Original Article

Microbiology Section

Moraxella Catarrhalis: An Often Overlooked Pathogen of the Respiratory Tract

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ABSTRACT

Background: *Moraxella catarrhalis* is an upper respiratory tract commensal which can also be pathogenic. It is now considered as the third most common pathogen of the respiratory tract.

Aim: The aim of the present study was to assess and evaluate the risk factors in adults with lower respiratory tract infections which were caused by *M. catarrhalis*.

Material and Methods: Sputum samples from 1402 adults with lower respiratory tract infections were studied over two years. *M. catarrhalis* was isolated from 137 samples. Data such as date, name, sex, age, smoking history and underlying disease conditions were collected to study the risk factors.

Results: Most patients (68%) were of above 50 years of age. Underlying risk factors such as COPD (37%) and diabetes mellitus (18%) were seen in a majority of the cases (87%). No underlying risk factors were detected in 12(12.7%) patients. The isolation was more during the colder months (63.5%). While all isolates were susceptible to Amoxyclav, only 14% were sensitive to Penicillin.

Conclusion: The isolation of *M.catarrhalis* should be considered significant in adult patients with lower respiratory tract infections and associated underlying risk factors. Since 86% of the isolates showed penicillin resistance, treatment with appropriate antibiotics should be instituted.

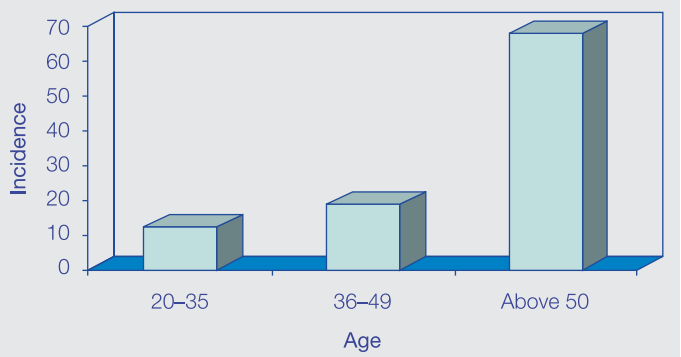
Key Words: *Moraxella catarrhalis*, Risk factors, β-lactamase production

INTRODUCTION

The common bacterial pathogens of the respiratory tract are *Streptococcus pneumoniae and Haemophilis influenzae,* followed by *Moraxella catarrhalis* [1]. *Moraxella catarrhalis*, a gram negative aerobic diplococcus, was first described in 1896 [1]. It was initially known as *Branhamella catarrhalis* or *Neisseria catarrhalis* and was considered as normal flora [1,2,3]. The recognition of *M. catarrhalis* as an important human respiratory tract pathogen, together with the increasing prevalence of β-lactamase producing strains, has generated much interest in this bacterium. The three clinical conditions which are commonly associated with this organism are otitis media (in children) and acute bronchitis or pneumonia in adults with Chronic Obstructive Pulmonary Disease (COPD) and sinusitis [2-7]. Because the organism rarely causes bacteraemia and empyaema, the diagnosis is usually based on the findings from expectorated sputum[4]. This study was conducted to determine the risk factors which were associated with lower respiratory tract infections caused by *M. catarrhalis*. It is in continuation of a previous study on the same sample load, wherein the prevalence and the antibiotic sensitivity of the isolates was studied and sent for publication. In that study, the isolation rate was 9.8% and a majority of the isolates were of *H.influenzae* and *Streptococcus pneumoniae* [Table/Fig-1].

MATERIAL AND METHODS

This study included1402 sputum samples from adults with lower respiratory tract infections. The period of the study was two years. The sputum sample was considered as the ideal one when it contained more than 25 polymorphonuclear leucocytes and less than 10 epithelial cells/low power field [1]. The specimens were subjected to gram staining, culture and antibiotic sensitivity studies.

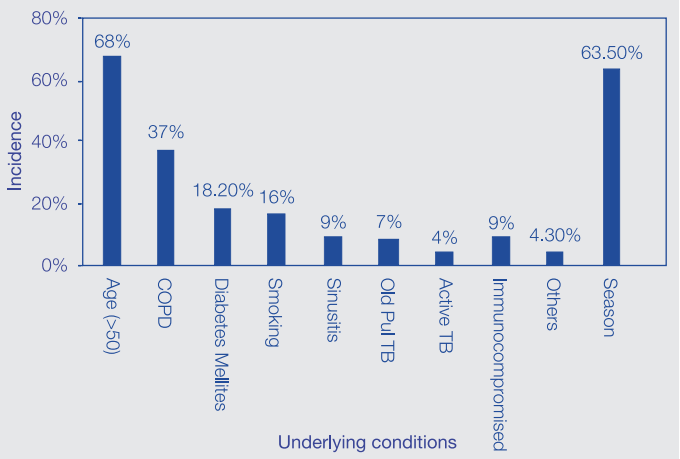


[Table/Fig-1]: Isolation of M. catarrhalis in relation to age

A gram stained sputum sample which showed a predominance of gram negative diplococci was highly predictive of the presence of *Moraxella catarrhalis* [8-12]. On gram staining, *M. catarrhalis* were seen as a kidney bean shaped diplococcus which was present intracellularly within the polymorphonuclear leucocytes and also extracellularly. The isolates were further identified by their colony characteristics and biochemical tests. The β-lactamase assay was done by the iodometric method and antibiotic susceptibility testing was done by the Kirby Bauer disc diffusion method as per the CLSI guidelines. The risk factors were studied in those patients from whom *M. catarrhalis* was isolated. Data such as date, name, sex, age, smoking history and underlying disease conditions were collected.

