"Molecular characterization of vatA and msrA (quinupristin-dafloprístin resistance) genes in MRSA and VRSA strains among *staphylococcus aureus* in surgical site infections at a tertiary care centre in Kanpur''

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Abstract

Introduction:-Introduction: The problem of surgical site infection (SSI), which contributes to significant morbidity and death, lengthens hospital stays, and ultimately raises healthcare expenditures, is still widespread and common.

Aim and Objectives: To study the microbiological profile of surgical site infections in post operative patients at a tertiary care centre, Uttar Pradesh, India.

Material and Methods: This was a Cross-sectional study conducted in a hospital setting over the period of 1 year 6 Month i.e,, October 2022 to April 2024 at a Rama Medical College Hospital & Research Centre. All surgically treated patients of both sexes were included. Patients who received a second surgery at the same location for any reason, patients receiving immunosuppressant medication, people with immunodeficiency diseases, people currently taking antibiotics, and people with infections elsewhere were all excluded from participating. If there was signs of a wound infection 48 hours after surgery, the patient was diagnosed with SSI. Suitable statistical analysis was carried out to analyse the data. Molecular detection was done for the detection of vatA and msr A gene by using Qiagen DNA extraction kit.

Results: A total no. of 99 patients underwent different types of surgeries. Out of 99 sample 52 were observed to be culture positive. Among the 52 culture positive cases Gram positive bacteria was most common isolated 32(32.2%) other than Gram negative bacteria 20(20.2%). The positive cases of MSSA was found to be (26.9%), CONS (17.3%), MRSA (11.5%) whereas in case of GNB, Klebsiella oxytoca and Pseudomonas aeruginosa was found to be (9.6%), Klebsiella pneumoniae (7.6%) followed by E.coli ,Proteus mirabilis with (3.8%), and least for Staphylococcus epidermitidis , Staphylococcus lugdinensis , Citrobacter, Enterobacter and MRCONS with (1.92%) . It was observed that the site of the infection most common affected was the superficial site with (81.2%). In the present study out of six MRSA isolates 4 were resistant for Quinupristin and 4 isolate was positive for msr A gene. It was also noted that out of six MRSA isolates 4 were resistant for Quinupristin and 1 isolate was positive for Vat A gene.

Conclusion: Abdominal surgeries were more likely to result in SSIs. After any type of surgery, patients who were male, with the age group of 30 years or above , had emergency surgery, had diabetes, and/or have had a lengthy hospital stay are more likely to develop SSIs.The increasing occurrence among male was attribute to the nature of the infected wounds which they come to surgical department.

Keywords: Surgical site infection, Prevalence, Microorganisms, Hospital stay.

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INTRODUCTION

Staphylococcus aureus a versatile gram positive pathogen endowed with thecapacity to adapt to diverse environmental conditions is responsible forcausing a multitude of illnesses in human beings that affect the blood stream, skin and soft tissues, respiratory tract as well as toxin mediated illnesses etc., [1]MRSA and VRSA has become an important nosocomial pathogen in many
countries.MRSA has also become an important cause of postoperative infection [2]. Isolation of MRSA from surgical sites have been associated with a lower frequency of primary healing and delayed healing [3].
Staphylococcus aureus remain the most common cause of SSI, despite the
universal practices and potent use of anti staphylococcal drug preoperatively.[4]Hospital acquired infections are major cause of morbidity and mortality in hospitals.Surgical site infection (SSI) is one of the major hospital acquired infection in hospitals.[5] Many bacteria are implicated in this Staphylococcus aureus (S.aureus) is major bacteria causing surgical site infection , both superficial and deep SSI. [5] In the present study , we have compared the extracellular and intracellular activities of Quinupristin/Dalfopristin against a panel of S. aureus (reference strains andclinical isolates) displaying specific mechanisms of resistance to streptogramins Aor B components. [6]The Resistance to Quinupristin-Dalfopristin in staphylococci required resistance to the streptogramin A component, and it generally requires resistance to the streptogramin B component It is interesting to note that combinations of streptogramin resistance genes in isolates of staphylococci have been seen previously, including isolates with 11 streptogramin A resistance gene. Combinations such as vatA-vgbA-vgaA, vgaAv-vatBvgaB, vgaAV-vatA-vgbA, and
vgaAv-vatA-vgbA-vatB-vgaB have been reported In staphylococci, the genes
responsible for resistance to the streptogramin B component antibiotics include erm, vgb, and msr. ermA, ermB, and ermC encoded enzymes, which is methylate an adenine residue in the 23S rRNA [7,8,9].

