

Chronic Cough in Children: A Retrospective Review

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Abstract

Cough is a common complaint in children. However, data on aetiologies and outcome of chronic cough are sparse in Hong Kong Chinese children. **Methods:** Records of children referred to the out-patient clinic for chronic cough, defined as cough for more than 4 weeks, in Kwong Wah Hospital, a secondary hospital, over a 12-month period were reviewed. Underlying diagnoses and outcomes after follow up for a variable period were ascertained. **Results:** 42 patients were included. Chronic cough cases represented 8% of the new referrals. The most common final diagnosis was allergic rhinitis (31%), followed by asthma. Over a follow up period ranging from 4 to 12 months, cough resolved in 54.8%, partially resolved in 40.5% and persisted in 4.7% of patients. Persistent nasal symptoms were identified in 54.8% of our chronic cough patient. 43.5% of allergic rhinitis patient had co-existing asthma. **Conclusion:** Allergic rhinitis with or without co-existing asthma is the commonest cause of chronic cough in children referred to this department.

Key words

Allergic rhinitis; Asthma; Child; Chronic cough

Introduction

Cough is a common complaint in children. The prevalence of chronic cough in children in Australia was 9.6-10.4%.¹ However, the aetiologies and outcome of chronic cough are rarely studied in children. We describe the findings of a retrospective survey of all new patients referred to this department for chronic cough over a twelve months period.

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Methods

All new referral cases with chronic cough in general paediatric out-patient clinic of Kwong Wah Hospital, a secondary hospital in Hong Kong, were noted over a 12-month period. The records were retrospectively reviewed. Patients were included if they were new referrals and had chronic cough, defined as cough for at least 4 weeks. Children with known chronic respiratory disorder were excluded. Demographic details, duration of cough, nasal symptoms, gastrointestinal symptoms, physical examination findings, referral diagnosis, medications used prior to referral, investigations done, prescription in our out-patient clinic and final diagnoses were recorded. There was no fixed protocol for chronic cough during the study period and investigations and treatment were at the discretion of the attending paediatricians. Results were counted as abnormal if blood eosinophil count $>0.3 \times 10^9 /L$, blood IgE level $> 100 \text{ IU/L}$, nasal smear eosinophil $>4\%$, skin prick test with at least one positive response,² lung function test³ with positive exercise challenge (15%

drop of FEV-1 after exercise). Any abnormal findings reported on CXR if performed would be analysed. Final diagnoses as made by the attending paediatricians were recorded. Outcomes of chronic cough were recorded as completely resolved, i.e. no or little cough; partially resolved, i.e. some cough; or persistent, i.e. no resolution of cough, as reported by patients or parents at the time of the current review.

Data were described in percentage, mean, standard deviation (S.D.) and skewed data were described in median with quartile range. Chi-squared test with Yates's correction was used to compare the gender difference in final diagnoses. Age and cough duration of patients with different final diagnoses was compared by one-way ANOVA with post-hoc test. Statistical significance was defined as $p < 0.05$.

Results

Forty-two children were included. It represented 8% of all our new referrals. The follow up period was between 4-12 months. The mean age was 5.0 ± 2.9 years. Twenty-

seven patients (64%) were male. The median cough duration was 15.12 weeks (8.12-52 week) (quartile range). Most of the cases were referred from Accident and Emergency Department (47.6%), followed by general practitioner (26.2%) and general out-patient clinic (23.8%) (Table 1). The most common reason for referral were chronic cough (52.4%), followed by asthma (38.1%), allergic rhinitis (7.1%), co-existing asthma and allergic rhinitis (2.4%) (Table 2).

54.8% of our chronic cough patients were found to have persistent nasal symptoms. Among patients prescribed long term corticosteroid nasal spray, only 46% of patients adhered to therapy. None of them had gastrointestinal symptoms. Thirty-one percents of patients had family history of atopy. Physical examination showed that 21% of patients had pale and swollen nasal mucosa and 12% had eczema, no other major anomalies were identified on physical examination. Investigations done in our out-patient clinic were listed in Table 3. The most common final diagnoses were allergic rhinitis (31%) followed by asthma (28.6%), co-existing asthma and allergic rhinitis (23.8%) and post viral cough (16.6%) (Table 2). None of the patients had serious underlying lung disease. 45.5% of asthma

Table 1 Sources of referrals

Accident and emergency department	Private general practitioners	Public general practitioners	Student health
47.6%	26.2%	23.8%	2.4%

