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Original Article

Prevalence of *Moraxella catarrhalis* infections of the lower respiratory tract in elderly patients

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Abstract

Objectives: To determine:

- rate of isolation of Moraxella catarrhalis in elderly patients having lower respiratory tract infection
- The antibiotic susceptibility pattern of Moraxella catarrhalis isolates.
- The predisposing factors responsible for Moraxella catarrhalis infections of lower respiratory tract.

Material and Method: This is a prospective study carried out at Manipal Teaching Hospital, Pokhara during May 2002 to April 2003. A total of 716 sputum samples collected from patients with suspected lower respiratory tract infection were investigated. The samples were subjected to Gram stain, culture and sensitivity. Sputum samples were inoculated on blood and chocolate agar and incubated at 37^0C for 18 to 24 hours in candle jar containing 3-5% Co_2. For the identification of bacterial isolates, the cultural and colonial characteristics were recorded and identified with the use of biochemical test. The susceptibility of bacterial isolates to antimicrobial agent was performed following Kirby-Bauer method. **Result:** Out of the 716 samples, 355 (49.58%) grew normal commensals of the upper respiratory tract. Respiratory pathogens were recovered from 361 (50.41%) samples. The most common respiratory pathogen was H. influenzae (26. 86%), followed by S. pneumoniae (21.16%). Moraxella catarrhalis accounted for 6.90%. Rate of isolation of Moraxella catarrhalis was higher in males than in females. Out of 25 isolates 16 were from males and 9 were from females. Frequency of isolation of Moraxella catarrhalis was more frequently seen in age group 61-70 years. It was most commonly recovered in winter. The most effective antibiotics were amoxicillin-clavulanate and ceftriaxone and least was ampicillin. **Conclusion:** Moraxella catarrhalis isolation from sputum especially in persons above 60 years of age and in the absence of other well established pathogens should not be disregarded as they can cause lower respiratory tract infection in these individuals.

Key words: Moraxella catarrhalis, lower respiratory tract infection, Nepal, Gram negative diplococci

Moraxella catarrhalis, formerly called *Neisseria catarrhalis* or *Branhamella catarrhalis* is a gram negative aerobic diplococcus frequently found as a commensal of the upper respiratory tract (1,2). Over the last 20 to 30 years, the bacterium has emerged as a genuine pathogen and is now considered an important cause of upper respiratory tract infection in otherwise healthy children and elderly people (3,4). More over, *Moraxella catarrhalis* is an important cause of lower respiratory tract infection, particularly in adults with chronic obstructive pulmonary disease, (COPD) (5). In immunocompromised host, the bacterium can cause a variety of severe infections including pneumonia, endocarditis, septicaemia, and meningitis (3,6). In addition, hospital outbreaks of respiratory disease due to *Moraxella catarrhalis* have been described (7,8), establishing the bacterium as a nosocomial pathogen. Because *Moraxella catarrhalis,* has long been considered a harmless commensal (1, 2, 3), relatively little is known about its pathogenic characteristics and virulence factors, although developments in the field of research have accelerated over the past 5 years.

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The emergence of *Moraxella catarrhalis* as a pathogen in the last decade, together, with increasing prevalence of β-lactamase producing strains, has renewed interest in these bacterial species (9). In the present study attempts have been made to determine rate of isolation of *Moraxella catarrhalis* in elderly patients (>55 years old) having lower respiratory tract infection (LRTI)

Material and methods

This is a prospective study conducted in the Department of Microbiology, Manipal Teaching Hospital, Pokhara Nepal from 1st may 2002 to 30th April 2003.

Inclusion criteria

- Patients above 55 years of age.
- Sputum samples showing predominantly gram-negative diplococci both intra and extracellular on gram stain.
- Heavy growth of *Moraxella catarrhalis* in culture in the absence of other respiratory pathogens including *Mycobacterium tuberculosis.*

Material

A total of 716 sputum samples were collected from patients attending the Manipal Teaching Hospital presenting with signs and symptoms of lower respiratory tract infection.

Methods

1. **Microscopy**
   Smears were prepared from the most purulent part of the sputum samples and stained with Gram stain. Number of pus cells, and epithelial cells, Gram's reaction, morphology and arrangement of the predominant organisms present were noted.

2. **Culture**
   Sputum samples were inoculated on blood agar and chocolate agar. The inoculated plates were incubated at 37^0C for 18 to 24 hours in candle jar containing 3-5% Co_2. Then the isolates in the primary plates were identified.

