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Study the Efficiency of Some Antibiotics on Staph. *aureus* Isolated from different Clinical Origins

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ABSTRACT

For the period from April to October 2022, (56) isolates of bacteria infected with Staphylococcus aureus were diagnosed, distributed among 5 isolates of aureus infection, out of a total of (23) isolates (41%) and (33) isolates of burn injuries. Of the total (56) isolates, the diagnosis is confirmed using the API STAPH system. Allergy testing was studied using (14) antibiotic tablets. He was an opponent of imipenem, *Staphylococcus aureus* bacteria. All isolates were sensitive at (100%), and the highest resistance to ciprofloxacin was at (100%), cefotaxime, imipenem, Tetracycline, ceftazidime, as they showed high resistance to the mentioned antibiotics and the reason for this was due to the bacteria's ability to produce beta-lactam enzymes. Also (50) isolates were detected out of a total of (56) isolates, and the results were that (89%) of the isolates were producing wide-spectrum beta-lactamase enzymes.

Keywords- *Staphylococcus aureus*, antibiotics, ß-lactamases.

I. INTRODUCTION

Staphylococcus aureus belongs to a species of the genus Micrococcaceae [1], the main type that causes diseases in humans. The normal skin, respiratory and digestive flora and that (20-50%) of normal people carry these bacteria. It is an opportunistic cause of many skin infections [2], positive for catalase, and can produce coagulase, a blood clotting enzyme that distinguishes it from other types of staphylococcus is also characterized by the production of the enzyme Dnase [3]

This bacterium causes common infections, including boils and abscesses, and is also one of the most important causes of hospital-acquired infections [2]. Antibiotics are one of the most important discoveries in medical science [4], especially beta-lactams. One of the most important reasons for beta-lactam resistance in these bacteria is their production of beta-lactamase enzymes. The current Study aims to find a determination of the sensitivity or resistance of Staphylococcus aureus bacteria to the studied antibiotics for each antibiotic, as well as to examine the isolates that produce beta-lactamase enzymes, especially those with a broad spectrum.

II. MATERIAL AND METHODS

Sample collection

(200) clinical samples, including swabs from the wound and burn infections and external ear swabs, were collected from Mosul General Hospital and burn halls from patients admitted to these two hospitals.

Bacterial isolation and Identification

Samples were grown in blood agar medium; dishes were incubated at (37 °C) for 18-24 h, then transferred to menthol saline medium, and dishes were set at (37 °C) for (24 h). The developing bacterial isolates were initially diagnosed based on the characteristics of their cultivation in terms of the size, texture, and color of the colonies. In addition to its ability to analyze blood cells. Then the bacterial isolates were subjected to microscopic examination using Gram stain and examined with an oil lens to distinguish between the shape of the

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cells, their collection method, their positivity, and their toxicity to the dye. Make a confirmatory diagnosis using. API Staph System.

Beta-lactamase enzyme test

In revealing the ability of the isolates under Study, the standard rapid iodine procedure was used to produce beta-lactamase enzymes, as reported in [6]. As for the broad-spectrum beta-lactamase assay, the disc approximation method used, as mentioned in [7]

Antibiotic sensitivity test

The sensitivity of bacterial isolates was studied using antibiotic tablets on Muller- Hinton agar medium. Kirby and Bauer's method a, according to [8]

