Le Infezioni in Medicina, n. 1, 81-87, 2026
doi: 10.53854/liim-3401-8

Clinical characteristics of community acquired pneumonia due to *Mycoplasma pneumoniae*: experience from an outbreak

Aparna Anil Nair[1], Vettakara Kandy Muhammed Niyas[2], Rajalakshmi Ananthanarayanan[2], Shijukumar Chella Durai[3], Divakar Jose[3], Arjun Padmanabhan[1]

[1]Department of Respiratory Medicine, KIMSHEALTH, Thiruvananthapuram, Kerala, India;
[2]Department of Infectious Diseases, KIMSHEALTH, Thiruvananthapuram, Kerala, India;
[3]Department of Pediatrics, KIMSHEALTH, Thiruvananthapuram, Kerala, India.

Article received 16 October 2025 and accepted 15 January 2026

SUMMARY

Background: Mycoplasma pneumoniae is a major cause of Community-Acquired Pneumonia (CAP) but often remains underrecognized because it requires molecular or serologic testing for diagnosis. In late 2024, an increase in cases with poor response to macrolides was noted at a tertiary hospital in Thiruvananthapuram, Kerala. This study describes the clinical profile, treatment, and outcomes of patients affected during this outbreak.
Methods: This retrospective study included all patients admitted with *M. pneumoniae* pneumonia between January 2024 and August 2025. Diagnosis was confirmed by PCR or IgM serology. Clinical features, laboratory parameters, radiologic findings, treatment, and outcomes were collected from records and analyzed using Jamovi (version 2.6.45).
Results: A total of 124 patients were included; 79.8% were <18 years (median age 9 years, IQR 6–14). Diagnosis was PCR-based in 97.6%. Cough (97.6%) and fever (95.2%) were the most common symptoms. Nineteen patients (15.3%) required supplemental oxygen, three (2.4%) non-invasive ventilation, and five (4.0%) invasive mechanical ventilation. Pleural effusion was noted in 24.2%. Extrapulmonary complications were rare, including one case each of encephalitis and pericardial effusion. Definitive therapy included doxycycline in 76.6%, azithromycin in 17.7%, and levofloxacin in 3.2%. One-third of patients initially started on macrolides required a change to alternative agents. Corticosteroids were used in 18.5%, and 33.0% required ICU care. Three patients (2.4%) died, all with significant comorbidities.
Conclusions: During the 2024–2025 outbreak, *M. pneumoniae* caused predominantly paediatric CAP but occasionally severe disease requiring intensive care. The frequent need to switch from macrolides suggests emerging resistance. Early recognition and use of alternative agents such as doxycycline or fluoroquinolones may improve outcomes.

Keywords: Mycoplasma pneumoniae, community-acquired pneumonia, outbreak, macrolide resistance, doxycycline, Kerala.

INTRODUCTION

Mycoplasma pneumoniae is a major cause of community acquired pneumonia. It is however, a relatively underrecognized cause of pneumonia, as the organism fails to grow in conventional culture media and requires special media or molecular techniques for its identification. The disease has been known to cause seasonal outbreaks, affecting predominantly children and young adults [1–3]. While the majority of the infections are mild; the disease can be severe and even lead to fatalities at times. There are also concerns regarding the growing prevalence of macrolide resistance in *Mycoplasma pneumoniae* (Macrolide-Resistant *M. pneu-*

Corresponding author
Arjun Padmanabhan
E mail: drarjun.p@kimsglobal.com

moniae; MRMP). Macrolide resistance rates vary geographically, and it is estimated that resistance is highest in the Western Pacific region (53.4%), followed by the South-East Asian region (9.8%), the Americas (8.4%), and Europe (5.1%) [4].

In the later months of 2024, our institute, a tertiary care hospital in Thiruvananthapuram, Kerala, observed an unusual increase in cases of *M. pneumoniae* pneumonia. Clinicians also noted suboptimal clinical response to macrolide therapy. Similar trends were reported from other hospitals in the region [5]. These concerns regarding rising case numbers, severity of illness, and possible macrolide resistance prompted us to study the clinical profile and outcomes of patients affected during this outbreak.