3. **Identification of isolates**
   i. The isolates were identified by various biochemical tests, which include catalase test, oxidase test, coagulase test, carbohydrate formentation test, Indole test, Methyl Red (MR) test, Voges Proskuer (VP) test, citrate utilization test, urease test, optochin sensitivity test, bile solubility test, nitrate reduction test, and satellism test.
   ii. The additional tests used for identification of *Moraxella Catarhalis* were their Gram stain morphology, oxidase test, catalase test, DNAase and Butyrate esterase production test as well as their inability to ferment sugars like glucose, maltose and sucrose

4. **Antibiotic susceptibility test**
   All the isolates of *Moraxella catarrhalis were* tested for antibiotic susceptibility by Kirby - Bauer disc diffusion method. Antibiotic discs were obtained from Hi-media. Mueller Hinton agar was used for susceptibility test. The result was interpreted as weather the organism was sensitive or intermediate or resistant to the antimicrobial agents.

Results

Out of the 716 samples, 355 (49.58%) grew normal commensals of the upper respiratory tract. Respiratory pathogens were recovered from 361 (50.41%) samples. The most common respiratory pathogen was *H. influenzae* (26. 86%), followed by *S. pneumoniae* (21.16%). *Moraxella catarrhalis* accounted for 6.90% of the total respiratory isolates.

Table 1: Profile of respiratory pathogens isolated

Pathogens	**No. of isolates**	**%**
H. influenzae	97	26.86
S. pneumoniae	78	21.16
H. parainfluenzae	31	8.58
K. pneumoniae	30	8.31
P. aeruginosa	27	7.47
M. catarrhalis	25	6.92
S.pneumoniae+H. influenzae	23	6.37
Acinetobacter species	14	3.87
Staph. aureus	5	1.38
Others	31	8.58
Total	**361**	**100.00**

Table 2. Sex wise distribution of patients with culture positive LRTI

Pathogen	Male	Female	Total
H. influenzae	47	50	97
S. pneumoniae	47	31	78
H. parainfluenzae	18	13	31
K. pneumoniae	19	11	30
p. aeruginosa	12	15	27
Moraxella catarrhalis	16	9	25
H.influenzae+S.pneumoniae	9	14	23
Acinetobacter species	9	5	14
S. aureus	3	2	5
Others	21	10	31
	201	**160**	**361**

Rate of isolation of *Moraxella catarrhalis* was higher in males than in females with male to female ratio of 1.78:1(fig 1). quency of isolation of *Moraxella catarrhalis* is more frequently seen in age group 61-70 years, followed by 71-80 years (Fig 2).

The recovery of *Moraxella Catarahlis* was highest in the month of January. There was a striking seasonal variation associated with the recovery of *Moraxella catarrhalis*. *Moraxella catarrhalis* was most commonly recovered in winter followed by autumn.

Out of 25 isolates, 24 (96%) were susceptible to both amoxycillin-clavulanate and ceftriaxone. Most strains were resistant to ampicillin (Table 3).

Table 3: Antibiotic susceptibility pattern of *Moraxella catarrhalis*

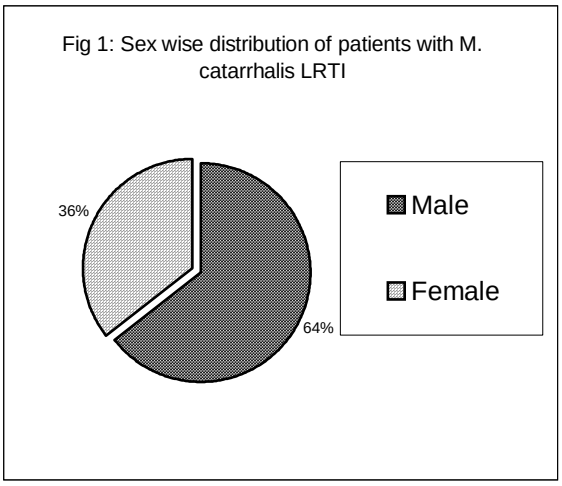
Antibiotics	Sensitive (%)	Resistant (%)	Total
Ampicillin (10mcg)	18 (72)	07 (28)	25
Ciprofloxacin (5mcg)	23 (92)	02 (08)	25
Amoxycillin-clavulanate (10/10mcg)	24 (96)	01 (04)	25
Cephalexin (30mcg)	19 (76)	06 (24)	25
Co-trimoxazole (1.25/23.75mcg)	19 (76)	06 (24)	25
Ceftriaxone (30mcg)	24 (96)	01 (04)	25

