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Antibiotic Sensitivity Test of Serratia marcescens isolated from Hospitals at AL-Diwaniyah Governorate

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Abstract

In order to identify bacteria that are thought to be opportunistic and cause a variety of illnesses, study samples were gathered for the current investigation. These samples included roughly 100 samples drawn from the hospital's floors, hallways, and wet areas in the restrooms in the Diwaniyah Governorate. Following sample collection, the samples were cultivated on culture media and then utilized. Culture of the samples on Bent's culture media and other media, such as blood agar and MacConkey's medium Following the results, biochemical tests were performed to determine the identity of the 80 isolates, which included 20 Serratia bacteria, 25 E. coli bacteria, 15 Pseudomonas aeruginosa bacteria, 15 Staphylococcus bacteria, and 10 Klebsiella bacteria. and then drug sensitivity testing and biochemical testing were carried out. When the isolates' resistance to the antibiotics used was tested, the results showed that tetracycline had the highest rate of resistance (75%), followed by aztreonam (60%), anti-meropenem (50%) and ciprofloxacin (50%) respectively.

Keywords: Hospitals infection, Serratia marcescens, E.coli, Staphylococcus

Introduction

Gram-negative *Serratia Marcescens* (SM) is a member of the *Yersiniaceae* family and genus *Serratia*. Currently, no pigmented strains of SM outnumber pigmented strains, particularly in individuals who are at risk. Typically, blood is used to isolate *Serratia marcescens*, which is then cultivated on blood agar or by employing selective culture techniques (McConcy).

Numerous antibiotics, such as colistin, nitrofurantoin, tetracyclines, macrolides, cephalosporins, and penicillin, are ineffective against *Serratia*. *marcescens*. Antibiotics including aminoglycosides, fluoroquinolones, and third-generation cephalosporins used to be the cornerstone of treatment for *S. marcescens* infections. Nevertheless, a large number of *Serratia. marcescens* clinical isolates currently exhibit various types of antibiotic resistance (Hertle, 2005) .

According to Phadke and Jacob (2016), *Serratia marcescens* is a Gram-negative opportunistic bacillus that can occasionally cause infections linked to healthcare settings as well as bacteremia and endocarditis in individuals who inject illegal narcotics. Given the paucity of clinical study data and worries about the possibility of causing multidrug resistance, this bacterium is still fairly unknown, making treatment decisions challenging. AmpC-catalyzed β-lactamase can be produced by *Serratia marcescens*.

Extended-Spectrum B-Lactamase (ESBL) may possibly be acquired via it (Mahlen, 2011). *S. marcescens* is less likely to overexpress AmpC β-lactamase than other more deadly bacteria (Tamma et al., 2021). As a result, treating *Serratia . marcescens* infections may not necessitate the use of broad-spectrum antibiotics like carbapenems or cefepime, which are typically stable against bacteria that produce AmpC (Harris *et al*., 2016; Tamma *et al*., 2021).

With the prevalence of Carbapenem-Resistant Enterobacteriaceae (CRE) rising globally, the adoption of carbapenem-sparing antibiotic regimens has emerged as a desirable alternative for antimicrobial stewardship (Tan *et al*., 2020).

Klebsiella infections are frequently seen in medical settings in people who are ill and undergoing

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treatment for various ailments. The most vulnerable to *Klebsiella* infections include those who use ventilators (breathing machines) or intravenous (vein) catheters, as well as those who are on prolonged courses of antibiotics. The overuse and ongoing usage of antibiotics has caused their consumption to rise globally. Consequently, there are now fewer therapeutic alternatives available for treating pathogenic organisms due to the rise in antibiotic resistance (O'Neill, 2016). The majority of regulatory, national, and international organizations view antimicrobial resistance (AMR) as a developing issue. The World Health Organization has identified AMR as one of the top 10 hazards to public health (Thangaraju and Venkatesan. ,2019).

Materials and Techniques of Operation

In this study 100 samples were gathered from the hospital's floor and hallways and subsequently cultivated on culture media. Following the results of a number of biochemical tests, a drug sensitivity test was conducted.

Using the disk approach, which was based on the techniques of Bauer and his colleagues (1966) and CLSI (2012), the drug susceptibility of bacterial isolates was examined. This included:

Place two to four *P aeruginosa* colonies in a test tube with five milliliters of Nutrient Soy Tryptone Broth, and then incubate for eight hours at 37°C. With the use of a physiological salt solution, the resultant growth was decreased. The tube's development was contrasted with that of a typical McFarland (0.5) tube. After dipping the cotton swab in soybean culture broth, the surplus was squeezed out by pressing on the tube's inner walls. To guarantee that the bacteria whose sensitivity was to be evaluated were distributed uniformly, the bacteria were planned and scattered on the solid Mueller-Hinton medium multiple times in various orientations. To make sure the dishes absorbed the moisture, they were left at room temperature for fifteen minutes.

A device called a Nanodrop spectrophotometer was used to detect and measure the amount of extracted DNA. By measuring the content of DNA (ng/µl) and assessing its purity by analyzing the absorbance, the DNA can be found. The Accu Power® PCR PreMix kit, manufactured by the Korean business Bioneer, was used to create the polymerase chain reaction mixture. A 1% agarose gel was used for electrophoresis in order to read the polymerase chain reaction (PCR) product result.

