



Etiology of Severe Acute Respiratory Infections in ICU-Admitted Patients During the COVID-19 Pandemic in Iran: A Single Center Study

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Abstract

Background: Acute respiratory infections (ARI) caused by a wide range of etiologies represent a significant public health challenge worldwide.

Objectives: In this study, we aimed to evaluate the characteristics of ARI caused by various respiratory pathogens among patients admitted to intensive care units (ICUs) in a referral hospital in Iran during the first four waves of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic.

Methods: A total of 395 patients with ARI were enrolled, all hospitalized in the ICUs of Nemazi Teaching Hospital, affiliated with Shiraz University of Medical Sciences in Shiraz, Iran, over a 13-month period from April 2020 to June 2021. Real-time polymerase chain reaction (RT-PCR) assays were used to detect SARS-CoV-2, influenza viruses, respiratory syncytial virus (RSV), *Mycoplasma*, and *Chlamydia* in nasopharyngeal fluid (NPS) samples. The demographic and clinical data, including underlying diseases, were also considered.

Results: Of the 395 patients, 209 (53.7%) were male, and the mean age was 32 ± 27 years. An etiology was detected in 63 (16%) patients, with 53 testing positive for SARS-CoV-2 and 5 each for *Chlamydia* and *Mycoplasma*. No RSV or influenza infections were detected. The highest rate of COVID-19 was observed among adults aged 36 to 65 years (5.31%), while the lowest rate was in children under 5 years old (0.3%). Shortness of breath was the most common symptom in SARS-CoV-2-infected patients (P -value ≤ 0.001). Of the total patients, 146 (37%) had at least one underlying disease, with diabetes being the most common (8.1%).

Conclusions: The absence of RSV and influenza infections, along with a notable number of *Chlamydia* and *Mycoplasma* infections during the first four waves of the SARS-CoV-2 pandemic, emphasizes the importance of continuous surveillance of the etiologies of ARI during respiratory pandemics. This information is critical for guiding appropriate infection control measures and selecting empirical antibiotic regimens.

Keywords: ARIs, Viral Respiratory Infections, Bacterial Respiratory Infections, ICU-Admitted Patients

1. Background

Globally, acute respiratory diseases are the most frequent illnesses across all age groups. Typically, these diseases are confined to the upper airways and are self-limiting; however, a small percentage of cases may progress to lower respiratory tract infections (LRTIs) such as bronchiolitis and pneumonia. Pneumonia, consistently ranking among the most severe conditions causing illness and death worldwide, is characterized as an acute inflammation of the lung parenchyma and is caused by numerous microorganisms, including

bacteria, viruses, and fungi (1, 2). Bacterial pathogens such as *Streptococcus pneumoniae* and *Hemophilus influenzae*, along with viral agents like respiratory syncytial virus (RSV) and influenza virus, are major contributors to pneumonia. Fortunately, vaccines are available and effective against the two bacteria and the influenza virus (3).

Clinicians treating patients with acute respiratory infections (ARI) in various hospital settings must be aware of the most common pathogens responsible for ARIs and their association with severe disease presentations to ensure appropriate patient

significant difference in clinical symptoms was observed between confirmed cases of bacterial and viral infections in patients with ARI.

Our study had several important limitations. The sample size was limited, and all samples were baseline, without follow-up data. Lower respiratory infections encompass various diseases caused by a wide range of pathogens, which may exhibit different spatiotemporal patterns. This study assessed a restricted number of infectious agents.

5.1. Conclusions

During the COVID-19 pandemic, this study emphasized the importance of accurate identification and diagnosis of respiratory illnesses in ICUs. Our findings indicated that SARS-CoV-2 was the dominant viral infection among ICU patients, with no non-COVID viral infections such as influenza or RSV detected during the study period. However, treatable bacterial infections, including *Chlamydia* and *Mycoplasma*, were identified in ICU patients.

This research contributes to a better understanding of the ecology of viral infections during the COVID-19 pandemic and the interplay between viral and bacterial infections in ICUs.

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Footnotes

Authors' Contribution: Gh. R. P. and M. Z.: Conceptualized and designed the study; M. J. and M. E.: Collected the data, drafted and revised the manuscript; N. H.: Performed the molecular tests; M. N. and N. A.: Initially analyzed and interpreted the data; M. J. and Gh. R. P.: Critically reviewed and revised the manuscript and all authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work in ensuring that the questions related to the accuracy or integrity of any parts of the work will be appropriately investigated and resolved.

Conflict of Interests Statement: The authors declare no competing interests.

Data Availability: The data that support the findings of this study are available on request from the

corresponding author.

Ethical Approval: The study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences. It adhered to the ethical principles and national norms and standards for conducting medical research in Iran, with the approval code IR.SUMS.REC.1400.268.

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