



A 4 YEAR STUDY OF METHICILLIN RESISTANT STAPHYLOCOCCUS ISOLATES FROM A TERTIARY DIAGNOSTIC CENTRE WITH SPECIAL REFERENCE TO MIC VALUES

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ABSTRACT

A retrospective analysis of Methicillin resistant isolates reported over the past 4 years was done. The sample types, the isolate species and susceptibility pattern were analyzed. MIC values were also looked discerned. The isolates were identified and susceptibility was done by Vitek 2 Compact using updated CLSI guidelines. Conclusion: Incidence of MRSA continue to be high. Skin and soft tissue infections is the predominant presentation followed by bacteremia. Staphylococcus aureus is the predominant species isolated. No VISA or VRSA in our study. Clindamycin, Vancomycin, Daptomycin and Linezolid are likely to show increased resistance in the future unless we use them judiciously. Tetracycline and Tigecycline group are useful options.

KEYWORDS : Methicillin, MRSA, Staphylococcus, MIC

INTRODUCTION:

Staphylococcus aureus is one of the important hospital and community acquired pathogen. It is responsible for causing a broad spectrum of disease ranging from mild superficial skin and soft tissue infections such as septicemia, deep seated abscess, pneumonia, infective endocarditis, and toxic shock syndrome.1

It is one of the the pathogens of greatest concern because of its intrinsic virulence factors, its ability to cause diverse array of life threatening infection, ability to adapt to different environmental conditions and its nasal carriage, which accounts for possible spread and re infection.2

Methicillin resistant Staphylococcus aureus – MRSA infections are associated with prolonged hospitalizations, increased mortality and increased costs as compared with MSSA infections. However such comparisons may be confounded by an increased incidence of co morbid conditions among patients with MRSA infections.3, 4, 5.

The prolonged hospital stay, indiscriminate use of antibiotics, lack of awareness, prior receipt of antibiotics etc are the possible predisposing factors of MRSA emergence.7

METHOD/ STUDY: A retrospective analysis of Methicillin resistant isolates reported over the past 4 years was done. The sample types, the isolate species and susceptibility pattern were analyzed. MIC values were also looked discerned. The isolates were identified and susceptibility was done by Vitek 2 Compact using updated CLSI guidelines

RESULTS:

1. A total number of 2,210 Staphylococcus species were isolated out of which 962 were Methicillin resistant Staphylococcus species. Hence MRSA accounts for 43.52 % of all the isolates received.
2. The prevalence of these isolates among various clinical specimens is as follows: Skin and soft tissue infections accounted for 68.78% of all infections and bacteremia due to MRSA was found in 14.33 % cases.

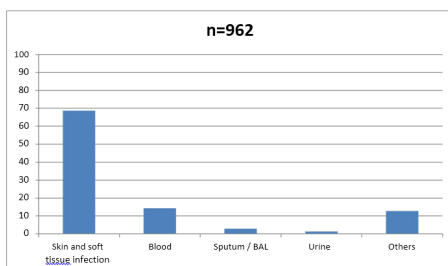


CHART 1: The prevalence of these isolates among various clinical specimens

3. Out of 962 methicillin resistant species, 697 were Staphylococcus aureus (72%), 115 were Staphylococcus epidermidis (11.9%) and 124 were Staphylococcus haemolyticus (12.8%).

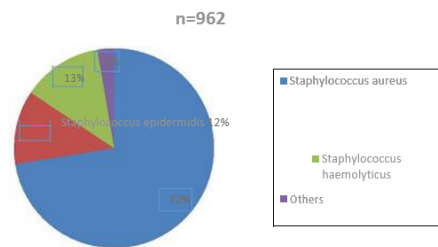


CHART 2: Species wise distribution of methicillin resistant isolates

4. Susceptibility pattern:

The antibiotics tested in the lab were Vancomycin, Linezolid, Teicoplanin, Daptomycin, Tigecycline, Tetracycline, Clindamycin, Co-trimoxazole and Gentamicin

The overall susceptibility of these methicillin resistant isolates to the various antibiotics is given as follows

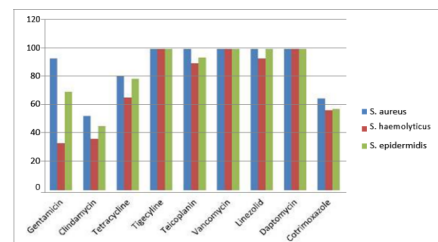


CHART 3: Susceptibility pattern (%) of 3 species of Staphylococcus to various antibiotics.

