

A Study of Causes of Chronic Cough in Children

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Abstract

Introduction: Chronic cough is a common condition that affects many children and can significantly impact their quality of life. The study aims to identify the different causes of chronic cough in children and their prevalence, and to evaluate the effectiveness of diagnostic tests and treatments.

Materials and Methods: The study involved a comprehensive review of medical records of children diagnosed with chronic cough in a large pediatric hospital over a one-year period.

Results: The results of the study suggest that the most common causes of chronic cough in children are asthma, upper airway cough syndrome, and gastroesophageal reflux disease. The study also found that diagnostic tests such as chest X-rays, spirometry, and bronchoscopy are useful in identifying the underlying cause of chronic cough. Treatment options for chronic cough include medications, lifestyle modifications, and behavioral interventions.

Conclusion: The findings of this study have important implications for the management of chronic cough in children and highlight the need for a multidisciplinary approach to diagnosis and treatment.

Keywords: Chronic Cough, Children, Causes, Asthma, Upper Airway Cough Syndrome.

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Introduction

Chronic cough in children is among the problems that lead to frequent consultations with doctor. Reported prevalence of chronic cough in children varies from 4.8% to 6.8% in community based surveys in the west. [1-3]

Chronic cough affects children in their school, exercise, sleep and other activities.

Children are sometimes requested to leave the class and prevented from participating in physical activity and these negative elements may perpetuate or intensify cough. This may lead to 'sick child' syndrome.

There are no consensus guidelines which have clearly defined when cough should be defined as chronic or persistent.

Various authors have defined chronic cough in children, however in different ways and the duration of cough for it to be labeled as chronic varies from 3 weeks to 12 weeks. [4-6]

Bronchial asthma along with cough variant asthma was found to be the commonest cause of chronic cough followed by tuberculosis in a study from Central India at Nagpur, having dry and hot weather (humidity ranges between 10 to 40% in different seasons, except in rainy seasons). In this study, asthma was found in 23.4% of patients, cough variant asthma in 13.8% and tuberculosis in 22.3% as etiological cause of chronic cough. [7]

Two studies from Mumbai, Western Maharashtra have reported asthma in 39% and 29% of patients of chronic cough, respectively. However, cough variant asthma has not been mentioned as a separate group in any of these two studies. [8, 9] Sinusitis was found to be a cause in 9.5% patients in central India. [7] Paramesh et.al. [10] from Bangalore found a similar prevalence while Nadkarni and Lahiri reported sinusitis in 16% of their patients in Mumbai. [8,9] A lower frequency of sinusitis in the study done in Nagpur could be due to dry weather and less humidity in Central India. [7]

There is not only a lack of consensus about the definition of chronic cough but even the spectrum of aetiology in chronic cough is very broad and involves a lot of clinical conditions. There is a need to have proper evidence based guidance to evaluate such cases with investigations aimed at faster diagnosis with low cost. While the western countries have developed guidelines for evaluation of chronic cough, but in our country there is lack of proper guidelines as there is huge gap in the knowledge of exact prevalence of the causes. It must be said that the reported prevalence in studies

from western countries may not be applicable to our settings.

There is a need for identifying aetiology of chronic cough among children in our country because while the investigations available have improved but no study has been published in this area for past decade or so.

With this background, we aimed to study the prevalence of different causes of chronic cough in children with their clinical pointers among children (0-16years).

Methodology

After receiving approval from the institutional ethical committee, a hospital based observational study was conducted in department of Pediatrics of tertiary care centre.

The study was conducted for 12 months among a convenient sample of 77 children attending the OPD/IPD of our hospital were enrolled. We included children of age 0 to 16 years with chronic cough (more than 2 weeks). We excluded children with known respiratory condition like cystic fibrosis, bronchiectasis, asthma, tuberculosis, children with congenital or acquired cardiac diseases, children with neuro-developmental delay and children with known HIV disease.

Detailed history and examination was done, specific pointers for cough noted, and algorithm detailed below was used to evaluate for the etiology of chronic cough. Specific diagnosis arrived at after appropriate investigations using algorithm below were tabulated and analyzed using standard statistical tools.

