ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 05 | May - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

THE UNRELENTING CHALLENGE OF VENTILATOR- ASSOCIATED PNEUMONIA IN ICU SETTINGS

Anaesthesiology

Dr Tulika Singh Associate Consultant, Ford Hospital And Research Center, Patna

Dr Gopi Kumhar Associate Professor, Department Of Anaesthesia, NMC And Research Centre, Kanpur.

ABSTRACT

Background: Ventilator-associated pneumonia (VAP) is one of the most common and serious infections among critically ill patients receiving mechanical ventilation. It significantly increases ICU morbidity, mortality, and length of hospital stay, posing ongoing challenges in clinical practice. **Aims And Objectives:** To determine the incidence, risk factors, causative organisms, antibiotic sensitivity patterns, and clinical outcomes associated with VAP in ICU patients. **Method:** This retrospective observational study was conducted on a total number of 200 mechanically ventilated patients, intubated for more than 48 hours. VAP diagnosis was based on CDC/NHSN guidelines. Patient data including demographics, clinicalrisk factors, microbiological profiles, and outcomes were analyzed using descriptive statistics. **Results:** The incidence of VAP was 19% (38 out of 200 patients). The most common risk factors identified were prolonged ventilation (>7 days), supine positioning, reintubation, and prolonged sedation. Klebsiella pneumoniae (34%) and Acinetobacter baumannii (29%) were the predominant pathogens, exhibiting high rates of multidrug resistance. The average ICU stay in VAP patients was 17.5 ± 5.3 days compared to 10.3 ± 3.8 days in non-VAP cases. ICU mortality among VAP patients was 34.2%. **Conclusion:** VAP remains a persistent threat in ICU settings, contributing to increased mortality and prolonged ICU stays. Targeted infection control measures, timely microbiological surveillance, and strict adherence to ventilator bundles are essential to mitigate this ongoing challenge

KEYWORDS

VAP, ICU, Antibiotic- Resistance, Mechanical Ventilation, Multidrug Resistant

INTRODUCTION

Ventilator-associated pneumonia is defined as pneumonia occurring more than 48 hours after endotracheal intubation. It accounts for up to 25% of all ICU infections and is associated with increased duration of mechanical ventilation, ICU stay, and healthcare costs. The multifactorial etiology and complex interplay of host factors, microbial resistance, and environmental conditions make prevention and management of VAP a clinical challenge.

Objectives

1. To determine the incidence of VAP in ICU patients on mechanical ventilation.
2. To identify the common pathogens and antibiotic sensitivity patterns.
3. To assess clinical outcomes including ICU mortality, length of stay, and duration of ventilation.

MATERIALS AND METHODS

Study Design: Retrospective observational study.
Sample Size: 200 mechanically ventilated patients.

Inclusion Criteria: Patients intubated for more than 48 hours.

Exclusion Criteria: Pre-existing pneumonia, immunocompromised status, or incomplete records.

Diagnostic Criteria: CDC/NHSN guidelines for VAP were followed (new infiltrates on chest imaging, fever, purulent secretions, leukocytosis, positive culture).

RESULTS

Out of 200 mechanically ventilated patients, 38 (19%) developed ventilator- associated pneumonia (VAP). The mean age of VAP patients was 56.7 ± 14.5 years, with a male predominance (male:female ratio = 1.8:1).
Risk factors significantly associated with VAP included: Prolonged mechanical ventilation (>7 days) – 76% Supine positioning – 58%
Reintubation – 21%
Sedation lasting >3 days – 65%
Microbiological Profile:
Klebsiella pneumoniae – 34% (ESBL-producing, sensitive to colistin)
Acinetobacter baumannii – 29% (MDR, sensitive to tigecycline)
Pseudomonas aeruginosa – 18% MRSA – 13%
Mixed flora – 6%

Clinical Outcomes:
Mean ICU stay in VAP patients: 17.5 ± 1.0 days Mean ICU stay in non-VAP patients: 10.3 ± 0.3 days ICU mortality among VAP patients: 34.2%
Duration of mechanical ventilation (VAP): 13.8 ± 4.6 days

An independent t-test showed a statistically significant difference in ICU stay between VAP and non-VAP patients ($t = 37.48$, $p < 0.00001$). The mean difference in ICU stay was 7.29 days, with a 95% confidence interval of 6.91 to 7.67 days, indicating a clinically significant increase in ICU burden among VAP patients

DISCUSSION

This study highlights the persistent burden of ventilator-associated pneumonia (VAP) in ICU settings, with an incidence of 19%, which is consistent with previously reported rates ranging from 10–25% in developing nations. The high incidence underlines the need for aggressive prevention and surveillance protocols.

