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Original Research Article

Prevalence of *Moraxella catarrhalis* in patients of lower respiratory tract infection with underlying risk factors

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ABSTRACT

Background: *Moraxella catarrhalis* is a Gram-negative diplococcus, commonly found as a normal flora in the human upper respiratory tract. Recently, *M. catarrhalis* has emerged as an important and common human respiratory tract pathogen. This study was aimed to determine the rate of isolation of *M. Catarrhalis* in patients attending a tertiary care hospital with lower respiratory tract infection (LRTI), antibiotic susceptibility pattern and predisposing factors responsible for their infection.
Methods: A prospective study was carried out in 1001 lower respiratory specimens from patients (above 20 years' age) with suspected LRTI. The study investigated by microscopic examination, culture and antibiotic sensitivity test according to the standard guidelines. Assessment of clinical significance of *M. Catarrhalis* was ascertained on the basis of preformed criteria.
Results: A total of 60 clinically significant *M. Catarrhalis* were isolated from the 930 culture positive samples. The isolates showed maximum sensitivity to second and third generation cephalosporins (95%), azithromycin (90%) followed by amoxicillin clavulanic acid (85%). Rate of isolation was more in males (70%) and elderly people above 60 years (63.33%) were found to be more affected. Patients (58.33%) with Chronic Obstructive Pulmonary Diseases (COPD) were found to be more prone to get infection by *M. Catarrhalis*.
Conclusions: *Moraxella catarrhalis* should be considered as significant lower respiratory tract pathogen especially in elderly patients with underlying risk factors like COPD.

Keywords: COPD, Lower respiratory tract infection, *Moraxella catarrhalis*

INTRODUCTION

Over the past three decades, *M. catarrhalis* has accounted for 10% of the bacteria mediated exacerbations in patients with chronic obstructive pulmonary disease (COPD).[1,2] Nosocomial respiratory tract infections are also caused by it.[3] The prevalence of betalactamase producing strains is increasing.[4] Many laboratories are not reporting these isolates from lower respiratory tract probably because they are overlooked as a normal commensal of the respiratory tract. The aim of the present study was to determine the prevalence of infections by *M. catarrhalis* in the lower respiratory tract infection (LRTI) with underlying risk factors and their antibiotic sensitivity pattern.

METHODS

The study was conducted in a tertiary care centre for a period of one year from October, 2015 to September, 2016. Sputum and bronchial wash samples were collected from patients with LRTI. Sputum samples were screened based on the Barlett's grading system and samples with a score of one and above were included in the study.[5] Inadequate sputum samples of Barlett's score less than 1 and patients without LRTI were excluded from the study.

A direct smear was prepared to look for status of pus cells and the predominant organism by gram staining. The specimens were inoculated on blood agar, chocolate agar and Mac Conkey agar. The media were incubated aerobically for 18-24 hours at 37^0C. The isolates were identified by colony characteristics, staining properties and biochemical tests. The gram-negative diplococci which grown well on chocolate agar as greyish white 1-3 mm colonies; poorly grown on Mac Conkey agar and remained intact when manipulated with a bacteriological loop similar to a hockey puck on a flat surface (hockey puck sign) were identified as *M. Catarrhalis* (Figure1).[6] It was confirmed by the positive oxidase, catalase, tributyrine hydrolysis test (Figure 2) and asaccharolytic activity.[7] Antibiotic sensitivity was determined by Kirby Bauer disk diffusion method according to the clinical and laboratory standard institute guideline.[8] The other isolates were also identified and antibiotic sensitivities were determined.

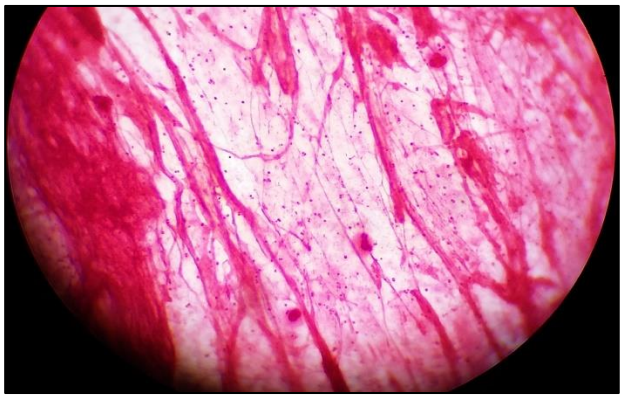

Figure 1: Gram stain of the sputum sample shows gram negative diplococci along with pus cells.