MATERIAL AND METHODS

Study settings and duration

This was a hospital-based, cross-sectional study carried out in the Department of Microbiology with collaboration with the Surgery Department at a tertiary care centre. The study was carried out over a period of study 1 year 6 months from October 2022 to April 2024. The Ethical clearance was duly obtained from the Institutional Ethical Committee.

Study population and sampling technique

All the cases admitted to the surgical wards (including both elective and emergency surgery) during the study period and those who met the eligibility criteria were included in the study.

Sample size calculation

The prevalence of SSI observed in the study by Tabiri et al. was 11.5% [11]. Based on this study, consideration.

SAMPLE SIZE:- SS (n)= 4PQ/L2
Where,P=Prevalence,Q= 100-p,L= Allowable error,
If the allowable error is 5 % SS (n) = 4×72x28
Sample Size (n) = 8064/81= 99

The sample size taken in our research study was 99 .

Inclusion criteria

1.Pus samples from surgical site infection of Post Operative patients of both sexes of all age group.
2. All patients from both IPD & OPD, culture positive for Staphylococcal infection was included in this study.
3. Patients of all age and gender was included in our study.
4. Samples showing Staphylococcus species as single causative agent of infection was included in this study.

Exclusion criteria

Pus samples from other than surgical site infection of patients of both sexes will be excluded in the study.

Ethical clearance

The study was carried out after getting ethical approval from the Institutional Ethical Committee and written consent was obtained from every study subject.

Data collection procedure

Data about the age of the patients, gender, demographic details, clinical details including the name of the procedure, date and duration of surgery, the experience of surgeons, , nature of the surgery, postoperative hospital stay, and the onset of illness (SSI) were collected by reviewing the patient's case sheet.The surgical wound dressings were removed 48

hours after the procedure. Indications of a wound infection was taken into account if the patient displayed local inflammatory changes at the wound site, such as edoema, redness, warmth, or discharge. If before applying the bandage, samples were taken to determine if there had been any discharge. Inflammatory changes alone were present but did not have any discharge, the wounds were watched for the emergence of until the patient was sent home, the wound. If inflammatory symptoms emerged within 48 hours, patients were followed with the assistance of the corresponding surgeons. These patients also received education and followed up for the creation of SSIs through mobile phone for the development of SSIs over a period of 30 days. The suspected wound infections were cleaned with sterile normal saline, followed by 70% alcohol, and then the specimen was collected using a sterile swab. Two swabs were taken from the depth of the wound, and/or the aspirates were collected in a sterile disposable syringe and transported to the laboratory within two hours. The color, consistency, and odor of the samples were observed and recorded. A direct thin smear was made from each wound swab and/or aspirates on a clean grease-free glass slide and was air dried. It was then heat-fixed, and Gram staining was done with positive and negative control (American Type Culture Collection [ATCC] Staphylococcus aureus 25923 and Escherichia coli 25922).

The presence of pus cells and microorganisms was observed under the oil immersion (100X) objective. The samples were cultured onto nutrient agar, 5% sheep blood agar, and MacConkey agar plates by adopting standard microbiological technique After 24 hours of incubation aerobically at 37°C, plates were read, and the isolates were identified based on colony morphology, Gram stain, motility, and biochemical tests.

Data analysis

The data obtained were entered in Microsoft Excel (Microsoft Corp., Redmond, WA), and the results were analyzed using SPSS (Statistical Package for the Social Sciences) version 21 (IBM Corp., Armonk, NY). All the data collected in the current study was categorical, so they were expressed in a table as frequency and percentage. Also, the figures were expressed as a pie chart. The association between risk factors and the presence of SSI was assessed using the Chi-square test. With a 95% confidence interval, a p-value of less than 0.05 was considered statistically significant.

RESULTS

Age-wise distribution (Table 1 and Graph 1)
A total of 99 patients with suspected surgical site infections were included in the study. The highest proportion of patients belonged to the 41–50 years age group (25.2%), followed by the 11–20 years and 21–30 years age groups, each accounting for 14.1% of cases. Children aged 0–10 years constituted 12.1% of the study population, whereas patients aged 31–40 years and 51–60 years contributed 10.1% and 11.1%, respectively. The lowest frequency was observed among patients aged ≥71 years (4.0%). These findings indicate that middle-aged adults were most frequently affected by surgical site infections.

Gender-wise distribution (Table 2 and Graph 2)
Among the 99 enrolled patients, males predominated with 72 cases (72.7%), while females accounted for only 27 cases (27.3%). The marked male predominance suggests a greater exposure of males to surgical procedures or a higher prevalence of risk factors predisposing them to surgical site infections in the study population.

