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ORIGINAL RESEARCH

Prevalence and Antibiotic Sensitivity Pattern of Staphylococcus aureus isolated in a Tertiary Care Hospital, Lucknow

Dayavanti Kumari[1], Neeti Mishra[2], Khyati Tiwari[3]

[1]Associate Professor, Department of Microbiology, T.S.Misra Medical College and Hospital, Amausi, Lucknow, Uttar Pradesh, India
[2]Professor, Department of Microbiology, T.S.Misra Medical College and Hospital, Amausi, Lucknow, Uttar Pradesh, India
[3]Associate Professor, Department of Microbiology, T.S.Misra Medical College and Hospital, Amausi, Lucknow, Uttar Pradesh, India

Correspondence author
Dayavanti Kumari
Associate Professor, Department of Microbiology, T.S.Misra Medical College and Hospital, Amausi, Lucknow, Uttar Pradesh, India

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Abstract
Introduction- Staphylococcus aureus is one of the common organism capable of causing a wide range of human diseases. It is a significant human pathogen that causes soft tissue infection, wound infection, and produces the pus.
Aim -To study the prevalence and antibiotic sensitivity pattern of Staphylococcus aureus isolated in a Tertiary Care Hospital
Objectives- i. To isolate Staphylococcus aureus and study the prevalence rate. ii. To study Antibiotic Sensitivity pattern.
Materials and Methods-The study was conducted in the Department of Microbiology, T.S. Misra Medical College & Hospital, Lucknow, for a duration of 1 year . 1200 pus were studied. Staphylococcus aureus with other bacteria were isolated and antibiotic profile was determined using standard protocol.
Result- Total 214(47.66%) Staphylococcus aureus were isolated from 449 culture positive samples. Staphylococcus aureus showed 100% sensitivity to Linezolid and Vancomycin; 91.12% sensitivity to tetracycline, 92.52% sensitivity to Gentamicin, 85.98% sensitivity to Teicoplanin, 83.64% sensitivity to Clindamycin, 71.96% sensitivity to cefoxitin,75.23% sensitivity to Erythromycin, 68.69% sensitivity to Ciprofloxacin, 52.80% sensitivity to Chloramphenicol, 56.54% sensitivity to Cotrimoxazole, 21.49% sensitivity to Penicillin.
Conclusion- Staphylococcus aureus is one of the common organism found in pus samples with increasing drug resistance. So appropriate use of antibiotics is very crucial in preventing emergence of multidrug resistance.
Keywords: Staphylococcus aureus, Enterococcus faecalis, Coagulase Negative Staphylococcos, Escherichia coli, Pseudomonas aeruginosa, Klebsiella species, Proteus species, Kirby Bauer disc diffusion.

Introduction:-

Staphylococcus aureus is a Gram Positive bacteria, cocci in shape, arranged in grapes like clusters. Staphylococcus aureus is one of the bacteria commonly found on the skin. Staphylococcus aureus is the common cause of surgical wound infections, bacteremia, nosocomial infections and causes superficial and deep infections. [1]

It belongs to the family Micrococcaceae, 0.5-1.5 µm diameter, aerobic and facultatively anaerobic, β-hemolytic, non-sporing, non-motile, fermentative, oxidase negative, noncapsulated, yellow zone formation around the colonies.

Staphylococcus aureus is one of the versatile pathogen capable of causing a wide range of human diseases. It is a significant human pathogen that causes soft tissue infection, wound infection, and produces the pus.[2]

Pyogenic infections presents with local and systemic inflammation usually with pus formation. These may be exogenous or endogenous. [3]

Pus is a collection of thick,yellow or white fluid, formed at the site of inflammation during infection. [4]

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Pyogenic infections are one of the important cause of sepsis. Staphylococcus aureus is one of the commonest organism causing wound infections, followed by other Gram-negative bacilli.These infections are very difficult to treat because of the pathogens with increasing antibiotic resistance [5]

Aim:-

To isolate Staphylococcus aureus and study its prevalence rate from pus samples and antibiotic sensitivity pattern.