Table 2 Referral and final diagnosis

Diagnosis	On referral	Final diagnosis
Asthma + allergic rhinitis	1 (2.4%)	10 (23.8%)
Asthma	16 (38.1%)	12 (28.6.0%)
Allergic rhinitis	3 (7.1%)	13 (31.0%)
Non-specific chronic cough	22 (52.4%)	0 (0%)
Post viral cough	0 (0%)	7 (16.6%)

Table 3 Investigations done by paediatricians for final diagnosis

	Numbers done	Abnormal result
Blood eosinophil count	8	5
Blood IgE level	7	4
Lung function test (exercise challenge)	6	0
Skin test	12	7
Chest X-ray	18	0
X-ray nasal sinus	2	0
Nasal smear for eosinophil	12	7

patient had allergic rhinitis and 43.5% of allergic rhinitis patient had asthma in the current study. Table 4 showed treatment prescribed on referral and in our out-patient clinic. Table 5 showed the progress of all the patients. 54.8% of patients had complete resolution of cough, 40.5% partially resolved and 4.7% had persistent cough. In the partially resolved group, 70% of patients had persistent nasal symptoms.

The characteristics of children with different final diagnoses were compared (Table 6). Duration of cough in children with asthma was significantly longer than children with allergic rhinitis (Scheffe post-hoc test, $p=0.023$). Age and gender distribution were similar. Resolution rate was not significantly different between children with different diseases, (Chi-squared test, $X^2 = 4.034$, $Df = 4$, $p=0.257$) albeit children with post-viral cough had the highest resolution rate (85.7%).

Discussion

The present study showed that most of the cases were labeled as non-specific chronic cough on referral and only a few patients were identified to have persistent nasal symptoms on referral. Many patients were noted to have persistent nasal symptoms when they were assessed in our out-patient clinic and management of post nasal drip seem to be a hurdle in our management of chronic cough children. In this study, two patients had persistent cough, one had poorly controlled allergic rhinitis because of poor treatment compliance; the other one did not reported nasal symptoms initially and nasal block was noted in subsequent follow up which was reported by another caretaker, cough resolved after proper management of post nasal drip, though it was beyond the one year time frame of this study.

It was shown that 20-40% of patients' chronic cough

Table 4 Medications prescribed on referral and in Kwong Wah Hospital

	On referral	Kwong Wah Hospital
Topical nasal corticosteroids	0	9
Prn inhaled beta 2 agonist	4	22
Inhaled steroid	1	8
Inhaled combined steroid and long acting beta 2 agonist	0	1
Hypertonic saline nasal drops/lavage	0	9

Table 5 Progress on follow up

	Resolution of chronic cough (54.8%)	Partially improved (40.5%)	Persistent (4.7%)
Asthma and allergic rhinitis	4	6	0
Allergic rhinitis	6	6	1
Asthma	7	4	1
Post viral cough	6	1	0

Table 6 Characteristic of children with different final diagnosis*

	Asthma n=12	Allergic rhinitis n=13	Asthma and AR n=10	Post viral cough n=7	p
Age on diagnosis	4.78 ± 3.32 yr	5.08 ± 2.22 yr	4.41 ± 3.98 yr	5.40 ± 2.50 yr	0.910
Number of male (%)	8 (66.67%)	11 (84.62%)	3 (30.00%)	5 (71.43%)	0.199
Median of cough duration (quartile range)	65.19 weeks (6.52-143.39 weeks)	13.04 weeks (8.66-21.64 weeks)	47.79 weeks (5.98-65.19 weeks)	8.66 weeks (4.34-17.21 weeks)	0.013
Number of complete resolution (%)	7 (58.33%)	6 (46.15%)	4 (40.00%)	6 (85.71%)	0.257

Data are presented as mean ± SD unless otherwise indicated; P values are comparison between children with different diagnosis using either one way ANOVA (for scale) or chi-squared test (for nominal / ordinal data).