Distribution of SSI according to wound type (Table 3 and Graph 3)
The majority of surgical site infections were superficial incisional infections, comprising 92 patients (92.9%). Deep surgical site infections were observed in only 7 patients (7.1%), while no organ-space infections were detected. This demonstrates that superficial wound infections constituted the predominant clinical presentation in the present study.

Elective versus emergency surgery (Table 4 and Graph 4)
Out of the 99 patients, 59 (59.5%) underwent emergency surgical procedures, whereas 40 (40.5%) had elective surgeries. The higher proportion of emergency procedures among patients with SSI suggests that emergency surgeries may be associated with an increased risk of postoperative wound infection because of limited preoperative preparation and contaminated surgical conditions.

Ward-wise distribution (Table 5 and Graph 5)
Most isolates were obtained from patients admitted to the Orthopaedics ward (76.8%), followed by the General Surgery ward (14.1%) and the ENT ward (9.1%). The predominance of orthopaedic cases indicates a greater burden of surgical site infections in implant-related and trauma surgeries performed in this specialty

. **Culture positivity (Table 6 and Graph 6)**
Among the 99 wound specimens processed, 52 (52.5%) yielded bacterial growth, whereas 47 (47.5%) showed no growth on culture. Of the culture-positive specimens, *Staphylococcus* species

constituted the largest group (32.2% of all samples), while other bacterial isolates accounted for 20.2%. These findings confirm that *Staphylococcus* species remain the predominant pathogens responsible for surgical site infections.

Distribution of bacterial isolates (Table 7 and Graph 7)

Among the 52 culture-positive isolates, methicillin-sensitive *Staphylococcus aureus* (MSSA) was the commonest isolate, accounting for 26.9%, followed by coagulase-negative staphylococci (CONS) (17.3%) and methicillin-resistant *Staphylococcus aureus* (MRSA) (11.5%). Among Gram-negative bacilli, *Klebsiella oxytoca* and *Pseudomonas aeruginosa* each accounted for 9.6%, followed by *Klebsiella pneumoniae* (7.6%). *Escherichia coli* and *Proteus mirabilis* each contributed 3.8%, whereas *Staphylococcus epidermidis*, *Staphylococcus lugdunensis*, MRCONS, *Citrobacter*, and *Enterobacter* were isolated in only 1.9% each

. **Distribution of Staphylococcal isolates (Table 8 and Graph 8)**

Among the 32 *Staphylococcus* isolates, MSSA was the predominant species, accounting for 43.7%, followed by CONS (28.1%) and MRSA (18.7%). MRCONS, *Staphylococcus lugdunensis*, and *Staphylococcus epidermidis* each constituted 3.1% of the isolates. These findings demonstrate that MSSA remains the predominant *Staphylococcus* species causing surgical site infections despite the presence of methicillin-resistant strains.

Demographic profile (Table 9 and Graph 9)

The majority of patients were residents of Kanpur (70.7%), while 29.3% belonged to neighbouring districts. This distribution reflects the tertiary referral nature of the study hospital, catering predominantly to patients from Kanpur and surrounding regions.

Table no.1Age wise distribution of the isolates

S.NO.	Age	No. of Isolates (n=99)	Percentage
1.	0-10	12	12.1%
2.	11-20	14	14.1%
3.	21-30	14	14.1%
4.	31-40	10	10.1%
5.	41-50	25	25.2%
6.	51-60	11	11.1%
7.	61-70	09	9.09%
8.	≤71	04	4.04%

Graph no.1 Age wise distribution of the isolates

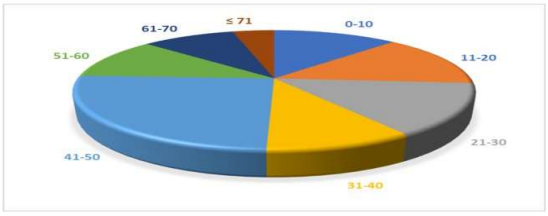


Table no.2 Gender wise distribution of the Isolates

S.No.	Gender	No. Of isolates(n=99)	Percentage
1.	Male	72	72.7%
2.	Female	27	27.7%

Graph no.2 Gender wise distribution of the Isolates

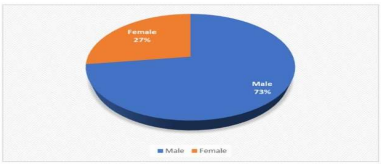


Table no.3 Distribution of SSI cases of the isolates

S.no	Type of wound	Numbers(n=99)	Percentage
1	SUPERFICIAL INCISIONAL SSI	92	92.9%
2	ORGAN SPECIFIC	00	0%
3	DEEP	07	7.07%

