

Original Research Article

Evaluation of chronic cough in children aged 2 year to 12 years

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ABSTRACT

Background: Chronic cough is a common complaint in children which causes distress and affects the quality of life of parents and children. While cough may be seen as a common condition of childhood without serious consequences, ignoring a cough that may be the sole presenting symptom of an underlying illness can lead to delayed diagnosis and progression to a chronic respiratory morbidity. Aims and objectives of the study was to evaluate the specific diagnosis and prognosis of chronic cough in children aged 2 to 12 years.

Methods: A prospective study was done in 100 children with chronic cough (history of cough >4 weeks) at Narayana Hospital, Nellore. Routine investigations like complete blood count with differential count, Mantoux test, sputum examination, and X ray chest and other investigations like bronchoscopy, HIV, CT scan chest and paranasal sinuses, barium swallow, endoscopy and biopsy whenever needed. Pearson Chi square test carried out to quantify significance difference, p value <0.05, considered significant.

Results: The mean duration of chronic cough was 56.27 days (1-5 months). Most of the children belonged to <6 years age with higher boys' prevalence. Breathlessness and fever noticed in 79% cases; it was found mostly in pneumonia cases as compared to other diagnosis (p=0.001). Sputum production noticed in 4, which found to be bronchiectasis. 1 case noticed with regurgitation, which is gastro oesophageal reflux disease. History of triggers for the symptoms of cough, wheeze and breathlessness is found to have a significant correlation with asthma (p=0.000). Asthma in 14% of cases, of which 12 were mild persistent and 2 were moderate persistent. Tuberculosis was diagnosed in 14% cases, Pneumonia in 12% cases, and Bronchiectasis in 12 cases. Undernourished children noticed in 56%, maximum number in tuberculosis group. Asthma was associated with pneumonia, mucous plug obstruction and collapse lung. Recurrent pneumonia was associated with airway anomaly, gastro esophageal reflux disease.

Conclusions: It should be remembered that a prolonged cough can be indicative of a more serious underlying condition, and always warrants thorough investigation.

Keywords: Asthma, Chronic cough, Pneumonia, Tuberculosis

INTRODUCTION

Cough is a common symptom that brings a child to medical attention.^{1,2} Cough gives protection to the tracheobronchial tree from potentially injurious substances and by removal of endogenous secretions and other materials, such as pus, necrotic tissue and foreign bodies.³ Cough causes significant anxiety to parents and

use of inappropriate or unnecessary medications for a cough in children is associated with adverse events.^{4,6} The etiology and management approach for cough in children differs greatly than adults, so the empirical approach commonly used in adults is unsuitable for children. Clinical evaluation of cough in children should also include an assessment of environmental factors, particularly tobacco smoke. An acute cough (cough less

than 4 weeks duration) is usually due to a viral infection or an upper respiratory infection.⁷ But a chronic cough (4 weeks or more) needs to be evaluated for the specific cause, as significant morbidity is associated with it and a serious illness needs to be ruled out.⁷ A single cause can be found in up to 82% of all cases of chronic cough.⁸

Most coughs of acute onset are self-limiting. Chronic cough gives more anxiety to parents and the physicians. Chronic cough is unlikely to occur in the absence of disease or abnormal physiological functioning.⁹ The etiology of prolonged cough in children is well-recognized as being different to that of adults, and the management of prolonged cough in children must, therefore, differ from the recommended management for adults.¹⁰ The most common causes of adult cough include asthma, gastroesophageal reflux or upper airway cough syndrome (previously known as postnasal drip); however, current evidence suggests that these causes are not common in children with prolonged cough.¹¹⁻¹³ Underlying abnormalities, such as airway lesions, have been found to be prevalent in younger (preschool-aged) children; therefore, the identification of potential causes must be considered along with treatment for the cough.¹⁴ Guidelines have been published by American, British and European respiratory groups regarding the management of cough.¹⁵⁻¹⁷ There is insufficient evidence available to make treatment recommendations, and further high-quality research is clearly needed. In some studies that were limited in quality, antibiotic treatment for younger (predominately preschool-aged) children presenting with a prolonged moist cough has been shown to be of benefit in resolving cough and preventing illness progression.

