

Prevalence and Drug Resistance Pattern of *Moraxella Catarrhalis* in Central Madhya Pradesh

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Abstract

Introduction: *Moraxella catarrhalis* is a gram negative, aerobic, oxidase positive diplococcus. It is frequently found as a commensal of the upper respiratory tract. In recent years *Moraxella* has gained importance as a pathogenic organism causing upper respiratory tract infections in apparently healthy children and in elderly population. The present prospective study was carried out in the microbiology department of our diagnostic centre with the aim of studying the prevalence of *Moraxella catarrhalis* in respiratory specimens and to study the antibiogram.

Materials and Methods: This was a prospective study carried out in Microbiology department of our diagnostic centre between July to December 2018. A total of 886 patients of both sexes registered for culture and sensitivity testing were included in the study. Samples were collected by following thorough aseptic techniques in sterile containers/swabs and were plated on 5% sheep blood agar and MacConkey agar and incubated at 37°C for 18-24 hours. Isolated organism was identified by Gram's stain and colony morphology and further by biochemical tests. Antibiotic sensitivity was done on Vitec II (Biomérieux)

Results: *Moraxella catarrhalis* was isolated in 16 out of 886 total specimens received for culture with an incidence of 1.81%. *Moraxella catarrhalis* was isolated in 7 sputum samples and in 9 (56.25%) throat swab specimens. Out of 108 sputum samples, no growth was observed in 66 (61.11%) patients and *Moraxella* was isolated in 7 (6.48%) cases. Out of 126 throat swab specimens, no growth was observed in 51.59% patients and *Moraxella* was isolated in 9 (7.14%) patients

Conclusion: Clinical interest in *M. catarrhalis* has gained momentum in recent years only, so the epidemiological data are lacking regarding the prevalence of *M. catarrhalis* infection. More studies with larger sample size are required to correctly assess the pathogenicity and resistance pattern of *M. catarrhalis*.

Keywords: *Moraxella*; Beta lactamase; Commensals; Upper respiratory tract.

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Introduction

Moraxella catarrhalis is a gram negative, aerobic, oxidase positive diplococcus. It was first described in 1896 as *Micrococcus catarrhalis*.¹ It was later

renamed as *Neisseria catarrhalis*. Later, in honour of Sara E. Branham, it was added to a new genus *Branhamella*.² It was in 1984 that *Branhamella catarrhalis* was reassigned to genus *Moraxella* and hence been called *Moraxella catarrhalis*.³ It

is frequently found as a commensal of the upper respiratory tract.^{4,5}

In recent years *Moraxella* has gained importance as a pathogenic organism causing upper respiratory tract infections in apparently healthy children and in elderly population.⁶⁻⁹ In immunocompromised patients, *Moraxella* is emerging as an important cause of lower respiratory tract infections, especially in patients having chronic obstructive pulmonary disease and can also cause empyema, severe pneumonia, endocarditis, otitis media, septicaemia and meningitis.^{10,11} It is also one of the leading causes of nosocomial respiratory infections.^{12,13} *M. catarrhalis* is known to produce Beta lactamase and therefore shows varying degrees of drug resistance.¹⁴ Increased incidence of isolation of *M. catarrhalis* in respiratory specimens and varying degrees of drug resistance has led to many studies about its prevalence and drug resistance pattern.

The present prospective study was carried out in the microbiology department of our diagnostic centre with the aim of studying the prevalence of *Moraxella catarrhalis* in respiratory specimens and to study the antibiogram.

Materials and Methods

This was a prospective study carried out in Microbiology department of our diagnostic centre between July to December 2018. A total of 886 patients of both sexes registered for culture and sensitivity testing were included in the study. The patients were divided into 0-20, 21-40, 41-60, 61-80 and more than 80 years age group in both the sexes. All clinical specimens including Sputum and throat swab were included in the study. Samples were collected by following thorough aseptic techniques in sterile containers/swabs and were plated on 5% sheep blood agar and Maconkey agar and incubated at 37°C for 18-24 hours. Isolated organism was identified by Gram's stain and colony morphology and further by biochemical

tests. Antibiotic sensitivity was done on Vitec II (Biomerieux).

