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Original Research Article

To determine the resistance pattern of *Staphylococcus aureus* in pus samplesVersha Rajput¹, Vasundhara Sharma^{1,*}, Umar Farooq¹, Sudhir Singh¹, Shweta R Sharma¹, Imran Ahmad¹¹Dept. of Microbiology, Teerthanker Mahaveer Medical College and Research Center, Moradabad, Uttar Pradesh, India

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ABSTRACT

Background: Staphylococcus aureus is a common health problem occurring as an important nosocomial pathogen, causing urinary tract infection, surgical site, blood stream and soft tissue infection. The aim of this research was conducted to determine MRSA and VRSa from the pus samples of admitted patients.

Aim & Objective: The aim and objective of study was to isolate the resistance pattern of Staphylococcus aureus in pus samples and their AST.

Materials and Methods: A total of 158 positive culture Staph aureus were taken from pus samples for the study during December 2019 - October 2020. Samples were cultured on Blood and MacConkey agar then incubated at 37°C for 24 hours. The modified Kirby Bauer's disc diffusion method was used to test antibiotic sensitivity of staphylococcus isolates.

Result: In total of 158 positive culture of Staphylococcus aureus, 66 (41.7%) were found to be MRSA and 4 (2.5%) were found to be VRSa. Out of 158 Staph aureus, 146 (92.4%) were resistant to Penicillin, followed by Amoxycillin 140 (88.6%), Ampicillin 139 (87.9%), Erythromycin 91 (57.5%), Cefoxitin 66 (41.7%), Gentamycin 56 (35.4%), Amikacin 52 (32.9%) and Teicoplanin 37 (23.4%).

Conclusion: An antibiotic policy and screening of susceptibility patterns of MRSA may help in reducing the prevalence rate of MRSA and antibiotic resistance. To stop its spread to the population, it is very important to eliminate MRSA colonization in patients and health care workers. Accurate treatment helps to reduce the rate of morbidity and improvement of patient's outcome.

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1. Introduction

Staph aureus is gram positive cocci, which are arranged in grapes like clusters. Staph aureus is commonly found on the skin. Staph aureus is an aerobic and facultative anaerobic organism. They produce yellow and white colour colonies on nutrient agar media. Staph aureus causes superficial and deep infections.¹ Staph aureus is the common cause of nosocomial infections, surgical wound infections and bacteremia (bacteremia means bacteria present in the blood).² Aggregation of dead leucocytes and pyogenic

bacteria is commonly known as PUS, “a yellow to white fluid”.³ Pus is formed due to injury caused by outside forces such as surgical wounds, burns, slight cuts, gunshot and after surgery.⁴ Staph aureus is mostly found in pus samples.

Minor cut of the skin will allow the bacteria present on the surface to enter the body and start multiplication locally. Immune cells fight against the bacteria.⁵ The isolated aerobes were identified as gram positive bacteria such as Staph aureus, Staph epidermidis and gram negative bacteria like E coli, Klebsiella pneumoniae.⁶ Pus is a thick fluid that can be generated by many organisms.⁷ Staph aureus is a important pathogen that creates problems for clinicians in the treatment of infections caused by an

* Corresponding author.

E-mail address: vasu2578@gmail.com (V. Sharma).

increase resistance to penicillin then now to oxacillin that means MRSA (Methicillin Resistant Staphylococcus aureus) also resistance other group of antibiotics like Linezolid, Vancomycin.⁸ There are 12 variant genes have identified Van A-E, G, H, L, M, N, R and X.⁹

2. Materials and Methods

This study was done on the patients attending Teerthanker Mahaveer Hospital and Research Centre (TMH & RC) Moradabad, UP, India, from December 2019 - October 2020. In this study patients of all the age groups (Except paediatric age) both male and female visiting in the Teerthanker Mahaveer Hospital were included and the pus samples were received from central laboratory of Microbiology Department for the microscopy, gram staining, manual culture and antibiotic susceptibility test. Total 158 isolates were of Staph aureus had been taken from the pus samples.

2.1. Detection of MRSA

All isolated microorganisms were screened for methicillin resistance using Cefoxitin disk (30mcg) and the plates were incubated for 24 hours at 35⁰C as per CLSI guidelines. For the zone of inhibition the petri plates were examined in reflected light on a non-reflected backdrop. According to CLSI guidelines isolated organism demonstrating an inhibition zone of inhibition of <14 mm were considered MRSA.¹⁰

2.2. Detection of VRSA

All isolated microorganisms were screened for Vancomycin resistance using Vancomycin disk (30mcg) and the plates were incubated at 35⁰C for 24 hours as CLSI guidelines. For the zone of inhibition the petri plates were examined in reflected light on a non- reflected backdrop. Isolated organism demonstrating an inhibition of <17 mm were considered VRSA according to CLSI guidelines.¹⁰

3. Results

In this study total 320 pus samples were included, out of which 158 samples were found positive for Staph aureus, after that antibiotic sensitivity testing was done for 158 Staph aureus isolates.

Table 1: Gender wise distribution

S.No.	Gender	Staph aureus	Total
1	Male	102 (64.6%)	158
2	Female	56 (35.4%)	158

Out of 158 Patients included, 102 (64.6%) were males and 56 (35.4%) were females. Out of 158 clinically diagnosed Staphylococcus aureus males were more in

number than to females. Table 1

Total 158 Staph aureus were isolated, out of which maximum numbers of Staph aureus were obtained from Surgery 67 (42.4%), followed by Orthopedics 36 (22.7%), Medicine 22 (13.9%), ENT 16 (10.1%), ICU 12 (7.5%) and least from Dermatology 5 (3.1%).