The patient flow following the enrollment is detailed below. Specific cough pointers detailed below (Table 8) were used as decision nodes for further investigation(s):

Table 1: Specific Cough Pointers

Clinical features	Likely cause to investigated
Exertional dyspnea, wheezing on auscultation, Reversible airway obstruction	Bronchial Asthma
Digital clubbing, recurrent episodes of wet cough, no improvement in wet cough after 4 weeks of antibiotics	Bronchiectasis
Feeding difficulty, cough or choking with feeding, developmental abnormality, neuromuscular disorder	Aspiration from above
Wet cough, failure to thrive, malabsorption	Cystic Fibrosis
Persistent sneezing, nasal itching, running nose, blocked nose	Persistent Allergic Rhinitis
Recurrent pneumonia, recurrent wheezing in young children	Gastro esophageal reflux disorder
Recurrent throat clearing, Post Nasal Drip suggestive by history/examination	Upper Airway Cough Syndrome
Chronic cough with fever ± weight loss and history of contact	Tuberculosis

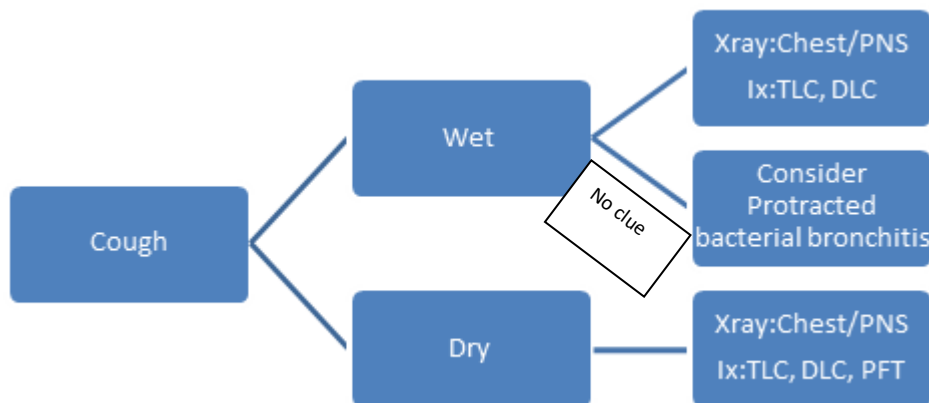


Figure 1: Algorithm for cough evaluation

The assessment of severity of cough and treatment outcome, cough resolution was done using visual analog scale (Figure 2) (21) and verbal descriptive score (Table 2) (22).

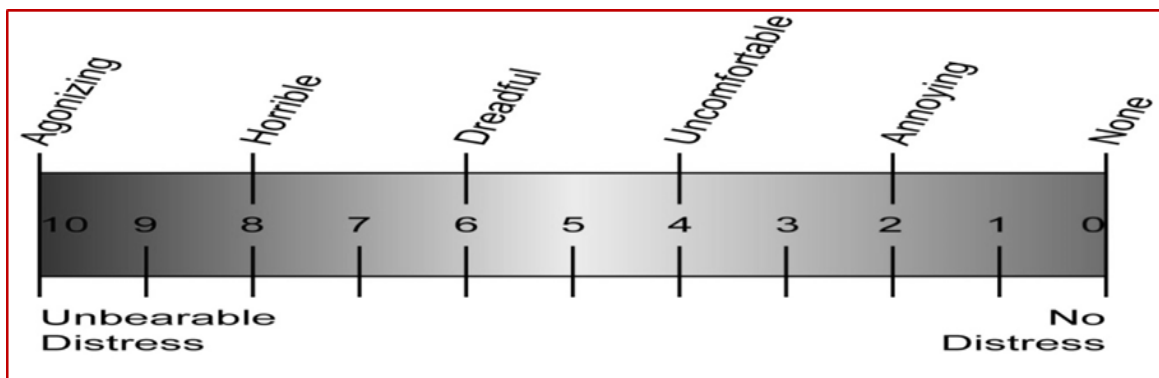


Figure 2: Visual analog scale

Table 2: Verbal descriptive score

Verbal category descriptive (VCD) scores Daytime score.	
0 =	no cough
1 =	cough for one or two short periods only
2 =	cough for more than two short periods
3 =	frequent coughing but does not interfere with school or other activities
4 =	frequent coughing which interferes with school or other activities
5 =	cannot perform most usual activities due to severe coughing
Verbal category descriptive (VCD) scores Night time score.	
0 =	No cough at night
1a =	cough on waking only
1b =	cough on going to sleep only
2 =	awoken once or awoken early due to coughing
3 =	frequent waking due to coughing

