ISSN: 2277- 7695
CODEN Code: PIHNBQ
ZDB-Number: 2663038-2
IC Journal No: 7725

Vol. 2 No. 4 2013
Online Available at www.thepharmajournal.com

THE PHARMA INNOVATION - JOURNAL

The prevalence of *Staphylococcus aureus* isolated from skin and soft tissue infections and its antibiotic susceptibility patterns

Dr. Shabbir M Thingna[1*] and Dr. Mohammed Shakil Shmad[2]

[1]Associate Professor, Department of Microbiology, Icare Institute Of Medical Science &Research, Haldia, West Bengal, India
[2]Assistant Professor, Department of Community Medicine, Chettinad Health & Research Institute, Kelambakkam, Chennai, Tamil Nadu, India

Aim: The objective of the present investigation was to assess the frequency and antibiotic susceptibility pattern of *S. aureus* that was isolated from a variety of clinical specimens of patients.
Method: Approximately 200 clinical specimens were collected and inoculated on sheep blood agar, chocolate, and mannitol salt agar. Incubated in an aerobic atmosphere at 35 °C for 18-24 hours. In order to ascertain antibiotic susceptibility, the Kirby-Bauer disc diffusion method was implemented.
Results: The investigation involved the collection of a total of 200 samples. Age categories 1-10 (15%), 11-20 (16%), 21-30 (32%), 31-50 (21%) and 51-70 (16%) were used to divide the samples. There were 146 males and 54 females. The age group with the highest *Staph aureus* isolate was 21-30 (33%), followed by 31-50 (23%) and 1-10 (9%). The highest isolate of *Staph aureus* from clinical specimens was more prevalent in males than in females due to gender. The prevalence of *Staph aureus* varied significantly among distinct clinical specimens. Swabs accounted for 32% of the isolates, while tips and pus accounted for 22% and 18%, respectively. Vancomycin exhibited the highest susceptibility level of *Staph aureus*, with Ciprofloxacin (60%), Septrin (59%), Erythromycin, and Amikacin (65) being equally effective. However, Amoxicillin exhibited the maximum resistance level (43%), followed by Tetracycline (38%), and Gentamycin (21%).
Conclusion: The most antibiotics that were discovered to provide consistent sensitivity were Erythromycin, Ciprofloxacin, and Vancomycin. Clinicians will be able to establish antibiotic treatment approaches by determining the prevalence and antibiotic sensitivity pattern of *Staph aureus*.

Keyword: *Staphylococcus aureus*, clinical specimens, antibiotic susceptibility

Introduction

Every year, millions of patients worldwide suffer from ill health and mortality as a result of nosocomial infections. *S. aureus* are Gram-positive cocci that typically exhibit colonies on a Gram's stain [1]. Skin and soft tissue infections are frequently caused by *S. aureus* [2]. Enterotoxins that induce foodborne illness are capable of being generated by certain strains. Consequently, *S. aureus* is a significant contributor to gastroenteritis in addition to cutaneous infections [3]. *S. aureus* evolved resistance to penicillin shortly after hospitals implemented the antimicrobial agent. By the 1970s, multidrug-resistant *S. aureus* (MRSA) had emerged [4]. Primarily from hospitalised patients in Europe, strains of *Staphylococcus aureus* that are resistant to penicillinase-resistant penicillin have

been identified [5, 6]. The mean incidence of MRSA bacteremia in England is approximately 40% of *Staph aureus* bacteremia [7]. MRSA was initially identified in 1961 and has since emerged as a significant nosocomial pathogen on a global scale. Extracellular coagulase, heat-stable nuclease, cell-bound clumping factor, and protein A production are among the numerous assays that can be employed to identify *S. aureus* [8, 9]. Alternative agents that may be implemented include tigecycline, linezolid, and daptomycin. Other agents that are relatively recent to consider include ceftaroline, dalbavancin, oritavancin, telavancin, or tedizolid. *S. aureus* became resistant to penicillin shortly after hospitals began employing the antimicrobial agent. By the 1970s, multidrug-resistant *S. aureus* had emerged [10]. It is unsurprising that nearly 100,000 severe MRSA infections occurred in 2005, with nearly 19,000 fatalities associated with MRSA. This figure is comparable to the 17,000 deaths caused by human immune deficiency virus and AIDS. Methicillin-resistant *S. aureus* (MRSA) was initially identified in the 1960s [9]. MRSA-related hospitalisations experienced a twofold increase between 1999 and 2005 [8]. The study aimed to compare the susceptibility pattern of *S. aureus* isolates against a variety of commonly used antibiotics over a two-year period and to ascertain the prevalence of *Staph aureus* among clinical specimens.

