ORIGINAL RESEARCH PAPER

Pulmonary Medicine

CLINICAL AND RADIOLOGICAL CHARACTERISATION OF ADULT BRONCHIECTASIS PATIENTS IN A TERTIARY CARE HOSPITAL IN KANCHIPURAM

KEY WORDS: Bronchiectasis, Radiology, Spirometry, Pseudomonas

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ABSTRACT

Background: Bronchiectasis is a final result of many pulmonary and systemic conditions and an important cause of morbidity and mortality in children and adults.
Aim: To describe the clinical characteristics, radiological and laboratory findings of non-cystic fibrosis bronchiectasis (NCFB) patients.
Materials and methods: Prospective analysis of clinical, radiological and microbiological findings was done on 69 adult individuals diagnosed with non CF bronchiectasis over a period of 1 year.
Results: Idiopathic bronchiectasis was the commonest (34%) followed by post TB and post infectious aetiologies (27.5% each). The common clinical presentation was cough with sputum production (89.9%). Spirometry showed normal pulmonary function in 32% and obstructive pattern in 45%. Radiologically, cylindrical type was the commonest. *Pseudomonas aeruginosa* was the commonest organism (30.4%) isolated, with majority (76%) having poor lung function.
Conclusion: Wide knowledge of the prevalent etiologies in a particular geographic area helps the clinician to effectively diagnose and treat these individuals.

INTRODUCTION:

Non-cystic fibrosis bronchiectasis (NCFB) is a chronic inflammatory condition from repeated insult and/or obstruction to small and medium-sized bronchi, leading to fixed dilatation and architectural distortion. (Koser & Hill, 2017). Laennac first described it in 1819 in a baby who died of whooping cough (Bilton & Jones, 2011).

The underlying etiology of bronchiectasis is often unknown (>50%) with common identifiable causes being post infectious, congenital mucociliary defects or hereditary immunodeficiency disorders (Chalmers & Sethi, 2017). Bronchiectasis is commonly associated with respiratory diseases (COPD and asthma) and also with systemic conditions like rheumatoid arthritis (Quint et al., 2016).

Disease prevalence has increased with the evolution of advanced diagnostic techniques such as HRCT (Chalmers & Sethi, 2017). Female preponderance is seen, which is attributed to altered inflammatory immune response with environmental, genetic and anatomical differences (Vidaillac, Yong, Jaggi, Soh, & Chotirmall, 2018).

Cole's hypothesis explains the pathophysiology of bronchiectasis as a vicious cycle of abnormal dilatation and decreased mucociliary clearance leading on to stagnation of secretions which paves way for the microbial colonisation. This leads to architectural damage causing permanent dilatation of airways thus starting the cycle again (King, 2011).

As it's a chronic disease, symptoms last for variable duration from months to years. Wet bronchiectasis describes the most common clinical presentation, chronic cough with tenacious mucopurulent expectoration (Oliva, Cortopassi, Herzog, & Rubinowitz, 2013). Chronic inflammation leads to hypertrophy of bronchial arteries causing hemoptysis in 50% and dyspnoea occurs in 25-50% of patients. (Altenburg, Wortel, van der Werf, & Boersma, 2015; Oliva et al., 2013). Exacerbations are common, characterised by sudden increase in signs and symptoms suggesting lower respiratory tract infection (Altenburg et al., 2015). Other non-specific findings such as crackles, clubbing and wheezing are commonly observed (Oliva et al., 2013).

Bronchiectasis is not a separate entity but a common pathway for many conditions making diagnosis difficult (Chalmers, Aliberti, & Blasi, 2015). But with pertinent history of chronic cough with sputum and haemoptysis with repeated sputum cultures positive for Pseudomonas aeruginosa, leads to suspicion of bronchiectasis. The definitive mode of diagnosis is HRCT (Altenburg et al., 2015). Mainstay of management is to identify and treat the underlying cause with reduction of exacerbations. Standard treatment protocol includes appropriate vaccination, airway clearance and antimicrobial therapy.

Hence the aim of this study was to analyse the aetiological, clinical, radiological and microbiological profile of bronchiectasis patients attending a tertiary care centre.

