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Expert Opinion Article

Prevalence and Antimicrobial Resistance Pattern of Staphylococcus aureus in the Kanpur Nagar.

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Abstract

Background: Staphylococcus aureus is a significant human pathogen responsible for a range of infections, with increasing concern due to rising antimicrobial resistance, particularly Methicillin-Resistant S. aureus (MRSA). This study aimed to determine the prevalence and antimicrobial resistance pattern of S. aureus in Kanpur Nagar.

Methods: A total of 309 clinical samples were collected from patients across various healthcare settings. Isolation and identification of S. aureus were performed using standard microbiological methods. Antimicrobial susceptibility testing was conducted using the Kirby-Bauer disc diffusion method following CLSI guidelines.

Results: The overall prevalence of S. aureus was 15.7%, with the highest recovery from nasal swabs, pus/wound samples, and throat swabs. MRSA was present across all age groups, most commonly in the 25–44 age group, though no significant association with age or gender was found. Antibiotic sensitivity was highest to vancomycin (86%), linezolid (79%), and gentamicin (70.6%), while penicillin (5.3%) and ampicillin (16%) showed high resistance levels.

Conclusion: The findings indicate a moderate burden of S. aureus in the region, with notable resistance to first-line antibiotics. Regular antimicrobial surveillance, judicious antibiotic use, and strict infection control policies are essential to limit the spread of MRSA and other resistant strains.

Keywords: Staphylococcus aureus, MRSA, antimicrobial resistance, Kanpur Nagar, prevalence, antibiotic sensitivity

Introduction: The human body is the living space of broad and vacillated masses of organisms with respectabilities that are meanwhile possibly dangerous and pleasing to human prosperity; along these lines, as of late, there has been a strong drive to totally depict the strains associated with different pieces of the body under different prosperity conditions [1] Thus, this innocuous commensal microorganism is right now comprehensive seen as an imperative tricky pathogen related to different defilements. S. aureus together with Staphylococcus epidermidis rank first among causative specialists for these sorts of commensal infections. Thusly, they transformed into the critical explanations behind pollutions of remedial additions and nosocomial sicknesses around the globe, and especially in developing nations [2]

S.aureus has for a long while been seen as a ruinous pathogen prepared to realize bacteremia associated with higher mortality stood out from other bacterial course framework sicknesses [3] The regions of Staphylococcus are the nasal layers and skin of warm-blooded animals, and they may achieve a broad assortment of pollutions, for instance, sustenance hurting, sepsis, pneumonia, osteomyelitis, skin maladies, and powerful endocarditis [4]

An examination in Thailand showed a nasal colonization from these strains and the straightforwardness of pollution transmission between recuperating office operator understudies.[5].

It is vital to evacuate the wellspring of disease alongside starting anti-microbial treatment to counteract re-contamination of the circulation system. Antimicrobial operators are the backbone of treatment for the treatment of septicemia. These patients should, accordingly get forceful course of parenteral antimicrobial treatment at the soonest, as a result of reality of the disease and scarcity of time.[6]

The MRSA strains are an issue the world over, generally in creating countries, which have one of kind inconveniences since alternative healing decisions are either unviable or extravagant. What's more, in medically struggling countries, serum poison utilize is even less controlled, and various enemy of microbials are open without a specialist's cure (64%) [7]

Material and Methods:

Study Design: Study was conducted in the of department of Microbiology, during a period from Aril 2024- March 2025 at Rama Medical College, Kanpur

Inclusion criteria:

1. Clinical specimens (e.g., pus, blood, urine, wound swabs) collected from patients attending healthcare facilities in Kanpur Nagar
2. Samples that show positive growth for Staphylococcus aureus confirmed by standard microbiological methods
3. Patients of all age groups and both sexes.
4. Samples collected within the defined study period.
5. Availability of complete antimicrobial susceptibility testing (AST) results.