Graph no.3 Distribution of SSI cases of the isolates

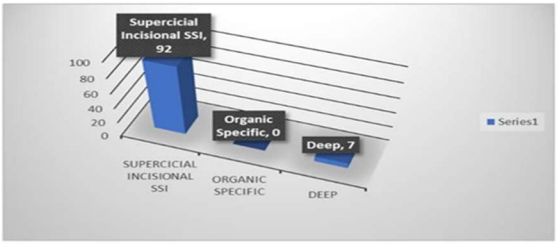


Table no.4 Distribution of SSI cases in elective surgery and emergency surgery

Types of Surgery	Numbers(n=99)	Percentage
ELECTIVE SURGERY	40	40.4%
EMERGENCY SURGERY	59	59.5%

Graph no.4 Distribution of SSI cases in elective surgery and emergency surgery

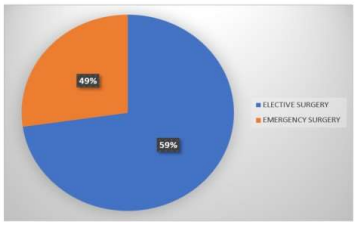


Table No.5 Ward wise Distribution of all the Isolates

S.No	Ward	Total No Of isolates(n=99)
1	Orthopaedics	76
2	Surgery	14
3	ENT	09

Graph No.5 Ward wise Distribution of all the Isolates

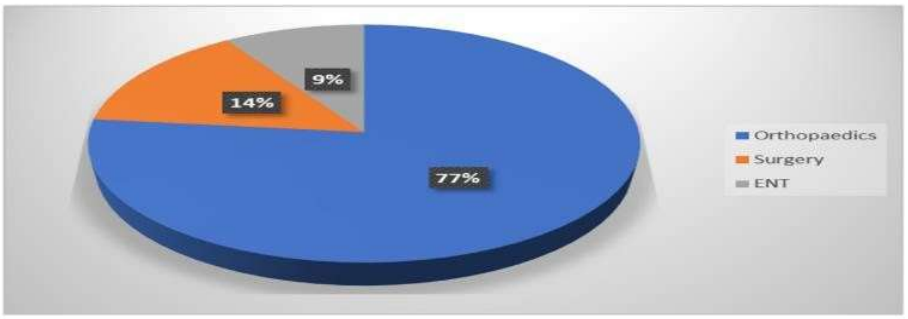


Table.6 Total Number of all the Isolates

S.No.	Type of Isolates	Total No. of samples (n=99)	Percentage
1.	*Staphylococcus species*	32	32.2%
2.	Other Isolates	20	20.2%
3.	No Growth	47	47.4%

Graph No.6 Total Number of all the Isolates

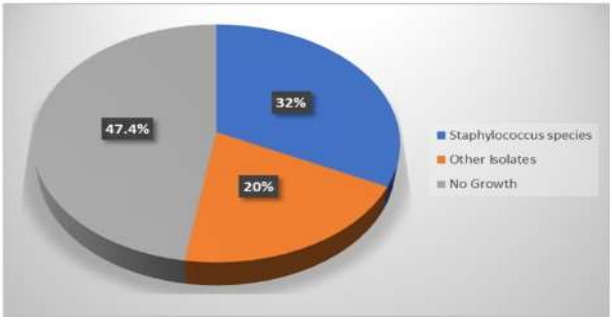
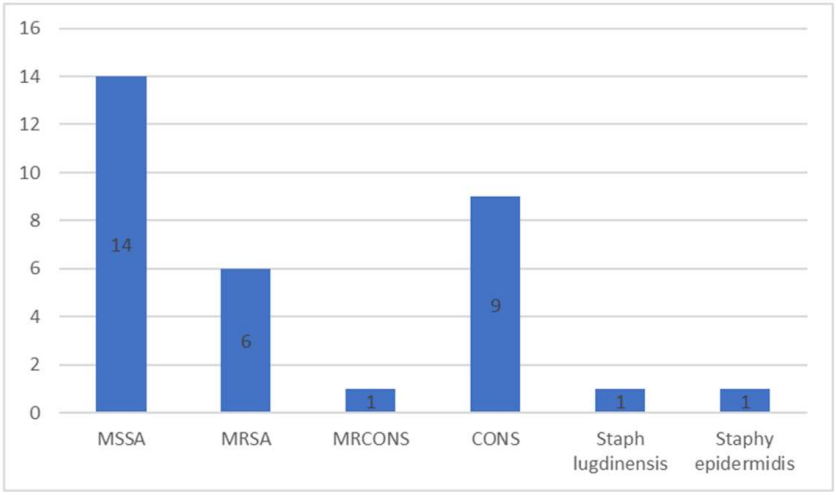