METHODS

This retrospective study was conducted among patients admitted to KIMSHEALTH, Thiruvananthapuram. We reviewed all cases of *M. pneumoniae* infection admitted between January 2024 and August 2025.

Patients were included if they (i) presented with an acute respiratory illness, (ii) had radiological evidence of pneumonia defined as new infiltrates on chest radiograph, and (iii) had laboratory confirmation of *M. pneumoniae* infection. Confirmation was established by either Polymerase Chain Reaction (PCR) - performed as a standalone assay or through multiplex syndromic PCR panels (BioFire® FilmArray Respiratory Panel or Pneumonia Plus Panel) on respiratory samples - and/or by serological evidence of acute infection indicated by a positive *M. pneumoniae* IgM. Patients with coinfection due to another respiratory pathogen were excluded. Clinical features, laboratory parameters, radiological findings, treatment received, and patient outcomes were systematically recorded and analyzed. Patients were followed until hospital discharge or death. Data were analyzed using descriptive statistics by Jamovi, version 2.6.45. Continuous variables were summarized as median with interquartile range (IQR), and categorical variables were expressed as frequency and proportion (n, %).

RESULTS

A total of 124 patients with *Mycoplasma pneumoniae* infection were included in the study. The temporal distribution of cases is shown in *Figure 1*. The diagnosis was based on a PCR test in 121 patients (97.6%). The median age was 9 years (IQR 6–14). 99 patients (79.85%) were less than 18 years of age. The youngest patient was 3 years old, and the oldest was 84 years. The sex distribution was nearly equal, with 63 (50.8%) males and 61 (49.2%) females. Comorbid illnesses were infrequent. Diabetes mellitus was present in 7 patients (5.6%), hypertension in 6 (4.8%), chronic kidney disease in 1 (0.8%), chronic neurological or neuromuscular disease in 2 (1.6%), coronary artery disease in 2 (1.6%), and malignancy in 1 (0.8%) (*Table 1*).

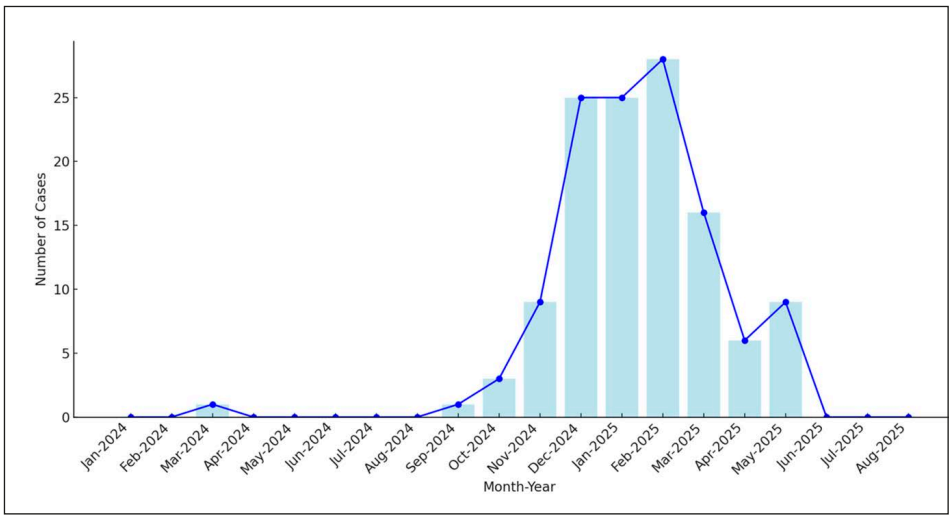

Figure 1
Monthly Distribution of *Mycoplasma pneumoniae* Cases (January 2024–August 2025).

Table 1 - Summary of Clinical and Laboratory Profile of Patients with *Mycoplasma pneumoniae* Infection. Data are presented as number (%) for categorical variables and as median (interquartile range) for continuous variables.