Hence current research designed to study the clinical and diagnostic spectrum of chronic cough in children aged 2 to 12 years.

METHODS

Children in the age group of 2 to 12 years, presenting with chronic cough (cough for 4 weeks or more), who came to the outpatient department during the study period were included.

Inclusion criteria

- Case definition: All children with chronic cough attending the outpatient department and/or getting admitted with chronic cough during the study period are included in the study.

Exclusion criteria

- Congenital heart diseases
- Cerebral palsy and neurological abnormalities.

Children in the age group of 1 to 12 years presenting with cough of 4 or more weeks in the out-patient department were admitted and a detailed history was elicited. Age,

sex distribution, clinical features associated with chronic cough like breathlessness, fever, nasal discharge, postnasal drip, regurgitation of feeds, any other focus of infection like ear discharge, family history of asthma, atopy, smoking, and past history of tuberculosis, wheezing and its relief with bronchodilators, history of overcrowding were recorded. Thorough clinical examination including a general examination and systems examination were done to check for other focus of infection and to rule out congenital heart disease. Chest examination was done to find out crepitations and wheeze. Following investigations were done in all of them. Routine investigations like complete blood count with differential count, Mantoux test, sputum examination, and X ray chest were done. Other investigations done were bronchoscopy, HIV-ELISA, CT scan chest and paranasal sinuses, barium swallow, endoscopy and biopsy whenever needed. The causes of chronic cough were made out as per the defined diagnostic criteria.

Diagnostic criteria

Bronchial asthma

The most widely accepted classification of asthma is that recommended by the National Heart, Lung, and Blood Institute's (NHLBI) National Asthma Education and Prevention Program (NAEPP) Expert Panel Report 2 and "GINA guidelines" (2019).

Pneumonia

Clinical examination revealed respiratory distress, crepitations in chest or bronchial breathing. X ray will give the clue of the diagnosis.

Bronchiectasis

Chronic cough duration with copious sputum production. Chest examination revealed coarse leathery crackles. X ray chest is diagnostic. High resolution CT chest remain the gold standard of diagnosis.

Tuberculosis

X ray chest and Mantoux test gave clue to diagnosis. FNAC of lymph node was contributory in some cases.

Gastroesophageal reflux

Barium swallow study demonstrated reflux of barium. Endoscopy revealed a lax lower oesophageal sphincter.

Sinusitis

X ray paranasal and other sinuses helped in the diagnosis- opacity or asymmetry of sinuses.

Foreign body aspiration

X ray chest was suggestive of collapse, emphysema, or reveal a radio opaque substance.

Postnasal Drip Syndrome (PNDS)

PNDS was considered when (i) patients described the sensation of having something drip down into their throats, frequent nasal discharge, and/or the need to frequently clear their throats, or (ii) physical examination of the nasopharynx or the oropharynx revealed mucoid or mucopurulent secretions and/or a cobblestone appearance of the mucosa.

Criteria for overcrowding

Children above 10 years are considered 1-person unit and children 1 to 10 years are considered as ½ person unit.

Statistical analysis

The mean and standard deviation of all quantitative parameters were calculated. Percent occurrence rate (Frequency) of different symptoms and diagnosis of the sample subjects was calculated.

Pearson Chi square test was applied to quantify extent of intergroup differences. (p value <0.05 was considered statistically significant).

RESULTS

Total number of children who presented with chronic cough recruited into the study was 100. Majority cases 38 (38%) presented with chronic cough belonged to 4-6 years age. The mean age of presentation was 5.5+ 2.5 years. 62 (62%) cases were boys and 38 (38%) were girls. The proportion of boys was more than girls in children who presented with chronic cough.

Characteristics of cough

The duration varied from 1 month to 5 months. The mean duration and standard deviation of cough was 56.27+ 28.45 days. Cough was not of any specific type in any of the cases. There was sputum production were 10 (10%) out of 100 cases. Hemoptysis was present in 2 (2%) case with chronic cough.

