# A STUDY OF OCCURRENCE OF ANTIBIOTIC RESISTANCE REPORTED AGAINST STAPHYLOCOCCUS AUREUS IN THE DEPARTMENT OF MICROBIOLOGY IN A TERTIARY CARE HOSPITAL IN HAPUR

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## ABSTRACT

**Objective:** The aim of the study is to evaluate the occurrence of antibiotic resistance reported against *Staphylococcus aureus* in the department of microbiology in a tertiary care hospital in Hapur.

**Methods:** Urine, pus, blood, throat swab, and sputum samples of 15–60-year-old patients were collected and cultured. 100 samples were selected where *S. aureus* had grown. Bacteria were identified and the antimicrobial sensitivity testing was carried out.

**Results:** The strain of resistant bacteria originates from an environment where several antibiotics are used. The bacteria were seen to be resistant frequently to 2–5 antibiotics. This indicates earlier exposure of the isolated bacteria to these drugs.

**Conclusion:** The high multiple antibiotic resistance is identified in this study and it is necessary to make changes to national antibiotic policy.

**Keywords:** Antibiotics, Resistance, *Staphylococcus aureus.*

## INTRODUCTION

Antibiotics are essential drugs that combat bacterial infections by disrupting the methods essential for bacterial cell growth and proliferation. Antibiotics are one of mankind's crucial medical inventions saving millions of lives throughout the years. The first broad-spectrum antibiotic, penicillin, was introduced into the world by Alexander Fleming in 1928. Penicillin has saved and is still saving millions of lives worldwide, playing a major role in treating bacterial diseases [1,2].

The genetic ability of resistant microbe to exhibit inhibitory action on antibiotics by resistance genes gives rise to the phenomena called antimicrobial resistance (AMR) [3]. There is no use for antibiotic treatment for infectious diseases that are self-limiting [4]. Dispensing antibiotics for self-limiting infections and also dispensing antibiotics without a prescription are very common practices in community pharmacies [5]. Large part of resistant pathogenic micro-organisms is caused due to human activities, consisting of indiscriminate use and misuse of antibiotics in humans, veterinary medication, and agriculture [6,7].

*Staphylococcus aureus* is a common source of nosocomial infection in hospitals. A wide variety of pathogens is highly laden in the environment of a hospital. Infections of surgical wounds, urinary tract infections, and lower respiratory tract infections are among the most common nosocomial infections and the important pathogenic bacteria responsible for a variety of diseases in humans and other animals is *Staphylococci* [8].

Antibiotic resistance is a serious threat to global public health security, making infections harder to treat and increasing the risk of morbidity, mortality, and economic burden [3]. *S. aureus* has been considered historically as a virulent human pathogen and very common cause of infection in hospitals. The organisms possess remarkable versatility with some strains overcoming most commonly used antibiotics. Exposure to new antibiotics results in further selection of homologous resistant strain particularly favored by irrational antibiotic administration.

To study the prevalence of antibiotic resistance in this population, the present study has been conducted.

## METHODS

A retrospective, open-type study was conducted in the department of microbiology, GS Medical College and Hospital, Hapur where urine, pus, blood, throat swab, and sputum samples of 15–60-year-old patients were collected and cultured on mannitol salt agar and blood agar plates incubated at 37°C for 24 h. 100 samples were selected where *S aureus* had grown.

Bacteria were identified by culture, morphological, and biochemical characteristic of bacteria using standard microbiological methods. The antimicrobial sensitivity testing was carried out by conventional disc agar diffusion method using Mueller–Hinton agar plates.
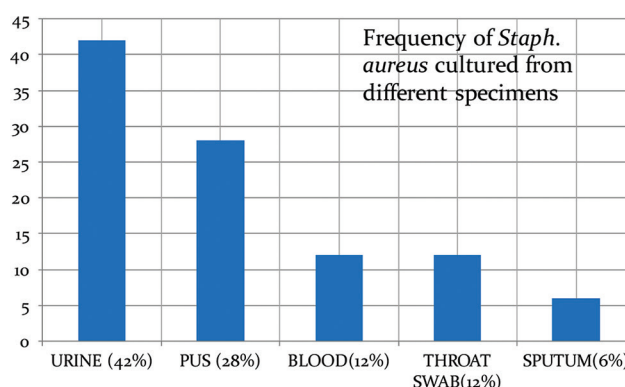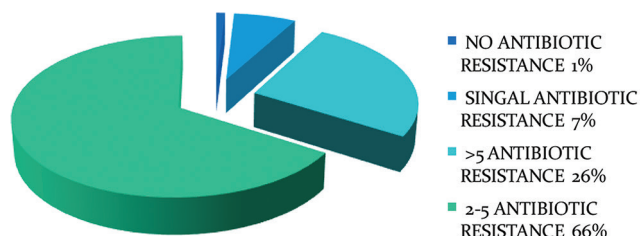
## RESULTS