The criteria for identification of *Moraxella catarrhalis* was -

Gram's stain: Gram negative, kidney shaped diplococcus

Colony morphology: grey white, hemispherical colonies about 1 mm in diameter, fragile and easy to crumble, with a waxy surface, lack of pigmentation of colony on blood agar and positive for Hockey puck test.

Biochemical tests: oxidase production, failure to produce acid from glucose, maltose, lactose, and sucrose, reduction of nitrate to nitrite.

Results

This was a prospective study carried out in Microbiology department of our diagnostic centre between July to December 2018. A total of 886 patients of both sexes registered for culture and sensitivity testing were included in the study. The patients were divided into 0-20, 21-40, 41-60, 61-80 and more than 80 years age group in both the sexes. Maximum patients 399 (45%) were in 21-40 years age group, followed by 192 (21.7%) in 0-20 years, 163 (18.4%) in 41-60 years, 117 (13.2%) in 61-80 years age group and 15 (1.7%) above 80 years of age. Out of 886 patients 459 (51.8%) were males and 427 (48.2%) were females with a male to female ratio of 1.07:1. (Table 1).

Moraxella catarrhalis was isolated in 16 out of 886 total specimens received for culture with an incidence of 1.81%. *Moraxella catarrhalis* was isolated in 7 sputum samples and in 9 (56.25%) throat swab specimens. Out of 108 sputum samples, no growth was observed in 66 (61.11%) patients and *Moraxella* was isolated in 7 (6.48%) cases. Out of 126 throat swab specimens, no growth was observed in 51.59% patients and *Moraxella* was isolated in 9 (7.14%) patients (Table 2).

Table 1: Demographic Data of Patients

S. No.	Age (years)	Male	%	Female	%	Total	%
1	0-20	117	25.5	75	17.6	192	21.7
2	21-40	174	37.9	225	52.7	399	45.0
3	41-60	84	18.3	79	18.5	163	18.4
4	61-80	78	17.0	39	9.1	117	13.2
5	>80	6	1.31	9	2.1	15	1.7
	Total	459	51.8	427	48.2	886	100

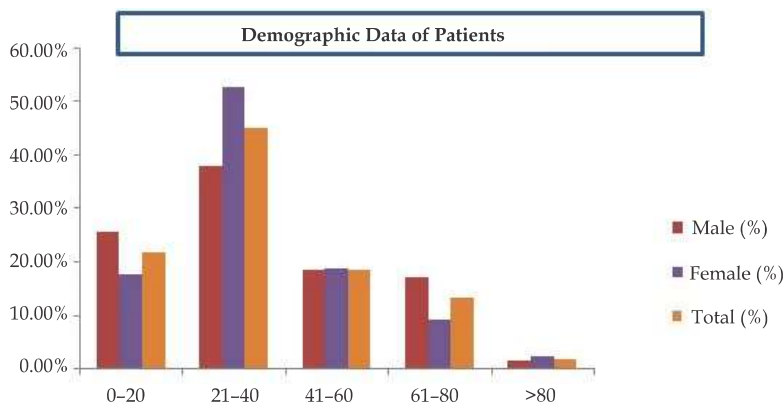


Fig. 1: Demographic Data of Patients

Table 2: Showing Incidence of Moraxella

Sr. No.	Specimen	Overall Total Patients	Overall % of Total Patients	No Growth		Moraxella	
				Total Patients	%	Total Patients	%
1	Sputum	108	12.19	66	61.11	7	6.48
2	Throat Swab	126	14.22	65	51.59	9	7.14
3	Other	652	73.59	336	51.53	0	0.00
Total		886	100	467	52.71	16	1.81

Out of 7 sputum samples in which Moraxella was isolated, one patient was below 20 years of age, 4 patients were in 41-60 years age group and two patients in 61-80 years age group. Out of these, 5(71.4%) were males and 2 (28.6%) were females. (Table 3)