III. RESULTS AND DISCUSSION

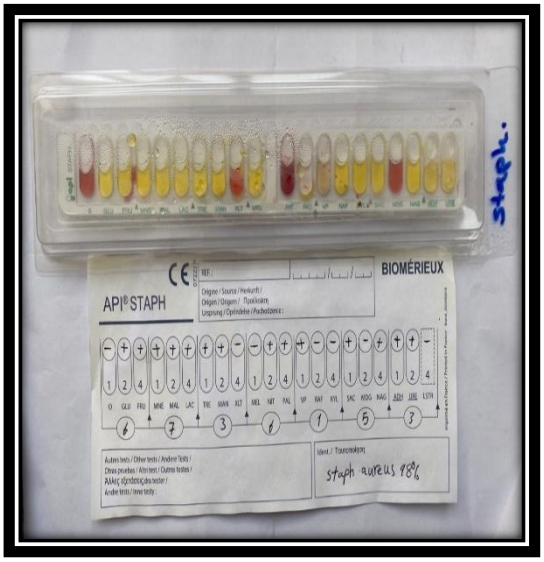
Isolation and Identification

When examining Staphylococcus aureus bacteria in (200) isolated samples of people with different conditions of both sexes, from patients who stood admitted to hospitals included in the Study, (56) isolates of S. aureus lived obtained distributed between burns and wounds—distributed to (28) isolates of burns (50%), and (23) isolates of wounds (41%). (5) isolated of the ear (9%). *Staphylococcus aureus* isolates showed a difference in the proportions of their isolates from pathological smears due to the difference in the number of patients and the availability of the isolate in the Study. The percentage of isolation from burn infections contrasted with what was found by [9], which indicated that the percentage of isolation was (20.2%). It also contradicts what was reached by [10], which indicated that the isolation percentage was 2%, and the results were different for the infection from wounds. With the Study of [11], which indicated an isolation rate of (9.81%), and an approach to what was reached by [12], where the isolation rate was (48.8%).

Table 1: Numbers and percentages of isolated bacteria distributed according to isolated sources

isolated bacteria / source of insulation	***S. aureus***	
	Number	Percentage
Burn swabs	28	50%
Wound swabs	23	41%
ear swabs	5	9%
environmental samples	56	100

Staphylococcus aureus was diagnosed by culture based on the characteristics of colonies growing on the culture medium used. It showed white colonies with regular edges, smooth, convex, and shiny, surrounded by a lysis zone (beta type) on the blood agar medium. Its yellow colonies appeared on the mannitol salt agar medium due to its ability to ferment mannitol sugar. As the medium's color turns red to yellow, Staphylococcus *aureus* isolates were also distinguished by their ability to produce coagulation enzymes, catalase, And their inability to produce the oxidase enzyme. Microscopic examination of the cells stained with Gram stain showed that they are spherical., Gram-positive and aggregated bilaterally tetragonal or in the form of clusters final confirmatory diagnosis of the isolates was carried out using the API-Staph system. As shown in Figer1



Picture 1: Diagnosis of S.aureus bacteria using API Stap system

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The antibiotics used

AM=Ampicillin10,CTX=Cefotaxime30,CAZ= Ceftazidime30,IMP=Imipenem10,GN=Gentamycin10, TE=Tetracyclin30,CIP=Ciprofloxacin5,Amoxaclin clavunic acid10.

Antibiotic susceptibility testing using the disc diffusion method

The antibiotic resistance rates, beta-lactam antibiotic resistance, ceftazidime, cefotaxime, amoxicillin-clavulanic acid (63.33%, 56.66%, 93.33%), and ciprofloxacin, Tetracycline, (100%), respectively, were the aminoglycoside group. Resistant isolates were shown, anti-cefixime, (36.66%,) and anti-Gentamicin (43.33%). As for anti-imipenem, all isolates were sensitive to it by (100%). It is most effective against isolates of bacteria *S. aureus* isolates from different sources where all isolates were (100%) sensitive to it [15]] indicated that the resistance to amoxicillin-clavulanic acid was(90 %) Indicates the percentage of resistance to this antibiotic. The results contradicted other studies, including [17], which indicated a rate of resistance to ampicillin (86.1%) [5] which indicated a rate of resistance to the antibiotic (89.8%) to (100%), and the isolates also showed resistance. For cephalosporins, the results were close to ceftriaxone [10] and [15]] where they indicated rates of resistance (72.2% and 70%) respectively, [14] also indicated that the rate of antibody resistance was (66.66%). Resistance was close to ceftazidime, as was cefotaxime. [18] which indicated 37.20% resistance, and the results varied with [17], which indicated resistance to cefotaxime (100%) and (29.1%). *S.aureus* Beta-lactam resistance. Antibiotics are of the first order due to their superior ability to produce beta-lactamase enzymes. These enzymes cleave the beta-lactam ring of the biological antigen. The widespread use of these antibiotics has increased the resistance rate, making it difficult to treat infections caused by these bacteria [15].