Parameter	*Value*
Demographics	Age: 9 (6–14) years Male: 63 (50.8%) Female: 61 (49.2%)
Comorbidities	Diabetes mellitus: 7 (5.6%) Hypertension: 6 (4.8%) CKD: 1 (0.8%) Neurological/Neuromuscular disease: 2 (1.6%) CAD: 2 (1.6%) Malignancy: 1 (0.8%)
Symptoms	Cough: 121 (97.6%) Fever: 118 (95.2%) Sputum: 90 (72.6%) Dyspnea: 73 (58.9%) Sore throat: 33 (26.6%) Headache: 18 (14.5%)
Pulmonary complications	Supplemental O2 requirement: 19 (15.3%) NIV requirement: 3 (2.4%) IMV requirement: 5 (4.0%) Pleural effusion: 30 (24.2%) Intercostal drainage: 5 (4.0%)
Extrapulmonary complications	Neurological: 1 (0.8 %) Pericardial effusion: 1 (0.8%) Hepatic enzyme elevation: 26 (21.0%)
Laboratory parameters (Median, IQR)	TLC: 8,700 (6,900–12,025)/µL ANC: 5,635 (4,393–8,825)/µL ALC: 1,900 (1,295–3,125)/µL Hemoglobin: 12.2 (11.2–13.1) g/dL Platelets: 284 (239–344) $\times 10^3$/µL CRP: 43.5 (21.0–90.7) mg/L Bilirubin: 0.3 (0.2–0.5) mg/dL AST: 31 (25–49) U/L ALT: 17 (12–34) U/L
Chest X-ray findings	Lobar consolidation: 56 (45.2%) Airspace opacities: 51 (41.1%) Segmental involvement: 12 (9.7%) Pleural effusion: 30 (24.2%)
Definitive therapy	Doxycycline: 95 (76.6%) Azithromycin: 22 (17.7%) Levofloxacin: 4 (3.2%) Levofloxacin + Doxycycline: 3 (2.4%)
Adjunctive Corticosteroids	23 (18.5%)
ICU admission	41 (33.0%)
Outcomes	Deaths: 3 (2.4 %) Lost to follow-up: 1 (0.8%) Discharged stable: 120 (96.7%)

Abbreviations: CKD, Chronic Kidney Disease; CAD, Coronary Artery Disease; NIV, non-invasive ventilation, IMV, invasive mechanical ventilation, TLC, Total Leukocyte Count; ANC, Absolute Neutrophil Count; ALC, Absolute Lymphocyte Count; CRP, C-Reactive Protein; AST, Aspartate Aminotransferase; ALT, Alanine Aminotransferase; ICU, Intensive Care Unit; IQR, Interquartile Range.

Cough was the most common presenting symptom, observed in 121 patients (97.6%), followed by fever in 118 (95.2%). Sputum production was reported in 90 patients (72.6%) and dyspnea in 73 (58.9%). Other symptoms included sore throat in 33 (26.6%) and headache in 18 (14.5%). 30 patients had pleural effusion and 5 needed intercostal drainage. The median peripheral oxygen saturation was 97% (IQR: 95 -98). Nineteen patients (15.3%) required supplemental oxygen, three (2.4%) required non-invasive ventilation, and five (4.0%) required invasive mechanical ventilation.

Extrapulmonary complications were uncommon in this cohort. Neurological involvement was noted in one patient, a 15-year-old girl diagnosed with *Mycoplasma* encephalitis. She developed altered behaviour three days after a febrile illness with respiratory symptoms. Her neurological status deteriorated, necessitating mechanical ventilation. MRI of the brain was normal. Cerebrospinal fluid (CSF) analysis revealed 17 lymphocytic cells with normal protein and glucose levels. *Mycoplasma pneumoniae* PCR was positive in both nasopharyngeal swab and CSF. She was treated with doxycycline and prednisolone, with gradual clinical improvement. Doxycycline was continued for 14 days, and corticosteroids were tapered over one month. Neuropsychiatric symptoms resolved slowly, and she remains under psychiatric follow-up.

One patient had pericardial effusion, which was mild and did not require any interventions. Mild hepatic enzyme elevation was observed in some patients (21%), none of them were clinically significant. No cases of clinically significant haemolytic anaemia, dermatological manifestations or myocarditis were noted. 8 patients had undergone the direct coombs test and 3 were positive, though the anaemia was not clinically significant.

