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Original Research Article

Prevalence of mupirocin resistance in methicillin resistant staphylococcus aureus (MRSA) at tertiary care teaching hospital, Tamil Nadu

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ABSTRACT

Background: Methicillin-resistant *S. aureus* (MRSA) is major colonization in hospitalized patients and professionals. Emergence of resistance may occur due to inappropriate or over usage of antibiotics and it leads to increase morbidity and mortality among patients. Mupirocin resistance became endemic in hospitalized patients.
Aim and Objective: The main objective of this study is to record the incidence of Mupirocin antibiotic resistance among MRSA isolates from hospitalized patients in a tertiary care hospital, Tamil Nadu.
Materials and Methods: A prospective observational laboratory-based study was conducted in tertiary care hospital. MRSA was isolated from clinical specimens based on the preliminary test and Kirby Bauer's Disc Diffusion Method. In MRSA isolates the Mupirocin resistance was categorized into high (200μg) and low level (5μg) discs (HiMedia) concentration.
Results: Out of 69 isolates of *S. aureus* 32 (46%) were MRSA and 37 (54%) MSSA. Among 32 MRSA isolates, four (12%) were high-level resistance and three (10%) were low level resistance to Mupirocin. Remaining 25 (78%) MRSA isolates showed sensitive to Mupirocin agent.
Conclusion: The study concludes, that the prevalence of Mupirocin resistance is low and is mandatory to include in the screening panel of MRSA. Regular monitoring of MRSA isolates for Mupirocin resistance is highly helpful for the eradication and complication among health care sectors.

1. Introduction

Methicillin-resistant *S. aureus* (MRSA) is a major threat for humans as well as in animals and it colonizes in both patients as well as health care professionals. Nasal carrier and local skin and soft tissue infections of *S. aureus* plays a vital role in pathogenesis and epidemiological development of risk in both nosocomial as well as community-acquired infections.[1] Different strains of *S. aureus* from nasal as well as other body fluids were share the same genotype.[2] Mupirocin is a topical antibiotic which is isolated from Pseudomonas fluorescence and it is used to treat skin and soft tissue bacterial infections.[3] Due to inappropriate or over usage of antibiotics may increase the resistance and also increase morbidity and mortality among haemodialysis as well as surgical intensive care unit (SICU)patients. Mostly Mupirocin resistance is infrequent in *S. aureus* and also became endemic in hospitalized patients and the resistance is highly detected based on their levels by using phenotypic methods like Kirby-Bauer disc diffusion methods, Staphylococcal cassette chromosome mec (SCCmec) typing and Minimum inhibitory concentration (MIC) of E-test were performed.[4–7] In the world literature, the prevalence Mupirocin resistance has been classified into different forms viz., Mupirocin resistant *S. aureus*

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(MuRSA) and high-level MuRSA (HLMuRSA) followed by Mupirocin-resistant MRSA (MuRMRSA), and high-level MuRMRSA (HLMuRMRSA) was recorded in the world wide.[5] Molecular methods have been applied for the detection of qacA/B genes in MRSA patients with Mupirocin resistance. The main purpose of the study is to record the prevalence of Mupirocin antibiotic resistance among MRSA isolates from hospitalized patients in the tertiary care hospital, Tamil Nadu.

2. Materials and Methods

A prospective observational laboratory-based study was conducted for a period of one year &four months in the Department of Microbiology, tertiary care teaching hospital. Specimens like Pus, wound swab, urine and blood were received from the hospitalized patients with clinical conditions like diabetic wound, urinary tract infection, and febrile patients from the department of General Medicine, Surgery and Paediatrics to the Bacteriology laboratory for routine diagnostic tests. MRSA was isolated based on the preliminary test. Antibiotic sensitivity was performed by using Kirby Bauer's Disc Diffusion Method and the interpretation of the results were recorded according to the CLSI guidelines.[8] MRSA was detected by Cefoxitin 30μg disc (HiMedia) and the resistance of Mupirocin was categorized into high and low level by using Mupirocin 200μg & 5μg discs (HiMedia).

3. Result

Out of 69 isolates of *S. aureus* 32(46%) were MRSA and 37 (54%) MSSA. Most of them were identified in pus samples (44%) followed by Urine (38%), wound swab (15%) and Blood (3%). Among 32 MRSA isolates, four (12%) were showed a high-level Mupirocin resistance (200μg) and three (10%) were low level resistance (5μg). Remaining 25 (78%) MRSA isolates showed sensitive to Mupirocin agent.

4. Discussion

Mupirocin is an effective treatment for MSSA and MRSA infection and the incidence of Mupirocin resistance have emerged in post-surgical patients as well as health care workers in many of the hospitals. In the present study, 46% and 54% of MRSA and MSSA were isolated from various clinical specimens, like pus (44%) followed by urine (38%), wound swab (15%) and blood infection (3%). Among 32 MRSA isolates, 12% was observed inhigh level resistance and 10% in low level resistance to Mupirocin. Hence, it shows that the high-level resistance was higher compared to the low-level resistance. In few studies, the Mupirocin high level resistance occurs in MRSA isolates which ranges from 0.62% to 4.81%with MICs value ranges 256 μg/L to $\geq$1024 μg/L.[3,4,9]

Most of the studies were discussed about the high and low level of Mupirocin resistance among MRSA isolates. However, few studies from India as well as other countries like Jamaica, Pakistan and Trinidad have recorded higher percentage in low level resistance which ranges from 0.44% to 44.1% and moderate to high level resistance to Mupirocin from 1.67% to 26.1%.[2,10–13] In this study, remaining 78% of MRSA isolates were highly sensitive to Mupirocin antibiotic. Similarly, Dadashi et al., have recorded an average prevalence of MuRSA, MuRMRSA, HLMuRSA and HLMuRMRSA were 7.6%, 13.8%, 8.5% and 8.1% respectively.[5]

Basically, the incidence of Mupirocin resistance has been calculated according to the infection. In this study, pus samples from surgical site were predominant for the isolation of MRSA and the resistance too followed by Urine, wound swab and Blood.[14] A similar study has been conducted that surgical site infections (74%) and blood stream infections (8%) are major reservoir for the isolation of MRSA strains.[15,16] However, in the present study, the MRSA strains with Mupirocin resistance show 44% in pus and 3% in blood samples and it is low when compared to the above study.

Improper or prolonged usage of the Mupirocin antibiotics may lead to increase the risks of pan resistance for the treatment of the wounds and pressure sores of the patients.[1] Warren et al., described that qacA/B(+) MRSA isolates were more likely resistant to Mupirocin.[7]

5. Conclusion

The present study indicates that a low prevalence of Mupirocin resistance was observed when compared to the other studies. It also concludes that Mupirocin resistance should be included in the screening panel for MRSA isolates procured from the pus and other clinical specimens. Genomic surveillance of MRSA isolates highly helpful to associate with the significance of qacA/B (+) genes and the eradication of mupirocin resistance among hospitalized patients as well as health care workers.

6. Author's Contribution

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Conception and design, acquisition of data, or analysis and interpretation of data has been done by the Sunil Indernath &Sudha K Either drafting the article or revising it critically for important intellectual content has been done by the Sunil Indernath Shanmugavadivoo, Sudha & Usha The final approval of the version to be published has been given by the Sudha, Sudha K & Shanmugavadivoo

7. Conflict of Interest

None to declare.

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