The resistance of these bacteria to the cephalosporins group may be due to changes in the PBPS-associated proteins of penicillin, which reduce its entry into the cell [13]. As for imipenem, the resistance rate was 0%. These results were close to [19], which reached a resistance rate (of 20%) for this antigen, as for the group of antigens of aminoglycosides, the results converged with the Study [14], which found a resistance rate of 41.66% gentamycin (36.1%) of the antigen tobramycin, The results contradict those of [16] and [15] where they found to the resistance ratios of (58.06% and 61%) (respectively to Gentamycin and for the anti-Amikacin). The isolates showed low resistance to this antigen. These results were close to the Study [17], which indicated that they referred to (16.6%) resistance to this antigen and (20.8%) to the antigen Gentamycin contrasted with what was reached by Also [23] when he referred to It as (30%) Resistant to two antibiotics Amoxaclin, Gentamycin, and the resistance to a tetracycline antagonist approached (43.33%) with [22] which indicated a resistance of (51.16). Its brighter results differed with other studies, where [15]] indicated a percentage of the antibiotics that affect the protein synthesis process by binding to Tetracycline, (30%) are resistant. It is an antidote. The efflux system is compatible with the bacterial cell ribosomes. The reason for the resistance to this antibody may be due to the efflux systems of Bacteria, as these systems reduce the accumulation of antigens inside the cell, which results in resistance [2] where they found to the resistance ratios of (58.06% and 61%) respectively to Gentamycin. For the anti-Amikacin, the isolates showed low resistance to this antigen. These results were close to the Study [17], which indicated that they referred to (16.6%) resistance to this antigen and (20.8%) to the antigen Gentamycin contrasted with what was reached. As for ciprofloxacin, the results were contradictory with the Study [23], which indicated 20% resistance, while many studies indicated variable results, where [17] indicated sensitivity (100%) [14] resistance (13.88%). [17] indicated that the high sensitivity of this antagonist is because it is one of the quinolones that is characterized by its rapid absorption and great permeability. Into cells and its effectiveness in killing bacteria in a short period, by inhibiting D.N.A. replication

β-lactamase Susceptibility of bacterial isolates to the production of beta-lactamase enzymes

The results showed the ability of (27) bacterial isolates isolated from different sources to produce beta-lactamase enzymes out of a total of 30 isolates (90%). The produced isolates were distributed among (5) isolates of external ear infections, which were (5) isolates. (100%) and (8) isolates of wound infections by (91.3%) and (14) isolates of burn infections by (100%). The results varied with Study [5] indicated that 65.3% of S.aureus isolates isolated from different sources were Producers of beta-lactamase enzymes. Most of the genes that code for the production of beta-lactamase enzymes are located on mobile genetic factors. Thus, the transmission of plasmids is mediated by these genes and genes encoding resistance to other antigens. [Different genera and species lead to an increase in the level of resistance to antibiotics [20].

Investigation of the production of isolates of broad-spectrum beta-lactamase enzymes EsβLs

The results of the current Study showed the ability of (14) clinical isolates with a percentage of (51.8%) to produce ESβLs enzymes out of a total of (27) isolates producing beta-lactamase enzymes. The results were close to the Study [21], where the production rate of its isolates for the enzyme was (58.9%) ESβLs and by (23) isolates out of a total of (33) isolates. In contrast, many studies indicated that these bacteria did not produce enzymes ESβLs, including a study [17] where none of its isolates gave a positive result for the production of the enzyme. Several studies have indicated that it has become a great exporter worldwide. [17]. The prevalence of broad-spectrum enzyme-producing bacterial strains in any hospital depends on various factors, including how antibiotics are used, the rate of transfer of the strains

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produced between Persons working and sleeping in hospitals, and the type of sterilization used in hospital units. The researcher [21] indicated that the strains that produce ESβLs are characterized by multi-resistance to multiple antigens And resistance to ESβLs antibiotics, including aminoglycosides. He also indicated that there is a relationship between the production of fluoroquinolones enzymes, which leads to an increase in the period of stay of patients infected with these strains in the hospital.

Picture 2: The ability of *S.aureus* isolates to produce broad-spectrum beta-lactamase enzymes

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