

## FREQUENCY OF STAPH AUREUS IN SEPTIC WOUND INFECTIONS

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## ABSTRACT

**Background:** Skin plays a pivotal role in protecting against micro-organisms. Damage to skin through cut, surgical incision, burn and road traffic accident etc. make it susceptible for micro-organism to invade our body. Septic wounds further put stress on immune system of already injured person, hence increase morbidity and mortality. Approximately 30% of the human population is colonized with Staphylococcus aureus. It is a leading cause of wound complication, soft tissue and skin infections, infective endocarditis, bacteremia and sepsis etc. **Objective:** Aim of this study is to determine frequency of Staphylococcus aureus in septic wound infections. **Methodology:** It was a cross sectional study done at surgical wards, burn center, orthopedic department and intensive care unit of Sir Ganga Ram Hospital, Lahore from September 2018 to November 2018. We obtained 150 consecutive pus samples from wounded patients presenting with clinical symptoms of septic wound. The collected samples were transported aseptically to the microbiology laboratory within 30 minutes and segregation was done on the basis of infection site such as knee joints, burn sites, caesarean operated sites etc. Collected samples were inoculated on blood agar and MacConkey agar. Mannitol Salt agar was used as a selective medium for isolation of Staphylococcus aureus after incubation at 37°C for 24 hours. The culture were analyzed for morphological, physiological and biochemical characteristics. For the identification of bacterial isolates samples were subjected to biochemical tests; catalase test, coagulase test and DNase test. Data was analyzed in the form of frequency and percentage with Microsoft Excel. **Results:** Bacteriological investigation of septic wounds pus sample of 150 consecutive patients, in which there were 88 (58.6%) males and 62 (41.4%) females. Mean age of our patients was  $28.91 \pm 5.56$  years, ranging from 20 – 50 years, 50 (33.33%) were aged 20 – 30 years, 40 (26.4%) were aged 31-40 years, 28 (18.6%) were aged 41-50 years and 32 (21.1%) were above 50 years. Out of 150 pus samples, 60 (40%) had septic wound with S.aureus growth out of which methicillin sensitive Staphylococcus was 30% and MRSA was 34.6% and there 5% cases that were also resistant to vancomycin. Two patients (4%) had fungal infections while 9 patients (18%) showed only gram negative rods and all were Catalase test negative. Source of infection was also found to be significant factor as 82 patients (55%) had poor unhygienic condition, 60 patients (40%) showed poor or improper dressing. **Conclusion:** In this study we observed that almost two third of the septic wounds were infected with staphylococcus aureus, which may be due to hospital acquired infections and nosocomial due to improper unhygienic condition. There is special need of strategy implementation to control hospital acquired and nosocomial infections for a healthy community. It is recommended that consultants should update their knowledge due to continuously emerging antimicrobial resistance.

**KEYWORDS:** Septic wound, Staphylococcus aureus, Catalase test. MRSA, VRSA.

## INTRODUCTION

Human skin protects underlying tissue from different kinds of microbes, which invade the skin, by providing innate immunity and thus controlling bacterial colonization.<sup>[1]</sup> Mechanical disruption due to any type of injury damages the skin breaking barrier and facilitating different microorganism including parasites, bacteria, fungi and viruses by establishing infection.<sup>[2]</sup> Septic wound infections exerts detrimental on patient life and disease prognosis. There is a big contribution of septic wound infections in hospital acquired infections among surgical cases and burn patients, increasing complication

and mortality rate.<sup>[3,4]</sup> It is difficult to control bacterial infection in wound patients especially in hospital environment. Staphylococcus aureus is facultative anaerobe that falls in gram positive category of bacteria having grape like structures in appearance. It is very important microbe causing skin infections that may lead towards serious systemic infections.<sup>[5,6]</sup> It is one of the most versatile nosocomial and dangerous human pathogen. In spite of the introduction of antimicrobial agents and improvements in the frequency and morbidity of staphylococcal diseases in the twentieth century, staphylococci have persisted as an important hospital and

community pathogen.<sup>[7]</sup> It is responsible for more than 80 percent of the supportive diseases encountered in medical practice. *Staphylococcus aureus* is now the leading causative pathogen in surgical site infections and burn septic wounds.<sup>[8]</sup> The pattern of antimicrobial susceptibility of *Staphylococcus aureus* is increasingly less effective in developing countries due to unnecessary and incomplete antibiotic course. Methicillin resistant *Staphylococcus aureus* (MRSA) was the most common pathogen of SSIs in the patients who underwent vascular, cardiac and orthopedic surgery.<sup>[9]</sup> A considerable increase in the prevalence of MRSA has been observed globally during the last decade. MRSA is the most common cause of hospital acquired infections, Hospital staff, infants, surgical patients and long staying patients in hospital are commonly affected by *S. aureus*.<sup>[11]</sup> Studies have proven sepsis in patients after surgery in operation theatre and/or in ward.<sup>1</sup> *Staphylococcus aureus* strains carry a wide variety of MDR genes on plasmids, which can be exchanged and spread among different species of *Staphylococci* and can be transferred to new bacterial hosts.<sup>[12]</sup> Hospital strains of *Staphylococcus aureus* are usually resistant to many useful antibiotics except vancomycin, although some microbiologist had reported the resistance of vancomycin.<sup>[10]</sup> The objective of this study was to determine the frequency of *Staphylococcus aureus* in septic wound infections.