The median Total Leukocyte Count (TLC) was

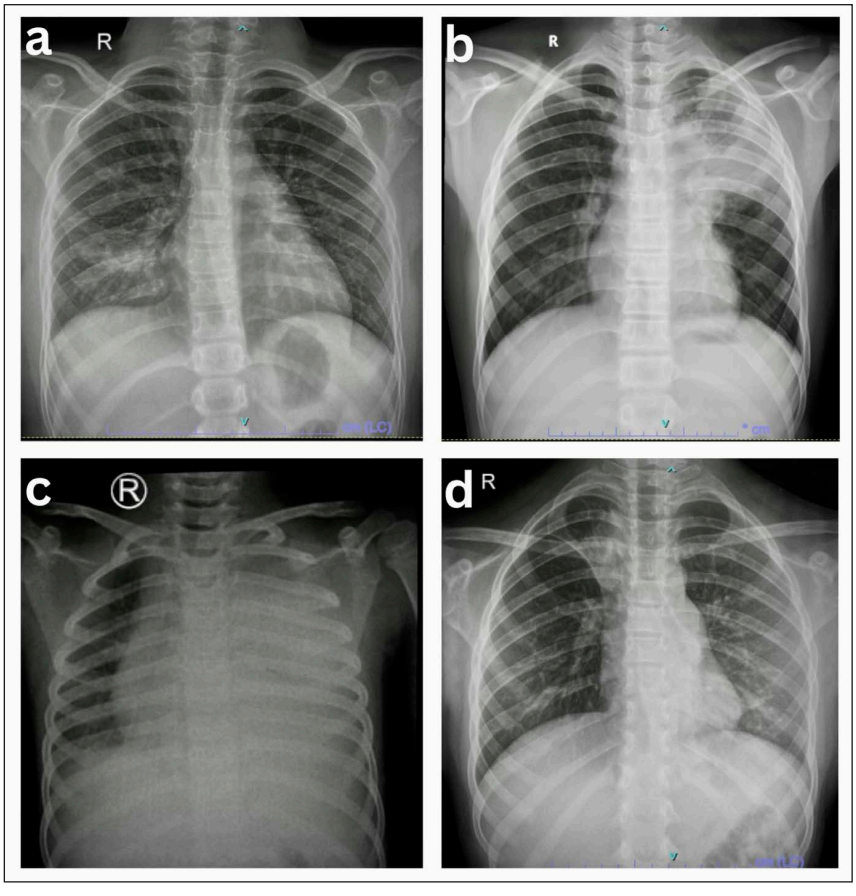

Figure 2
Chest X-ray patterns in patients with *Mycoplasma pneumoniae* infection: **a)** air space opacities in the right lower zone suggestive of bronchopneumonia; **b)** lobar consolidation left upper lobe; **c)** massive pleural effusion (left); **d)** collapse consolidation right upper lobe.

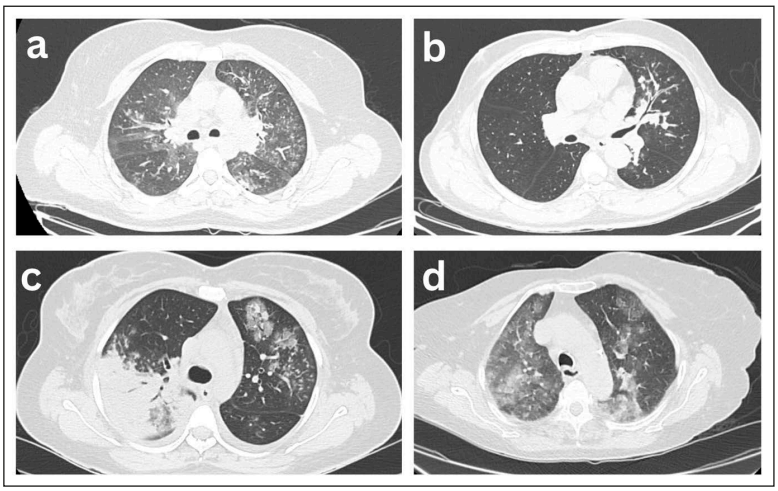

Figure 3
CT chest patterns in patients with *Mycoplasma pneumoniae* infection:
a) Ill-defined ground glass nodules forming a tree in bud pattern noted uniformly in bilateral upper lobes;
b) Segmental consolidation with air bronchogram and multiple peri bronchovascular nodules in left upper lobe;
c) Dense consolidation with adjacent tree in bud nodules in RUL posterior segment and GGO in Left UL;
d) GGO in Bilateral upper lobes suggestive of bronchopneumonia