The cough occurred most frequently during the day than at night. Day time cough frequency was documented in 72 (72%) and nighttime cough in 28 (28%).

Seasonal variation of cough was noted in 10 (10%). There was no postural variation of cough or expectoration in any of the cases. There were 62 (62%) of cases with chronic cough presented with breathlessness and fever was associated in 79 (79%) cases.

History of triggers for symptoms like cough, wheeze and breathlessness was noted in 26 (26%) of cases. Regurgitation was noted in 5 (5%) cases of chronic cough. Out of whom, 1 case had hematemesis.

Tuberculosis

Contact history of TB was present in 13 (13%) cases. Past history of treatment with anti-tuberculosis drug was present in 5 (5%) cases. Previous history of wheeze and relief with bronchodilators was documented in 25 (25%) of the cases with chronic cough. Past history of pneumonia was noted in 4 (4%) cases.

Family history

Family history of asthma was observed in 14 (14%) cases, atopy in 14 (14%) cases. Family history of passive smoking was present in 12 (12%) cases.

Overcrowding was noted in 10 (10%) cases as per the criteria defined above.

Immunization

79% were fully immunized as per National Immunization Schedule, 12% were partially immunized and 8% was not given any of the vaccines. None of the cases were given Pneumococcal or Hemophilus influenza B vaccine. BCG scar was absent in 20 (20%) cases.

Weight

Weight less than 80% is considered undernourished. Number of undernourished children in our study was 56 (56%). Cervical lymphadenopathy was noted in 35 (35%) cases. Clubbing was seen in 9 (9%) cases of chronic cough.

Chest examination

Rhonchi was noted in 33 (33%) cases. Crepitations were observed in 80 (80%) cases.

Diagnosis

The causes of chronic cough were found to be bronchial asthma in 14%, bronchiectasis in 12%, pneumonia 12%, foreign body in 5%, gastro esophageal reflux disease in 4%, airway anomalies in 3%, maxillary sinusitis in 2%, bronchiolitis obliterans in 1%, interstitial lung disease in 1%, laryngeal papilloma in 1%, hypoplasia lung in 1%, post nasal drip syndrome in 1%, paraganglioma in 1%, erosive gastritis in 1%, undiagnosed in 1% (Figure 1).

The four leading causes of chronic cough in this study were found to be Bronchial asthma, Tuberculosis, Pneumonia and Bronchiectasis. Among the tuberculosis, latent TB was diagnosed in 1 case, miliary TB in 1 case, endobronchial TB in 10 cases. The number of cases with seasonal variation of cough in this study was 8, and all

these cases had the final diagnosis as asthma with the

significant p value (0.001).