Risk factors identified in this study—such as prolonged mechanical ventilation, supine positioning, reintubation, and extended sedation—are well-documented contributors to VAP. These findings reinforce the importance of adhering to ventilator care bundles and early weaning protocols.

The microbiological profile observed was dominated by multidrug-resistant (MDR) Gram-negative organisms, particularly Klebsiella pneumoniae and Acinetobacter baumannii. These pathogens are known for their resistance to broad-spectrum antibiotics, complicating management and contributing to higher morbidity and mortality. The emergence of MDR organisms underscores the urgency of robust antimicrobial stewardship and institutional antibiograms to guide empirical therapy.

The clinical impact of VAP in our cohort was substantial. VAP patients had a significantly prolonged ICU stay (17.5 vs. 10.3 days, $p < 0.00001$), which reflects increased resource utilization. The mean difference of 7.29 days with a 95% CI of6.91 to 7.67 days is both statistically and clinically significant. Furthermore, the mortality rate of 34.2% among VAP patients emphasizes the seriousness of this complication.

Overall, our findings align with global data, reaffirming that VAP continues to be a critical challenge in ICU care. A multidimensional strategy involving strict adherence to preventive protocols, regular microbiological monitoring, and judicious antibiotic use is essential to reduce the VAP burden

CONCLUSION

VAP continues to be a formidable challenge in ICU management due to its high incidence, complex risk profile, and association with resistant pathogens. Early diagnosis, preventive strategies, and targeted antimicrobial therapy are essential to improve patient outcomes

Funding – No source of funding
Conflict Of Interest – None declared
Ethical Approval – The study was approved by the ethics committee

REFERENCES

1. Chastre J, Fagon JY. Ventilator-associated pneumonia. Am J Respir Crit Care Med. 2002;165(7):867-903.
2. Kalil AC, Metersky ML, Klompas M, et al. Management of adults with hospital-acquired and ventilator-associated pneumonia: 2016 clinical practice guidelines by the IDSA and ATS. Clin Infect Dis. 2016;63(5):e61-e111.
3. Kollef MH. Prevention of hospital-associated pneumonia and ventilator-associated pneumonia. Crit Care Med. 2004;32(6):1396-405.
4. Hunter JD. Ventilator associated pneumonia. BMJ. 2012;344:e3325.
5. Gupta A, Agrawal A, Singh A, et al. Incidence, risk factors and microbiological profile of ventilator-associated pneumonia in a tertiary care intensive care unit. Indian J Crit Care Med. 2011;15(2):96–101.
6. Khilnani GC, Zirpe K, Hadda V, et al. Guidelines for antibiotic prescription in intensive care unit. Indian J Crit Care Med. 2019;23(Suppl 1):S1–S63.
7. Rosenthal VD, Bijie H, Maki DG, et al. International Nosocomial Infection Control Consortium (INICC) report, data summary of 36 countries, for 2004–2009. Am J Infect Control. 2012;40(5):396–407
8. Kollef MH, Chastre J, Fagon JY, et al. Global prospective epidemiologic and surveillance study of ventilator-associated pneumonia. Chest. 2014;146(3):949–58.
9. Craven DE, Hudcova J, Lei Y. Diagnosis, prevention, and treatment of ventilator-associated pneumonia. Clin Chest Med. 2008;29(3):633–52.
10. Damas P, Frippiat F, Ancion A, et al. Prevention of ventilator-associated pneumonia and its impact on the incidence of ICU-acquired infection. Crit Care Med. 2015;43(1):22–30