8,700 cells/µL (IQR 6,900–12,025), with a median Absolute Neutrophil Count (ANC) of 5,635 cells/µL (IQR 4,393–8,825) and Absolute Lymphocyte Count (ALC) of 1,900 cells/µL (IQR 1,295–3,125). The median hemoglobin was 12.2 g/dL (IQR 11.2–13.1), and the median platelet count was 284 $\times 10^3$/µL (IQR 239–344). C-reactive protein (CRP) levels had a median of 43.5 mg/L (IQR 21.0–90.7). Median serum bilirubin was 0.3 mg/dL (IQR 0.2–0.5). Among liver enzymes, median AST was 31 U/L (IQR 25–49), and ALT was 17 U/L (IQR 12–34).
Chest X-rays demonstrated lobar consolidation in 56 (45.2%) and airspace opacities in 51 patients (41.1%). Segmental involvement was observed in 12 patients (9.7%). Pleural effusion was present in 30 patients (24.2%). Few representative x-rays are shown in *Figure 2*. Computed Tomography (CT) of the chest was available in 13 patients. Major abnormalities in CT scan included consolidation (12 patients), Ground Glass Opacities (GGO) (8 patients), pleural effusion (7 patients) and bronchiolitis (2 patients). CT patterns are shown in *Figure 3*.
Among the 124 patients, 88 (71.0%) received an antibiotic with potential activity against *Mycoplas-*

Table 2 - Clinical Characteristics of Patients with Fatal Outcomes due to *Mycoplasma pneumoniae* Infection.

Age/Sex	*Comorbidities*	*Clinical Details*	*Comments*
54/M	Non-resolving pneumonia, Possible organizing pneumonia, possible connective tissue disease (ANA RNP/Sm+), on steroids	Admitted with fever and purulent cough ×3 days, hypoxic and hypotensive at admission. CXR: bilateral extensive opacities. BAL PCR positive for *M. pneumoniae*; other tests negative.	Likely death from progression of underlying lung disease and sepsis; *M. pneumoniae* may have worsened illness.
56/F	CAD (TVD), PVD, Diabetes mellitus	Fever and cough ×6 days, intubated for respiratory failure. HRCT: bronchopneumonia. Improved with doxycycline + meropenem, extubated; later developed ACS and pulmonary edema.	Severe CAP due to *M. pneumoniae*; terminal event from ACS and pulmonary edema.
47/M	HOCM with severe LVOTO	Fever and cough ×6 days, later SOB and orthopnea. HRCT: patchy consolidation + GGOs. Intubated for hypoxia, developed shock and multiorgan failure.	Severe CAP due to *M. pneumoniae* triggered worsening of underlying disease → cardiogenic pulmonary edema.

Abbreviations: ANA – Antinuclear antibody, RNP – Ribonucleoprotein, Sm – Smith antigen, CXR – Chest X-ray, BAL – Bronchoalveolar lavage, PCR – Polymerase chain reaction, CAD – Coronary artery disease, TVD – Triple vessel disease, PVD – Peripheral vascular disease, ACS – Acute coronary syndrome, HRCT – High-resolution computed tomography, CAP – Community-acquired pneumonia, HOCM – Hypertrophic obstructive cardiomyopathy, LVOTO – Left ventricular outflow tract obstruction, SOB – Shortness of breath, GGO – Ground-glass opacity.