Results

A total of 77 children up to 16 years of age with chronic cough were included in this study. The age of the subjects enrolled ranged from 1 month to 184 months with

mean age of 74.36 month \pm S.D. 48.01. The median age was 72 months and interquartile range was 36 to 106.8 months. Majority of them were boys (67.5%). [Table 3]

Table 3: Demographic variables

Demographic variables	Frequency (%)	
Age	0 to 24 months	15 (19.5%)
	25 to 60 months	20 (26%)
	>61 months	42 (54.5%)
Gender	Boys	52 (67.5%)
	Girls	25 (32.5%)

Table 4 shows the mean clinical skill survey score among interns at the end of eCLS compared with 5 departments. We found that the mean score at the end of emergency medicine postings was comparable to end of eCLS course scores ($p=0.289$). The mean scores increased at the end of general medicine, ENT and

anesthesia compared to end of eCL course scores and this increase was statistically significant when paired t-test was applied ($p<0.05$) However v found that the mean scores at the end of obstetrics postings decreased significantly compared to end of eCLS course scores ($p<0.05$)

Table 4: Cough variables

Cough variables	Frequency (%)	
Type of cough	Dry	65 (84%)
	Wet	12 (16%)
Duration of cough	14-28 days	48 (62.4%)
	29-56 days	13 (16.8%)

	>56 days	16 (20.8%)
Cough pattern	Delayed recovery pattern	35 (45.5%)
	Recurrent pattern	32 (41.5%)
	Persistent pattern	10 (13%)

Severity of cough

Most of children gave a Verbal Descriptive Score (daytime score) of 3 on a scale of 0-5 denoting frequent coughing but not interfering with school or other activities.

Table 5: Verbal descriptive cough score

Characters	Pre-treatment
Mean	2.89
Standard deviation	0.68
Median	3.0
Interquartile range	2.0-3.0
Maximum score	4
Minimum score	2

Table 6 details about the characteristics of cough as a symptom which suggest that it may be marker of an underlying significant disease.

Table 6: Characteristics of chronic cough suggesting significant disease

Characteristics	Frequency	Percentage
Wet cough	12	16
Persistent pattern	10	13
Diurnal variation	40	52
Triggers for cough exacerbation	40	52
Past history of cough	34	44.2

Specific Cough Pointers

Most of the study cases had clinical clues or pointers towards likelihood of a Specific Cough. Specific Cough Pointers were present in 72 of the 77 cases (93.5%) and are detailed below (Table 7):

Table 7: Specific cough Pointers (n=72)

Specific cough pointer	Frequency	Diagnosis suspected and worked for
Wheeze	27	Asthma
Exertional dyspnea	13	Asthma / cardiac disease
PND	17	UACS (delayed recovery after URI or sinusitis)
Nasal symptoms like nasal itching, sneezing etc (>2 different types)	12	Allergic rhinitis
Recent h/o cold without any chest signs	9	UACS (delayed recovery after URI or sinusitis)
Clubbing	2	Any chronic suppurative lung disease / Cystic fibrosis, ILD or cardiac disease
Chronic cough with fever	4	TB
Recurrent feed regurgitation, recurrent wheezer, vomiting, not gaining weight	3	GERD
Choking each time with feeding	2	TEF

Characteristic honking cough, no nocturnal symptoms, cough disappears once attention diverted	2	Habit cough
Wet cough > 4 weeks	1	Bronchiectasis
Definitive history of choking, decreased air entry on one side	1	Foreign body
Fever, tachypnea, and crepitation	1	Pneumonia

Arriving at final causes for Chronic Cough

The patients were assessed based on the detailed evaluation and characterization of cough and other attendant symptoms, clinical examination and as needed investigations (following the algorithm detailed in the methodology section) and the diagnosis were further firmed up based on the response to the treatment for the diagnosis made. The Table 13 provides the list of final diagnosis arrived in our study population.

