Letter to Editor

Challenges in Diagnosing Post-COVID Pneumonia in Kazakhstan – The Role of Point-of-Care Testing: A Letter to the Editor

Dear Editor

Community-acquired pneumonia (CAP) remains a major public health challenge worldwide.[1] Empirical antimicrobial therapy for CAP must balance broad-spectrum coverage with judicious use to address rising antibiotic resistance. Therefore, establishing microbiological epidemiology data is essential to propose the most appropriate treatment.

The coronavirus disease 2019 (COVID-19) pandemic has altered the etiology of adult lung injury, with a greater emphasis on viruses. However, its impact on the causative structure of CAP remains unclear.

We conducted a cross-sectional study from January to June 2024 in two multidisciplinary hospitals in Aktobe, Kazakhstan, to evaluate the etiology of CAP in the post-COVID period. This study was approved by the Local Ethical Committee of the West Kazakhstan Marat Ospanov Medical University (Approval no:1; dated 24.01.2023). Written informed consent was obtained from all patients. The study included 184 hospitalized adults diagnosed with CAP. Examination and treatment followed clinical practice and local guidelines. To determine the etiology of CAP, culture testing of lower respiratory tract samples (sputum) was performed, along with rapid urinary antigen tests for *Legionella* and *Streptococcus (S.) pneumoniae* (Vegal Pharmaceuticals, Spain). Polymerase Chain Reaction (PCR) testing for atypical pathogens (*Mycoplasmoides pneumoniae* and *Chlamydia (C.) pneumonia*) was conducted using the DT-95 DNA amplifier (DNA Technology, Russia). Additionally, immunochromatographic rapid tests for influenza A/B and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) antigen detection were performed using respiratory swabs (Rapid Bio, Russia). Immunochromatographic rapid tests were conducted for all patients; urinary antigen tests were performed in severe CAP cases, and sputum cultures or PCR testing were carried out for patients able to provide sputum samples. Key characteristics, comorbidities, and diagnostic method distribution are detailed in table 1.

Among 91 sputum samples collected for culture testing, 60 were excluded after bacterial microscopy and were not further cultivated. PCR testing was performed on 94 respiratory samples. An etiological diagnosis was established in 53 (28.8%) patients using at least one diagnostic method. Among 61 detected pathogens, the most prevalent were *M. pneumoniae* 21 (34.4%), *S. pneumoniae* 12 (19.7%),

Table 1: Baseline characteristics of patients with post-COVID pneumonia in Aktobe, Kazakhstan

Demographic characteristics		Value
	Age, years (median [IQR])	55 (35.5-69)
Sex (n, %)	Female	104 (56.5%)
	Male	80 (43.5)
Comorbidities (n, %)	Arterial hypertension	98 (53.3%)
	COPD	31 (16.8%)
	CHF	40 (21.7%)
	Anemia	38 (20.7%)
	Diabetes mellitus	28 (15.2%)
	Ischemic heart disease	30 (16.3%)
Diagnostic approaches (n, %)	Immunochromatographic rapid tests	184 (100%)
	PCR testing	92 (50%)
	Culture testing	91 (49.5%)
	Rapid urinary antigen tests	22 (12%)
Outcomes	Length of stay (days, median [IQR])	8 (7; 9)
	Hospital mortality (n, %)	8 (4.3%)

COPD: Chronic obstructive pulmonary disease; CHF: Chronic heart failure; PCR: Polymerase chain reaction

Klebsiella pneumoniae 7 (11.5%), *C. pneumoniae* 6 (9.8%), and *Moraxella catarrhalis* 6 (9.8%) cases (figure 1). Viruses were less common, with only 1 case of SARS-CoV-2 infection was identified. Co-infections were observed in 18.9% of patients with established etiological diagnoses, including the following combinations: *M.pneumoniae*+*S.pneumonia* (2 cases, 3.8%), *C.pneumoniae*+*S.pneumoniae* (2 cases, 3.8%), *C.pneumoniae*+*Haemophilus (H.) influenza* (2 cases, 3.8%), *M.pneumoniae*+*H. influenzae* (2 cases, 3.8%), *M.pneumoniae*+*M.catarrhalis* (1 case, 1.9%), and *M.pneumoniae*+SARS-CoV-2 (1 case, 1.9%).

To our knowledge, this is the first post-COVID-19 study in Kazakhstan to examine CAP etiology in hospitalized adults, using comprehensive PCR and point-of-care (POC) testing.