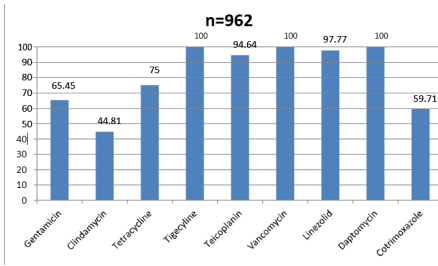
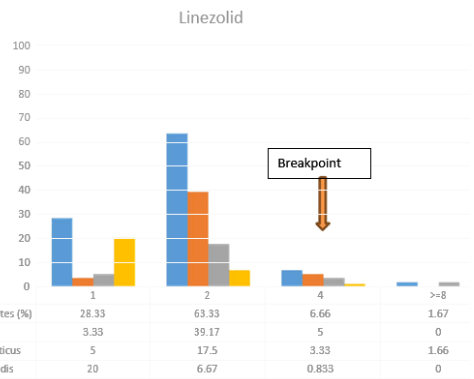
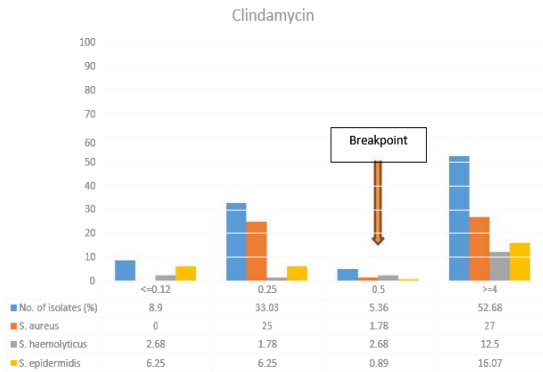


CHART 4: Overall average susceptibilities (%) to various antibiotics

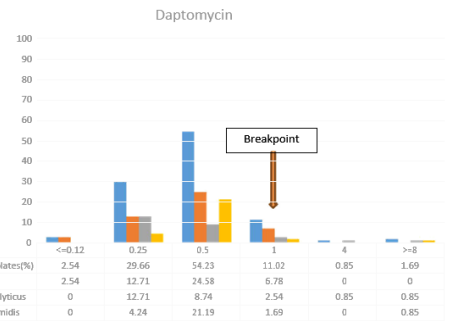
5. *S. aureus* and *S. epidermidis* were fully susceptible to Vancomycin, Tigecycline and Linezolid. We did not find VISA or VRSA in our study.
6. *S. hemolyticus* in our study was the least susceptible amongst the 3 species.
7. 9 isolates of *S. hemolyticus* were Linezolid resistant. They were isolated from central line tips (4) and tissue (5).
8. Gentamicin susceptibility was variable with 93.33% susceptible for *S. aureus* , 69.69% for *S. epidermidis* and only 33.33% for *S. hemolyticus*
9. Tigecycline, Vancomycin and Daptomycin were susceptible to all the methicillin resistant isolates
10. Clindamycin is the least sensitive (44%) amongst all the antibiotics tested.



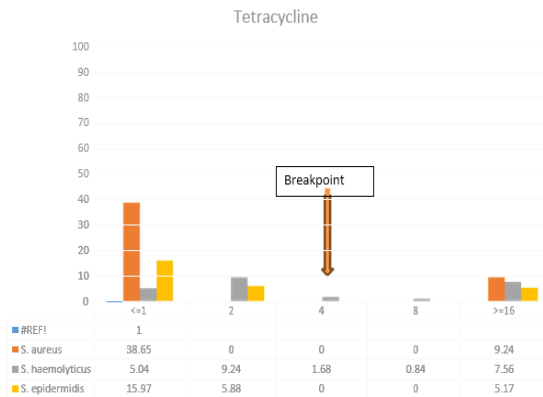
Linezolid is showing MICs creeping very close to the breakpoint MICs. This is due to the overuse, misuse and abuse of this drug in clinical practice



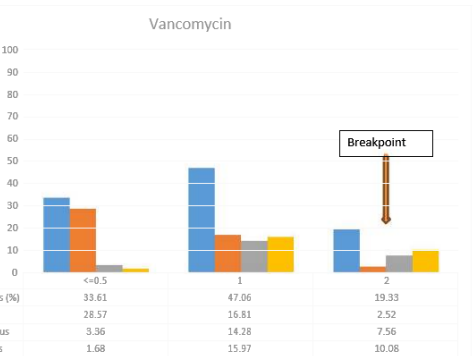
Clindamycin MICs are crowded very close to the breakpoint MICs and the possibility of further increase in resistance is higher.