## METHODOLOGY

It was a cross sectional study done at surgical wards, burn center, orthopedic department and intensive care unit of Sir Ganga Ram Hospital, Lahore from September 2018 to November 2018. We obtained 150 consecutive pus samples from wounded patients presenting with clinical symptoms of septic wound. The collected samples were transported aseptically to the microbiology laboratory within 30 minutes and segregation was done on the basis of infection site such as knee joints, burn sites, caesarean operated sites etc. Collected samples were inoculated on blood agar and MacConkey agar. Mannitol Salt agar was used as a selective medium for isolation of *Staphylococcus aureus* after incubation at 37°C for 24 hours. The culture were analyzed for morphological, physiological and biochemical characteristics. For the identification of bacterial isolates samples were subjected to biochemical tests; catalase test, coagulase test and DNase test. Data was analyzed in the form of frequency and percentage with Microsoft Excel.

## RESULTS

Bacteriological investigation of septic wounds pus sample of 150 consecutive patients, in which there were 88 (58.6%) males and 62 (41.4%) females. Mean age of our patients was  $28.91 \pm 5.56$  years, ranging from 20 – 50 years, 50 (33.33%) were aged 20 – 30 years, 40 (26.4%) were aged 31- 40 years, 28 (18.6%) were aged 41-50 years and 32 (21.1%) were above 50 years. Of these 150 study cases, 105 (70%) were illiterate and 45

(30%) were literate. Out of 150 pus samples, 60 (40%) had septic wound with *S. aureus* growth. Twelve (40%) patients were found to be suffering from diseases caused by other *Staphylococcus* species out of which methicillin sensitive *Staphylococcus* was 30% and MRSA was 34.6% and there 5% cases that were also resistant to vancomycin. Two patients (4%) had fungal infections while 9 patients (18%) showed only gram negative rods and all were Catalase test negative. 97 patients (64%) belonged to lower class, 37 patients (36.5%) belonged to middle class and 16 patients (10.6%) belonged to upper class family. Source of infection was also found to be significant factor as 82 patients (55%) had poor unhygienic condition, 60 patients (40%) showed poor or improper dressing.

## DISCUSSION

In current study we found that postoperative wound, burn patient wounds were mostly infected by *S. aureus*. It has been also observed that septic infections was the most common illness recorded in hospitals which further poor the prognosis of disease. Presence of *S. aureus* will not necessarily lead to development of a clinical infection but when this occurs it can lead to sepsis/bacteremia and ultimately death.<sup>[13]</sup> *S. aureus* can be found in normally healing wound as it is present in our normal human flora and it is very difficult to completely eliminate this pathogen.<sup>[14]</sup> In our study, *S. aureus* was the most common organism (36%) among all the pathogens isolated from surgical site infections (SSIs). Our results in surgical wound were consistent with similar studies carried out by elsewhere in India.<sup>[15]</sup> Surgical site infections are a major cause of morbidity of post-operative surgical patients and in spite of using broad spectrum antibiotics including potent anti-staphylococcal drugs for perioperative prophylaxis, *S. aureus* remains most common cause of SSI that may be due to multidrug resistant pathogens i.e. MRSA or VRSA.

The incidence of MRSA is different all over the world. A multicenter study was conducted in Pakistan to see prevalence of MRSA strains in various cities.<sup>[15]</sup> It was found to be 42% over a 10 months period. There was a difference in the MRSA frequency in different parts of the country; highest seen in Lahore (61%), closely followed by Karachi (57%), Rawalpindi (46%), Peshawar (36%) and Azad Kashmir (32%) while minimum resistance were seen in Sukkur (2%).<sup>[15]</sup> In this current study, *S. aureus* was found to be 40% out of which methicillin sensitive *Staphylococcus* was 30% and MRSA was 34.6% and there 5% cases that were also resistant to vancomycin.

