATS questionnaire, cough for 4 or more days/week for as much as 3 months is considered as chronic cough.[9] All the children with chronic cough were assessed by pulmonary function test (FEV1/FVC) and Minirhinoconjunctivitis Quality of Life questionnaire. FEV1/FVC < 0.8 was considered as abnormal. Those with abnormal lung function test were given bronchodilator and spirometry was repeated. If there was reversal of lung function by > 12% improvement of FEV1, the subject was considered as a case of asthma. Peak Nasal Inspiratory Flow(PNIF) was assessed with the help of an In-check peak flow meter(In-Check, Clement, Clerke Int. Ltd, Essex, UK) to assess blocked/ stuffy nose (< 2SD from controls). All results were recorded in pre – designed structured proforma. Data was tabulated in Microsoft Office Excel 2007 and statistical analysis was done using SPSS (version: 22.0).

## RESULTS

After analyzing the questionnaire data from 2500 children, 518 (20.7%) were found to have chronic cough, 417 (16.7%) had upper airway problems and 203 (8.1%) were provisionally diagnosed as asthmatics [Table 1-4].

**Table 1: Prevalence of Asthma, Chronic Cough and Upper Airway Problems.**

	Number	Percent
Asthma	203	8.1
Chronic Cough	518	20.7
Upper Airway Problems	417	16.7

**Table 2: Anthropometry and Spirometry of Asthmatics.**

	Asthma	No Asthma	P Value	Significance
	Mean ± Std. Deviation	Mean ± Std. Deviation		
Height	139.67 ± 8.21	142.21 ± 8.06	0.007	Significant
Weight	35.69 ± 8.49	37.28 ± 8.35	0.101	Not Significant
FEV1	1.97 ± 0.25	2.21 ± 0.35	<0.001	Significant
FVC	2.68 ± 0.36	2.24 ± 0.35	<0.001	Significant
PNIF	53.52 ± 10.59	55.55 ± 10.28	0.089	Not Significant

**Table 3: Anthropometry and Spirometry of subjects with Chronic Cough.**

	Chronic Cough	Not Chronic Cough	P Value	Significance
	Mean ± Std. Deviation	Mean ± Std. Deviation		
Height	140.37 ± 6.86	142.43 ± 8.35	0.001	Significant
Weight	34.77 ± 7.62	37.77 ± 8.44	<0.001	Significant
FEV1	2.09 ± 0.28	2.22 ± 0.36	<0.001	Significant
FVC	2.38 ± 0.39	2.25 ± 0.36	<0.001	Significant
PNIF	42.61 ± 12.33	58.73 ± 6.39	<0.001	Significant

**Table 4: Anthropometry and Spirometry of subjects with Upper Airway Problems.**

	Upper Airway Problems	Not Upper Airway Problems	P Value	Significance
	Mean ± Std. Deviation	Mean ± Std. Deviation		
Height	141.35 ± 5.57	142.14 ± 8.52	0.250	Not Significant
Weight	33.44 ± 6.1	37.9 ± 8.56	<0.001	Significant
FEV1	2.12 ± 0.28	2.21 ± 0.36	0.002	Significant
FVC	2.25 ± 0.34	2.28 ± 0.38	0.385	Not Significant
PNIF	38.08 ± 8.32	58.86 ± 6.46	<0.001	Significant

Prevalence of Asthma, Chronic Cough and Upper Airway Problems was higher in adolescent males [Table 5-6].

**Table 5: Age wise distribution.**

	8-10 years	11-12 years
Asthma	25	178
Chronic Cough	102	416
Upper Airway Problems	89	328

**Table 6: Gender wise distribution**

	Male	Female	Total	P Value	Significance
Asthma	153	50	203	0.327	Not Significant
Chronic Cough	397	121	518	0.0097	Significant
Upper Airway Problems	325(18)	92(13.2)	417(16.7)	0.0034	Significant

Among upper airway problems, commonest was stuffy nose, followed by rubbing of nose/eyes and sneezing [Table 7].

**Table 7: Upper Airway Problems**

Upper Airway Problems	Number	Percent
Need to rub Nose/Eyes	988	39.5
Need to blow nose repeatedly	808	32.3
Sneezing	950	38
Stuffy/Blocked Nose	1347	53.9
Runny Nose	427	17.1

Wheezing causing breathlessness, exercise induced wheezing and production of phlegm with or without colds, all bear statistical significance in chronic cough, asthma and upper airway problems [Table 8]. 39.2% asthmatics and 71% cases of upper airway problems had chronic cough. Statistically significant association was found among asthma, upper airway problems and chronic cough [Table 9-11].