In the pre-antibiotic era, pneumococcus caused 90-95% of pneumonia cases. However, its prevalence has significantly declined due to widespread pneumococcal vaccination, reduced smoking, early empiric antibiotic use, and improved PCR diagnostics which enabled better detection of atypical and viral pathogens.[2]

Large pre-pandemic studies indicated viral pathogens were more prevalent than bacterial causes in pneumonia cases.[3] However, the findings of the present study indicated only one case of SARS-CoV-2, and no influenza A and B viruses were detected.

The prevalence of atypical pathogens such as *M. pneumoniae* over pneumococcus might stem from poor sputum quality, underestimating pneumococcal pneumonia. Conventional culture, the gold standard for bacterial detection in CAP, has limited sensitivity and serotype identification, especially in adults.[4] Additionally, antibiotic pretreatment further diminishes bacterial culture sensitivity. In the present study, one-third of pneumococcal cases were detected using rapid urinary antigen tests, which were not affected by previous antibiotic use, and thus provide a reliable detection method despite prior therapy. The patient population indicated frequent hospitalization of patients with mild pneumonia who could have been managed outpatient. This hospitalization pattern might also influence the CAP etiology. Notably, we detected a predominance of *M. pneumoniae* infections, consistent with its known epidemiological pattern of regional outbreaks occurring every 3-7 years and lasting 1-2 years. This finding was consistent with other post-pandemic reports of increased *M. pneumoniae* detection in adults.[5]

In conclusion, the etiology of CAP in adults in our region appeared unchanged from the pre-COVID era. Given the frequent detection of hard-to-culture bacteria, broader PCR use in clinical practice is recommended. An important consideration was that many pneumonia patients either could not produce sputum or provided poor-quality samples, which significantly compromised microscopy-based diagnostic pathways.

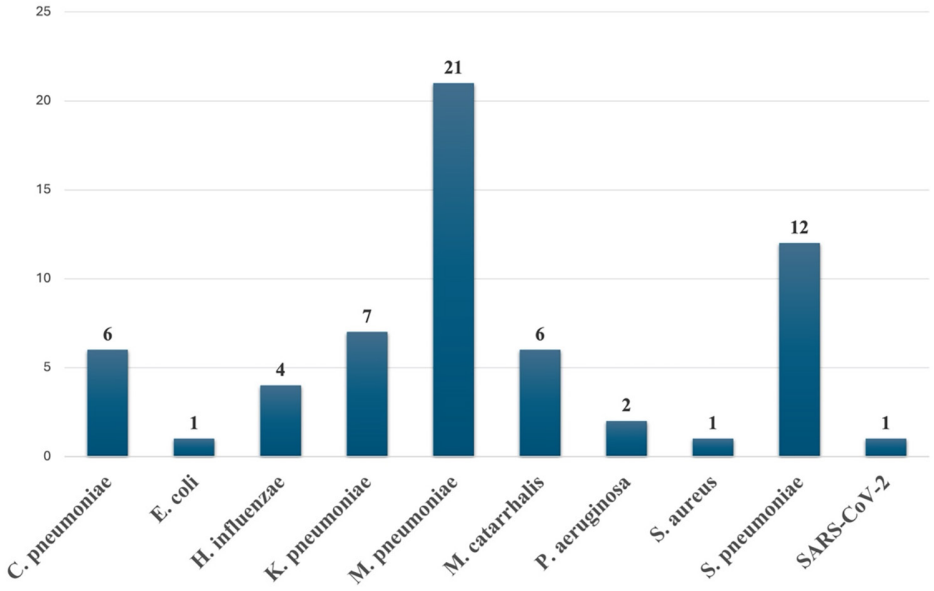

Figure 1: The bar chart illustrates the frequency of different pathogens in patients with community-acquired pneumonia in Aktobe, Kazakhstan.

To address this limitation, broader implementation of POC testing should be prioritized. These rapid diagnostic tools enable reliable CAP etiology determination even when traditional culture-based methods are precluded by insufficient or poor-quality biological specimens.

Authors' Contribution

N.A: Conceptualization, formal analysis, investigation, methodology, writing original draft; S.R: Conceptualization, formal analysis, investigation, methodology, supervision, reviewing and editing; G.S: Supervision, reviewing and editing; A.M, S.S, D.S, S.K, H.R: Data curation, reviewing and editing. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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