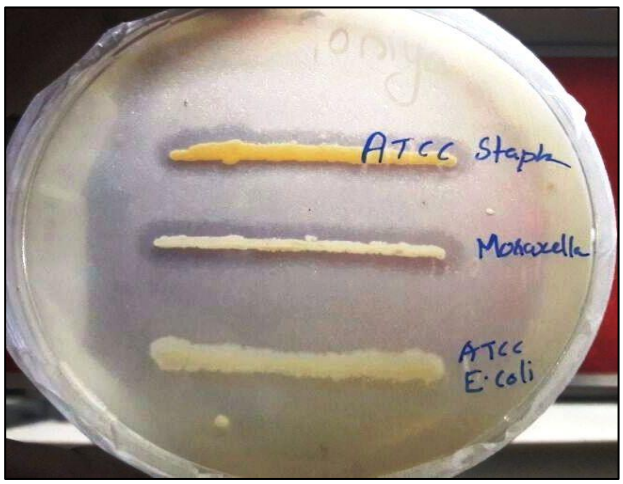

Figure 2. Tributyrine hydrolysis test. Tributyrin degradation by Moraxella is indicated by clear zones surrounding the lipolytic colonies in the otherwise turbid culture medium. ATCC strains of *Staphylococcus aureus* (ATCC 25923) and *Escherichia coli* (ATCC 25922) were used as positive and negative controls.

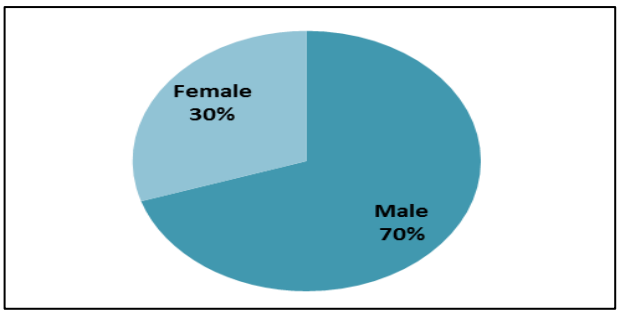

Figure 3: Distribution of gender.

Association of LRTI caused by *M. catarrhalis* with demographic factors such as age and gender and various risk factors were studied. The following criteria were considered for determining the pathogenic significance of the isolate.

- Clinical evidence of respiratory tract infection such as productive cough and shortness of breath
- *M. catarrhalis* as a predominant potential pathogen isolated from an appropriate and adequate specimen
- Clinical response on treatment with antibiotic to which isolate was susceptible.

RESULTS

Among 930 isolates from patients with lower respiratory tract infections 60 (6.45%) were *M. Catarrhalis*. Other bacterial isolates were as follows: *Pseudomonas aeruginosa*- 245 (26.34%), *Klebsiella pneumonia*- 214 (23.01%), *Acinetobacter baumanii*- 160 (17.20%), *Pneumococci*- 91 (9.78%), *Staphylococcus aureus* -48 (3.17%) and *Escherichia coli* -44 (4.74%) followed by *Haemophilus influenzae*-38 (4.08%), *Stenotrophomona smaltophilia*- 20 (2.15%) and *Burkholderia spp.*10- (1.08%) (Table 1).

Table 1: Bacteria isolated from lower respiratory tract infections (N = 930).