Table no.7 Total number of pus sample from post operative cases of wound for culture of isolates

Types of organism	Numbers of isolates(n=52)	Percentage
MSSA	14	26.9%
CONS	09	17.3%
MRSA	06	11.5%
Klebsiella Oxytoca	5	9.6%
Pseudomonas Aeruginosa	5	9.6%
Klebsiella Pneumoniae	04	7.6%
Escerichia coli	02	3.8%
ProteusMirabilis	02	3.8%
Staphylococcus Epidermidis	01	1.9%
Staphylococcus Lugdinensis	01	1.9%
MRCONS	01	1.9%
Citrobacter	01	1.9%
Enterobacter	01	1.9%

Graph.8 Total number of pus sample from post operative cases of wound for culture *staphylococcus species*



Graph no.7 Total number of pus sample from post operative cases of wound for culture of isolates

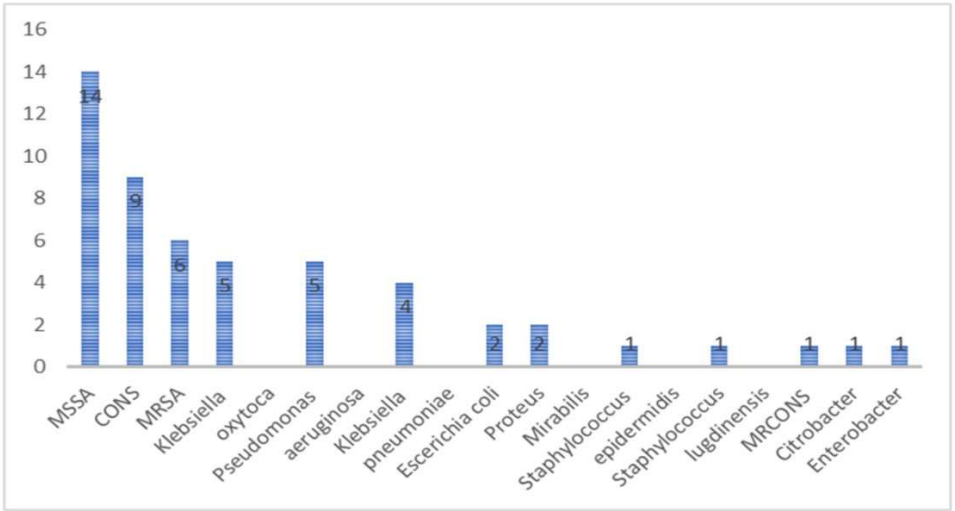


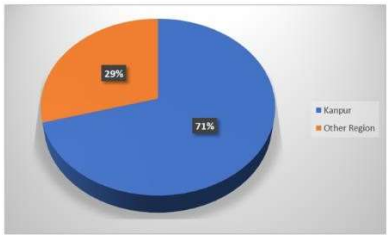
Table no.8 Total number of pus sample from post operative cases of wound for culture *staphylococcus species*

S.No	Organism	Total no of sample(n=32)	Percentage
1	*MSSA*	14	43.7%
2	*MRSA*	06	18.7%
3	*MRCONS*	01	3.1%
4	***CONS***	**09**	**28.1%**
5	*Staphylococcus lugdinensis*	01	3.1%
6	*Staphylococcus epidermidis*	01	3.1%
7	Total	32	100%

Table no.9 Demographic profile of isolates

S.No	Region	Total no of samples(n=99)
1	Kanpur	70
2	Other Region	29

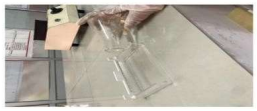
Graph no.9 Demographic profile of isolates



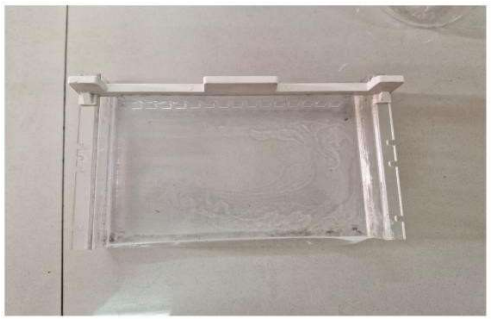
Agarose Gel Preparation

1 Gram Agarose powder
+
98ml Autoclaved Distilled Water
+
2ml TAE Buffer
Allow to Boil at 90°C for 2min.
Allow to cool
Add 8 µl Etbr Dye.
Pour to the comb Electrophoresis Plate





Agarose Gel



DNA Loading

- Loading Dye- 3 µl
  +
  DNA Samples- 7µl
  Electrophoresis at 90 ^{0}C
  for 20-25 min.