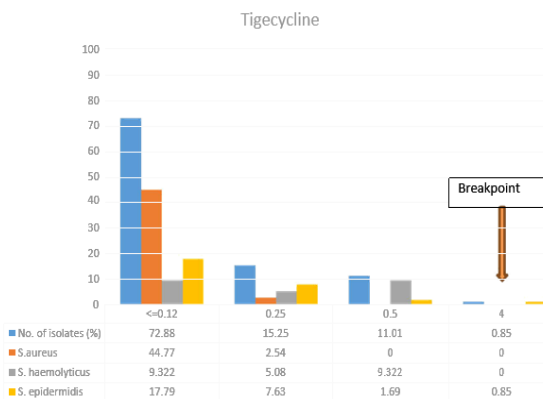
Daptomycin Is also showing majority of the isolates very close to the breakpoint MICs and therefore resistance development in the future is likely



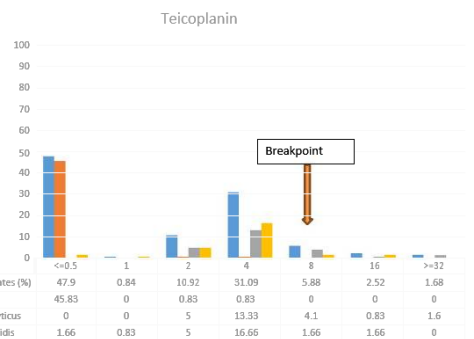
A higher percentage of isolates are much lesser than the breakpoint MICs for Tetracycline and therefore this drug will continue to be useful in the future.



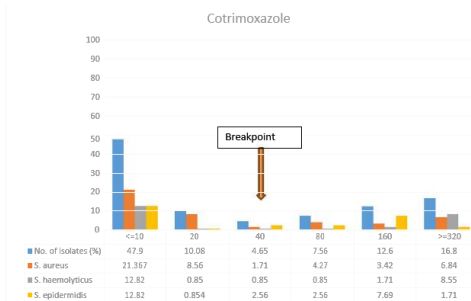
Vancomycin Is also showing majority of the isolates very close to the breakpoint MICs and therefore resistance development in the future is likely



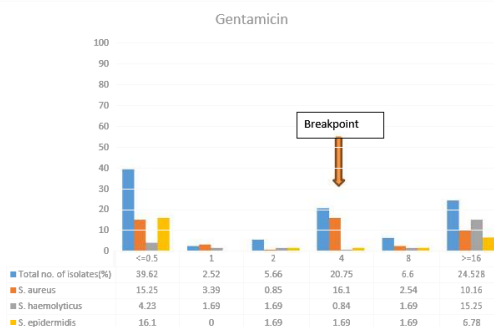
Tigecycline MIC values are much lower as compared to breakpoint MICs. So the resistance development probability in the near future is low.



A majority (47%) of isolates are much lesser than the breakpoint MICs. But 31% of the isolates are at MIC 4 which is close to breakpoint MIC 8 resulting in the possibility of VISA development in the future.



47.9% isolates have MIC below 10 for Co-trimoxazole but around 37% isolates have MIC above the breakpoint MICs. So the inference is inconclusive



Gentamicin showed results similar to Co-trimoxazole and no inferences can be made

DISCUSSION:

- In our study, MRSA accounted for 43.52 % of all the isolates received. This is in concordance with the INSAR study conducted across the country with select centres which was 42% in 2008 and 61% in 20096
- Skin and soft tissue infection formed the predominant cases. This is similar to the INSAR study conducted across the country with select centres which was 64% in 2008 and 40% in 20096. Blood stream infections accounted for 14.33 % of cases. This is similar to the INSAR study conducted across the country with select centres which was 15% in 2008 and 17.9% in 20096. This was also similar to the study carried out by Jyoti Kumari, et al.8 and Bindu D, et al.9
- S.aureus was the predominant incriminating accounting for 72% of all isolates.
- S.aureus and S. epidermidis were fully susceptible to Vancomycin, Tigecycline and Linezolid. We did not find VISA or VRSA in our study. This is in concordance with Faryal et al.11
- Poor susceptibility to Clindamycin(44%), Co-trimoxazole (59%) and Gentamicin(65%), was high in Methicillin resistant isolates. This result is similar to the study carried out by Arunava Kali, et al.10
- Our study revealed 9 isolates of Linezolid resistant Staphylococcus hemolyticus. A study from Mysore reported 4 similar cases.12. Similar case report on Linezolid resistant Staphylococcus hemolyticus has been reported by Matlani et al.13 and Varsha Gupta, et al.17.
- A detailed analysis of MIC values showed Clindamycin (33%) , Vancomycin (47%) , Daptomycin (54%) and Linezolid (63%) had isolates close to breakpoint MIC and would therefore be likely to develop increased resistance in the near future. Whereas Tetracycline and Tigecycline are very useful drugs in view of their low overall MICs of 74% and 99% isolates below the Break point MICs

CONCLUSION:

- Incidence of MRSA continue to be high
- Skin and soft tissue infections is the predominant presentation followed by bacteremia
- Staphylococcus aureus is the predominant species isolated

