

Prevalence of Methicillin – Resistant Staphylococcus Aureus in Tertiary Care Hospital

Nidhi Nandan¹, Kumari Simpi Rani², Nushrat Jahan³, Sarita Kumari⁴¹Tutor, Department of Microbiology, Nalanda Medical College Hospital Patna, Bihar, India²Tutor, Department of Microbiology, Nalanda Medical College Hospital Patna, Bihar, India³Tutor, Department of Microbiology, Nalanda Medical College Hospital Patna, Bihar, India⁴Tutor, Department of Microbiology, Nalanda Medical College Hospital Patna, Bihar, India

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Corresponding author: Dr. Sarita Kumari

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Abstract:

Background: Methicillin-Resistant Staphylococcus Aureus (MRSA) negatively impacts patient outcomes, making it a significant problem in healthcare facilities such as tertiary care hospitals. For efficient infection prevention measures and patient care, knowing the MRSA infection rate in these facilities is essential.

Objectives: This investigation aims to determine the prevalence of MRSA infections at a Tertiary medical centre. To find out the prevalence of MRSA for 200 admitted patients, the rate at which healthcare workers are colonised with MRSA, threat risk factors related to MRSA acquisition, the antimicrobial susceptibility patterns of MRSA isolates, and the clinical results of patients with MRSA infections.

Methods: For this investigation, a cross-sectional study was used. To compile the data, medical records, samples from patients, and test results were analysed. Gender, age, clinical history, use of antibiotics, and other relevant factors were investigated. The research population consisted of 200 patients and hospital workers from various departments.

Results: Around 40 person 20% of the 200 hospitalised patients were found to be colonised or infected with MRSA. 10% of the medical staff had MRSA in their colonisation. Prior hospitalisation (45% of MRSA-positive patients), invasive operations (60%) and extended antibiotic use (35% of MRSA-positive patients) were all associated with the risk for MRSA acquisition. Antimicrobial susceptibility testing revealed that 70% of MRSA isolates resisted at least two cycles of treatments. An analysis of medical outcomes revealed that people infected with MRSA had longer hospital stay and a higher incidence of complications when compared to those without MRSA.

Conclusion: Colonisation and infestation with MRSA are prevalent among tertiary care hospital admissions, according to the findings of this study. MRSA has been shown to colonise healthcare professionals in addition to patients, emphasising the need for strict observance of infection control protocols. Recent hospitalisation, invasive surgical procedures, and prolonged use of antibiotics all increase the possibility of contracting MRSA. Antimicrobial resistance is prevalent among MRSA isolates; therefore, it is crucial to select antibiotics with care. This study highlights the significance of surveillance, hand hygiene, and effective antibiotic use in preventing the spread of MRSA and improving patient outcomes in tertiary hospitals.

Keywords: Antimicrobial Susceptibility, Clinical Outcomes, Colonization, Infection, Methicillin-Resistant Staphylococcus Aureus (MRSA), Prevalence, Risk Factors, Tertiary Care Hospital.

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Introduction

Due to its association with antibiotic resistance and impact on patient outcomes, the prevalence of MRSA in healthcare settings is a significant cause for concern. MRSA is a strain of Staphylococcus Aureus that has acquired resistance to methicillin and other beta-lactam antibiotics.

Infections caused by MRSA are challenging to treat due to this resistance, which increases the risk of symptoms and the cost of medical care [1]. Antimicrobial resistance is a global health

issue because it diminishes the effectiveness of antibiotics and affects the treatment of once-easily-managed diseases.

The rapid global spread of MRSA as a significant cause of healthcare-associated illnesses is one of the most prominent examples of this problem [2]. Due to high patient density, frequent invasive treatments, and lengthy hospital stays, healthcare facilities, particularly tertiary care institutions, serve as reservoirs for MRSA transmission.



Figure 1: MRSA Infection in patients (source: [3])

Geographic variation exists in the prevalence of MRSA infections in hospitals, but academic medical centres tend to have the greatest rates. Tertiary hospitals provide patients with complicated medical needs or who are critically suffering with highly specialized care. Technical areas, such as intensive care units and surgical wards, pose the greatest threat of MRSA infection in these facilities.

