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Original Article

Incidence and Antimicrobial Susceptibility of *Mycoplasma pneumoniae* in Saudi Arabia

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Mycoplasma pneumoniae is increasingly recognized as a common and an important pathogen in community-acquired respiratory tract infections (RTIs) and pneumonia, particularly in school-age children and young adults. To determine the incidence and antibiotic susceptibility of *M. pneumoniae* at the main hospitals in Riyadh, Saudi Arabia, we studied 552 respiratory samples from patients diagnosed with different clinical diagnosis. The isolation, identification, enumeration and antibiotic resistance test for *M. pneumoniae* were performed using Pneumofast kit. There were 194 patients (35.1%) with current *M. pneumoniae* infection, mostly among younger age groups, with pneumonia the most common underlying clinical condition. All tested isolates were susceptible to four antibiotics included in the Pneumofast kit, doxycycline, minocycline, ciprofloxacine and erythromycin. The findings suggest that *M. pneumonia* infection in Saudi Arabia is more common among younger age groups, and pneumonia is the most common underlying clinical condition among patients with *M. pneumoniae* infection, that cannot be distinguished from other respiratory infections on the basis of clinical and radiographic diagnosis alone.

Key Words: *Mycoplasma pneumoniae*, Incidence, Antibiotic susceptibility

INTRODUCTION

Mycoplasma pneumoniae belongs to the family of smallest living prokaryotes, which lacks a cell wall and has sterols in its cell membrane (1). *M. pneumoniae* is an important causative organism of respiratory infections in children and young adults. *M. pneumoniae* infections display a spectrum of symptoms and signs, ranging from asymptomatic infection to severe and potentially fatal pneumonia or extrapulmonary manifestations (2, 3). *M. pneumoniae* pneumonia has been reported in 10~40% of cases of community-acquired pneumonia and shows an even higher incidence during epidemics (2, 4). *M. pneumoniae* is a small bacterium that can be artificially cultured and is very sensitive to certain antibiotics in *in vitro* assays. The organism is fastidious and difficult to grow on cultures. Therefore, diagnosis of infections caused by this organism is usually confirmed with serological tests or polymerase chain reaction-gene amplification techniques (2). We have the facility to perform *Mycoplasma* culture in our college laboratory as a new kit. However, as published information concerning *M. pneumoniae* infections in Saudi Arabia is insufficient (5, 6), I wished to study the incidence and antibiotic susceptibility of culture proven infections caused by this organism at King Saud General Hospital in Saudi Arabia.

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MATERIALS AND METHODS

Study subjects

Five hundred fifty two respiratory specimens (sputum, nasopharyngeal aspiration, endotracheal secretion, and bronchoalveolar lavage) for *M. pneumoniae* culture were obtained from patients with respiratory tract infections seen as inpatients or in the outpatient or emergency departments, King Saud General Hospital, Saudi Arabia. Respiratory specimens were also Gram-stained and cultured for bacteria. Information collected included patient's data and clinical diagnosis. The study was approved by the local Research Ethics at King Saud General Hospital.

Microbiological method

For this study a commercial kit, Pneumofast (Elitech France SAS, Allee de Craponne, France), was used according to the manufacturer's instructions. The kit was used for isolation, identification, enumeration and resistance test of *M. pneumoniae*. The kit is for 8 specimens: one agar Petri dish and one PNEUMOFAST® tray for each specimen. A SP4 like agar base allows the isolation and the morphological identification of *Mycoplasma*. The PNEUMOFAST® tray allows the quantification, the identification in liquid medium using the susceptibility profile to 4 antibiotics (doxycycline, minocycline, ciprofloxacine and erythromycin).

Table 1. Baseline characteristics of 552 patients with respiratory symptoms tested for *M. Pneumoniae* culture

Characteristics	Frequency (%)
Sex	
Male	293 (53)
Female	259 (47)
Age groups (years)	
0~1	52 (9.4)
2~5	190 (34.4)
6~15	74 (13.4)
16~30	27 (4.8)
31~50	73 (13.2)
51~60	41 (7.3)
>61	97 (17.5)
Clinical diagnosis	
Pneumonia	273 (49.4)
Upper respiratory tract infection	112 (20.3)
Bronchitis	63 (11.5)
Suspected T.B	104 (18.8)
Positive *M. pneumoniae* Culture	194 (35.1)

RESULT

A total of 194 respiratory specimens from 552 patients were positive for *M. pneumoniae* over one year study period. The base line characteristics of the patients are summarized in Table 1. Of all specimens, 273 (49.4%) were associated with pneumonia, 112 (20.3%) with upper respiratory tract infections, 63 (11.3%) with bronchitis, and 104 (18.8%) were suspected tuberculosis.