- No VISA or VRSA in our study
- Clindamycin, Vancomycin, Daptomycin and Linezolid are likely to show increased resistance in the future unless we use them judiciously.
- Tetracycline and Tigecycline group are useful option

REFERENCES:

- Fateh Rahimi, Majid Bouzari, Mohammed Katouli, Mohammed Reza Pourshafie. 2013. Antibiotic Resistant and Methicillin Sensitive Staphylococcus aureus in Tehran, Iran. Jundishapur J. Microbiology, 6(2):144-149.
- Waldvogel F A, Staphylococcus aureus. Mandell GL, Bennet JE, Dolun R, Livingston C, editors. Principle and Practice of Infectious Diseases. 2000:2069-2092.
- Abramson MA, Sexton DJ. Nosocomial methicillin resistant and methicillin susceptible Staphylococcus primary bacteremia: at what costs? Infect Control Hosp Epidemiol 1999; 20:408-411.
- Carbon C. Costs of treating infections caused by methicillin resistant staphylococci and vancomycin-resistant enterococci. J Antimicrob Chemotherapy 1999; 44: 31-36.
- Rubin RJ, Harrington CA, Poon A et al. The economic impact of Staphylococcus aureus infection in New York City hospitals. Emerg Infect Dis 1999; 5:9-17.
- Methicillin resistant Staphylococcus aureus (MRSA) in India: Prevalence & susceptibility pattern. Indian J Medical Research 2013 Feb; 137(2): 363-369
- Anupurba S, Sen MR, Nath G, Sharma BM, Gulati ak, Mohapatra TM. Prevalence of methicillin resistant in a tertiary care referral hospital in eastern Uttar Pradesh. Indian J Med Microbiol 2003; 21:49-51.
- Jyoti Kumari, Shalini M Shenoy, Shrikala Baliga, Chakrapani M, Gopalkrishna K Bhat. Healthcare associated Methicillin Resistant Staphylococcus aureus. SQU Medical journal; May 2016; Volume 16; Issue 2.
- Bindu D, Chitraksha Saikumar, MV Vinith. Prevalence and Antibiotic susceptibility of Methicillin Resistant Staphylococcus aureus isolates in tertiary care centre. Journal of Pharmaceutical Sciences and Research. Volume 9(12); 2017; 2329-2331.
- Arunava Kali, Selvaraj Stephen, Sivaraman Umadevi, Shailesh Kumar, Noyal Mariya Joseph, Srinivasan Srirangaraj. Changing trends in resistance patterns of Methicillin resistant Staphylococcus aureus. Journal of Clinical and Diagnostic Research; 2013, September; Vol-7(9); 1979-1982,
- Susceptibility pattern of methicillin resistant Staphylococcus aureus to vancomycin and other alternate agents: report from a private sector hospital laboratory. Faryal Saleem Naima Fasih, 2 Afia Zafar J Pak Med Assoc Vol. 67, No. 11, November 2017.
- Occurrence of linezolid-resistant Staphylococcus haemolyticus in two tertiary care hospitals in Mysuru, South India. Vineeth Rajan, Pradeep Halebeedu Prakash, Shubha Gopal. Journal of Global Antimicrobial Resistance. March 2017 Volume 8, Pages 140-141.
- Linezolid-resistant mucoid Staphylococcus haemolyticus from a tertiary-care centre in Delhi M. Matlani1, T. Shende2, V. Bhandari4, R. Dawar3, R. Sardana3 and R. Gaiind1 1) Department of Microbiology, VMMC & Associated Safdarjung Hospital, 2) All India Institute of Medical Sciences, 3) Department of Microbiology, Apollo Hospital New Delhi, New Delhi and 4) National Institute of Animal Biotechnology (NIAB), Miyapur, Hyderabad, Telangana, India
- Linezolid resistant Staphylococcus haemolyticus : First case report from India. Varsha Gupta, Shivani Garga, Ruby Jain, Sudhir Garg, Jagdish Chandra. Asian Pacific journal of tropical medicine. Volume 5, Issue 10, October 2012, Pages 837-838.
- Linezolid resistant clinical isolates of Methicillin resistant Coagulase negative Staphylococci and Enterococcus faecium from China. Jia Chang Cai, Yan Yan Hu, Rong Zhang, Hong Wei Zhou, Gong-Xiang Chen. 01 November 2012, Journal of Medical Microbiology, 1568-1573
- Staphylococcus haemolyticus - an emerging threat in the twilight of antibiotics age. Tomasz Czekaj, Marcin Giszewski, Eligja M. Szewczyk. Microbiology society. 01 November 2015, Microbiology : 2061-2068.
- Linezolid resistant Staphylococcus haemolyticus: First case report from India. Varsha Gupta, Shivani Garg, Ruby Jain, Sudhir Garg, Jagdish Chander. Asian Pacific Journal of Tropical Medicine. (2012) 837-838.