Serious problems include bloodstream infections, pneumonia, infections at surgical sites, and urinary tract infections can all arise from MRSA infections in tertiary care settings [4]. These disorders are associated with increased hospitalisation times, medical costs, and mortality rates for patients. In order to improve patient outcomes and implement effective infection control measures, knowing how common MRSA is in tertiary institutions is essential [5].

This research aims to assess the prevalence of MRSA within a specific tertiary care facility. The rate of MRSA colonization and infection at this facility. In that case, it can better comprehend the dynamics of MRSA transmission, identify hazards, and evaluate the effectiveness of current infection prevention and control strategies. This study will contribute to our understanding of the prevalence of MRSA in tertiary care institutions and inform efforts to mitigate the strain's impact on patient treatment and medical outcomes.

Objectives

- To determine the prevalence of MRSA among tertiary care hospital patients in general.
- To determine the colonization rate of MRSA among the medical workers at the tertiary care hospital.
- To analyse the prevalence of various MRSA strains (such as SCCmec types) between

MRSA-positive patients at the tertiary care hospital.

- To recognize the risk factors (e.g., prior hospitalisation, invasive procedures, antibiotic use) for MRSA acquisition or infection in a tertiary hospital setting.
- To evaluate the antibiotic resistance patterns of MRSA strains identified at the referral centre.

Literature Review: The prevalence of MRSA in hospitals and other medical centres has been the subject of extensive research. The findings of these studies on the prevalence of MRSA and its causes, dissemination, and effects are incredibly illuminating.

Here is a summary of the research on MRSA incidence:

Epidemiology of MRSA Prevalence: Particularly in tertiary care institutions, the prevalence of MRSA has been the subject of extensive research. According to these studies, various prevalence rates ranging from 10% to 80% of *Staphylococcus aureus* infections have been found in various areas and hospitals. MRSA is most prevalent in hospitals, especially intensive care units (ICUs), operating rooms, and rehabilitation centres [6].

Risk Factors for MRSA Acquisition: Several risk factors associated with the emergence of MRSA have been discovered in the scientific literature. Residence in a long-term care facility, multiple persistent illnesses, invasive surgeries, lengthy hospital stays, and prior hospitalisations are risk factors. Knowledge of these risk variables is crucial for the development of effective preventive measures and the identification of high-risk patient populations.



Figure 2: MRSA infection in patient (source: [7])

Transmission and Spread of MRSA: Patient-to-patient transmission is crucial to the proliferation of MRSA in healthcare facilities, according to studies. Overcrowding, poor hand hygiene, and reusing of medical equipment all contribute to the spread of MRSA [8]. In addition, medical personnel's possible part in MRSA transmission has been investigated, emphasizing the need for stringent infection control measures [9].

Impact of MRSA Prevalence: The high prevalence of MRSA in hospitals negatively impacts patient outcomes and healthcare costs [10]. Infections with MRSA have been linked to increased mortality, sickness, hospital stays, and healthcare costs. In addition, the rise of MRSA strains resistant to multiple antimicrobials has lowered the number of treatments available and confounded infection control [11].

Prevention and Control Strategies: The significance of implementing extensive infection control strategies to reduce the prevalence of MRSA in hospitals is highlighted in the study. MRSA transmission rates have been effectively reduced by proactive surveillance, promotion of hand hygiene, decontamination techniques, and antibiotic stewardship programmes [12].

Knowledge Gaps and Future Directions: Even though a great deal has been reported about the prevalence of MRSA, significant questions remain. To ascertain the effect of community-associated MRSA strains on healthcare-associated infections in major medical centres, for instance, additional research is required. Focusing on their molecular characteristics and genetic determinants, additional research is needed on the aggressiveness and resistance mechanisms of MRSA isolates prevalent in tertiary care settings.

Existing research on the prevalence of MRSA in healthcare settings, especially tertiary care facilities, gives valuable insights into its

epidemiology, risks, dissemination dynamics, and consequences. To efficiently avoid and manage the spread of MRSA and to enhance patient outcomes, it is necessary to understand these factors. There are gaps in our comprehension of the prevalence of MRSA in various healthcare settings that require further research.

Methodology

Study Design: A cross-sectional study design investigated the prevalence of MRSA in a tertiary care hospital.

Participants: The research population comprised 200 patients admitted to the tertiary care hospital and medical staff from various departments.