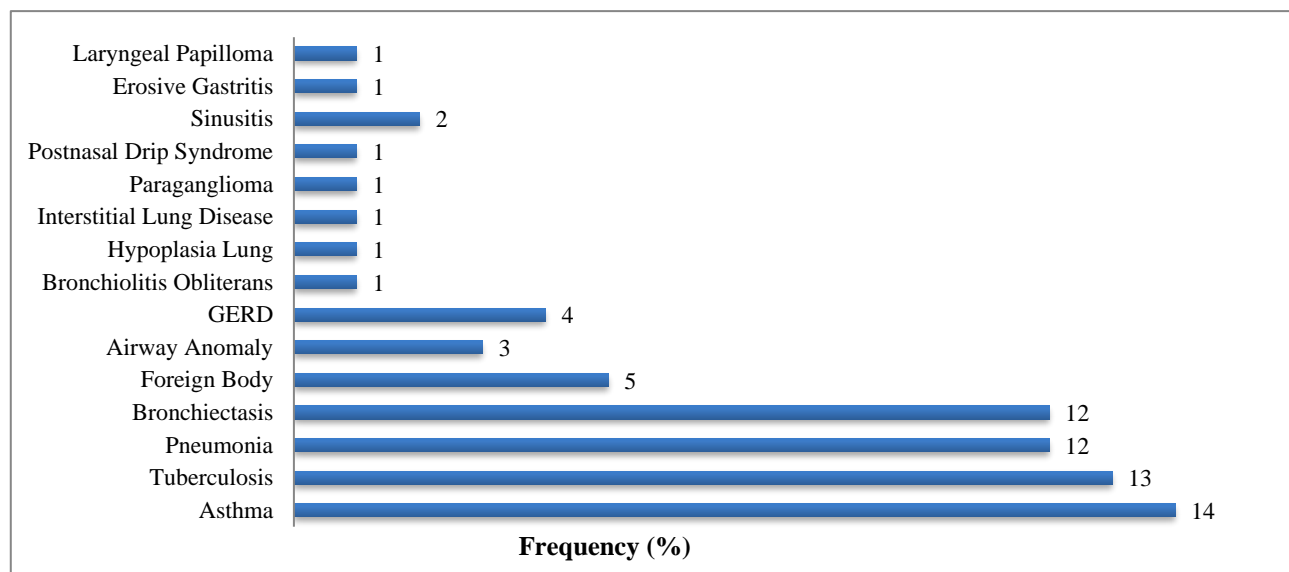


Figure 1: Etiology or diagnosis of chronic cough in children and their frequency.

Association of fever with chronic cough

Fever was the presenting symptom with chronic cough in all the cases diagnosed as pneumonia when compared to 25% of asthma cases, 75% of TB cases, and 78% of bronchiectasis cases. The difference observed is statistically significant, p value 0.001.

Breathlessness and chronic cough association

Of the children who presented as chronic cough, in whom diagnosis was TB, 90% cases presented with breathlessness in this study. In asthma, 50% cases presented with breathlessness. Hence, in this study it was found that, >90% of tuberculosis cases presented with breathlessness at the time of presentation. All the cases with sputum production were diagnosed finally as bronchiectasis.

Regurgitation and chronic cough

Regurgitation was noted in 8% of the cases of chronic cough. Of whom, 2 cases were diagnosed as gastro esophageal reflux disease, 1 case as erosive gastritis and other one as tracheomalacia. Regurgitation is a significant history for diagnosis of gastro esophageal reflux disease (p value 0.000).

Triggers and chronic cough

Out of 26 cases with history of triggers for cough, breathlessness and wheeze, 14 cases were diagnosed finally as asthma and other cases as pneumonia. The

difference observed was found to be statistically significant (p value 0.000).

Atopy and chronic cough

Family history of atopy was noted in 14 cases of chronic cough, of them 6 were in asthma group, 3 in pneumonia group and 1 in sinusitis group. Atopy was more commonly observed among asthma cases when compared to other conditions and the difference was found to be statistically significant (p value 0.000).

Family history of asthma in chronic cough

The number of children with family history of asthma was 14 cases of chronic cough. 5 cases were in asthma group, 1 case in TB group, 1 in bronchiectasis group, and 1 in pneumonia group. This difference in the family history of asthma was found to be statistically significant (p value 0.040).

Past history

Past history of wheeze with response to bronchodilators was found in 23 patients of chronic cough. Out of the 17 patients, the final diagnosis was asthma in 12 patients and pneumonia in 4 patients. Past history of wheeze is found in more number of patients with asthma than other conditions. The difference observed is found to be statistically significant (p value 0.000). Under nutrition was found in 78% of TB cases, 75% of bronchiectasis children, 50% of pneumonia cases and 50% of asthma cases. Under nutrition was more prevalent among the TB

cases when compared to others, but the difference was found to be statistically insignificant (p value 0.118).

Contact history of TB and chronic cough

Contact history of Tuberculosis was found in 9 tuberculosis cases and 2 bronchiectasis case and 2 pneumonia case. Contact history of tuberculosis is found to be a significant risk factor for diagnosing tuberculosis (p value 0.000).

Clubbing

Clubbing noted in 9 cases of chronic cough, of which 1 case was diagnosed as interstitial lung disease and the other 5 as bronchiectasis. Clubbing was more common in bronchiectasis case than other cases. This difference is found to be statistically significant (p value 0.000).