Materials and Methods

Study design and setting

The department of conducted a cross-sectional study. CSF, urine, catheter tips, pus, pus samples, sputum, and surgical site infections comprised approximately 200 clinical specimens. The specimens were inoculated onto chocolate, mannitol salt, and sheep blood agar. The dishes were subsequently incubated in an aerobic atmosphere at 35 °C for 18–24 hours. The colony morphology, gram's staining, catalase, and coagulase assays were used to identify *S. aureus*. In order to ascertain antibiotic susceptibility, the Kirby-Bauer disc diffusion method was implemented. The antibiotics tested were AK-Amikacin (30µg), Amoxicillin (30 µg), Doxycillin 30 (30 µg), Levofloxacin (30 µg), Erythromycin (15 µg), pencillin (10 µg), ceftazidime (30mcg), gentamicin (10 mcg), Piperacillin (30 µg), ciprofloxacin (5µg), Imipenem (30 µg), Vancomycin (25 µg), SXT-Sulfamethoxazole (25µg), Nalidixic acid (30 µg), Nitrofurantoin (300 µg), tetracycline (30mcg), tobramycin (10 mcg), Colistin (10Fg), Augumentin (30ug). Results of the disc diffusion method were interpreted in accordance with the Clinical and Laboratory Standards Institute (CLSI, 2009). The Ethics Committee approved the experimental protocol for research on the hospital infection control unit after meticulously considering all ethical considerations for the patient studies.

Statistical analysis

Clinical specimens were numerically sequenced and coded subsequent to data collection. The investigator subsequently inputted the data into a Microsoft Excel 2010 (Microsoft Corporation, Redmond, WA) spread sheet database to estimate the distribution of *Staph aureus* growth in specimens, as well as the susceptibility and resistance patterns of *Staph aureus* to antibiotics. The database was designed to collate, quantify, and analyse the data. The Excel spreadsheet was employed to generate frequency tables, charts of counts, and percentages, as well as to compile tables of summary statistics, using the appropriate formulas.

Results

Total 200 samples were collected during study. We divided the samples according age groups 1-10 (15%), 11-20 (16%), 21-30 (32%), 31-50 (21%) and 51-70 (16%).(table 1) 146 were males and 54 were females.

The age group with the highest *Staph aureus* isolate was 21-30 (33%), followed by 31-50 (23%), and 1-10 (9%). (Table 2) More males than females had the highest isolate of *Staph aureus* from clinical specimens, as indicated by gender.

The prevalence of *Staph aureus* varied significantly among distinct clinical specimens. Swabs accounted for 32% of the isolates, while tips and pus accounted for 22% and 18%, respectively.(Table 3)

Vancomycin exhibited the highest susceptibility level of *Staph aureus*, with Ciprofloxacin (60%), Septrin (59%), Erythromycin, and Amikacin (65) being equally effective. However, Amoxicillin exhibited the maximum resistance level (43%), followed by Tetracycline (38%), and Gentamycin (21%).

Table 1: Distribution of samples according to age groups

Age group	N	Percentage
1-10	30	15%
11-20	32	16%
21-30	64	32%
31-50	42	21%
51-70	32	16%

Table 2: Distribution of *Staph aureus* growth in clinical specimens according to age group

Age group	1-10	11-20	21-30	31-50	51-70
%	9%	17%	33%	23%	18%
Number	18	34	66	46	36

Table 3: Distribution of the *Staph aureus* growth in specimens

SAMPLE	swab	urine	pus	Catheter tip	csf	sputum
%	32%	14%	18%	22%	5.5%	8.5%
Number	64	28	36	44	11	17

Discussion

A nosocomial pathogen of the utmost severity, *S. aureus* is responsible for substantial morbidity and mortality [9]. Transient hand carriage on the hands of health care personnel and patient-to-patient transmission of *S. aureus*-infected or colonised patients are the primary methods of transmission. The cross-sectional study revealed that the number of *Staphylococcus aureus* isolates from clinical specimens was higher in male specimens than in female specimens. Loreen A *et al*.[11] conducted a study that concurs with our observation, indicating that "male gender was identified as a risk factor for *S. aureus* nasal carriage." Judyta E *et al.* [12], demonstrated that "risk factors for S aureus carriage were sex-dependent."

The current study determined that a high *Staphylococcus aureus* isolate was obtained from swabs, tips, and sputum over the course of two years. Conversely, and Metha A *et al*. [13]. Rajaduraipandi K *et al*. [14]. conducted prior investigations that demonstrated elevated isolation rates from wound swabs and sputum. While Qureshi H *et al*. [15]. reported a high isolation rate from sputum.