RESULTS

Over the period of two years, 137 *Moraxella catarrhalis* isolates (9.8%) were obtained from 1402 adult patients with lower respiratory tract infections. The risk factors which were studied



[Table/Fig-2]: Risk factors in M. catarrhalis infections

were age, underlying lung disease, systemic disease, immunocompromised state, influence of smoking and seasonal variation. 68% of the isolates were from people of above 50 years of age. [Table/Fig-2] Other risk factors included chronic obstructive pulmonary disease (37%), diabetes mellitus (18.2%), sinusitis (9%), old cases of pulmonary tuberculosis (7%), active cases of pulmonary tuberculosis on treatment (4%), the immunocompromised state (9%), congenital heart and lung disease (4.3%) and smoking (16%). 18 patients had no underlying risk factors. There was increased isolation of *Moraxella catarrhalis* during the colder months (63.5%). Among the isolates, 86% were β-lactamase producers which showed resistance to Penicillin, but there was 100% sensitivity to amoxycillin-clavulanic acid.

DISCUSSION

Moraxella catarrhalis is a gram negative aerobic diplococcus which is frequently found as a commensal of the upper respiratory tract and has been recovered exclusively from humans [5]. Over the last few decades, it has emerged as a genuine pathogen and is now considered as an important cause of upper respiratory tract infections in otherwise healthy children and elderly people [5, 6]. Moreover, it is an important cause of lower respiratory tract infections, particularly in adults with COPD [6]. The emergence of *M. catarrhalis* as a pathogen, together with the increasing prevalence of β-lactamase producing strains, has renewed interest in this bacterial species. The underlying risk factors which were associated with *M. catarrhalis* infections were studied. Age was a critical determinant of the pathogenic significance of the isolates of *M. catarrhalis*. With advancing age, the pathological significance of the isolates becomes greater [2]. Studies have shown that the elderly are at an increased risk of respiratory tract infections which are caused by *M. catarrhalis* when compared to the young adults. Most of these patients had underlying lung diseases like COPD, bronchiectasis and other conditions like diabetes mellitus, corticosteroid therapy and malignancy [12]. In our study too, we found that the incidence of *M.catarrhalis* was maximum in people of age 50 yrs and above, with a serious underlying pathology or systemic condition. The finding of infections in otherwise normal, healthy adults suggests that there may have been an increase in the number of the more virulent strains [11]. COPD (37%), diabetes mellitus (18.2%) and smoking (16%) were the common predisposing factors which were identified in our study. Sinusitis, old and active cases of pulmonary tuberculosis, the immunocompromised state and congenital heart and lung disease were the other risk factors which were seen. The overlapping of these risk factors was seen in some patients. We have noted that there was a striking increase in the number of isolates of *M. catarrhalis* during the winter months, as had been observed in a study by Gillian M Wood and Barbara C Johnson et al. [2]. A predisposing viral infection has been proposed as the mechanism for the seasonal variation of *M. catarrhalis*, but this is unproved as yet.

In a study by Sanjay Sethi and Timothy F Murphy, in cases of acute exacerbation of chronic COPD, the three predominant bacterial species which were isolated were *H. influenzae, M. catarrhalis* and *Strep. pneumoniae* [13]. It was reported that the acquisition of a new strain of *M. catarrhalis* in COPD enhances airway inflammation from the base line and alters the protease-antiprotease balance towards a more proteolytic environment. It has also been reported that these changes are greater during exacerbations which are associated with *M. ctarrhaliis,* as compared to colonization by this pathogen [15]. In our study, a pure growth of *M. catarrhalis* was seen only in 14 cases. A majority of the isolates were seen together with other respiratory pathogens, of which *H. influenzae* and *Streptococcus pneumoniae* were the predominant organisms (57.1%). It has been demonstrated in vitro that the BRO enzymes of *M .catarrhalis* can confer protection from β-lactam antibiotics to other co-existing respiratory pathogens which reside in the host. This phenomenon which has been referred to as the indirect pathogenicity of *M.catarrhalis*, may lead to antibiotic failure when treating a mixed infection containing both susceptible bacteria and resistant *M.catarrhalis* strains [6,8,9,10,12,14]. The antibiotic sensitivity patterns showed a high level of resistance to Penicillin, with 86% of the strains producing β-lactamase. A combination of amoxycillin-clavulanic acid showed 100% sensitivity.

CONCLUSION

Moraxella catarrhalis is being identified as an important respiratory tract pathogen, especially in adults above 50 years of age and with underlying lung diseases. It is also known to confer protection against beta-lactam antibiotics to other co-existing respiratory pathogens. So, *M. catarrhalis* which is isolated from patients with underlying risk factors should be considered as significant and should be given due importance. Appropriate antibiotics should be administered since most of the isolates are penicillin resistant strains.

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