MATERIALS AND METHODS

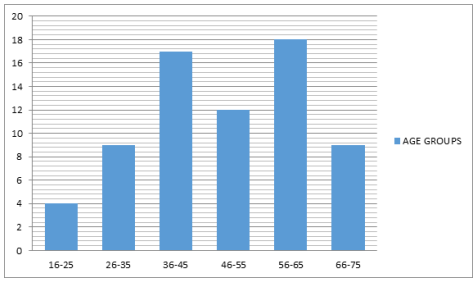
The study commenced after obtaining approval from the ethical committee. Sixty nine individuals who had chronic cough with mucopurulent expectoration, bilateral pan digital clubbing and crackles on auscultation were recruited. HRCT was taken to confirm the diagnosis of bronchiectasis. Informed consent was obtained from all patients and from parents of patients who were <18 years of age. A detailed clinical history and physical examination was performed. After basic investigations, sputum samples were sent for AFB smear to RNTCP lab and for routine bacterial culture sensitivity to microbiology lab. All the study participants were subjected to spirometry using KoKo legend spirometer fulfilling the acceptability and reproducibility criteria as per American Thoracic Society recommendations. The parameters measured in spirometry include Forced Vital Capacity (FVC), Forced expiratory volume in 1 second (FEV1), ratio of FEV1 to FVC (FEV1%).

Statistical analysis was carried out using SPSS version 21.0 (IBM, SPSS, US) software with regression modules installed. In this study analysis were done using chi-square tests. p value = < 0.05 is considered as significant.

RESULTS:

Among 69 study participants, 38 (55.1%) were females and 31(44.9%) were males. The patients' age range from 17 to 75 years with the majority in age group of 56-65 years (26.1%) followed by 36-45 years (24.6%) as shown in **Fig 1.**

FIGURE 1: Bar diagram showing the age distribution of study participants



Median age of study participants was 51 yrs. Out of 69 subjects, 16 (23.2%) were smokers and 14 (20.3%) were alcoholics. Fourteen out of 69 had COPD and 6 had bronchial asthma.

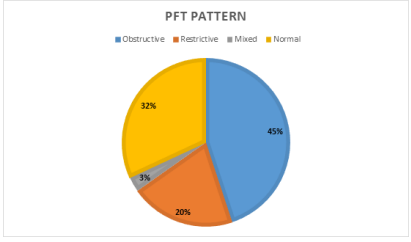
Among the 69 individuals, 62 (89.9%) presented with productive cough, 36 (52.2%) with dyspnoea, and 20 (29%) with haemoptysis. On examination, 22 (31.9%) individuals had clubbing, 65 (94.2%) and 28 (40.6%) subjects had crackles and rhonchi respectively on auscultation **(Table 1)**

Table 1: Clinical features of bronchiectasis

Clinical features	Frequency (%)
Productive cough	89.9
Dyspnoea	52
Haemoptysis	29
Clubbing	31.9
Rhonchi	40.6
Crackles	94.2
With COPD	20.3
With asthma	8.7

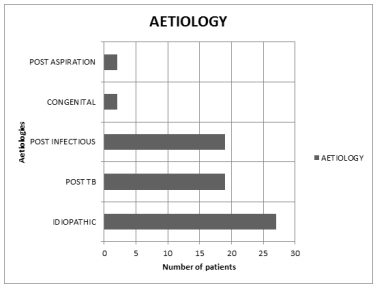
Spirometry showed normal respiratory pattern in 22 (32%) patients with obstructive pattern in 31 (45%) individuals as shown in **Fig 2**.

FIGURE 2: Pie chart showing the spirometry findings



Idiopathic bronchiectasis was the commonest [27 (39.1%)] followed by post TB and post infectious etiologies accounting for 27.5% (n=19) each, with the congenital and post aspiration being the last accounting for 2.9% (n=2) each as shown in **Fig 3**.

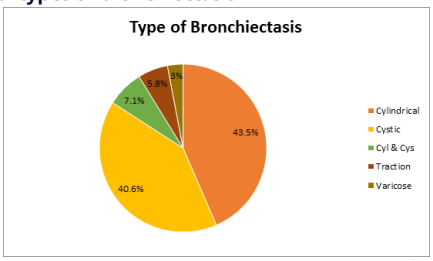
FIGURE 3: Bar chart showing various aetiologies



Left sided disease is seen in 43.7% of patients with bilateral lower lobe involvement in 31.8%. Cylindrical bronchiectasis (43.5%) was the most common radiological type followed by cystic variant, [n=28 (40.6%)] cylindrical & cystic combination, traction and varicose bronchiectasis accounting for 7.1%, 5.8% and 3% respectively as shown in **Fig 4**.

There was a significant association between the frequency of haemoptysis with cystic bronchiectasis (p value 0.004).

FIGURE 4: Pie chart showing the percentage of various radiological types of bronchiectasis



Sputum cultures grew *Pseudomonas aeruginosa* in 21 (30.4%), followed by *Klebsiella pneumoniae* and *Streptococcus pneumoniae* which accounted for 27.8% and 8.7% respectively. Comparing sputum microbiology with spirometry pattern, Out of the 21 patients who grew Pseudomonas in sputum culture, obstructive pattern on spirometry was seen in 16 of them showing a significant association (p value 0.034).