**Table 8:**

	Had an attack of wheezing that caused breathlessness		Usually bring up phlegm with or without colds		Ever get wheezing after playing hard or exercise		p Value	Significance
	Yes (no. %)	No (no. %)	Yes (no. %)	No (no. %)	Yes (no. %)	No (no. %)		
Asthma	130 (64)	73 (36)	77 (37.9)	126 (62.1)	203 (100)	0 (0)	<0.0001	Significant
Chronic Cough	130 (25.1)	388 (74.9)	394 (76.1)	124 (23.9)	203 (39.2)	315 (60.8)	<0.0001	Significant
Upper Airway Problems	88 (21)	329 (79)	392 (94)	25 (6)	79 (18.9)	338 (81.1)	<0.0001	Significant

**Table 9: Association of Asthma with Chronic Cough**

Asthma	Chronic Cough		Total (no. %)	p Value	Significance
	Chronic Cough (no. %)	Not Chronic Cough (no. %)			
Asthma	203 (39.2)	0(0)	203 (8)	<00001	Significant
No Asthma	315 (60.8)	1982 (100)	2297 (92)		
Total	518 (100)	1982 (100)	2500 (100)		

**Table 10: Association of Upper Airway Problem with Chronic Cough.**

Upper Airway Problems	Chronic Cough		Total (no. %)	p Value	Significance
	Chronic Cough (no. %)	Not Chronic Cough (no. %)			
Upper Airway Problems	368 (71)	49 (2)	417 (16.7)	<0.0001	Significant
Not Upper Airway Problems	150 (29)	1933 (98)	2083 (83.3)		
Total	518 (100)	1982 (100)	2500 (100)		

**Table 11: Association of Upper Airway Problem with Asthma.**

Upper Airway Problems	Asthma		Total (no. %)	p Value	Significance
	Asthma (no. %)	No Asthma (no. %)			
Upper Airway Problems	77(38)	340(14.8)	417(16.7)	<0.0001	Significant
Not Upper Airway Problems	126(62)	1957(85.2)	2083(83.3)		
Total	203 (100)	2297(100)	2500(100)		

## DISCUSSION

The main diagnostic tool i.e. the American Thoracic Society Questionnaire is recommended as a standard questionnaire for studies of children below 13 years of age in epidemiologic investigations. It is designed to assess respiratory symptoms of children by questioning parents. The questionnaire is well validated and has been used in a number of studies.<sup>[10]</sup>

The 28-item Juniper Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) has strong measurement properties but for large clinical trials, surveys and practice monitoring, where high efficiency is important, a shorter questionnaire is needed. Using five RQLQ databases, items with high item-item correlations were combined and then the highest scoring items were selected for the MiniRQLQ (14 questions). There are five domains: activity limitations (standardized), practical problems and

nose symptoms, eye symptoms and other symptoms. The MiniRQLQ has strong measurement properties and measures the same construct as the original RQLQ. The questionnaire is well validated for symptoms of rhinitis and has been used in a number of studies.<sup>[7,8]</sup>

Our study shows, the high prevalence of chronic cough in children could result from upper airway problem rather than asthma. This prevalence of cough is not associated with an increased prevalence of wheeze in majority of these children (74.9%). However, this increased prevalence of cough is associated with persistent phlegm production with or without colds (76.1%). About 77% children with chronic cough had stuffy/blocked nose.

The prevalence of upper airway problems in our study was 16.7% and is well comparable to 14.6% found in a study by Berman BA.<sup>[11]</sup> The commonest problem was stuffy/blocked nose (53.9%) followed by nose/eyes rubbing (39.5%) and sneezing (38%). The pathogenesis of these cough involves a combination of microaspiration, post nasal drip of mucus, spreading of inflammation via systemic circulation, naso-bronchial reflex, sino-bronchial reflex, lack of nasal functions in subjects with rhinitis together with mechanisms of central and peripheral cough plasticity.<sup>[12]</sup> During a common cold, patients are experiencing bouts of coughing as a result of minor environmental insults such as change in air temperature or exposure to noxious stimuli like cigarette smoke, allergens. In our study, there were widespread areas of Parthenium hysterophorus which is also a potent noxious stimulant for allergic respiratory problems.<sup>[13]</sup>

Among 518 subjects with chronic cough, we found 60.8% had no asthma which was statistically significant ( $p < 0.0001$ ). Hence, use of isolated cough as a marker of asthma is indeed controversial. More remarkable results were found by M Seear in a prospective review of 81 children with chronic cough, where none had asthma on final diagnosis.<sup>[14]</sup> Similar conclusion was drawn by Thomson et al in a retrospective study in 2002.<sup>[15]</sup> In other studies, when airway profiles have been examined in children with isolated chronic cough, very few children with airway inflammation were found to be consistent with asthma.<sup>[16-18]</sup> Marguet and colleagues concluded that chronic cough is not associated with the cell profiles suggestive of asthma and in isolation should not be treated with prophylactic anti-asthma drugs.<sup>[18]</sup> The majority of children with cough do not have asthma.<sup>[19,20]</sup> In contrast, some hospital based clinical studies of children presenting with chronic cough have found asthma as the most common cause.<sup>[21,22]</sup>

Among 203 diagnosed asthmatics, 38% had upper airway problems. When allergy, eczema, otitis media, viral upper respiratory infection or sinusitis is present in a patient, asthma must be considered as possible sequelae. Similarly, if a patient has

symptoms of intermittent or persistent asthma, consideration must be given to the presence of allergy, eczema, otitis media, viral upper respiratory infection, or sinusitis as comorbid conditions or possible triggers for the asthma symptoms. Our study shows, statistically significant association between asthma and upper airway problems. Similar results are found in studies conducted abroad.<sup>[23,24]</sup> Reduction of these asthma triggers and comorbid conditions is also likely to reduce asthma medication requirements.

## CONCLUSION

Chronic cough is frequent problem among children. When associated with wheezing, cause is more likely to be asthma. In the rest, upper airway problems dominate. Strong association exists among chronic cough, asthma and upper airway problems. Correct diagnosis is mandatory for proper management. Treatment and control of upper airway symptoms is essential for control of asthma symptoms.

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