Table 3: Age Wise Distribution of Moraxella Isolate in Sputum

S. No.	Age (years)	Sputum	
		Male	Female
1	0-20	0	1
2	21-40	0	0
3	41-60	3	1
4	61-80	2	0
5	>80	0	0
Total: 7 (43.75%)		5 (71.4%)	2 (28.6%)

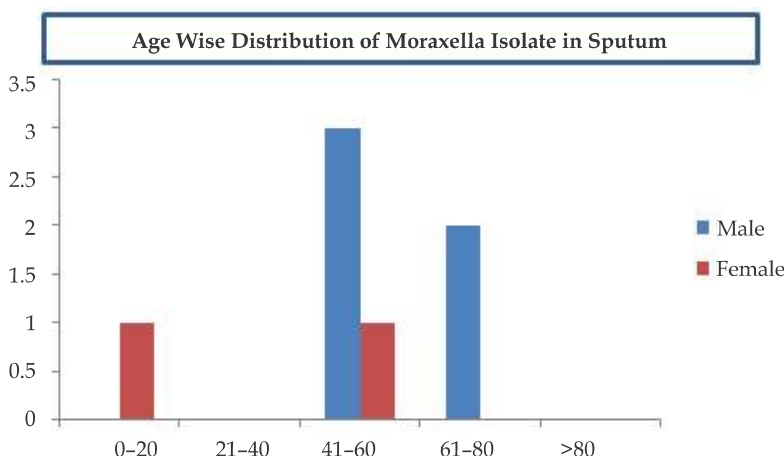


Fig. 2: Age Wise Distribution of Moraxella Isolate in Sputum

Of the 9 throat swab specimens in which Moraxella was isolated, 2 patients were below 20 years of age, 6 were in 21–40 years age group and only one in 61–80 years age group. Out of these 9 patients, 8 (88.8%) were males and 1 (11.2%) were females (Table 4).

Table 4: Age Wise Distribution of Moraxella Isolate in Throat Swab

Throat Swab			
S. No.	Age (years)	Male	Female
1	0 - 20	1	1
2	21 - 40	6	0
3	41 - 60	0	0
4	61 - 80	1	0
5	>80	0	0
Total: 9 (56.25%)		8 (88.8%)	1 (11.2%)

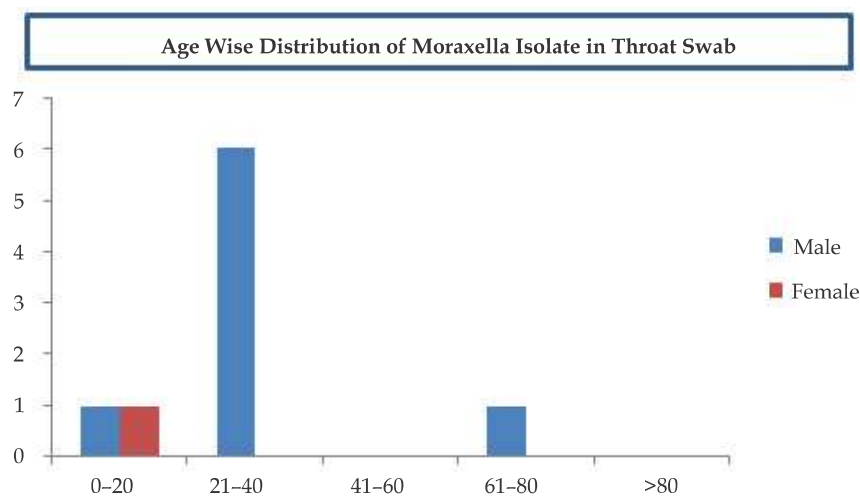


Fig. 3: Age Wise Distribution of Moraxella Isolate in Throat Swab

Out of the total 16 Moraxella isolates, 6 (37.5%) were in 21–40 years age group, followed by 4 (25%) in 61–80 years group and 3 each (18.75%) below 20 and above 80 years of age.

