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The Etiology of Bronchiectasis in Iran

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Abstract

Background

Bronchiectasis is defined by permanent and abnormal widening of the bronchi. Although this process occurs in the context of chronic airway infection and inflammation, since there is no accurate estimation of the etiology of the disease. This study aimed to determine the most important cause of bronchiectasis in Tehran, Iran.

Materials and Methods

In this retrospective cohort study we used the information of 91 patients admitted to two subspecialty lung hospitals in Tehran- Iran, where a wide range of bronchiectasis patients from around the country referred during 2013to 2014 period. Patients referring with the manifestation of chronic productive cough who had not responded to conventional treatment with the evidences of bronchiectasis on high resolution computed tomography were included. Data were analyzed using SPSS-16.0.

Results

The etiology of bronchiectasis was diagnosed in 73 of 91 patients (80.2%), the most important of which included cystic fibrosis, post infectious, and primary ciliary dyskinesia (PCD). The most common causes of bronchiectasis in the children group (Age ≤ 18 years), were cystic fibrosis (57.1%), allergic bronchopulmonary aspergillusis (14.3%) and PCD (9.5%), respectively. In the adults group (Age >18 years), the most common causes were post infectious (22.6%), PCD (15.7%) and cystic fibrosis (14.3%), respectively.

Conclusion

Main causes of bronchiectasis in this study were not significantly different from other studies. Special attention should be paid to the probable causes of bronchiectasis in order to effectively execute on-time diagnosis, proper treatment and management of complications.

Key Words: Bronchiectasis; Children, Cystic fibrosis; Pneumonia; Primary ciliary dyskinesia.

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1- INTRODUCTION

Bronchiectasis is manifested with radiographic appearance of irreversible dilatation of the bronchi and clinical symptoms of chronic productive cough. This condition can be locally associated with recurrent phlegm diseases, infectious symptoms or generalized destruction of the airways and respiratory failure in diffuse forms (1, 2). Although thanks to vaccinations and the use of antibiotics, the incidence of bronchiectasis has decreased in developed countries, it is still considered as an important cause of chronic respiratory failure in developing countries (3).

Respiratory infections, foreign body, cystic fibrosis, primary and secondary immune deficiencies, primary ciliary dyskinesia, aspiration syndromes, and congenital malformation are considered as common causes of the disease (4, 5). Nowadays, tuberculosis and Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) are considered to be predisposing factors of the disease in developing countries (3).

There is no accurate estimation on the prevalence of this disease in some regions of the world. Particularly in developing countries, few studies have been published on the etiology of the disease. Since the detection of the etiology of bronchiectasis plays an important role in its proper management (6), the present study aimed to provide an accurate estimation on the prevalence and major causes of the disease in Iran, by investigating the possible causes of bronchiectasis in patients referred to two tertiary referral hospitals in the Tehran, the capital city of Iran.

2- MATERIALS AND METHODS

2-1. Methods

This cohort study retrospectively conducted in Tehran, Iran, in 2013 to 2014. The medical records of all inpatients and outpatients with bronchiectasis in the Children's Medical Center affiliated with Tehran University of Medical Sciences and Dr. Masih Daneshvari Hospital affiliated with Shahid Beheshti University of Medical Sciences from June 22, 2013 to April 22, 2014 were collected. Both hospitals act as tertiary referral centers for pulmonary disease in pediatrics located in Tehran, the capital city of the country, with an access to a wide range of bronchiectasis patients referred from around the country.

All those patients referred with the manifestation of chronic productive cough and evidence of bronchodilation in the chest high-resolution computerized tomography (c-HRCT), who did not respond to conventional treatment was enrolled in this study. The Ethics Committee of Tehran University of Medical Sciences reviewed and approved the process of the current study (ID number: 9111464002).

2-2. Statistical analysis

All data were analyzed using SPSS software package for windows, version 17 (SPSS Inc. Chicago, USA). Descriptive statistics were used to describe the demographic data and clinical history data of all subjects participating in the study. As for parametric variables, the mean ± standard deviation [SD], minimum, and maximum were calculated. Also, for non-parametric data, the frequency and percentage were calculated. Subgroups were compared using independent t-test and chi square as for continuous and categorical variables, respectively. P-value less than 0.05 was taken to be statistically significant.

3- RESULTS

The data of 91 eligible patients including 42 male (46.1%) and 49 female (53.9%) cases were included in this study.