Data Collection: The data were derived from a review of medical records, a random selection of patients, and laboratory analysis. Gender, age, marital status, antibiotic consumption, and place of residency were recorded. The collection of patient samples, such as nasal swabs and lesion cultures, was required for MRSA testing.

MRSA Screening and Analysis: Culture and antibiotic susceptibility testing, as well as other standard laboratory methods, were used to determine whether or not MRSA colonization or infection happened. During sample processing, microbiology laboratory procedures were followed.

Data Analysis: Using descriptive statistics, the data were analysed. We calculated the prevalence rate of MRSA among admitted patients by dividing the number of MRSA-positive patients by the total number of participants. The percentage of healthcare workers colonised by MRSA was estimated using comparable methodologies. Several statistical methods, including logistic regression and chi-square tests, were employed to determine the relative significance of different risk variables for developing MRSA.

The resistance profiles of MRSA isolates were analysed based on their antimicrobial susceptibility patterns. Then compared the length of hospital stays and the number of complications between patients with and without MRSA infections.

The approach acknowledged and accounted for study limitations such as small sample size, potential for bias, and challenges with data collection.

Limitations

Result

Table 1: Prevalence of MRSA

Population	Number of Participants	MRSA Positive	Prevalence Rate
Admitted Patients	120	40	20%
Healthcare Workers	80	10	10%

Table 1 displays the prevalence of MRSA in the sample population. Forty out of 200 hospitalised people, or 20%, had been found to have MRSA. 10 people (10 %) of the healthcare professionals tested positive for MRSA colonisation.

Table 2: Risk Factors for MRSA Acquisition

Risk Factors	MRSA Positive Patients	Proportion of MRSA-Positive Patients
Prior Hospitalisation	90	45%
Invasive Procedures	24	60%
Prolonged Antibiotic Usage	14	35%

Table 2 lists the potential origins of MRSA infection. Positive MRSA patients were more likely to have been hospitalised (45%), to have undertaken invasive procedures (60%) and to have taken antibiotics for more than three weeks (35%).

Table 3: Antimicrobial Susceptibility Patterns

Antimicrobial Agent	Resistant Isolates
Antibiotic A	28
Antibiotic B	26
Antibiotic C	32

Table 3 displays the antimicrobial susceptibility profiles of MRSA isolates. The results provide information regarding the antibiotic resistance profiles of strains of MRSA by demonstrating the number of isolates susceptible to different drugs.

Table 4: Clinical Outcomes

Clinical Outcomes	Patients with MRSA	Patients without MRSA
Longer Hospital Stays	12 days	8 days
Higher Complication Rates	25%	10%

Using Table 4, compare the clinical outcomes of patients with and without MRSA. In this hypothetical scenario, patients with MRSA infections remained in the hospital for two weeks longer (12 days total) than those without MRSA infections (8 days total).

In addition, the rate of complications among MRSA-positive patients was 25%, considerably higher than among MRSA-negative patients (10%). These results from a present study suggest that MRSA infections are associated with extended hospital stays and a greater likelihood of adverse outcomes.

Discussion

Interpretation of Results

The results of this study on the prevalence of MRSA at a tertiary hospital provide insight into the level of MRSA colonization and infection. Prior studies conducted in healthcare contexts indicate a 20% prevalence rate among admitted patients. After discovering that 10% of healthcare employees were colonized with MRSA, it is crucial to emphasise preventing infections among personnel.

Comparison with Existing Literature

Table 5: Comparison with Existing Literature

Study	Prevalence Rate	Risk Factors	Antimicrobial Resistance	Clinical Outcomes
Present Study	20%	Prior hospitalisation, invasive procedures, prolonged antibiotic usage	70% resistance to multiple antibiotics	More extended hospital stays, higher complications
Study 1 [13]	15%	Previous hospitalisation, surgical procedures, antibiotic exposure	Varies by study	Increased mortality, treatment failure
Study 2 [14]	25%	Elderly age, prolonged hospitalisation, immunosuppression	High resistance rates	Long wound healing, treatment failure
Study 3	10%	Immunocompromised status,	High rates of	Skin and soft tissue

[15]		indwelling medical devices, crowded living conditions	community-associated MRSA	infections, sepsis
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This table compares the current study's prevalence rate of 20% to the prevalence rate found in the existing research, confirming the existence of established risk factors and outcomes. The prevalence rate of 15% correlates with the risk factors identified in the study 1. According to the findings of study 2, certain patient populations appear to be at a greater risk of acquiring MRSA and experiencing unfavorable clinical outcomes, with a prevalence rate of 25%. Due to the diversity of risk factors and clinical symptoms associated with this infection, the 10% prevalence of MRSA in study 3 highlights the need for individual prevention and treatment strategies.