Exclusion Criteria:

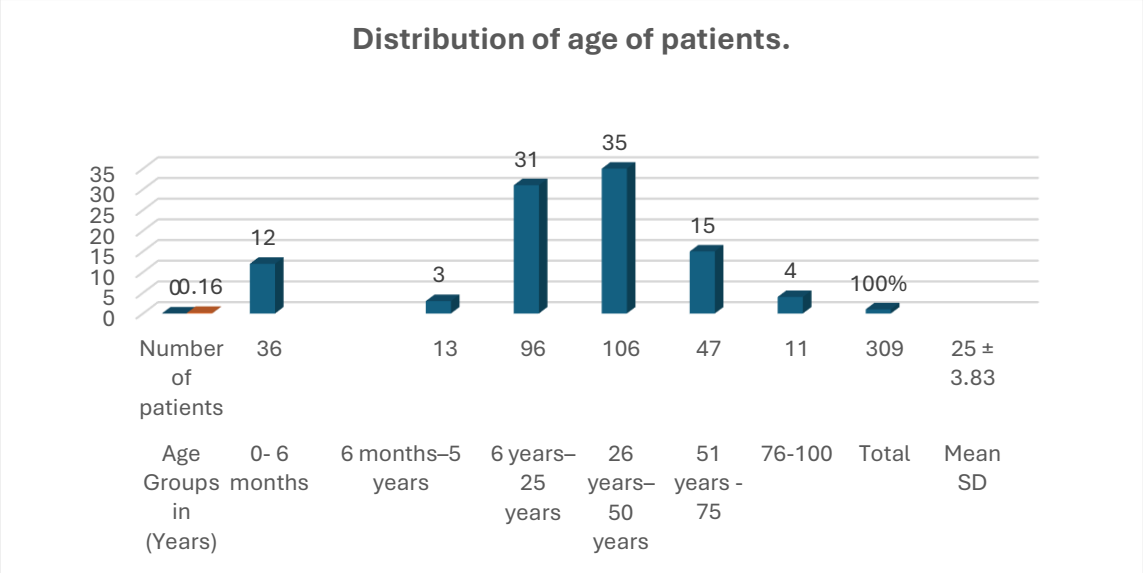
1. Samples with no growth or growth of organisms other than Staphylococcus aureus.
2. Contaminated, poorly labeled, or improperly transported specimens.
3. Repeated samples from the same patient with identical resistance profiles.
4. Records with incomplete clinical or laboratory data.

Result

Table no. 1 Age distribution of the patients.

Age Groups in (Years)	Number of patients	Frequency (%)	
0- 6 months	36	12	
6 months–5 years	13	3	
6 years–25 years	96	31	
26 years–50 years	106	35	0.16
51 years -75	47	15	
76-100	11	4	
Total	309	100%	
Mean SD	25 ± 3.83		

Fig no: 1 distribution of age of patients.



The age distribution of the 309 patients reveals that the majority fall within the 6 to 50 years range, with 32% in the 6–25 years group and 35.3% in the 26–50 years group, indicating a predominantly young to middle-aged population. Children under 5 years of age, including those aged 0–6 months (12%) and 6 months–5 years (4.3%), make up a smaller portion of 16.3%, while older adults aged 51–100 years represent 19.2% of the total sample. The mean age of the population is 25 ± 3.83 years. The p-value of 0.16 indicates that the differences observed in age group distribution are not statistically significant, suggesting that the variation in patient numbers across age groups may be due to random chance rather than any specific pattern or association.

Table no: 2 gender distribution of patients

Sex	Number of patients	Percentage	P value
Female	150	49	0.60
Male	159	51	
Total	**309**	**100**	