were due to more than one cause.^{4,5} In this study, 23.8% of patients were diagnosed to have co-existing asthma and allergic rhinitis. The link between asthma and allergic rhinitis was suggested.⁶ Allergic rhinitis patients were shown to have impaired spirometry results⁷ and physicians should assess asthma patients for symptoms of allergic rhinitis to improve asthma treatment.⁸ Thirty-five percent of the partially resolved group had persistent allergic rhinitis. Causes of failure of allergic rhinitis treatment included poor adherence to medications; patient (or parents) misunderstanding about the dosing or administration of the medication; nasal obstruction that prevents drug delivery; additional nasal pathology, such as polyps, sinusitis, or septal deviation; heavy persistent exposure to allergen; and incorrect diagnosis.⁹ In this study, poor adherence to medications was the major cause of failure. More than half of our patients did not tolerate long-term nasal spray and had poor compliance. It seems that antihistamine alone did not adequately control the nasal symptoms. Although our experiences with compliance of inhaled corticosteroid for asthma were good, the compliance with long term nasal spray was poor. One of the reasons might well be that parents were not aware of the impact of allergic rhinitis on children's health. Education of parents about the causes of chronic cough, the link of allergic rhinitis and asthma and necessity of combined therapy may help improve the compliance of long-term nasal spray therapy. Further research into this poor adherence to treatment of allergic rhinitis is warranted. A systemic approach¹⁰ and the use of allergic rhinitis diary could improve management of allergic rhinitis. Nasal symptoms should be graded as intermittent or persistent, and then further graded as mild, normal sleep and daily activity or moderate to severe, abnormal sleep, impaired daily activity. Stepwise treatment should be offered, from allergen avoidance, intermittent oral antihistamine, regular steroid nasal spray to combination of treatment. Patient should be reviewed in 2-4 weeks time. Treatment should be stepped up or down accordingly.¹⁰

However, the side effect of first generation antihistamine on central nervous system is undesirable.¹¹ Newer generation antihistamine was showed to be effective in treating allergic rhinitis¹² and it was also safe in small children.¹³ If parents refused traditional treatment, acupuncture was suggested to be an effective alternative medicine in management of allergic rhinitis.¹⁴ Hypertonic saline was prescribed in our centre for patients with allergic rhinitis for clearing of nasal blockage and thinning of mucus.¹⁵

Cough after an upper respiratory tract infection usually resolved after 3 weeks.¹⁶ In this study, patient with cough

for at least 4 weeks were included. 16.6% of patients were diagnosed to have post-viral cough. For post-viral cough patient, the median duration of cough was 8.66 weeks. It suggested that a proportion of the post viral cough could last for more than 4 weeks.

Gastroesophageal reflux (GER) was suggested to be one of the important cause of respiratory symptoms,¹⁷ 61% of patients with GER had respiratory symptoms.¹⁸ Interestingly, 50-75% of patients with GER did not present with gastrointestinal symptoms.¹⁹ However, over half of the patients' reflux cough, diagnosed by pH study, did not respond to treatment of GER.²⁰ All of our patients did not have gastrointestinal symptoms. Parents of partially resolved and persistent group declined 24-hour oesophageal pH study because of its' invasive nature. Hence, the data on gastroesophageal reflux was not available in this study. In adult patients, trial of treatment with proton pump inhibitor was suggested without 24-hour oesophageal pH study,²¹ however, the evidence for the benefit of similar approach is not available in children.

Passive smoking may also be an important factor in children with chronic cough. In this study, 52.6% of patient in partially resolved and persistent group were passive smoker although it was based on self reporting and the amount of environmental tobacco smoke exposure was not quantified. Qian et al reported that higher exposure to ETS and the presence of parental asthma were associated with higher reporting of persistent cough, persistent phlegm, cough with phlegm, bronchitis, wheeze, and asthma.²² We should put more effort in educating parents and grandparents in this area.

There was no diagnostic protocol for chronic cough in our clinic. The rate of complete resolution of cough after treatment was 54.8%. In an adult general respiratory clinic without diagnostic protocol, it was reported that the rate of persistent cough was 43%.²³ However, causes of cough were identified in 99% of cases and successful rate was reported as 98% in centre utilising diagnostic protocol for chronic cough.²⁴

There were several limitations in this study. As this study reviewed cases in our general paediatric clinic, there was no standardised evaluation protocol and follow up interval varied between patients. The experience of the attending doctor, variation in investigations and variation in follow up period may also affect the final diagnosis and outcome. A prospective study with regular, fixed follow up period and an evaluation protocol would help us in further understanding the aetiologies and outcome of chronic cough in our department.

Conclusion

Allergic rhinitis with or without co-existing asthma is the commonest cause of chronic cough in Hong Kong children who were referred to this department.

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