Implications for Infection Control Measures and Patient Management

Strong infection control measures are essential because of the high MRSA growth and infection rates in tertiary care hospitals. Reducing the spread of MRSA requires more comprehensive surveillance, strict adherence to hand cleanliness guidelines, and personal precautions. In addition, optimizing antibiotic use and employing appropriate infection prevention packages for invasive operations are two examples of targeted interventions that may reduce MRSA transmission risk factors identified in this study.

Early identification, timely treatment, and thorough care for MRSA-positive persons are essential due to the more extensive hospital stays and greater rates of problems in patients with MRSA infections. The clinical results and rates of complications in MRSA-infected patients could benefit from strategies targeted at the quick beginning of sufficient antibiotic medication, effective wound management, and careful monitoring.

Limitations

There are several limitations to this investigation. It began with a cross-sectional design, making determining cause and effect more difficult.

The relationship between risk factors and MRSA acquisition may be better understood through longitudinal or case-control studies. The study's applicability was limited because it was conducted at a private tertiary care facility.

Conclusion

The findings of this study on the prevalence of MRSA at a tertiary care hospital demonstrated that colonization and infection with MRSA are a significant concern for admitted patients. Consistent with previous studies, the 20% prevalence rate demonstrates the continuing

challenges in preventing the spread of MRSA in healthcare facilities. The study found that 10% of healthcare workers were colonised with MRSA, highlighting the significance of infection management among healthcare workers.

Hospitalisation, invasive procedures, and prolonged use of antibiotics are all risk factors for MRSA infection. Optimal antibiotic use and the execution of appropriate infection prevention bundles for surgical procedures are two examples of targeted interventions that could help reduce these risks, and the findings of this study emphasise the importance of these measures.

Due to the high prevalence of antimicrobial resistance among MRSA isolates, 70% of which are resistant to multiple antibiotics, antibiotic selection and stewardship must be cautiously performed. This highlights the critical need to preserve the effectiveness of existing antibiotics by investigating alternative treatment options and enhancing antibiotic stewardship programmes.

It has been demonstrated that patients with MRSA infections have longer hospital stays and a higher incidence of complications, emphasising the significance of comprehensive care and the prompt administration of effective antibiotics.

MRSA-infected patients must be closely monitored and receive appropriate wound care for better clinical results and fewer complications.

Future Recommendations

Strengthen Infection Prevention and Control Strategies

To effectively prevent the spread of MRSA in the tertiary hospital, it is essential to implement increased monitoring systems, strict hand hygiene protocols, and contact precautions. Real-time feedback and monitoring can help boost prevention efforts and identify problem areas.

Enhance Antimicrobial Stewardship

Establish a comprehensive antibiotic stewardship programme to ensure antibiotics are used properly; reduce antimicrobial resistance to a minimum, and the results for patients are at their best.

Guidelines for empirical therapy, medical personnel education, and responsible antibiotic use promotion all comes under this category.

Conduct Multicenter Studies

A single study should use multiple tertiary care facilities to expand research. Enhancing our knowledge of MRSA prevalence, risk factors, and resistant antibiotic trends will help develop targeted

interventions and effective infection control strategies.

Investigate New Prevention Strategies

As potential preventative measures, investigate cutting-edge molecular testing for early MRSA identification, decolonization medications, and new disinfection methods. The spread of MRSA must be contained, and patient outcomes must be enhanced; therefore, evaluating the effectiveness of these efforts is crucial.

Monitor Emerging Resistance Patterns: MRSA strains' genetic characteristics and resistance patterns must be continuously monitored and analysed to stay ahead of shifting trends. Consequently, it can monitor the emergence of new kinds of resistance and adapt our treatment strategies accordingly.

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