The prevalence and antibiotic susceptibility patterns of a variety of *Staph aureus* isolates obtained from a variety of clinical subjects were ascertained. The present study demonstrated that *Staphylococcus aureus* was highly sensitive to vancomycin, a finding that was consistent with the research conducted by Mehta A *et al*. [13] and Rajaduraipandi K *et al*. [14]. The most prevalent drug resistance of *S. aureus* was observed in 2018 against colistin 101 (99%), Augmentin 93 (91%), and ceftazidime 77 (75%). Tetracycline (32%), Gentamycin 34 (24%), and Amoxicillin (46%), were the next most frequently observed drug resistances. In contrast, Qureshi H *et al*.[15] reported that 97.8% of the *Staph aureus* they had recorded were resistant to Gentamicin. Additionally, Unaezuoke J *et al*.[16] reported that *Staphylococcus aureus* isolates exhibited a high resistance to penicillin, 89.6% to ampicillin, 87.5% to tetracycline, and 75.0% to chloramphenicol.

Conclusion

Vancomycin, Ciprofloxacin, and Erythromycin were the most frequently identified antibiotics that demonstrated consistent sensitivity to *S. aureus* isolates. The nature of *S. aureus* isolates in this hospital could be better understood by epidemiologists as a result of these findings.

References

1. James J, Michael A, Karen C, Guido F, Marie L, Sandra S, *et al.* Manual of Clinical Microbiology. 11th ed. Washington, DC: ASM Press; c2012.
2. David S. Clinical Infectious Disease. Cambridge, United Kingdom: Cambridge University Press; c2012.
3. Hajo G, Marta A, John B, Eidne T. Emergence and resurgence of methicillin-resistant *Staphylococcus aureus* as a public-health threat. Lancet. 2006;368(9538):874-885.

4. Yves L, Florence B, Michel G. *Staphylococcus aureus* and food poisoning. Genet Mol Res. 2003;2(1):63-76.
5. Acar F, Courvalin P, Chabbert P. Methicillin-resistant staphylococcemia. bacteriological failure of treatment with cephalosporins. Antimicrob Agents Chemother (Bethesda). 1970;10:280-285.
6. Barber M. Naturally occurring methicillin-resistant staphylococci. J Gen Microbiol. 1964;35:183-190.
7. Centers for Disease Control and Prevention (CDC). *Staphylococcus aureus* resistant to vancomycin. JAMA. 2002;51(26):565-67.
8. Betty A, Daniel F, Alice S. Staphylococcus, Micrococcus and Similar Organisms, Chapter 19. In: Baily and Scott's Diagnostic Microbiology. 11th ed. St. Louis: Mosby Inc; c2002.
9. Sachdev D, Amladi S, Nataraj G, Baveja S, Kharkar V, Mahajan S, *et al.* An outbreak of methicillin-resistant *Staphylococcus aureus* (MRSA) infection in dermatology indoor patients. Indian J Dermatol Venereol Leprol. 2003;69(6):377-80.
10. Gould I, David M, Esposito S, Garau J, Lina G, Mazzei T, *et al.* New insights into methicillin-resistant *Staphylococcus aureus* (MRSA) pathogenesis, treatment and resistance. Int. J Antimicrob Agents. 2012;39(2):96-104.
11. Loreen A, Josseph J, Pamela F, Jianfang H, Michael A, Richard P, *et al.* Preoperative risk factors for nasal carriage of *Staphylococcus aureus*. Cambridge University Press, 2011, 25(6).
12. Judyta E, Barbara A. Sex differences in the risk factors for *Staphylococcus aureus* throat carriage. Am J Infect Control. 2010;45(1):29-33.
13. Mehta A, Rodrigues C, Sheth K, Jani S, Hakimiyan A, Fazalbhoy N, *et al.* Control of methicillin-resistant *Staphylococcus aureus* in a tertiary care Centre–A five-year study. J Med Microbiol. 1998;16:31-34.
14. Rajaduraipandi K, Mani K, Panneerselvam K, Mani M, Bhaskar M, Manikandan P, *et al.* Prevalence and antimicrobial susceptibility pattern of methicillin - resistant *Staphylococcus aureus*: A multicenter study. Indian J Med Microbiol. 2006;24:34-38.
15. Qureshi H, Rafi S, Qureshi S, Ali A. The current susceptibility patterns of methicillin-resistant *Staphylococcus aureus* to conventional anti - Staphylococcus antimicrobials at Rawalpindi. Pak. J Med. Sci. 2004;20:361-364.
16. Unaezuoke J, Aririatu L. A survey of antibiotic-resistant *Staphylococcus aureus* strains from clinical sources in Owerri. J Appl. Sci. Environ Manag. 2004;8(1).