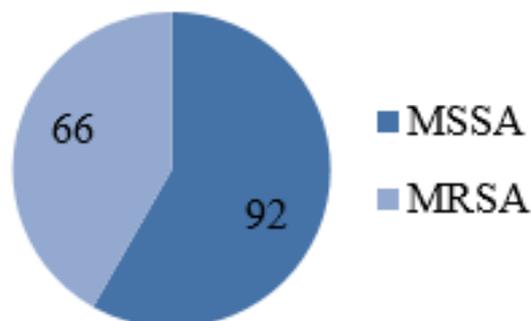


Fig. 1: Show MSSA and MRSA

Out of 158 Staph aureus were isolated, 92 (58.2%) were Methicillin Sensitive Staph aureus (MSSA) and 66 (41.7%) were Methicillin Resistance Staph aureus (MRSA). Figure 1

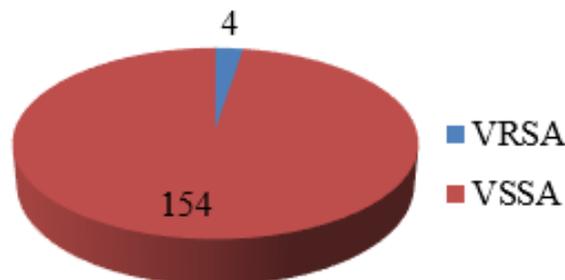


Fig. 2: Show VSSA and VRSA

Out of 158 Staph aureus were isolated, 154 (97.4%) were Vancomycin Sensitive Staph aureus (VSSA) and 4 (2.5%) were Vancomycin Resistance Staph aureus (VRSA). Figure 2

4. Discussion

In both community and hospital acquired infections, Staph aureus is one of the most frequently isolated pathogens. MRSA is a methicillin-resistant strain of the bacterium Staph aureus. In our study, Out of 158 pus samples, 102 (64.6%) Staph aureus were isolated from males and 56 (35.4%) from females. On comparison our present study with the previous study that have been done in different

areas of the country. In similar to this study Devi U S et al⁴ in 2017 there were 59 Staph aureus isolated 38 (64.4%) were males and 21 (35.5%) were females.

In our present study, the maximum number of Staph aureus were found in Surgery ward 67 (42.4%), where as 36 (22.7%) Staph aureus were found in Orthopedics, 22 (13.9%) were found in Medicine, 16 (10.1%) were found in ENT, 12 (7.5%) were found in ICU and 5 (3.1%) were found in Dermatology. A study done by Banker N et al,² the maximum number of Staph aureus were found in General Surgery 207 (68.09%), followed by Orthopedics 31 (10.20%), Medicine 19 (6.25%), ENT 11 (3.62%) and Dermatology 5 (1.64%) In our study, out of 158 Staph aureus were isolated, 66 (41.7%) were MRSA and 4 (2.5%) were VRSA. MRSA were detected by their sensitivity to Cefoxitin/Oxacillin as performed according to CLSI guidelines. Prevalence of MRSA in previous study by Harshan K H et al,¹¹ Banker N et al² and Devi U et al⁴ were 29.7%, 28.8% and 26.9%. A study of Banker N et al² showed only 1.9% isolates were resistance to Vancomycin. While in our study 2.5% isolated were resistance to Vancomycin. Harshan H K et al¹¹ in a study reported a high level resistance to Penicillin (97.5%), followed by Erythromycin (46.3%) and Gentamycin (29.7%). Staph aureus isolated showed high resistance to Penicillin (92.4%) followed by Amoxycillin (88.6%), Ampicillin (87.9%), Norfloxacin (86.7%), Erythromycin (57.7%) and Cefoxitin/Oxacillin (41.7%) and Teicoplanin (23.4%) in our research. And most of the Staph aureus isolated showed higher sensitivity to Vancomycin (97.4%), Linezolid (93.6%), Doxycyclin (92.4%), Rifampicin (85.4%), and Clindamycin (70.8%) and Amikacin (67.0%).

5. Conclusion

Emergence of MRSA and VRSA infections is a growing problem in our hospital. Our research shows that antibiotics sensitivity patterns of isolated Staph aureus can help in formulating the hospital antibiotic policy. Accurate treatment helps to reduce the rate of morbidity and improvement of patient's outcome. An antibiotic policy and screening of susceptibility patterns of MRSA may also help in reducing the prevalence rate of MRSA and antibiotic resistance. Infections that are caused by MRSA, Vancomycin is the most effective drug and to protect its value for the long life infections, the use of Vancomycin as first choice of treatment should be avoided. The tolerance of Teicoplanin, Linezolid and Doxycyclin to MRSA shows low resistance, so they may be useful in the treatment of staph infections.

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7. Conflicts of Interest

The authors declare no potential conflict of interest with respect to research, authorship, and/or publication of this article.

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Author biography

Versha Rajput, Post Graduate Student

Vasundhara Sharma, Associate Professor

Umar Farooq, Professor and HOD

Sudhir Singh, Professor

Shweta R Sharma, Associate Professor

Imran Ahmad, Assistant Professor

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