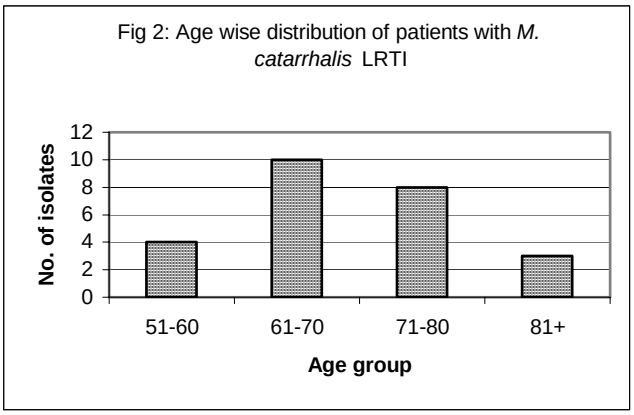
There was good correlation between isolation of *Moraxella catarrhalis* with clinical findings (table 4). Productive cough was present in 92% (23/25). A positive finding in chest x-ray was detected in 72% (18/25) of patients. Fever was present in 28% (7/25) of the patients. A significant proportion of patients had some underlying predisposing factors acting either in combination or alone (table 4). These factors included old age (>60 years old), chronic obstructive pulmonary disease, cardiac failure, and malignancy, in 88, 64, 32 and 12 percentages of patients respectively. Diabetes mellitus was present in 1 and malnutrition in 5 patients. Another important factor predisposing to *Moraxella catarrhalis* infection was smoking which was found in 88% of the patient in whom *Moraxella catarrhalis* was isolated.

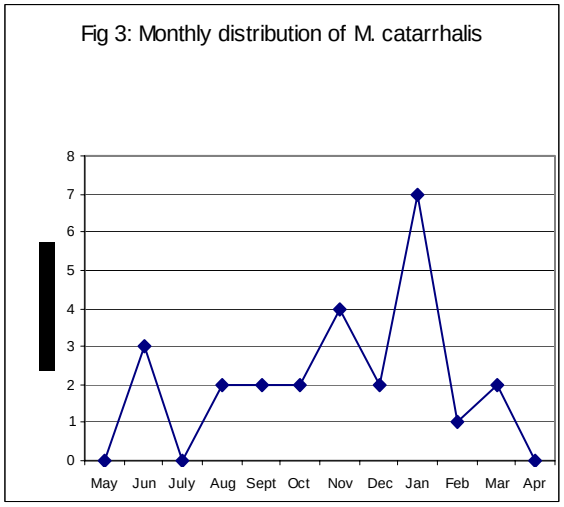
Table 4. Correlation of isolation of Moraxella catarrhalis with clinical findings

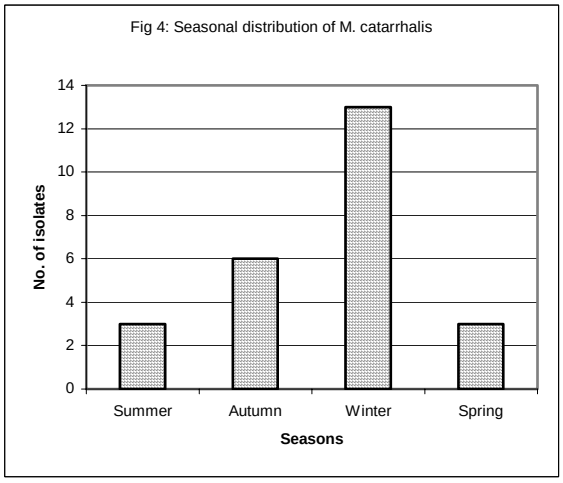
Clinical findings in patients (n=25)	Present (%)	Absent
Productive cough	23 (92)	02
Fever	07 (28)	18
H/O smoking	22 (88)	03
H/O alcohol consumption	12 (48)	13
Positive findings in chest x-ray	18 (72)	07
COPD	16 (64)	09
Cardiac failure	08 (32)	17
Diabetes mellitus	01 (04)	24
Malignancy	03 (12)	22
Neutropenia	00	25
Malnutrition	05 (20)	20
Old age (>60 years)	22 (88)	03
Positive response to antibiotics	23 (92)	02*

* One patient expired and in the other there was no clinical improvement









Discussion

Moraxella catarrhalis was the sixth most commonly isolated respiratory pathogen and it followed *H. influenzae*, *S. pneumoniae*, *K. pneumoniae*, and *P. aeruginosa.* It accounted for 6.92% (25 of 361) of all respiratory pathogens isolated during the study period. This finding is similar to that of Shimada et al (10) who had carried out study in Japan and found the isolation rate of *Moraxella catarrhalis* to be 4.25%.