PCR Product Estimation


Vat A-VF **Vat A-VR**	**F-TGGTCCCGGAACAACATTTAT-R** **TCCACCGACAATAGAATAGGG**	**268bp**	**55°C**
MsrA-MF **MsrA-MR**	**F-GGCACAATAAGAGTGTTTAAAG-R** **AAGTTATATCATGAATAGATTGTCCTGTT**	**940bp**	**50°C**

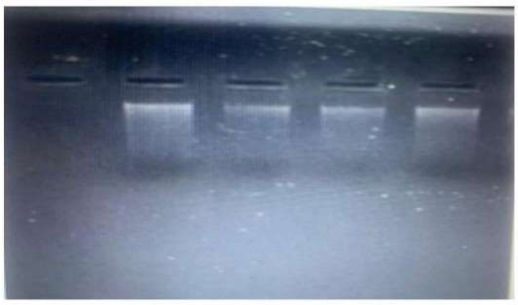


Fig: The DNA Extraction in Agarose gel

Fig: The PCR Cycling Conditions

Fig: The DNA Extraction in Agarose gel

Table 9:

In the present study out of six MRSA isolates 4 were resistant for Quinupristin and 4 isolate was positive for msr A gene.

Detection of msrA Gene in Quinupristin dalfopristin resistant *Staphylococcus aureus*

S.No	Type of Isolate	No.of MRSA	Quinupristin/ Dalfopristin Resistant	msrA Gene detected
1	*Staphylococcus aureus*	06	04	04

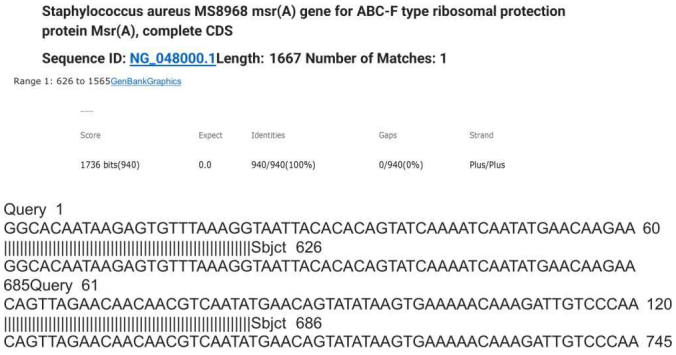
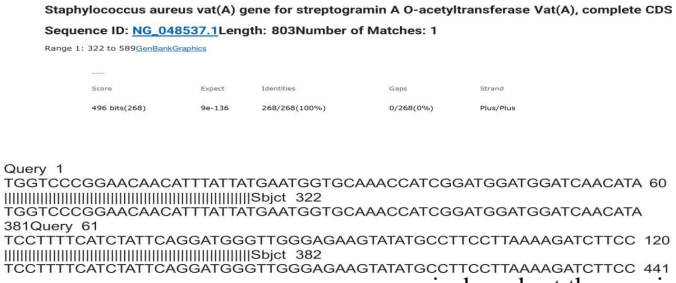


Table 10:

Detection of vat A Gene in Quinupristin dalfopristin resistant *Staphylococcus aureus*

S.No	Type of Isolate	No.of MRSA	Quinupristin/ Dalfopristin Resistant	Vat A Gene detected
1	*Staphylococcus aureus*	06	04	01

In the present study out of six MRSA isolates 4 were resistant for Quinupristin and 1 isolate was positive for Vat A gene.