Most common disease entity identified in our patients with chronic cough of over 2 weeks duration was delayed recovery after URI which was diagnosed in 16 children (20.7%). Sinusitis was diagnosed in 7 children (9.1%). These two entity combined together are also referred to as Upper Airway Cough Syndrome (UACS) in our study.

Allergic rhinitis was diagnosed in 16 children (20.8%), out of which 11 (14.3%) had persistent allergic rhinitis and 5 (6.5%) had intermittent allergic rhinitis.

Table 8: Final diagnosis and frequency

Final diagnosis	Frequency	Percent
Delayed recovery after URI	16	20.7
Asthma	11	14.3
Allergic rhinitis	9	11.7
Preschool multi trigger wheezer	9	11.7
Sinusitis	7	9.1
Preschool multi trigger wheezer + allergic rhinitis	5	6.5
Tuberculosis	5	6.5
Pneumonia	3	3.9
airway abnormality	3	3.9
Asthma + allergic rhinitis	2	2.6
Habit cough	2	2.6
GERD	1	1.3
Tropical pulmonary eosinophilia	1	1.3
Interstitial lung disease	1	1.3
Foreign body	1	1.3
Bronchiectasis +cystic fibrosis	1	1.3
Total	77	100.0

Discussion

This study was carried out in the 0-16 years old children with chronic cough (>2 weeks duration) of unknown etiology who were using outpatient or inpatient services at our hospital. Seventy seven children

were prospectively enrolled and followed up till diagnosis and improvement.

In our study, we included patients below 16 years with median age 6 years (IQR 3-8.9 years). Median cough duration among our study subjects was 3 weeks (IQR 1.5-

45 days). Male: female ratio was 2.08:1. The Table below compares the demographic details of our study cases with other published pediatric studies.

The other reported studies among children on the subject have a very variable age spread which should be born in mind while comparing these studies with the present one. In the study conducted by Singh et al. [11] age group was 5 to 10 years with mean age of 7.8 ± 3.1 years while Marchant et al. [12] reported findings from a relatively younger group with median age of 2.6 years (IQR 1.2 to 6.9). On the other hand, study by Asilsoy et al. [13] as well as Khushoo et al. [14] had study groups with an age spread closer to our group (mean age 8.44 ± 2.13 and mean age 7.8 years, respectively).

In our study among 77 patients, 52(67.5%) were males and 25(32.5%) were females in the ratio of 2.08:1. Just as with age, the sex distribution and ratio of Males to females is also showing wide variation, though all studies have a male preponderance, this

difference may be due to demographic causes not related to any influence of gender on diseases causing chronic cough.

In our study, median cough duration was 21(3 weeks) days (interquartile range 17.5-45 days) and mean duration was 42.37 days (6 weeks) ± 56.19 (8 weeks) days. Dani et al. [7] reported cough duration of 3-4 weeks seen in 68% cases and of 4-5 weeks in 10.6%. Marchant et al. [12] patient group had relatively longer median duration of cough (24 weeks; IQR 12 to 48 weeks). While Asilsoy et al. [13] as well as Khushoo et al. [14] reported a comparable mean duration of cough (16 weeks ± 20 weeks and 18 ± 6 weeks respectively).

Dry cough was seen in most (84%) of our cases and wet cough was seen in 12 (16%) which is similar to description by Dani et al. [7] (72.3% dry cough) from our country. In contrast the studies from Australia and US have reported wet cough as the predominant pattern (Marchant et al. [12], In Asilsoy et al. [13], Chang et al. [15,16])