The mean age of patients at onset of the symptoms was 14 ± 16.4 years (1 month to 52 years) and their mean age at the time of diagnosis was 23.7 ± 15.7 years (1-59 years). The mean delay in diagnosis was 11 years (1 month to 45 years). The etiology of bronchiectasis was diagnosed in 73 patients (80.2%), the most important of which included cystic fibrosis, post infectious following severe pneumonia, and primary ciliary dyskinesia (**Table.1**).

Herein this study, 21 children (12 males and 9 females) were included, the mean ages of which were 2.7 ± 3.4 years (one month to 10 years) and 9.3 ± 4.4 years (2-16 years) at onset of symptoms and the time of diagnosis, respectively. The most common clinical manifestations resulting in diagnosis in these children were productive cough and wheezing in 17 patients (81%), sinusitis and pneumonia in 14 patients (66.7%), exertional dyspnea in 10 patients (47.6%), clubbing in 9 patients (42.9%), otitis media, hemoptysis and failure to thrive (FTT) in 7 patients (33.3%) and chronic diarrhea in 2 patients (9.5%), respectively. The most common causes of bronchiectasis in the children group were cystic fibrosis in 12 patients (57.1%), Allergic bronchopulmonary aspergillosis (ABPA) in 3 patients (14.3%) and Primary ciliary dyskinesia (PCD), and asthma each in 2 patients (9.5%), Tuberculosis in one patient (4.7%), and primary immunodeficiency in form of hyper immunoglobulin M in one patient (4.7%), respectively.

The most common known etiology of pediatric bronchiectasis was cystic fibrosis (12 patients, 57.1%), whose symptoms started at the mean age of 2.8 and diagnosed at the age of 8.5 (2 to 16 years). Additionally, 7 (out of 12 children with cystic fibrosis), were born to consanguineous marriages. Productive cough (9 patients), pneumonia and exertional dyspnea (8 patients), sinusitis-(7 patients), clubbing (6 patients), failure to thrive (FTT) and hemoptysis (5 patients), chronic diarrhea and otitis media (2 patients), were the most common clinical manifestations in these patients. The adults in this study included 70 patients (30 men and 40 women), whose mean age was 18.2 ± 17.3 years (one month to 52 years) and 28.1 ± 15.4 years (1 to 59 years) at the time of onset of symptoms and diagnosis, respectively. The most common symptom leading to diagnosis in these patients included productive cough and wheezing (42 patients, 60%), pneumonia (40 cases, 57.1%), exertional dyspnea (30 patients, 42.9%), sinusitis (29 patients, 41.4%), otitis media (15 patients, 21.4%), hemoptysis (21 patients, 30%), clubbing (20 patients, 28.6%) and fatty diarrhea (5 patients, 7.1%), respectively.

The most common known causes of bronchiectasis in adults were post infectious following severe pneumonia in 16 patients (22.6%), Primary ciliary dyskinesia (PCD) in 11 patients (15.7%), and cystic fibrosis 10 patients (14.3%), Tuberculosis and asthma each in 4 patients (5.7%), primary immunodeficiency in form of common variable immunodeficiency in 3 patients (4.3%) and in form of hyper immunoglobulin M in one patient (1.4%), and Goodpasture syndrome in one patient (1.4%), respectively. The diagnosis was unknown in the remaining 20 cases (28.6%).

In adult patients with bronchiectasis caused by post infectious, the mean ages of onset and diagnosis were 19.8 years (one month to 52 years) and 32.2 years (1 to 59 years), respectively. These observations included pneumonia, wheezing and productive cough in 11 patients (68.8%), exertional dyspnea in 8 patients (50%), Hemoptysis in 7 patients (43.8%), clubbing and otitis media each in 5 patients (31.2%) and sinusitis in 4 patients (25%).

Table-1: Causes of bronchiectasis diagnosed in the study population including both children and adults

Causes	Number (male/female)	Common complaints	First symptom age (year)	Diagnostic delay (year)
Cystic fibrosis	22 (12/10)	Pneumonia, exertional dyspnea,	5.5 ± 6.48 (1 month-22)	6.4 ± 5.2 (1 month- 19)
Post infectious (severe pneumonia)	16 (5/11)	Cough, Fever, Dyspnea	32.2 ± 18.36 (1 month-59)	9.5 ± 13.4 (1 month- 9.5)
Primary ciliary dyskinesia	13 (8/5)	Sinusitis Productive cough wheezing	7.4 ± 6.35 (1 month-45)	20.6 ± 5.1 (2-45)
Allergic Bronchopulmonary Aspergillusis	10 (6/4)	Wheezing, Dyspnea	21 ± 7.6 (1 month-42)	10 ± 4.9 (1 month-43)
Tuberculosis	5 (3/2)	Chronic cough, Weight loss	28.4 ± 21.3 (5-51)	10.6 ± 8.9 (3-24)
Primary immunodeficiency	5 (3/2)	Sinusitis Pneumonia Otitis media	8.8 ± 10.1 (1 month- 6)	9.5 ± 0.7 (3-16)