DISCUSSION

The present study revealed that surgical site infections (SSIs) were distributed across all age groups, with the 41–50 years age group contributing the highest proportion (25.2%), followed by young adults aged 11–20 years and 21–30 years, both at 14.1% each Pediatric patients (0–10 years) also formed a considerable proportion at 12.1%, whereas elderly patients aged ≥71 years accounted for only 4% of cases.These findings highlight that middle-aged individuals are at maximum risk, likely due to multiple contributing factors including higher occupational exposure, stress-related immunosuppression, and the coexistence of comorbidities such as diabetes and hypertension. In contrast, the relatively lower rates among elderly patients may reflect reduced exposure opportunities, selective mortality, or smaller representation in the surgical cohort.the majority of infections were superficial wounds, comprising 92.9% of the total cases, while deep wounds accounted for only 7.1%. The predominance of superficial infections may be explained by the direct exposure of skin and subcutaneous tissues during surgical procedures, making them more vulnerable to microbial contamination. Superficial SSIs are also more easily identified and reported compared to deep infections, which may remain clinically silent until complications occur., the majority of cases were admitted to the Orthopedics ward (61.6%), followed by the General Surgery ward (31.3%), while only 7.1% were from the ENT ward. The predominance of orthopedic cases highlights the vulnerability of bone and joint surgeries to surgical site infections, particularly due to the use of implants, long operative times, and challenges in maintaining asepsis. General surgery cases also contributed significantly, reflecting the contamination risks associated with

abdominal and soft tissue procedures. The relatively lower proportion of ENT infections may be explained by shorter and less invasive procedures, resulting in fewer SSIs.nearly 47.5% of wound samples showed no bacterial growth, which could be attributed to prior antibiotic therapy, low bacterial load, or limitations of conventional culture methods. Among culture-positive cases, Staphylococcus aureus remained the predominant pathogen, with Methicillin-sensitive S. aureus (MSSA) isolated in 14.1% and Methicillin-resistant S. aureus (MRSA) in 6.1%. Coagulase-negative staphylococci (CONS) were also significant, accounting for 9.1% of isolates, particularly in patients with implants. Gram-negative organisms such as Klebsiella spp. (9.1%), Pseudomonas aeruginosa (5.1%), E. coli (2%), and Proteus mirabilis (2%) also contributed notably. Rare isolates included Staphylococcus lugdunensis, MR-CONS, Enterococcus, and Citrobacter, each at 1%.the antibiotic susceptibility profile of isolates revealed alarmingly high resistance rates. Universal resistance (100%) was observed against Amoxicillin-Clavulanate (AMC), Cefotaxime (CTX), and Amoxicillin-Sulbactam (A/S). Ampicillin resistance was also very high at 90%, while fluoroquinolone resistance ranged between 60–70%. Conversely, higher sensitivity was retained to glycopeptides such as Vancomycin (97% sensitive), oxazolidinones such as Linezolid (100% sensitive), and newer agents including Tigecycline (100% sensitive) and Imipenem (100% sensitive).

The present study demonstrated that **middle-aged adults (41–50 years)** constituted the largest proportion of surgical site infections (SSIs), while males were affected more frequently than females. This observation is comparable with previous epidemiological studies, which have shown that male patients and individuals in the economically active age group are more likely to undergo trauma, emergency procedures, and implant-related surgeries, thereby increasing the risk of postoperative wound infection. The overwhelming majority of infections in the present study were **superficial incisional SSIs (92.9%)**, whereas deep infections were relatively uncommon. Superficial infections are generally detected earlier because of evident inflammatory changes and wound discharge. Similar findings have been reported by **Afaq and Sujatha**, who emphasized that early microbiological diagnosis and prompt wound assessment are essential for preventing progression to deep surgical site infections and improving patient outcomes. Emergency surgeries constituted a higher proportion of infected cases than elective procedures. Emergency surgical interventions often allow limited time for adequate patient optimization, skin preparation, and antimicrobial prophylaxis, thereby increasing the risk of contamination. These findings support the importance of standardized infection prevention strategies and quality assurance measures in surgical practice, as highlighted by **Dr. Nashra Afaq** in her publications on microbiology laboratory quality systems and hospital accreditation. Microbiological analysis showed that **Staphylococcus aureus** remained the predominant pathogen causing SSIs, with MSSA isolated more frequently than MRSA. However, the isolation of MRSA highlights the continuing challenge posed by multidrug-resistant organisms in postoperative wound infections. Gram-negative organisms including **Klebsiella spp.** and **Pseudomonas aeruginosa** [10,11,12] also contributed substantially to the overall microbiological profile. These observations are consistent with studies evaluating MRSA prevalence and antimicrobial resistance in tertiary care hospitals. Molecular characterization revealed the presence of the **msrA** gene in four quinupristin–dalfopristin-resistant MRSA isolates, whereas the **vatA** gene was detected in only one isolate. This finding indicates that efflux-mediated resistance appears to be more prevalent than enzymatic inactivation among resistant isolates in the present setting. Continuous molecular surveillance, antimicrobial stewardship, and infection control programmes are therefore essential to limit the emergence and dissemination of resistant *Staphylococcus aureus* strains.