Cervical lymphadenopathy and chronic cough

Cervical lymphadenopathy was noted in 35 cases of chronic cough. Of them, 10 cases were diagnosed as TB, 6 were diagnosed as bronchiectasis, 4 diagnosed as pneumonia. Cervical lymphadenopathy was found to be associated more with TB cases than other conditions. The difference observed was found to be statistically significant (p value 0.001).

Mantoux test

Mantoux test was done in 90% cases of chronic cough patients where tuberculosis was suspected. Out of them, 13 were positive and 77 were negative. Of the Mantoux positive cases, 13 were in tuberculosis group, 12 in pneumonia group and 8% in asthma group. Mantoux positivity was found to be more among the TB cases when compared to other conditions. The difference observed was found to be statistically significant (p value 0.000).

Leucocyte counts

Total leukocyte count was normal in 60 cases, increased in 40 cases of chronic cough. 2 cases showed an absolute eosinophil count of 4800, which was diagnosed as eosinophilic pneumonia.

Sputum for Acid fast bacillus (AFB)

Sputum/Resting gastric juice for AFB was done in 50 patients and all were negative for AFB.

Radiography

X ray chest was done in all the patients. Radiograph chest was normal in 21 patients with chronic cough. In 3 children with suspected sinusitis, X ray paranasal sinuses was taken, which revealed sinusitis. 25 cases of chronic cough had consolidation in the X ray, but the final

diagnosis of pneumonia was made in 12 cases only. This is due to the fact that many cases of tuberculosis and bronchiectasis had X ray feature suggestive of consolidation. Out of the 12 cases of bronchiectasis, x ray reported as bronchiectasis in 5 cases, bronchiectasis with consolidation in 3 cases and in the other case, the report was consolidation only. A case of miliary tuberculosis was diagnosed by x ray chest.

Barium swallow

Barium swallow was done in 6 chronic cough cases with suspected gastro-esophageal reflux. Gastro esophageal reflux disease was diagnosed in 4 cases and barium swallow was normal in other 2, a case of pneumonia and a case of laryngomalacia. Barium swallow was found to be positive in GERD cases than in other condition. This difference observed was found to be statistically significant (p=0.000)

HIV ELISA was done in 12 cases with suspected immunodeficiency, all were non-reactive.

Broncho-alveolar lavage

Broncho-alveolar lavage was done for 4 cases of the chronic cough with suspected endobronchial tuberculosis and for a case of eosinophilic pneumonia. Three were negative for acid fast bacilli. In case of eosinophilic pneumonia, eosinophil count was found to be 45%, neutrophils 10%, lymphocytes 5%, monocytes 40% in bronchoalveolar lavage.

Computed tomography scan

CT chest in 18 cases for the confirmation of 12 bronchiectasis, 1 interstitial lung disease, 1 paraganglioma, 1 bronchiolitis obliterans was confirmed by CT scan.

DISCUSSION

Majority cases (38%) presented with chronic cough belonged to 4-6 years age. The mean age of presentation was 5.5 ± 2.5 years. 62 (62%) cases were boys and 38(38%) were girls. The proportion of boys was more than girls in children who presented with chronic cough. Duration of cough in study population varied from 1-5 months. The mean duration and standard deviation of cough was 56.27 ± 28.45 days. All the cases of chronic cough with sputum production had the final diagnosis as bronchiectasis. There was no significant correlation noted between the timing of cough and the diagnosis. This is comparable to the study of Dani, in which the cough has occurred frequently during daytime in 61 (57.4%) cases as opposed to nighttime cough in 33 (39.3%) cases.¹⁸

In this study, seasonal variation of cough was noted in 10%. Percentage of non- seasonal cough in the study of Dani was 62.7%. All the cases with seasonal variation

had the final diagnosis as asthma in this study. In this study, breathlessness was observed in 79% cases, whereas 62.7% in a study by Dani.

The 90% cases were associated with fever, whereas a study of Dani, where fever was an associated symptom in 44 (45.7%) cases.

Family history of asthma was present in 12 cases compared to 16% cases in the study of Dani. Family history of atopy was noted in 14 chronic cough cases, compared to 11 (11.7%) cases in the study of Dani (p value 0.001).