4- DISCUSSION

According to the results of the current study which collected the information of 91 inpatients and outpatients with bronchiectasis in the Children's Medical Center and Dr. Masih Daneshvari Hospital from June 22, 2013 to April 22, 2014, the etiology of bronchiectasis was diagnosed in 73 of patients (80.2%), the most important of which included cystic fibrosis, post infectious following severe pneumonia, and PCD.

In this study, cystic fibrosis was the most common cause of bronchiectasis in children group, and the third most common cause in adults group. Although the exact prevalence of bronchiectasis is unknown in children with cystic fibrosis, however in different studies, 50% to 70% of patients with cystic fibrosis at the age of 3-5 years, showed confirmed changes of bronchiectasis in computerized tomography (CT)-scan. Furthermore, bronchiectatic changes progressed in 75% of patients with cystic fibrosis despite the receipt of appropriate treatment (7). In countries where cystic fibrosis screening is not performed routinely at birth, more attention to the diagnosis of cystic fibrosis in patients referring with respiratory symptoms can delay the development of bronchiectasis with correct and timely diagnosis of this disease. Post infectious bronchiectasis following severe pneumonia has revealed as another significant cause of bronchiectasis in our study. Different studies have shown the relationship of acute lower respiratory infections in childhood with chronic bronchitis (8-12) and impaired lung function in adulthood (13-15).

Evidence has shown that even one episode of severe lower respiratory tract infection can lead to the development of bronchiectasis in a way that the risk of the development of bronchiectasis with recurrent and more severe lung infections increases (16). Vaccination against the most common causes of pneumonia in

children (pneumococci, haemophilus influenzae, etc.), correct and timely diagnosis along with complete course of treatment and its complications (empyema, lung abscess, etc.) can be effective approaches for the prevention of bronchiectasis due to infectious agents.

PCD was another major cause of bronchiectasis in this study. Although a definitive diagnosis of PCD is based on respiratory cilia motility defects observed with an electron microscope and confirmed by genetic testing, however this study raised diagnosis based on the most common clinical symptoms (chronic productive cough, recurrent pneumonia, chronic sinusitis, persistent otitis media, and male sterility) and ruling out other causes of bronchiectasis by a pulmonologist. In the study by Nikolaizik and Warner, 17% of children younger than 20 years old suffered from bronchiectasis caused by PCD (17).

Also, in a study by Shoemark et al. that was done on adults, this disease was estimated as the cause of bronchiectasis in 10% of cases (18). At the present time, a special center with facilities required for screening (nasal nitric oxide [NO] measurement) and diagnosis (biopsy of nasal mucosa and examination under electronic microscope) can improve the quality of care for these patients.

The main limitation of the current study was how the patients were selected. Since most patients diagnosed with bronchiectasis are diagnosed years after the onset of symptoms (19), it seems that the selection of patients from subspecialty centers leads to the selection of cases with a more severe and complicated clinical course. In the case of population-based sampling, the diagnosis of the patients with a stable clinical course such as pneumonia and localized bronchiectasis following pneumonia is expected to comprise a higher percentage of patients.

It seems that the main cause of bronchiectasis in this study is not significantly different from other studies. Moreover, as the most important clinical approach, other than the preventative approach such as proper vaccination, proper treatment of pneumonia and its complications, a diagnostic algorithm including evaluation of the performance of the immune system, sweat test, sputum smear and culture, Mantoux test and where necessary, supplementary examinations such as bronchoscopy, gastroesophageal reflux disease (GERD) examination and nasal mucosal biopsy, and electronic microscope examination should be used in order to diagnose the underlying cause of bronchiectasis. However, the authors believe that the physician's clinical awareness is the most important factor contributing to early diagnosis, elimination of treatable factors, and thus contribution to patients' clinical course.

5- CONCLUSION

Bronchiectasis has many different etiologies. The evaluation and determination of an underlying etiology determine the treatment and prognosis of this disease. However, the authors believe that the physician's clinical awareness is the most important factor contributing to early diagnosis, elimination of treatable factors, and thus contribution to patients' clinical course.

6- CONFLICT OF INTEREST

The authors have declared that no competing interest exists.

7-ACKNOWLEDGMENTS

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