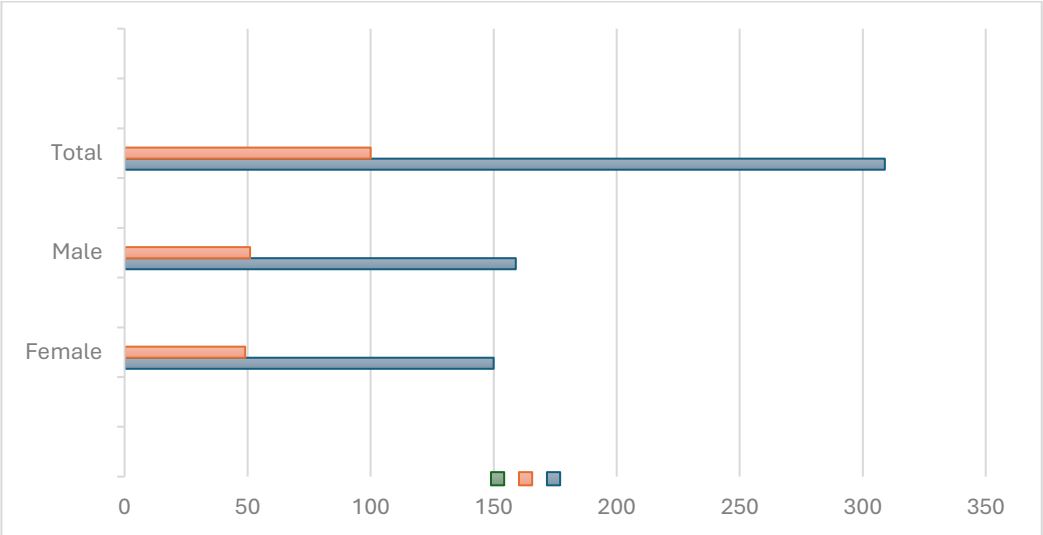


Fig no:2 gender distribution of patients

The sex distribution among the 309 patients is nearly equal, with 51% male and 49% female. The p-value of 0.16 indicates that there is no statistically significant difference between the number of male and female patients. This suggests that gender does not appear to be a determining factor in the composition of this patient population.

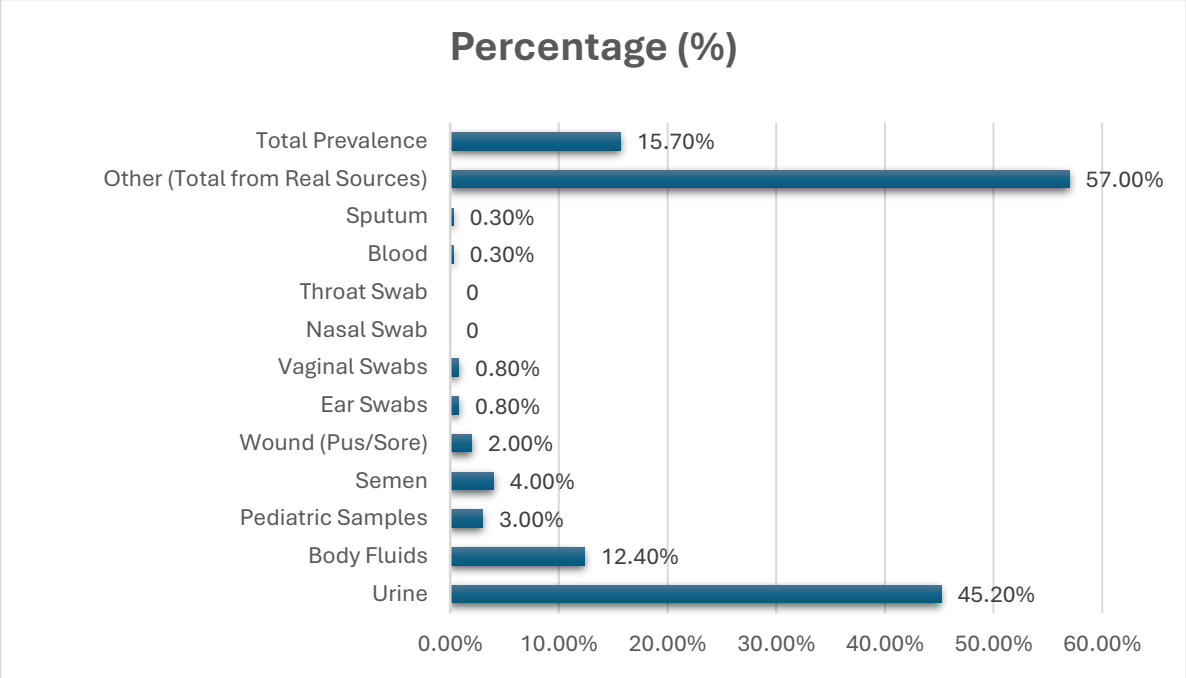


Figure no: 3 Sample distribution.

The majority of S. aureus isolates (57%) were recovered from real clinical sources such as blood, ear discharge, throat swab, nasal swab, and pus/wound, with the nasal swab showing a significantly higher recovery rate, indicating it as a key reservoir for colonization and potential transmission.