Polard and colleagues (11), in 1986 also found the isolation rate of *Moraxella catarrhalis* to be 5.3%, which is more or less similar to our finding. Sarubbi et al, *in 1990* (12) *however, found the rate of isolation of Moraxella catarrhalis* to be much lower that is only 2.7%. On the other hand, Hager et al (13) in 1987 found rate of isolation of *Moraxella catarrhalis* in pure culture in 61% of cultures. This figure is much higher from that of the present study.

The male to female ratio was found to be 1.78:1 (table 2). Similar reports have been made by Ioannidis et al (14), in 1995. This is probably due to the habit of smoking, which is more common amongst the males.

The rate of isolation of *Moraxella catarrhalis* (table 4) was highest in 6th decade followed by 7th decade of life. The mean age of the patient with *Moraxella catarrhalis* lower respiratory tract infection was 70.52 years.

Hager et al (13) in 1987, in their literature review summarized the mean ages of the patient to be 64.8 years which is lower than that found in our study. The reasons for the highest recovery of the *Moraxella catarrhalis* in elderly persons may be decreased systemic immunity due to old age, decreased local immunity in the respiratory tract due to smoking, alcohol consumption, etc. and predisposing chronic airway diseases which is common in old age.

The recovery of *Moraxella catarrhalis* was found to be highest in the month of January (table 5).
This finding is similar to those obtained by Sarubbi et al (12) in 1990, who also found recovery of *Moraxella catarrhalis* to be high during the winter months. The high incidence of viral infections in autumn and winter may have a role to play in weakening the defense system of the respiratory tract there by predisposing to infection with low-grade pathogens like *Moraxella catarrhalis* during winter.

Jakubicz et al. in 1997 (15) also found the frequency of *Moraxella catarrhalis* higher in autumn- winter period than in summer.

Antibiotic susceptibility test revealed (table 3) that only 4% of *Moraxella catarrhalis* isolates were resistant to both amoxycillin- clavulanate and ceftriaxone. 8% of strains were resistant to ciprofloxacin. Resistance was encountered more frequently with ampicillin to which 28% of stains were resistant.

This data indicates that the antibiotic susceptibility of *Moraxella catarrhalis* is similar to other recent studies. Thornsberry et al (16) in 1996-1997 found that the most active for *Moraxella catarrhalis* were amoxycillin-clavulanate, ceftriaxone, and levofloxacin (100%) and the least active was ampicillin. Jakubicz et al in 1997 (15) reported ampicillin resistance in 66.7% strains of *Moraxella catarrhalis*, they however found all the strains to be sensitive to ofloxacin and amoxycillin-clavulanate.

Productive cough appeared to be the commonest complaint (table 4) with 92% of patients with *Moraxella catarrhalis* lower respiratory tract infection having this particular complaint. Fever was however not found to be a predominant feature. The production of purulent sputum has also been described by other workers to be characteristic feature of *Moraxella catarrhalis* lower respiratory tract infection (17).

The most important predisposing factors were old age (>60 years) and history of smoking followed by COPD and alcohol consumption.

Similar findings have been reported by Ioannidis et al (14) who in 1995 described the clinical spectrum of *Moraxella catarrhalis* bacteraemia in 58 patients. He however, found neutropenia and malignancy as commonest predisposing factors in contrast to our findings. In the present study neutropenia was found in none and malignancy was found in 12% (3 of 25) of the patients.

Conclusion

There have been many reports of *Moraxella Catarhalis* infection from the western countries; however, no such reports are made from Nepal and the other countries in the Indian sub-continent. These cases are probably not reported or isolation of *Moraxella catarrhalis* is overlooked as they are

considered to be normal commensals of the respiratory tract.

The findings of the present study however shows that *Moraxella catarrhalis* isolation from sputum especially in persons above 60 years of age and in the absence of other well established pathogens can not be disregarded as they can cause lower respiratory tract infection in these individuals. The emergence of drug resistance especially to beta-lactam antibiotic is another fact that needs to be addressed.

Moraxella catarrhalis used to be considered as emerging pathogen, now it had been established as a pathogen causing a variety of infections including lower respiratory tract infections. It should, therefore be borne in mind that isolation of this organism from clinical samples including sputum needs to be taken seriously.

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