Materials and Methods:-

The study was conducted in the Department of Microbiology, T.S. Misra Medical College and Hospital, Lucknow, for a duration of 1 year. Total 1200 pus samples from different wards with suspected pyogenic infection were studied, to see the prevalence of Staphylococcus aureus. Samples were received in sterile swabs and sterile syringe. Direct Gram's staining was done for each samples. Blood agar and MacConkey agar were used to culture these samples, and after culture plates were incubated over-night at 37 degree centigrade. After incubation plates were observed for any growth. Tests like Gram's staining, catalase test, coagulase test and biochemical tests were performed to isolate Staphylococcus aureus. Sensitivity pattern of Staphylococcus aureus were checked by doing Antibiotic Sensitivity Tests by Kirby-Bauer Disc Diffusion methods as per CLSI guidelines.

Results:-

Total 1200 pus samples were studied. Out of 1200 samples, growth were seen in 449 (37.41%) samples, and no growth were seen in 751(62.58%) samples. **Table 1**

Total Samples	Growth positive samples	Growth negative samples
1200	449 (37.41%)	751 (62.58%)

Table 1: (Growth rate from total samples)

Out of 449 growth positive samples, Gram positive bacteria were 302 (67.26%) and Gram negative bacteria were 147 (32.73%). **Table 2**

Growth positive Samples	Gram positive bacteria	Gram negative bacteria
449	302 (67.26%)	147 (32.73%)

Table 2: (Gram positive and Gram negative bacteria from Growth positive samples)

Out of 449 culture positive samples, organism isolated were Staphylococcus aureus 214 (47.66%), Enterococcus faecalis 37 (8.24%), Coagulase Negative Staphylococcus 51 (11.35%), Escherichia coli 57 (12.69%), Pseudomonas aeruginosa 48 (10.69%), Klebsiella species 33 (7.34%) and Proteus species 9 (2%).**Table 3**

Bacteria isolated	Number (%)
Staphylococcus aureus	214 (47.66%)
Enterococcus faecalis	37 (8.24%)
Coagulase Negative Staphylococcus	51 (11.35%)
Escherichia coli	57 (12.69%)
Pseudomonas aeruginosa	48 (10.69%)
Klebsiella species	33 (7.34%)
Proteus species	9 (2.00%)

Table 3: (Bacterial isolates from pus samples)

Antibiotic sensitivity pattern of Staphylococcus aureus is given in **Table 4**

Antibiotics	Staphylococcus aureus (214)
Cefoxitin	154 (71.96%)
Ciprofloxacin	147 (68.69%)
Chloramphenicol	113 (52.80%)
Clindamycin	179 (83.64%)
Cotrimoxazole	121 (56.54%)
Erythromycin	161 (75.23%)
Gentamicin	198 (92.52%)
Linezolid	214 (100%)
Penicillin	46 (21.49%)

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Teicoplanin	184 (85.98%)
Tetracyclin	195 (91.12%)
Vancomycin	214 (100%)

Table 4: (Antibiotic sensitivity pattern of Staphylococcus aureus)

Discussion:-

The present study was conducted in theDepartment of Microbiology, T.S. Misra Medical College and Hospital, Lucknow. The study was done to isolate Staphylococcus aureus from pus samples to see its prevalence and to study the antibiotic sensitivity pattern. Total pus sample studied were 1200, out of which 449 (37.41%) showed positive growth and 751 (62.58%) showed negative growth.

In a study conducted by Soni et al, total 1474 pus samples were studied, in which 21.98% were culture positive. [6]. A study conducted in Andhra Pradesh in year 2018, total 100 pus samples were studied in which 21 different bacterial isolates were seen. [7]. In a study by done in year 2019 at Gaya , total 2516 pus samples were studied, in which bacterial growth were seen in 150. [8]

In our study total 449 culture positive samples were seen, in which organism isolated were Staphylococcus aureus 214 (47.66%), Enterococcus faecalis 37 (8.24%), Coagulase Negative Staphylococcus 51 (11.35%), Escherichia coli 57 (12.69%), Pseudomonas aeruginosa 48 (10.69%), Klebsiella species 33 (7.34%) and Proteus species 9 (2%).

