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"Isolation, Charactrisation and Antibiotic Résistance of *Staphalococcus Aureus* from Waste Water"

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Abstract:The number of invasive procedures performed recently, the rise in immunocompromised cases, and the increasing trends in S. aureus strains' resistance to antibiotics have all contributed to a significant increase in the complications associated with Staph aureus infections. Despite the existing data, S. aureus-related diseases are not high on the public health agenda in Kenya and other developing nations when it comes to antibiotics and formulating strategies for control programs compared to wealthy nations. Thus, there is a legitimate need to conduct research and provide a comprehensive report on the trends and patterns, primarily and particularly with reference to antimicrobial resistance. Determining Staphylococcus aureus's drug resistance to different antibiotic classes was the goal of this investigation. This information is important for enhancing baseline data on S. aureus antibiotic resistance found in human clinical specimens, which will help with the responsible use of antibiotics and the development of control program strategies. Using gram staining, catalase, and oxidase, among other assays, all culture isolates were shown to belong to the Staphylococcus aureus genus. Staphylococcus was characterized as gram positive, catalase positive, and oxidase negative isolates. Staphylococcus aureus was identified through further analysis using mannitol salt agar fermentation of the isolates and positive coagulase tests. Millimeters were used to measure and classify the region of clearing of sensitivity and tolerance into three categories: sensitive, resistant, and intermediate. The present study reported that, *S. aureus* was most sensitive to Azithromycin, whereby 46 (61%) samples were sensitive. Penicillin on the hand was least sensitive showing 29% level of sensitivity. Methicillin, Gentamicin had more than 50% level of sensitivity, That is, 41 (55%) and 40 (53%) respectively. Other antibiotic drugs including ampicillin, augmentin and tetracycline demonstrated less than 50% sensitivity, That is, 29 (39%), 32 (43%) and 33 (44%) respectively.

Keyword: (antibiotic resistance, penicillin, methicillin, gentamycin, argumentin, tetracycline, sensitivity)

1. INTRODUCTION

Staphylococcus aureus (S. aureus) antibiotic resistance is a serious danger to public health. Even though S. aureus is a common bacteria found on the skin and mucous membranes, it can cause a wide range of illnesses, from minor infections to dangerous infections after surgery. If Staphylococcus aureus is found in clinical specimens, it is considered a medically significant bacteria due to its capacity to express many pathogenic characteristics. S. aureus infection complications have skyrocketed in the recent past due to a variety of invasive surgeries, an increase in immunocompromised cases, mostly from HIV infection, and cancer, among other reasons.

Given the rising trends in S. aureus strains linked to the pathogen's increased antimicrobial resistance, which is creating an urgent need for improved protocols and sensitive drug monitoring for S. aureus infection treatment and prevention. Hospitals have been linked to S. aureus, which is now a prevalent cause of infection in the population. The emergence of resistance strains of this bacterium has often coincided with the prescription of new antibiotics. Most notably, it is now common to find S. aureus isolates resistant to beta-lactam antibiotics.

Kenya and other developing nations place a low priority on S. aureus-associated diseases on the public health agenda, despite the information that is already accessible and in comparison to industrialized nations. Thus, it is necessary to conduct an investigation. and provide a full analysis on the trends and patterns, with a focus on antimicrobial resistance in particular. Determining Staphylococcus aureus's degree of drug resistance to different antibiotic classes was the goal of this investigation. This information is important for enhancing baseline data on S. aureus antibiotic resistance found in human clinical specimens, which will help with the responsible use of antibiotics and the development of control program strategies.

They are second only to Escherichia coli in the pathogenesis of hospital acquired infections, accounting for almost 80% of supportive illnesses seen in clinical practice. Methicillin and its derivatives were then the preferred medications for treating infections brought on by this bacteria. Meanwhile, reports of methicillin-resistant Staphylococci from Italy and the USA have been made. Prior to the widespread usage of methicillin, a strain of S. aureus that was naturally resistant to the antibiotic was discovered.

2. Methodology for this research

1. **Sample Collection**: The sample was collected aseptically from waste water of Chh Sambhaji nagar. Sample was collected in a sterile bottle and brought to lab.
2. **Microbial isolation**: Isolation and identification of *Staphylococcus aureus* will performed at MGM IBT lab.
3. **Culturing of *Staphylococcus aureus*:** Samples from all specimens were inoculated in BTB agar, Mannitol agar overnight by method serial dilution and spread plate method.
4. **Primary identification and characterization:** *Staphylococcus aureus* genus identified by various tests, That are gram staining, catalase and oxidase . Catalase positive, gram positive and oxidase negative isolates were defined as *Staphylococcus*. If the colonies turned gram positive colonies, a catalase and oxidase tests were done. Samples positive for coagulase test then it is aureus.
5. **Antibiotic resistivity:** The sample will be cultured on Muller-Hinton agar, along with a series of gram-positive and broad-spectrum medication-containing discs, which will be incubated for the entire night at 37 °C. The sensitivity of the isolated colonies to five commonly used antimicrobial medications—ampicillin, penicillin, azithromycin, cefexine, and cefadoxine—will be evaluated. The disc diffusion method was used to test for antibiotic susceptibility in accordance with the Clinical and Laboratory Standards Institute's recommendations. Millimeters will be used to measure the clearing area, which will then be classified as sensitive, resistant, or intermediate.

Sr. no	Antibiotics	Sensitivity (%)	Resistivity (%)	Intermediate (%)	Zone of inhibition
1)	Azithromycin	10%	90%	-	No zone
2)	Penicillin	29%	71%	-	
3)	Amoxicillin	40%	60%		1st well-1.8cm 2nd well-2.5cm
4)	Cefodoxine	46.7%	53.3%		1st well-3.8cm 2nd well-3cm
5)	Ampicillin	39%	44%	17%	1st well-3.6cm 2nd well-3.5cm
6)	Cefixine	70%	30%		1st well-5.5cm 2nd well-3.5cm

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