Frequency of *Staph. aureus* cultured from different specimens

**Table 1: Antibiotic resistance pattern of Staph. aureus from different specimens.**

| Antibiotic | Urine (n=42) | Pus (n=28) | Blood (n=12) | Throat (n=12) | Sputum (n=6) | Total | % |
|---|---|---|---|---|---|---|---|
| Penicillin | 37 | 27 | 9 | 6 | 6 | 85 | 85% |
| Amoxicillin | 29 | 18 | 8 | 6 | 4 | 65 | 65% |
| Amoxiclav | 26 | 17 | 3 | 5 | 5 | 56 | 56% |
| Erythromycin | 21 | 16 | 7 | 3 | 4 | 51 | 51% |
| Clindamycin | 15 | 13 | 6 | 6 | 2 | 42 | 42% |
| Ceftriaxone | 21 | 10 | 3 | 1 | 6 | 41 | 41% |
| Ciprofloxacin | 18 | 16 | 2 | 3 | 1 | 40 | 40% |
| Ofloxacin | 19 | 10 | 1 | 4 | 5 | 39 | 39% |
| Moxifloxacin | 8 | 9 | 3 | 4 | 1 | 25 | 25% |
| Co-trimoxazole | 5 | 1 | 2 | 2 | 0 | 10 | 10% |

**Table 2: Multiple antibiotic resistance (MAR) index.**

| No. of antibiotic resistant | No. of specimens | MAR index |
|---|---|---|
| 0 | 1 | 0 |
| 1 | 7 | 0.1 |
| 2 | 12 | 0.2 |
| 3 | 14 | 0.3 |
| 4 | 24 | 0.4 |
| 5 | 16 | 0.5 |
| 6 | 13 | 0.6 |
| 7 | 7 | 0.7 |
| 8 | 4 | 0.8 |
| 9 | 2 | 0.9 |
| 10 | 0 | 1.0 |

Antibiotic resistance diagram in different samples.



- NO ANTIBIOTIC RESISTANCE 1%
- SINGAL ANTIBIOTIC RESISTANCE 7%
- >5 ANTIBIOTIC RESISTANCE 26%
- 2-5 ANTIBIOTIC RESISTANCE 66%

## DISCUSSION

Antibiotic resistance could be a major factor affecting the inappropriate supply of antibiotics to patients with mild diseases due to a lack of information about antibiotics [9]. As a result, continuing education at regular intervals is essential to keep ourselves up to date and improve our knowledge of antibiotic use. Creating awareness about antibiotics and antibiotic resistance in society will further promote the rational use of antibiotics [10].

The prevalence of antibiotic resistance is very high in community and hospitals [11,12]. Both in developing and developed countries, antibiotic resistance is a critical issue of concern, making it a global issue [13-17].

In our study, the ten most frequent antibiotics against which the isolated bacteria were resistant are shown in Table 1. MAR index is a tool used to know the spread of bacterial resistance in a given population. An MAR >0.2 implies that the strain of such bacteria has originated from an environment where multiple antibiotics were used. The bacteria were resistant frequently to 2–5 antibiotics Table 2. The observed resistance against these antibiotics is a probable indication of earlier exposure of the isolated bacteria to these drugs. The most common specimen from which *S. aureus* was isolated is urine.

## CONCLUSION

The high multiple antibiotic resistance identified in this study makes it necessary to formulate a national antibiotic policy that restricts practitioner prescribing antibiotics randomly without assessing the need and prevents self-medication by restrict marketing of antibiotics without prescription.

Hospital staff must work together to make hospital safe by preventing cross infections.

There should be a restriction on the use of newer and higher class of antibiotics.

If possible, there should be an antibiotic susceptibility test before antibiotic prescription.

Our aim should be to give

## "RIGHT DRUG FOR RIGHT BUG"

## AUTHORS CONTRIBUTIONS

All the authors contributed equally in conducting the experiment and drafting of manuscript.

## CONFLICTS OF INTEREST

The authors declare that there is no any conflict of interest as the present work is solely done by the authors.

## AUTHORS' FUNDING

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