Bacterial isolate	Number (%)
Moraxella catarrhalis	60 (6.45%)
Pseudomonas aeruginosa	245 (26.34%)
Klebsiella pneumonia	214 (23.01%)
Acinetobacterbaumanii	160 (17.20%)
Pneumococci	91 (9.78%)
Haemophilus influenza	38 (4.08%)
Staphylococcus aureus	48 (5.17%)
Escherichia coli	44 (4.74)
Stenotrophomonas maltophilia	20 (2.15%)
Burkholderia spp.	10 (1.08%)

The rate of isolation of *M. catarrhalis* was more in males 42 (70%) than in females 18(30%) (Figure 3). Moraxella infection was found to be more in elderly people more than 60 years - 63.33% (Table 2). COPD as predisposing factor was present in 35 patients (58.33%) (Table3).

Other pulmonary causes for Moraxella infection were old pulmonary tuberculosis -8 (13.33%), carcinoma of lung - 7 (11.67%), bronchiectasis - 8(13.33%) and pneumonia-2 (3.33%) (Table 3). History of smoking was present in 43 (71.67%) patients. Other co-morbidities were diabetes mellitus, hypertension and coronary artery diseases.

Table 2: Age wise distribution of patients with Moraxella infection (N = 60).

Age group	Number (%)
< 30	5 (8.33%)
31-40	4 (6.67%)
41-50	7 (11.67%)
51-60	6 (10%)
>60	38 (63.33%)

Table 3: Underlying pulmonary pathology in patients with *Moraxella* infection (N = 60).

Pulmonary pathology	Number (%)
COPD	35 (58.33%)
Pulmonary tuberculosis	8 (13.33%)
Lung carcinoma	7 (11.67%)
Bronchiectasis	8 (13.33%)
Pneumonia	2 (3.34%)

Table 4: Antibiotic sensitivity pattern of *Moraxella catarrhalis* (N = 60).

Antibiotics	Sensitive (n %)	Resistant (n%)
Pencillin	15 (25%)	45 (75%)
Amoxicillin clavulanate	51 (85%)	09 (15%)
Cefuroxime	57 (95%)	03 (05%)
Ceftriaxone	57 (95%)	03 (05%)
Azithromycin	54 (90%)	06 (10%)
Cotrimoxazole	42 (70%)	18 (30%)
Levofloxacin	48 (80%)	12 (20%)

In our study, isolates of *M. catarrhalis* showed maximum susceptibility to second and third generation cephalosporins (95%), azithromycin (90%) followed by amoxicillin clavulanate (85%) Table 4.

DISCUSSION

The recognition of *M. catarrhalis* as a respiratory pathogen was delayed until the past 20 years because it was indistinguishable from commensal Neisseria by Gram stain and also difficult to distinguish by colony morphology. In different recent studies, *M. catarrhalis* has been seen as a significant pathogen associated with LRTI with isolation rate of 4.5% to 20%.[9-13] In the present study the isolation rate is 6.45%. This finding correlates with the study of Tamang et al.[13] COPD was the underlying pathology in the majority of patients from whom *M. catarrhalis* was isolated. Evidence of infection by *M. catarrhalis* in COPD patients is proved by the predominance of Gram negative diplococci on Gram stain and almost pure culture of *M. catarrhalis* in sputum samples of a subset of patients with exacerbations of COPD. Studies by above authors using trans tracheal aspiration and bronchoscopy with the protected specimen brush to sample the lower airways have revealed pure culture of *M. catarrhalis* in patients with COPD.[14,15] The present study also used sputum and bronchoscopy samples from suspected cases of exacerbations of COPD and these samples showed predominant Gram negative diplococci on Gram staining and almost pure culture of *M. catarrhalis*. A specific immune response has been observed following exacerbations of COPD associated with *M. catarrhalis* in the sputum. Acquisition of a new strain of *M. catarrhalis* is associated with clinical exacerbations.[16]

In our study the rate of isolation of Moraxella from COPD patients was 12.9%. All other patients had some chronic lung disease. The study could not detect *M. Catarrhalis* in acute respiratory tract infection without any underlying chronic lung disease. Different studies have proved the age of the patient as a critical determinant of the pathogenic significance of the *M. Catarrhalis* infection that the more the advanced age is, the greater the pathological significance of the isolate.[13,17] Our study also found that majority of patients (63.33%) was above 60 years old.