In the present study, six MRSA isolates were recovered from surgical site infections. Among these, only one isolate (16.7%) harboured the **vatA** gene, indicating that **vatA-mediated quinupristin–dalfopristin resistance was relatively uncommon**. The low prevalence of the **vatA** gene suggests that enzymatic inactivation of streptogramin A is not the predominant mechanism of resistance among the MRSA isolates in the present study.

Similar findings were reported by **Schmitz et al. (2000)**, who investigated streptogramin resistance genes among *Staphylococcus aureus* isolates and found that **vatA** was detected only in a small proportion of resistant isolates, whereas other resistance determinants such as **vga** and **erm** genes were more prevalent. Their study concluded that **vatA** remains an uncommon mechanism of resistance in clinical MRSA isolates.

Likewise, **Roberts (2008)** reviewed MLS_B resistance genes in Gram-positive bacteria and reported that **vatA** is generally found at a low frequency in *Staphylococcus aureus*

and is usually associated with acquired plasmids or transposons. The study emphasized that continuous molecular surveillance is necessary to monitor the dissemination of these resistance determinants.

A study by **Kadlec and Schwarz (2012)** also demonstrated that **vatA**-positive MRSA isolates were uncommon but clinically significant because they confer resistance to streptogramin A antibiotics through acetyltransferase-mediated drug inactivation. The authors highlighted the importance of detecting **vatA** along with other streptogramin resistance genes to understand the molecular epidemiology of antimicrobial resistance.The findings of the present study are therefore consistent with previous reports demonstrating the **low prevalence of the vatA gene** among MRSA isolates. Although only one isolate carried **vatA**, its presence indicates the emergence of transferable streptogramin resistance genes in the hospital environment. Routine molecular screening, strict infection control practices, and antimicrobial stewardship programmes are essential to prevent further dissemination of these resistance determinants.

[13-15].

Conclusion

This study meticulously explored the demographic distribution, microbiological characteristics, antibiotic resistance profiles, and molecular features of Staphylococcus aureus isolates, placing special emphasis on the vatA and msrA resistance genes. The investigation focused on patients suffering from surgical site infections (SSIs) at a tertiary care hospital in Kanpur. The findings not only shed light on the epidemiological trends and resistance dynamics at play but also underscore the significant clinical implications of SSIs within this healthcare environment. These insights are crucial for understanding the challenges faced in managing infections and enhancing patient outcomes.SSIs were observed across all age demographics, yet the most significant burden was noted among middle-aged individuals, particularly those aged 41 to 50 years. This prevalence underscores the influence of various factors such as comorbidities, occupational hazards, and lifestyle choices that heighten susceptibility to infections. Furthermore, pediatric and young adult populations also demonstrated a considerable incidence, indicative of their immunological vulnerabilities and increased exposure risks inherent to their age. Although elderly patients represented a smaller proportion of cases, their clinical significance cannot be overlooked, as they often grapple with frailty and a diminishing capacity for wound healing. Additionally, a striking male predominance of 72.7% highlights the implications of gender-specific patterns in occupational exposure and healthcare-seeking behaviors.The vast majority of surgical site infections (SSIs) were classified as superficial, accounting for an impressive 92.9%. In contrast, those categorized as deep infections, while considerably rarer at 7.1%, present a more severe clinical challenge. A notable trend emerged indicating that emergency surgeries experienced a marginally higher incidence of SSIs compared to elective procedures. This observation likely stems from inherent limitations in preoperative preparation and the heightened challenges in maintaining aseptic protocols during urgent interventions.Examining the data on a ward-by-ward basis reveals that the Orthopedics department bore the brunt of these infections, with a striking 61.6% of isolates originating from implant-associated and trauma-related surgeries. Meanwhile, the General Surgery department also showed a significant contribution, holding a substantial 31.3% of the cases. Not to be overlooked, ENT procedures, though associated with SSIs less frequently, still face an inherent risk of infection.Staphylococcus aureus continued to reign as the predominant pathogen, with methicillin-susceptible Staphylococcus aureus (MSSA) detected in 14.1% of cases, significantly outpacing methicillin-resistant Staphylococcus aureus (MRSA) at 6.1%. In addition, a concerning rise in Gram-negative organisms, particularly Klebsiella and Pseudomonas, highlighted their role as significant contributors to severe infections, especially in deeper tissues. The vat A and msrA gene was also detected which means more care and awareness program should be followed with strict AST policy.

Declarations:

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

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