In this study, history of passive smoking was observed in 12% chronic cough cases, comparable to the case control study of Daljit which had a family history of smoking as 16.7% of cases in contrast to 6.4% in controls (p=0.05).¹⁹

Contact history of tuberculosis was present in 13% cases of chronic cough. This is comparable to the study of Dani et al where the contact history of tuberculosis was noted in 13 (13.8%) cases of chronic cough. Clubbing was seen in 9% cases of chronic cough compared to 5 (5.3%) cases in the study of Dani et al.

In this study, cervical lymphadenopathy was noted in 35% cases, whereas number of cases with cervical lymphadenopathy in Dani's was 25 (26.5%) out of 94 chronic cough cases.

Rhonchi was noted in 33 (33%) and Crepitations were observed in 80 (80%) cases in this study. Study of Dani showed 48 cases (51%).

The most common diagnosis in this study was found to be bronchial asthma in 12% cases of chronic cough. Study made by Suna Asilsoy et al, where 25% of the cases were diagnosed to have asthma and asthma like condition.²⁰ Shally Awasthi et al, in a prospective study based on questionnaire method found the prevalence of asthma and wheeze to be 2.3% and 6.2%.²¹

In this study, pneumonia is diagnosed in 12% cases. Persistent pneumonia was diagnosed in 2 cases and recurrent pneumonia in 2 cases. One case of recurrent pneumonia was found to have gastro esophageal reflux disease, and the other case had laryngomalacia. One case of persistent pneumonia had asthma as predisposing factor. Lodha R in their study of causes of persistent pneumonia found out asthma and post-tubercular bronchiectasis as the important causes of persistent pneumonia.²²

Foreign body was diagnosed in 4 cases of chronic cough. Dani et al, diagnosed foreign body in 2 (2.2%) cases. Flexible bronchoscopy was diagnostic in all the cases. Rigid bronchoscopy was therapeutic in retrieval of foreign body in 3 cases. In this study, Gastro esophageal reflux was diagnosed in 4% cases which is comparable to the study of Dani et al, 2 (2.2%) cases, and the study by

Suna Asilsoy in which, 4.6% of cases were diagnosed to have GERD.

Sinusitis was diagnosed in 2% case in this study. Dani et al, from Nagpur, sinusitis was diagnosed in 9 (9.5%) patients. Interstitial lung disease was diagnosed in 1 case. Radiography showed bilateral hyperinflation.

Laryngeal papilloma was diagnosed in 1 case. This was an accidental diagnosis made in a child who presented with cough for 3 months, voice change of 2 weeks, stridor, and breathlessness for 5 days and throat tenderness. Direct micro laryngoscopy under general anaesthesia, revealed multiple masses just above the glottis. Biopsy showed papillomatous change, micro laryngeal excision was done. It is a rare viral disease where a number of non-cancerous growths form in the respiratory tract. Paraganglioma- left bronchus was diagnosed in 1 case. HRCT showed enhancing hypodense intraluminal lesion extending up to subcarinal region causing complete obstruction of left lower lobar and partial obstruction of left upper lobar bronchi with distal atelectasis of left lower lobe and lingular segments of left upper lobe paraganglioma. Pneumonectomy left lung was done. Paraganglioma is said to cause recurrent pneumonia.²³

Bronchiolitis obliterans was diagnosed in 1.6% (n=1) case. HRCT showed bronchiectatic changes both lower lobes with tractional atelectasis with air trapping - Bronchiolitis Obliterans Organizing Pneumonia (BOOP).

In this study, Hypoplasia right lung was the diagnosis in 1 case. The overall prevalence from autopsy findings is 1.1 per 1000 live births and 9.8 per 1000 referrals.^{24,25}

CONCLUSION

Chronic cough is more common in children less than 6 years of age in this study. The major causes of chronic cough in children in this study were asthma, tuberculosis, pneumonia and bronchiectasis. Rare causes of chronic cough (hypoplasia lung, interstitial lung disease, paraganglioma and laryngeal papilloma) identified in this study. A child presenting with chronic cough cannot be left undiagnosed as the rare underlying cause may prove to be fatal if not investigated in proper time.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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