Other studies also reported that *S. aureus* is a killing human pathogen cause a variety of diseases in human i.e. skin infection, life threatening septicemia, meningitis and toxic shock syndrome. These pathogens are difficult to eradicate because it possess abilities to colonize and exploit the host functions.<sup>[16]</sup> Similar to current study, a study in burns patients showed that about two third

patients had burns wound\nd infected with staph. Aureus.<sup>[17]</sup> Assessing the risk of recurrence, past history of infections was found to be the strongest risk factor. Patients with positive history of aseptic infections had at least two episodes of infection in past. In this work, it was observed that, there were higher risks of septic diseases among those who are post-operative wound infections then those who have other wounds infections due to poor hygiene and overcrowding. We also observed that knowledge of antimicrobials regarding their susceptibility and resistance and empirical therapy was not satisfied or outdated among consultants. There was no concept of multidisciplinary approach regarding treatment of such cases. It is recommended that consultants should update their knowledge due to continuously emerging antimicrobial resistance.

## CONCLUSION

Our study showed that two third of the septic wounds were infected with staphylococcus aureus, which may be due to hospital acquired infections and nosocomial due to improper unhygienic condition. There is special need of strategy implementation to control hospital acquired and nosocomial infections for a healthy community. It is recommended that consultants should update their knowledge due to continuously emerging antimicrobial resistance.

## REFERENCES

1. Rojas B, Aliments T, Rites R. Staphylococcus aureus infection in the surgery of burns Kaunas University of Medicine Hospital, Lithuania. *Medicine*, 2003; 11: 1078.
2. Dip RN, Taking A, Echakachi CM, Malongue A, Akoachere J. In-vitro antimicrobial activity of selected honeys on clinical isolates of *Helicobacter pylori*. *African health sciences*, 2007.
3. Komolafe O, James J, Kalongolera L, Makoka M. Bacteriology of burns at the Queen Elizabeth Central Hospital, Blantyre, Malawi. *J Burns*, 2003; 29: 235-238.
4. Nasser S, Mabrouk A, Maher A. Colonization of burn wounds in Ain Shams University Burn Unit. *J Burns*, 2003; 29: 229-33.
5. Clinical and Laboratory Standards Institute (CLSI). Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Fifth Informational Supplement. CLSI document M100-S25. CLSI, 2015. 240.
6. Maor Y, Rahav G, Belausov N, Ben-David D, Smollan G, Keller N. Prevalence and characteristics of heteroresistant vancomycinintermediate *Staphylococcus aureus* bacteremia in a tertiary care center. *J Clin Microbiol*, 2007; 45(5): 1511-4.
7. Bison AL, Stevens DL. Streptococcal infections of skin and soft tissues. *New England Journal of Medicine*, 334: 2402-46. <https://doi.org/10.1056/NEJM199601-253340407> PMID: 8532002.
8. Jana J, Abbott S, Brenden R Overview of the etiology of wound infections with particular emphasis on community acquired illnesses. *European journal of clinical microbiology & infectious diseases*, 1997; 16: 189-201.
9. Angus J, Ollie D Drug sensitivity patterns of bacterial isolates from septic post-operative wounds in a regional referral hospital in Uganda. *African health sciences*, 2007; 7.
10. Mehta M, Dutta P, Gupta V Bacterial isolates from burn wound infections and their antibiograms: A eight-year study. *Indian Journal of plastic surgery*, 2007; 40: 25.
11. Esebelahie N, Newton-Esebelahie F, Omoregie R. Aerobic bacterial isolates from infected wounds. *African Journal of Clinical and Experimental Microbiology*, 2013; 14: 155-159.
12. Shittu A, Kolawole D, Oyedepo E A study of wound infections in two health institutions in Ile-Ife, Nigeria. *African journal of biomedical research*, 2002; 5.
13. A.N. Oli, R.A. Iyinagolu, U.J. Ichoku, M. C. Ugwu, I Ezeobi, O. S. Ejiofor, LO Anagu, C.O. Esimone Antibiotic Susceptibility Profile of Community Isolates of *Staphylococcus Aureus*. *Journal of Pharmaceutical Research and Opinion*, 2013; 7: 42 - 47.
14. Larsen HS, Connie RM. *Staphylococci: TB of Diagnostic Microbiology* 3rd edition; WB Saunders. Editors; Mahon CR, Manuela's G, 2007; 341.
15. Howard BJ. Nosocomial Infections- an Overview. *Text Book of Clinical and Pathogenic Microbiology*, 1994: 2nd Ed. Howard BJ (Editor Mosby-Year Book Inc., St. Louis, MO, USA. Wertheim Heiman F L, Melles Damian C, Vos Margreet C, Leeuwen Willem van, Belkum Alex van, Verbrugh Henri A, Nouwen Jan L: The role of nasal carriage in *Staphylococcus aureus* infections; *Lancet Infect Dis.*, 2005; 5: 751-62.
16. Naik G, Deshpande RS. A Study on surgical site infections caused by *Staphylococcus aureus*, with a special search for methicillin resistant isolates. *J Clin Diag Res.*, 2011; 5: 502-8.
17. Suchitra Joyce B, Lakshmi Devi N. Surgical site infections: Assessing risk factors, outcomes and antimicrobial sensitivity patterns. *African Journal of Microbiology Research*, 2009; 3: 175-9.