Results

The primary objective of sample collection was to isolate the bacteria *Serratia Marcescens* and identify the isolates based on the phenotypic traits of the developing colonies. These colonies were medium-sized gray circular colonies (2 to 4 mm) and produced a beta-hemolytic substance with a narrow hemolytic zone on MacConkey agar medium. There is no visible generation of red color.

The oxidase and indole synthesis tests in the biochemical tests yielded negative findings for every isolate. Regarding the IMViC test set, which comprised the following tests: citrate intake, methyl red, Fuchs-Proskauer, indole, and catalase test, the outcome was positive. Each isolate was identified based on its capacity to break down and agglutinate gelatin. The results for the current study included 20 *Serratia* bacteria, 25 *E. coli* bacteria, 15 *Pseudomonas aeruginosa* bacteria, 15 *Staphylococcus* bacteria, and 10 *Klebsiella* bacteria as in (table 1).

Table 1. Show the genus and percentage rates

Genus	Percentage
E coli	(31.2%)25
Serratia marcescens	(25%)20
Pseudomonas aeruginosa	(18.7%)15
Staphylococcus aureus	(18.7%)15
klebsiella	(12.5%)10
Total	80

Important findings from this study were also revealed by the antibiotic test conducted with the tablets, which are as follows:

Aztreonam came in second at 60%, followed by ciprofloxacin and anti-meropenem at 50%, and tetracycline at 75%, according to the results of antibiotic resistance .as at(table2)

Table 2 Show the result of antibiotic test against Serratia marcescens

Typeof antibiotic	Resistance	intermediate	sensitive
Amikacin	8(%40)	5(%25)	7(%35)
Ciprofloxacin	10(%50)	6(%30)	4(%20)
Gentamicin	5(%25)	10(%50)	5(%25)
Tetracycline	15(%75)	4(%20)	1(%5)
Ampicillin	0(%0)	19(%95)	1(%5)
Aztreonam	12(%60)	6(%30)	2(%10)
Meropenem	10(%50)	8(%40)	2(%10)
Carbenicillin	9(%45)	10(%50)	1(%5)
Chloramphenicol	4(%20)	15(%75)	1(%5)
Cefepime	5(%25)	9(%45)	6(%30)

Discussion

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In keeping with its role as an opportunistic infection agent, Serratia*. marcescens* has typically been associated with low intrinsic pathogenicity. extracellular materials like DNase, chitinase, lecithinase, lipase, gelatinase, and siderophores are produced by nearly all isolates; nevertheless, it seems that these products do not function as strong virulence factors in *Serratia*. *marcescens* (Hertle, 2005). However, current research suggests that *Serratia marcescens* might also produce other invasive components. ShIA, a pore-forming haemolysin secreted by nearly all *Serratia. marcescens* isolates, is linked to inflammatory mediator release and cell cytotoxicity. It is believed that this cytotoxin aids in tissue penetration (Hertle., 200 (Figure 1. show Percentage of types of bacteria *Klebsiella* diseases are present see at medicals setting at patient that are illness and also undergoing treatments of vary ailments. all most vulnerable into *Klebsiella* diseases that include this use ventilators (means breathing machines) or intravenous (veins) catheter, also as these that is onto prolonge courses for antibiotic.

According into a studies release today as a part for proceeding for Decennial 2020: The 6th Internationals Conference for Healthcare-Associate Infections, hospitals floor was often and rapid contaminate with a antibiotics-resistant bacteria through hours for a patient's admissions, providing a pathway of a spread for potential harmful organisms into peoples. at March, the pandemics forced the cancellation of Decennial 2020, a joint society for healthcare epidemiology for Centers of Disease Control and America and Prevention efforts. The journal Infection Control and Hospital Epidemiology have released a supplements issue contains all for abstracts that was accepte of meeting.

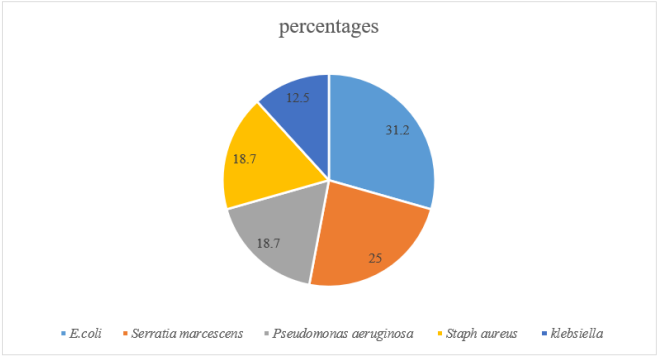

Figure 1. show the percentage rates of bacterial types

Conclusions

Serratia marcescens infections are dangerous and should be treated seriously since they can cause a high death rate and, through their actions, can result in a high rate of antibiotic resistance, which can be fatal. It can also cause serious infections and can develop into an opportunistic pathogen; therefore, many effective and extensive studies should be conducted on this bacterium.

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