ma pneumoniae (macrolides, doxycycline, or respiratory fluoroquinolones) as part of their initial empiric therapy. Following confirmation of diagnosis, definitive therapy consisted of doxycycline in 95 patients (76.6%), azithromycin in 22 (17.7%), levofloxacin in 4 (3.2%), and a combination of levofloxacin with doxycycline in 3 (2.4%). Among the 33 patients who were initially started on a macrolide antibiotic, 11 required either the addition or substitution of an alternate agent (doxycycline or levofloxacin) due to inadequate clinical response, as decided by the treating physicians. Majority of the patients who did not respond to macrolides (82%) belonged to the paediatric age group and did not have any comorbidities. Adjunctive corticosteroids were used in 23 patients (18.5%). 41 patients (33.0%) required ICU admission. Of the cohort, three patients expired, one was lost to follow-up, and all remaining patients were discharged in stable condition. All three patients who died had significant comorbidities (*Table 2*), and *Mycoplasma pneumoniae* infection likely worsened the underlying illness, contributing to death.

DISCUSSION

Our study documents a community outbreak of *Mycoplasma pneumoniae* infection that started in the later months of 2024 and extended to early months of 2025, observed in a tertiary care hospital in southern India. A similar trend has been reported by hospitals from various Indian states [5, 6]. *M. pneumoniae* remains an underrecognized cause of community-acquired respiratory tract infections, mainly because the organism does not grow in conventional culture media and diagnosis relies on molecular methods, which are not routinely ordered in clinical practice. A study from New Delhi reported that Mycoplasma pneumoniae accounted for 5% cases of community acquired acute respiratory tract infections [7]. Other studies have reported a higher prevalence of *Mycoplasma pneumoniae* in community-acquired pneumonia, although many were limited by small sample sizes [6]. In our study, the majority of patients (79.8%) belonged to the paediatric age group. This is consistent with the known epidemiology of *Mycoplasma pneumoniae*, which primarily affects children. The lower incidence in adults is thought to be due to partial protection from humoral immunity acquired after prior infections. However, this immunity may wane over time, making reinfections possible in adulthood [8].

Chest X-ray findings in *Mycoplasma* pneumonia can be varied, and no single pattern is characteristic [7]. Though classically described as an atypical pneumonia, many patients can have lobar consolidations, as seen in our study. Pleural effusion was seen in 24.2% of cases, a rate similar to previous published studies [9, 10].

Our experience shows that *Mycoplasma pneumoniae* infection can present with severe disease, and not all patients conform to the typical "walking pneumonia" pattern. However, a higher proportion of patients due to severe disease in our cohort could be due to a referral bias, our centre being a tertiary care hospital. 15.3% required supplemental oxygen, 2.4% required non-invasive ventilation, and 4.0% required invasive mechanical ventilation.

Three patients in our cohort expired. While all three had significant comorbidities and the cause of death could have been exacerbation of their underlying cardiac/respiratory condition, we believe that Mycoplasma infection either triggered or exacerbated their decompensation.

The majority of our patients received doxycycline as definitive therapy. Among those initially started on a macrolide, 33% required a switch to alternative agents such as doxycycline, levofloxacin, or a combination of both due to poor clinical response. Similar findings have been reported from other centers. In a study from Kerala conducted during the same period, 40% of patients initiated on macrolides demonstrated inadequate clinical response, necessitating a change in therapy [5]. That study also identified a high prevalence of macrolide resistance, with the A2063G mutation in the 23S rRNA gene detected in 30.7% of samples tested by sequencing. In contrast, a 2023 study from Chennai did not detect macrolide resistance mutations (A2063G or A2064G) in *M. pneumoniae* isolates from children with community-acquired pneumonia [11].

Clinicians should remain vigilant for macrolide resistance when treating *M. pneumoniae*. Lack of response to macrolides should prompt consideration of doxycycline or levofloxacin. Concerns regarding their use in children are well recognized. While tetracyclines can cause permanent tooth discoloration, doxycycline is unlikely to do so and is considered safe for children of all ages when ad-

ministered for less than 21 days [12, 13]. Similarly, though quinolones are not recommended as first line agents in children due to risk of musculoskeletal toxicity, their use is justified when no other effective agent is available [14, 15].