The present study showed that 95% of isolates were sensitive to cefuroxime and ceftriaxone, followed by azithromycin and amoxicillin-clavulanate 90 and 85% respectively. This observation is similar to that of Tamang et al and Safia et al.[11,13] The emergence of B-lactamase producing strains makes it necessary to report the accurate antibiotic susceptibilities to avoid treatment failure.[3,9,12]

CONCLUSION

Results of this study showed that *Moraxella catarrhalis* is very significant in cases of lower respiratory tract infections especially in cases of COPD and cases with other underlying lung pathologies. Continued surveillance of antimicrobial susceptibility and optimum antibiotic therapy should be carried out to prevent the emergence of resistant strains.

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REFERENCES

1. Murphy TF. Moraxella catarrhalis, Kingella and other Gram negative cocci. In: Principles and practice of infectious disease, 7 nth ed. USA, Elsevier; 2010:2771-4.
2. Murphy TF, Brauer AL, Grant BJ. Moraxella catarrhalis in chronic obstructive pulmonary disease. Burden of disease and immune response. Am J Respire Crit Care Med. 2005;172:195-9.
3. Cees M, Hol VC, Fleer A, Dijk HV, Belkaum AV. Moraxella catarrhalis: From Emerging to Established Pathogen. Clin. Microbiol Rev; 2002;15:125-44.
4. Schmitz FJ, Beeck A, Perdikouli M. Production of BRO beta lactamases and resistance to complement in European Moraxella isolates. J Clin Microbiol. 2002;40:1546-8.
5. Winn JW, Allen S, Janda W, Koneman E. Guidelines for collection, transport, processing, analysis and reporting of cultures from specific specimen sources. In: Koneman's colour atlas and textbook of Microbiology, 6th edition. Lippincott, Williams and Wilkins publications; 2006:68-111.
6. Riley W. Acinetobacter and Moraxella. In:Topley and Wilson's microbiology and microbial infections,10nthedn. ASM press. 2005:1306-8.
7. Collee JG, Fraser AG, Marmion BP, Simmons A. (Eds.), Mackie and McCartney, Practical Medical Microbiology, 14th Edn, Churchill Livingstone; 1996:140.
8. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing. 24th Informational Supplement, Wayne(PA): Clinical and Laboratory Standards Institute; 2014;34:M100-S24.
9. Prashanth HV, Saldanha RMD, Shenoy S. Moraxella Catarrhalis - a rediscovered pathogen. Int J Biol Med Res. 2011;2:979-81.
10. Krishna S, Sagarika S, Jeer M, Sureka YA, Shafiyabi S, Pushpalatha H, et al. Prevalence and antibiotic sensitivity pattern of Moraxella Catarrhalis in patients with lower respiratory tract infections in a tertiary health care centre in India. Int J Curr Microbiol App Sci. 2016;5:72-8.
11. Uddin SB, Ahmed Z, Arsalan SA, Shafiq S. Prevalence and resistance pattern of Moraxella catarrhalis in community acquired lower respiratory tract infections. Infect Drug Resist. 2015;8:263-7.
12. Mohager MO, Omer AA, Elhassan MM. Detection of Moraxella catarrhalis among respiratory tract infected patients. J Biosci Res. 2012;l3:220-8.
13. Tamang MD, Dey S, Makaju RK, Jha BK, Shivananda PG, Bhramadatan KN. Prevalence of Moraxella catarrhalis infections of the lower respiratory tract in elderly patients. Kathmandu Univ Med J. 2005;3:39-44.
14. Sethi S, Murphy TF. Bacterial infection in chronic obstructive pulmonary disease in 2000.A state of the art review. Clin microbial Rev. 2001;14:336-63.
15. Sethi S, Murphy TF. Infection in the course and pathogenesis of chronic obstructive pulmonary disease. N Engl J Med. 2008;359:2355-65.
16. Sethi S, Evans N, Grant BJB. New strains of bacteria and exacerbations of COPD. N Engl J Med. 2002;347:465-71.
17. Gillian M, Barbara C, Josephm G. Moraxella catarrhalis pathogenic significance in respiratory tract infections treated by community practitioners. Clin Infect Dis. 1996;22:632-6.

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