Authors	Our study	Dani VS et.al. ⁷	Marchant JM et.al. ¹²	Khushoo V et.al. ¹⁴
Study group; Cough duration	0-16 yrs; >2 weeks	1-12 yrs; >3 weeks	0-18 yrs; >3 weeks	5-12 yrs; >8 weeks
Bronchial asthma	16.9% (AR+ asthma 2.6%)	23.4%	-	7.5%
Asthma like syndrome /Cough variant asthma/preschool MTW	18.2% (AR + MTW 6.5%)	13.8%	3.68%	5%
Delayed recovery (remission of cough under follow up without treatment)	20.7%	-	22.2%	-
Sinusitis	9.1%	9.5%	-	-
Tuberculosis	6.5%	22.3%	0.92%	-
Pulmonary eosinophilia	1.3%	9.5%	0.92%	-
Bronchiectasis	1.3%	5.3%	5.5%	-
Bronchopneumonia	3.9%	5.3%	-	-
Pertussis	-	4.2%	0.8%	-
Gastro-esophageal reflux	1.3%	2.2%	2.76 %	27.5%
Foreign body aspiration	1.3%	2.2%	-	2.5%
Protracted bronchitis	-	-	39.8%	-

Congenital malformation	3.9%	-		-
Habit Cough	2.6%	-	0.9%	-

Conclusion

In conclusion, the type and character of cough gave important clues to the possibilities which are aided by the other accompanying symptoms and signs (specific clues). Most causes can be diagnosed with detail history, examination and basic investigations and only few cases required higher level investigations and clinical pointers of those cases should be well recognized so that early intervention can be made.

References

1. Faniran AO, Peat JK, Woolcock AJ. Persistent cough: Is it asthma? Arch Dis Child. 1998; 79: 411-414.
2. Ninan TK, Macdonald L, Russell G. Persistent nocturnal cough in childhood: A population based study. Arch Dis Child. 1995; 73: 403- 407.
3. Schenker MB, Samet JM, Seizer FE. Risk factors for childhood respiratory disease-The effect of host factors and home environment exposures. Am Rev Respir Dis. 1983; 128: 1038-1043.
4. Irwin RS, Curley FJ, French CL. Chronic cough: the spectrum and frequency of causes, key components of the diagnostic evaluation, and outcome of specific therapy. Am Rev Respir Dis. 1990; 141:640-647.
5. Irwin RS, Boulet LP, Cloutier MM, Fuller R, Gold PM, Hoffstein P et al. Managing cough as a defense mechanism and as a symptom: a consensus panel report of the American College of chest physicians. Chest. 1998; 114:133S-181S.
6. Phelan PD, Asher MI. Recurrent and persistent cough in children. N Ethics J. 1999 June:41-45.
7. Dani VS, Mogre VS, Saoji R. Evaluation of chronic cough in children: clinical and diagnosis spectrum and outcome of specific therapy Indian Pediatr. 2002 Jan; 39(1): 63-69.
8. Lahiri K. Chronic cough in children: Evaluation and management. Asian Pediatr Prac. 1997; 1:85 -88.
9. Nadkarni UB, Lahiri K, Naik M. Spectrum of chronic cough in children. Abstract XXXVII National Conference of Indian Academy of Pediatrics, Hyderabad. 2000.
10. Paramesh H, Kabra SK. Evaluation of cough in children. Pediatrics Today. 1999; II: 479-483.
11. Singh D, Arora V, Sobti PC. Chronic/Recurrent Cough in Rural children in Ludhiana, Punjab. Indian Pediatrics. 2002; 39:23-29.
12. Marchant JM, Masters IB, Taylor SM, Cox NC, Seymour GJ, Chang AB. Evaluation and outcome of young children with chronic cough. Chest. 2006;129(5):1132-41.
13. Asilsoy S, Bayram E, Agin H, Apa H, Can D, Gulle S et al . Evaluation of chronic cough in children. Chest. 2008; 134(6):1122-1128.
14. Khoshoo V, Edell D, Mohnot S, Haydel R, Saturno E, Kobernick A. Associated factors in children with chronic cough. Chest. 2009; 136(3): 811-815.
15. Chang AB, Eastburn MM, Gaffney J, Faoagali J, Cox NC, Masters MB. Cough quality in children: a comparison of subjective vs. bronchoscopic findings. Respir Res 2005; 6: 3.
16. Yadav S., Gupta D. K., Patil P. H., Tiwari A., & Soni P. To Study the Pharmacotherapy of Diabetes Mellitus Type 2 Patient in Echo Health Care & Research Centre, Indore. Journal of Medical Research and Health Sciences, 2023; 6(2): 2389-2397.