CONCLUSIONS

Mycoplasma pneumoniae is an important cause of community-acquired pneumonia and can result in severe illness requiring intensive care, though most infections are mild. Our experience highlights the need for clinicians to remain alert to its potential severity and to recognize the growing challenge of macrolide resistance. Early consideration of alternative agents such as doxycycline or fluoroquinolones may be warranted in patients not responding to macrolide therapy. Strengthening diagnostic capacity and monitoring antimicrobial resistance are essential to improve outcomes in future outbreaks.

Funding
None

Conflicts of interest
None

Acknowledgements
We thank the Department of Microbiology, KIMSHEALTH, Thiruvananthapuram for their help in molecular diagnosis of *Mycoplasma pneumoniae* infections.

REFERENCES

[1] Kant R, Kumar N, Malik YS et al. Critical insights from recent outbreaks of Mycoplasma pneumoniae: decoding the challenges and effective interventions strategies. *Int J Infect Dis*. 2024; 147: 107200.
[2] Avolio M, Reffo I, Rigo S, et al. Back to normality? Respiratory viruses, Mycoplasma pneumoniae, Chlamydophila pneumoniae, and Bordetella pertussis trends: local epidemiological update after the COVID-19 storm. *Infez Med*. 2025; 33(3): 311-320.
[3] AlBahrani S, Al Otaibi TO, AlZahrani SJ, et al. Trend of *Mycoplasma pneumoniae* infections and hospital admissions post-COVID-19: single-center study 2023-2024. *IJID Reg.* 2025; 16: 100721.
[4] Kim K, Jung S, Kim M et al. Global trends in the proportion of macrolide-resistant Mycoplasma pneumoniae infections: a systematic review and meta-analysis. *JAMA Open.* 2022; 5(7): e2220949.
[5] Bhaskaran PN, Kumar A, Shashindran N, Menon VP. Macrolide resistance due to A2063G mutation in 23S rRNA gene of Mycoplasma pneumoniae, Kerala, India, 2024. *Indian J Pediatr*. 2025; 92(8): 872.
[6] Natarajan A, Ramalingam S, Ganapathy S, et al. Silent emergence of Mycoplasma pneumonia from 2022 to 2024. *Med India*. 2025; 4: 23-27.
[7] Sreenath K, Kabra SK, Dey AB et al. Mycoplasma pneumoniae among hospitalized patients with acute respiratory tract infections in an Indian tertiary care hospital: an underreported health problem. *Microbiol Spectr.* 2022; 10(4): e0158922.
[8] Kumar S. Mycoplasma pneumoniae: a significant but underrated pathogen in paediatric community-acquired lower respiratory tract infections. *Indian J Med Res.* 2018; 147(1): 23-31.
[9] Kutty PK, Jain S, Taylor TH, et al. Mycoplasma pneumoniae among children hospitalized with community-acquired pneumonia. *Clin Infect Dis.* 2019; 68(1): 5-12.
[10] Clyde WA. Clinical overview of typical Mycoplasma pneumoniae infections. *Clin Infect Dis.* 1993; 17 Suppl 1: S32-36.
[11] Perumal D, Heamchandsaravanan AR, Shanmugam K, et al. Detection of macrolide resistant mycoplasma pneumoniae in children with lower respiratory tract infection by sanger sequencing targeting domain v region of 23S rRNA Gene. *J Pure Appl Microbiol.* 2023; 7(1): 338-344.
[12] Cross R, Ling C, Day NPJ, McGready R, Paris DH. Revisiting doxycycline in pregnancy and early childhood: time to rebuild its reputation? *Expert Opin Drug Saf.* 2016; 15(3): 367-382.
[13] Pöyhönen H, Nurmi M, Peltola V, et al. T. Dental staining after doxycycline use in children. *J Antimicrob Chemother*. 2017; 72(10): 2887-2890.
[14] Burkhardt JE, Walterspiel JN, Schaad UB. Quinolone arthropathy in animals versus children. *Clin Infect Dis.* 1997; 25(5): 1196-204.
[15] Jackson MA, Schutze GE, Committee on Infectious Diseases. The use of systemic and topical fluoroquinolones. *Pediatrics.* 2016; 138(5): e20162706.