ANTIBIOTIC RESISTANCE PATTERN IN ISOLATES OF *STAPHYLOCOCCUS AUREUS*

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Received on: 02.11.2020
Accepted on: 06.04.2021

ABSTRACT

This study was carried out to investigate the prevalence of *Staphylococcus aureus* and antibiotic sensitivity pattern in animal and human isolates. 42 swab samples of human skin and animals *viz.* goat, cattle and buffalo were collected from domestic area of Bikaner Rajasthan. The samples were cultured on bacteriological media for the isolation of *Staphylococcus aureus* using standard methods of isolation and identification of bacteria. In the present investigation *S. aureus* isolates were subjected to antibiogram studies using 14 antibiotics belonging to different categories and generations where in variations were recorded in sensitivity patterns. All isolates (100%) were sensitive to imepenem (except human isolate, F1,F2 and F3) and 88.46% cephalothin, in continuation more than 80% isolates were sensitive to three antibiotic namely cefepime (80.76%), cloxacillin (80.76%) and cefazolin (80.76%). In this this study 100% isolates were resistant to ampicillin and 84.61% were resistant to ampicillin sulbactum. Since many variations were found in the antibiogram of *S. aureus* from different sources thus the analysis was carried out.

Key words: *Staphylococcus aureus,* infection, antibiotics

Introduction

Staphylococcus aureus is a serious human pathogen responsible for life-threatening infections like septicemia, nosocomial pneumonia, endocarditis, and toxic shock syndrome (TSS). In humans, this organism has become a major cause of nosocomial and community-acquired infections with increased hospital morbidity and mortality. *S. aureus* has been implicated in many nosocomial infections including some invasive infections such as nosocomial bacteremia and septicemia (sepsis). Antimicrobial resistance among pathogens is becoming a life threatening problem world-wide.

Excessive usage of antibiotics has caused 23,000 mortality cases due to development of antibiotic resistant bacterial infections (CDC, 2013). According to Margonis *et al*. (2018) and Wang *et al*. (2016) resistance in bacteria is a serious matter because as bacteria evolve and form ways to nullify the antibiotics, the antibiotics become ineffective, letting these deleterious organisms to survive in multiple environments.

High prevalence has been reported in tertiary hospitals in US, Southern European countries, Asia and South America (Diekema *et al*., 2001). In Africa, MRSA prevalence varies with different countries, high in some and low in others (Bell *et al*., 2002). In Nigeria, investigated on methicillin-resistant *Staphylococcus aureus* have been conducted, particularly in southwestern zone (Adesida *et al*., 2005; Shittu and Lin, 2006; Ghebremedhin *et al*., 2009; Adeleke and Asani, 2009; Onipede *et al*., 2009).

Hussain (2015) studied only a small portion of its economy on healthcare, epidemics could drive the country to a catastrophe. For the control and prevention of such infections, knowledge about the antibiotic resistance levels of clinically isolated strains is crucial. In the present investigation *S. aureus* isolates were subjected to antibiogram studies using 14 antibiotics belonging to different categories and generations where in variations were recorded in sensitivity patterns.

Materials and Methods

Collection of sample

A total of 42 samples from human skin and animals *viz.* goat, cattle and buffalo (nasal and saliva swabs) sources were collected. These sample sources belonged to two different places in Bikaner (Rajasthan). The samples were collected in the morning aseptically and were immediately taken thereafter to the laboratory on ice for further processing.

Microbial media

Nutrient Agar, Nutrient Broth, Mannitol Salt Agar, Muller Hinton Agar were used at different steps.

Identification and characterization of isolated strains

Isolated strains were initially identified by Gram-staining, followed by Mannitol fermentation testing (Winn, 2006).

Determination of antimicrobial susceptibility by disc diffusion test

Antimicrobial susceptibilities was determined by Kirby Bauer method (Bauer *et al*., 1966) as recommended by Kassin *et al*. (2016), to test all the isolates against the panel of fourteen different antibiotics, which include Ampicillin (10 mg), Ampicillin+Sulbactum (10/10), Methicillin (5), imepenem (10 mcg), gentamicin (10 mcg), cephalothin (30 mcg), cefepime (30 mcg), cefazolin (30 mcg), cloxacilin (10 mcg), ticarcillin+calvulanic acid (75/10 mcg), Nitrofurantoin (300 mcg), Norfloxacin (10 mcg), Oxacillin (1 mcg), and Vancomycin (30 mcg).

Results and Discussion

Identification of isolates from specific sample sources. There was total 26 isolates which were identified by Gram

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staining as well as Mannitol fermentation.

Antibiotic susceptibility

In the present investigation *S. aureus* isolates were subjected to antibiogram studies using 14 antibiotics belonging to different categories and generations where in variations were recorded in sensitivity patterns. All isolates (100%) were sensitive to imepenem (except human isolate, F1, F2 and F3) and 88.46% cephalothin, in continuation more than 80% isolates were sensitive to three antibiotic namely cefepime (80.76%), cloxacillin (80.76%) and cefazolin (80.76%). In this this study 100% isolates were resistant to ampicillin and 84.61% were resistant to ampicillin sulbactum. Since many variations were found in the antibiogram of *S. aureus* from different sources thus the analysis was carried out.

Similar results were recorded by Pereira *et al*. (2009) in an antibiogram study of 148 food origin isolates of *S. aureus* who recorded that strains were highly resistant to beta-lactams, ampicillin and penicillin, respectively. Seventy per cent of the isolates were resistant to beta-lactam antibiotics followed by ampicillin and penicillin (73%). Close to our observations, Khichar (2011) used 27 different antibiotics against 28 *S. aureus* isolates of cattle mastitis origin wherein they recorded that most effective antibiotic was azithromycin (92.86%) followed by cloxacillin and methicillin (89.29%). He also recorded resistance towards ampicillin, cefixime, metronidazole and nalidixic acid for all the isolates. In the present study significant difference in the antibiogram pattern from different sources of *S. aureus* may indicates pattern and frequency of use of various antibiotics from human and animals.

Antibiotic resistance is escalating on a far greater rate than the introduction of new medicines into clinical practice, leading the world to a global health burden. Due to the widespread production and reckless use of antibiotics, a large number of microbes have developed resistance against these antibiotics, rendering these drugs useless. *Staphylococcus aureus* is a troublesome human pathogen that can cause a diverse range of infections from ordinary wound infections to life-threatening diseases like osteomyelitis, bacteraemia and heart valve infections (Diekema *et al*., 2019; Tong *et al*., 2015).

Conclusion

Staphylococcus aureus is an important pathogen which causes heavy economical losses to dairy industry and mainly in humans it causes severe infections including superficial skin lesions, deep abscesses and more serious infections such as pneumonia, mastitis, meningitis, urinary tract infections, corneal infections, arthritis, osteomyelitis, food poisoning, toxic shock syndrome, endocarditis and toxinosis. The organism is showing increasing trend towards antibiotic resistance. In this study, the prevalence of *S. aureus* may be considered to be high to warrant urgent infection awareness. Also, results from the study more research and monitoring of trend of nosocomial infection. Empirical treatment of *S. aureus* infection should be based on prior determination of local resistance patterns.

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