M. pneumoniae isolated from 194 cases was subjected

Table 2. The incidence of culture-proven *M. pneumonia* infection in 194 Patients

Characteristics	Frequency of positive culture (%)
Sex	
Male	117 (60)
Female	77 (40)
Age groups (years)	
0~1	39 (22.1)
2~5	57 (29.4)
6~15	28 (14.4)
16~30	2 (1.0)
31~50	11 (5.7)
51~60	17 (8.8)
>61	40 (20.6)
Clinical diagnosis	
Pneumonia	82 (42.2)
Upper respiratory tract infection	63 (32.5)
Bronchitis	33 (17.0)
Suspected T.B	16 (8.3)

to *in vitro* antibiogram testing. The tested isolates were found to be susceptible to doxycycline, minocycline, ciprofloxacine and erythromycin which are included in the PNEUMOFAST® tray.

DISCUSSION

M. pneumoniae causes a wide spectrum of community-acquired respiratory infections, ranging from asymptomatic or mild upper respiratory tract infections to pneumonia. Although only 3~10% of cases infected with *M. pneumoniae* actually develop pneumonia, the organism is the most common cause of primary atypical pneumonia and accounts for approximately 20% of all pneumonia cases in the general population (7). In the USA, The annual incidence of *M. pneumoniae* infection has been estimated to be almost 12 cases per 1,000 inhabitants (8).

In the present study, of the 552 cases clinically diagnosed with upper and lower respiratory tract infections, *M. pneumoniae* was detected in 194 (35.1%), using a cultural method with a commercial kit, Pneumofast. Slightly lower detection rates have been reported by Gray *et al*. in Djibouti (31%) (9), Kleemola *et al*. (32.5%) in Finland (10), and by Chay *et al*. (33%) in Singapore (11). Also, much lower detection rate was reported by Foy (15%) in the USA (12). This variation in incidence may be explained by the difference in geographical or climatic factors. Lower incidence rates have generally been reported in tropical regions and during warmer months, and higher rates in temperate regions and during colder months, although there is not universal agreement on this (12, 13).

M. pneumoniae was found predominantly in children who were aged < 5 years. Similar findings have been reported from Scotland (14), the Philippines (15) and Hong Kong (16). In the present study, school age children showed the highest proportion of positive results (14.4% of all 6~15 years old) compared with 6.7% of all adults (16~50 years olds) and lower than 29.4% of older people (>50 years old). Our findings that schoolchildren and older people are the prevalent age groups of *M. pneumoniae* infection agree with reports in the USA in 1973 and 1979 by Foy *et al*. (12), in Sweden by Vikerfors *et al*. (17) and in Denmark by Lind and Bentzon (18). Schoolchildren is more likely to be exposed to *M. pneumoniae* during this period of their life because they spend much time in closed populations such as schools, universities and military camps.

In the present study, males (60%) had a higher rate of infection with *M. pneumoniae* than females (40%). Similar results have been reported by others (4, 5), although Foy (12) and Lind and Bentzon (18) suggest that mothers of schoolchildren are more likely to be at risk of *M. pneumoniae* infection because they are in closer contact with their infected children than fathers.

Pneumonia was the most frequent underlying clinical condition (42.2%) among the *M. pneumoniae* positive cases in this study. This was followed by upper respiratory tract infection, bronchitis and tuberculosis suspected patients.

The antibiotic susceptibility testing for *M. pneumoniae* is not routinely performed in clinical microbiology laboratories. It is usually carried out in larger institutions with special research interests, due to the difficulty in culturing the organism, its slow growth rate, and the lack of a standardized method for testing the susceptibility (19). In the present study, all the tested isolates were susceptible to doxycycline, minocycline, ciprofloxacine and erythromycin. Similar results have been obtained by others. Study by Kenny and Cartwright, the *in vitro* susceptibility of *M. pneumoniae* was tested against several new quinolones, tetracycline and erythromycin (20). The organism was found to be most susceptible to erythromycin, tetracycline, ofloxacin, ciprofloxacin, lomefloxacin and fleroxacin. In other study performed by Waites *et al*., erythromycin was found to be the most active antibiotic followed by clindamycin, tetracycline and ciprofloxacin (21).

As published information concerning *M. pneumoniae* infections in Saudi Arabia is insufficient, the present study is the first to document the incidence, clinical picture and antibiotic susceptibility of *M. pneumonia* among patients with respiratory tract infection in Saudi Arabia. The findings suggest that *M. pneumonia* infection in Saudi Arabia is more common among young age groups, and pneumonia is the most common underlying clinical condition among patients

with *M. pneumoniae* infection, that cannot be distinguished from other respiratory infections on the basis of clinical and radiographic diagnosis alone. Erythromycin remains the drug of choice in the treatment of *M. pneumoniae* infection.

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