Table: 3 Methicillin Resistant Pattern of S. aureus with age group and gender.

Age Group (Years)	MRSA Cases (n, %)	Non-MRSA Cases (n, %)	p-value	Odds Ratio (OR)	95% Confidence Interval (CI)
<1	0 (0.0%)	-	0.999	-	-
1–14	7 (20.6%)	41 (25.6%)	0.567	1.673	(0.29, 9.76)
15–24	8 (23.5%)	38 (23.8%)	0.732	1.357	(0.23, 7.78)
25–44	12 (35.3%)	52 (32.5%)	0.805	1.238	(0.22, 6.72)
45–64	5 (14.7%)	13 (8.1%)	0.757	0.743	(0.11, 4.86)
65+	2 (5.9%)	7 (4.4%)	—	—	—

Urine samples had the highest individual prevalence (45.2%), while sputum and blood had the lowest (0.3%), highlighting variability in S. aureus distribution across body sites and the need for site-specific surveillance in clinical diagnosis and infection control.

The 25–44 age group had the highest proportion of MRSA (35.3%), but no statistically significant association was observed across age groups ($p > 0.05$ in all cases).

The odds ratios for MRSA in all age groups showed wide confidence intervals, reflecting low statistical power, likely due to small sample sizes in each group.

Table no: 4 Sensitive or resistance evaluation result of antibiotics

Antibiotic	Sensitivity %	Resistance %
Ampicillin	16	17
Amoxicillin	39	39
Vancomycin	86	6
Linezolid	79	4
Cotrimoxazole	49.6	39
Cephoxitin	18.3	6
Ciprofloxacin	52.6	30.3
Erythromycin	55	28
Gentamicin	70.6	17
Penicillin	5.3	48.3
Clindamycin	56.3	9.3
Rifampicin	38.4	3
Chloramphenicol	41	0
Teicoplanin	46.3	0.05
Amikacin	48.6	0

The highest sensitivity of S. aureus was observed with vancomycin (86%), linezolid (79%), and gentamicin (70.6%), indicating their continued effectiveness. Penicillin (5.3%) and ampicillin (16%) showed poor sensitivity, reflecting high resistance. Overall, resistance was moderate to high for several first-line antibiotics, highlighting the need for regular antimicrobial stewardship and sensitivity testing.

Discussion:

This study revealed a 15.7% prevalence of Staphylococcus aureus in Kanpur Nagar, with the highest recovery from nasal swabs, confirming the nose as a primary colonization site. Although the 25–44 age group showed the highest MRSA proportion, no significant association was found between age or gender and MRSA occurrence.

Antibiotic susceptibility testing showed high sensitivity to vancomycin (86%), linezolid (79%), and gentamicin (70.6%), while penicillin and ampicillin had poor efficacy, indicating growing resistance to commonly used antibiotics. These findings underscore the need for routine surveillance, rational antibiotic use, and strict infection control measures to manage S. aureus, especially MRSA, in clinical settings.

Conclusion:

The study highlights a moderate prevalence of Staphylococcus aureus (15.7%) in Kanpur Nagar, with the nasal cavity identified as a major colonization site. A significant proportion of isolates exhibited resistance to commonly used antibiotics, while vancomycin, linezolid, and gentamicin remained largely effective. The detection of MRSA across age groups without significant demographic association emphasizes the need for continuous surveillance, rational antibiotic use, and strengthened infection control practices to combat the growing threat of antimicrobial resistance

Strength:

1. Provides region-specific data on Staphylococcus aureus in Kanpur Nagar, where limited studies are available.
2. Focuses on the critical issue of antimicrobial resistance, relevant to current global and local health concerns.
3. Utilizes clinical isolates, increasing the practical relevance of findings for patient care.
4. Follows standardized microbiological methods for culture and antibiotic susceptibility testing.
5. Includes a range of commonly used antibiotics for a comprehensive resistance profile.

Limitations:

1. Limited range of antibiotics tested.
2. Study conducted in a single center in Kanpur Nagar.
3. Small sample size limits generalizability.
4. Molecular confirmation of MRSA (e.g., mecA gene) was not performed.
5. Community-acquired and hospital-acquired strains not differentiated.

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