All the isolates were sensitive to piperacillin/

Tazobactam, ceftiaxone, cefoperazone/sulbactam, Cefipime, Imipenem, Meropenem, amikacin, Gentamicin, Tigecycline, colistin and Trimethoprim/sulfamethaxole, while showing resistance only to Ciprofloxacin (Table 5).

Table 5: MIC Value of Moraxella

Antimicrobial	MIC	Interpretation
Piperacillin/ Tazobactam	<= 4	Sensitive
Ceftriaxone	<= 1	Sensitive
Cefoperazone/ Sulbactam	<= 8	Sensitive
Cefepime	<= 1	Sensitive
Imipenem	<= 0.25	Sensitive
Meropenem	<= 0.25	Sensitive
Amikacin	<= 2	Sensitive
Gentamicin	<= 1	Sensitive
Ciprofloxacin	>2	Resistant
Tigecycline	<= 0.5	Sensitive
Colistin	<= 0.5	Sensitive
Trimethoprim/ Sulfamethoxazole	<= 20	Sensitive

Discussion

Respiratory tract infections are one of the leading causes of morbidity worldwide. *Moraxella catarrhalis* is a part of normal bacterial flora of the upper respiratory tract and its prevalence and colonization is dependent on age and immune status of the patient. Approximately 1% to 5% of the healthy adults carry *M. catarrhalis* in their respiratory tract. In infants, it normally colonises the nasopharynx.¹⁵ In the last two decades, however, *Moraxella* has proved to be pathogenic.¹⁶

In our study, the prevalence of *M. catarrhalis* infection was 1.81%. In a study done by S. Krishna *et al.*, rate of isolation of *M. catarrhalis* in patients with lower respiratory tract infections was 10.24%.¹⁷ Anita KB *et al.* in their study in 2011 demonstrated a 9.8% isolation rate.¹⁸ Tamang *et al.* in their study had an isolation rate of 6.9% for *M. catarrhalis*.¹⁹ In their study, the males outnumbered the females similar to the study by S. Krishna *et al.* In our study too, we observed a male preponderance with a male to female ratio of 2.16: 1 with 68.4% males and 31.6% females. Eltaib *et al.* in their study also found 63% males to be affected by *M. catarrhalis*.¹⁹ Naveen Gupta *et al.* also found a male preponderance in their study.⁽¹⁶⁾

In our study, 37.5% isolates were in 21–40 years of age followed by 25% in 61–80 years age. Anita K.B. *et al.* and Naveen Gupta *et al.* in their study found that most of their patients were above 50 years of age. It may be due to the fact that as age advances, the immunity decreases and many chronic diseases like Diabetes, hypertension affect the individuals. In the study by S. Krishna *et al.*, most of the isolates were resistant to Ampicillin and sensitive to Amoxicillin/clavulanic acid. Safia Badar *et al.* also observed similar findings in their study.²¹ Naveen *et al.* observed maximum susceptibility to Cefotaxime, tetracycline, ciprofloxacin, Amikacin and Gentamycin. In our study we demonstrated sensitivity to most of the antibiotics except ciprofloxacin. Tabassum *et al.* showed 75% sensitivity to macrolides (clarithromycin, erythromycin), and 95% sensitivity to quinolones (ciprofloxacin).²²

M. catarrhalis carriage rate in children has been observed to be as high as 75% in various studies while in healthy adults it is about 1%–3%. Nasopharyngeal carriage rates in winter and autumn are higher as compared to summer and spring.²³ *M. catarrhalis* is emerging as an important pathogen in recent years. Many factors such as mucociliary clearance, alveolar macrophage

activity, complement mediated killing of bacteria, local aerodynamics and surfactant activity are thought to play a major role in host defense against this organism.²⁴

Conclusion

Clinical interest in *M. catarrhalis* has gained momentum in recent years only, so the epidemiological data are lacking regarding the prevalence of *M. catarrhalis* infection. More studies with larger sample size are required to correctly assess the pathogenicity and resistance pattern of *M. catarrhalis*.

Conflict of Interest: None

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