Discussion

Bronchiectasis is a chronic debilitating lung disease which is a final destination for a number of respiratory and systemic disorders (Oliva et al., 2013). It was once considered an orphan disease due to decreased hospital admissions which was ascribed to effective immunisation with improved sanitation and nutrition. However, the definitive diagnosis of the disease even with minimal clinical suspicion is now promptly done with advanced imaging technique, HRCT. Thus bronchiectasis is no longer an orphan disease which needs to be studied extensively to effectively treat these patients (Mobaireek, 2007).

Female preponderance is seen in bronchiectasis with worse clinical outcome, poor lung function, maximum exacerbations and mortality. This is attributed to genetic predisposition, sex hormones and comorbidities along with their underestimation of symptoms and delayed seeking of medical attention (Raghavan & Jain, 2016; Vidaillac et al., 2018). This holds well in this study as well, where 55% of the study individuals were females.

In this study, the most common clinical presentation was chronic cough with sputum production (89.9%) which closely matched with other studies where productive cough was reported in 82% of 277 patients (Dimakou et al., 2016) and 96% of 103 patients (Altenburg et al., 2015). The amount of sputum produced is one of the important determinants of quality of life. Haemoptysis in bronchiectasis occurs due to chronic airway inflammation with hypertrophy of bronchial vessels. Habesoglu et al,2011, reported history of hemoptysis to be present in one third (32.8%) of their patients with eight of them being admitted only for hemoptysis (Habesoglu, Ugurlu, & Eyuboglu, 2011a). However this is less frequent when compared to Oliva et al (50%) and Dimakou et al., 2016 (37%). Present study results match with Dimakou et al, in that dyspnea (52.2%) was the second common complaint followed by hemoptysis (29%) with the frequency being lower than all other studies.

The primary cause of bronchiectasis could not be established in 34% of cases with post infection (27.5%) and post TB (27.5%) being the common recognised causes in this study. This is similar Dimakou et al 2016, where post TB (22.3%) and post infection(25.2%) were the most common causes with the idiopathic category being 34%(Dimakou et al., 2016). Satirer et al.,2018, reported primary ciliary dyskinesia to be the most common cause of bronchiectasis, attributing this to their advanced diagnostic methods and introduction of nasal NO in their centre (Satırer et al., 2018)

The association of COPD with bronchiectasis poses a great challenge in the diagnosis and treatment of these patients. Though a causal association is not proven, there is a definite increase in severity of symptoms and exacerbations with poor

prognosis. (Martinez-Garcia & Miravitlles, 2017). It is important to know this overlap as the management strategy varies for the two conditions (Hurst, Elborn, & Soyza, 2015). This overap is reported to be 18.4% by Habesoglu et al,2011 with the range being 29-50%. In the present study, 20.3% (n=14) of the bronchiectasis patients had COPD.

The role of HRCT in bronchiectasis is not only to confirm the diagnosis but also to localise and know the severity of disease which aids in providing an appropriate management (Singh, Bhalla, & Jana, 2018). Cylindrical bronchiectasis was the commonest (43.5%) radiological type in this study, followed by cystic variety (40.6%). Angrill et al, 2002 reported cylindrical type to be the commonest, with the frequency being higher than our study (73%) (Angrill et al., 2002). However other studies state cystic type to be the commonest radiological type of bronchiectasis followed by cylindrical type (Alzeer, 2008; Habesoglu et al., 2011a) Cystic type is reported to be associated with higher frequency of hemoptysis and poor PFT results (Habesoglu, Ugurlu, & Eyuboglu, 2011b; Perera & Screaton, 2011).This holds good in our study with respect to hemoptysis where there was a significant association with cystic type of bronchiectasis (p value 0.004)

Unlike healthy non-smokers, the lower respiratory tract of bronchiectasis patients is often colonised with potentially pathogenic organisms (PPM) with pseudomonas colonisation being associated with severe disease and increased mortality (Angrill et al., 2002; Wilson et al., 2016). Colonisation with PPM was reported to be 64% with Hemophilus influenzae being the commonest organism by Angrill et al.,2002 as against 75.4% in the present study. However, in this study, Pseudomonas aeruginosa was the commonest PPM isolated from sputum (30.4%) which is similar to Dimakou et al 2002 with the frequency (43%) being higher than the present study.

Pseudomonas colonisation has been reported to be significantly associated with worse lung function (ref) this holds well in the present study, evidenced by observing increased frequency of obstructive pattern in majority of these patients. (76% p value 0.034)

To conclude, bronchiectasis, an end result of various diseases commonly present with productive cough, hemoptysis and dyspnea, either as a single entity or as co morbidity with COPD or asthma. Wide knowledge of the prevalent etiologies and type of bronchiectasis in a particular geographic area helps the clinician to effectively diagnose and treat these individuals.

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