In a study conducted by Maharjan B., in year 2021; out of 139 culture positive cases, S. aureus 105 (75.5%) was found, followed by Escherichia coli 7 (5.04%) and Staphylococcus epidermidis 7 (5.04%); Pseudomonas aeruginosa 6 (4.3%); unidentified organism 4 (2.9%); Enterococcus 2 (1.45%), Proteus mirabilis 2 (1.45%) and Staphylococcus saprophyticus 2 (1.45%); Salmonella Typhi 1 (0.72%), Klebsiellapneumoniae 1 (0.72%), Klebsiellaoxytoca 1 (0.72%), and Citrobacter species 1 (0.72%) [2]

In a study conducted by Khan R A, out of total 152 positive pus samples, organism isolated were Klebsiellaspp (36.2), Escherichia coli (16.5%), Pseudomonas (9.9%), Proteus (5.3%), Serratia (0.7%), Staphylococcus aureus (21.7%) and Coagulase negative Staphylococcus (7.2%) ; and two fungal isolates identified were Candida spp (0.7%) and Aspergillus spp (0.7%). [3]

In our study Staphylococcus aureus showed 100% sensitivity to Linezolid and Vancomycin; 91.12% sensitivity to tetracycline, 92.52% sensitivity to Gentamicin, 85.98% sensitivity to Teicoplanin, 83.64% sensitivity to Clindamycin, 71.96% sensitivity to cefoxitin,75.23% sensitivity to Erythromycin, 68.69% sensitivity to Ciprofloxacin, 52.80% sensitivity to Chloramphenicol, 56.54% sensitivity to Cotrimoxazole, 21.49% sensitivity to Penicillin.

In a study by Maharjan B., Staphylococcus aureus was found to be sensitive towards Linezolid followed by Doxycycline whereas it was found resistant towards Ciprofloxacin and all strains of S. aureus were found to be sensitive towards Vancomycin. [2]

In a study in Hyderabad by Khan R A, Staphylococcus aureus was 100% susceptible to Linezolid and Vancomycin. [3]

In a study by Mita et al, out of total 27 Staphylococcus aureus,MRSA was detected in 13(48.1%) S. aureus isolates and were susceptible vancomycin 27(100%) and linezolid 25(92.5%). [4]

In a study done by Soni et al, Staphylococcus aureus isolated showed 100% sensitivity to Linezolid and Vancomycin; 88% sensitivity to Chloramphenical and Gentamicin; 84% sensitivity to tetracycline, 76% sensitivity to Clindamycine, 56% sensitivity to Erythromycin,36% sensitivity to Moxifloxacin, 20% sensitivity to Ciprofloxacin, 12% sensitivity to Co-trimoxazole and 0% sensitivity to Penicillin.[6]

In a study of Andhra Pradesh by Kumari P H P, Staphylococcus aureus showed highest sensitivity to antibiotics like linezolid (83.3%) and teicoplanin (50%). [7]

In a study done in Assam by Choudhury D, Methicillin sensitive strains of staphylococcus Aureus (MSSA) showed resistance to antibiotics like cefuroxime, amoxicillin and clavulanic acid. [9]

In a study done by Nirmala S., Staphylococcus aureus isolated showed 100% sensitivity to Linezolid and Vancomycin. [10]

In a study by Adhikari P, Staphylococcus aureus isolated showed 100% sensitivity to Vancomycin, 89.3% sensitivity to Chloramphenicol, 86.5% sensitivity to Gentamycin, 79.7% sensitivity to Cephalexin, 73.6% sensitive to Cloxacillin, 71.2% sensitive to Doxycycline, 60.5% sensitive to Cotrimoxazole, 60.1%sensitive to Clindamycin, 40.9% sensitive to Erythromycin, 36.8% sensitive to Ciprofloxacin and 8.4% sensitive to Penicilin. [11]

In a study by Kavitha K et al, majority of Staphylococcus aureus isolates were sensitive to Vancomycin 97%, Gentamicin 95%, Ciprofloxacin 85%, Erythromycin 78.1%, Oxacilin 52%, Ampicilin 61.3%. [12]

Conclusion:-

Staphylococcus aureus is one of the common organism found in pus samples. Increasing antibiotic resistance among Staphylococcus aureus are making treatment

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difficult, so appropriate use of antibiotics is very crucial in preventing emergence of multidrug resistance.

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