

Original Research Article

Determination of Antibiotic Resistance Pattern in *Staphylococcus Aureus* Isolated From Patients Referred to Hospitals and Medical Centers of Tabriz City, Iran

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Abstract: *Background and purpose:* *Staphylococcus aureus* is a common pathogen of nosocomial infections. Increased infections caused by this bacterium in developing countries have led to many problems. The aim of this study was to determine the prevalence of antibiotic resistance of *S. aureus* isolated from urinary tract infections to some commonly used antibiotics. *Materials and Methods:* In this cross-sectional descriptive study, 100 *S. aureus* isolates were collected from patients with urinary tract infections. These isolates were identified using standard laboratory and culture methods in a specific medium. Kirby-Bauer disk diffusion method was used to evaluate the antibiotic susceptibility pattern of the strains. *Results:* Phenotypic evaluation of antibiotic resistance pattern of *S. aureus* strains showed the highest resistance to antibiotics methicillin and penicillin (91%), erythromycin (86%) and gentamicin (75%) and the highest sensitivity was related to The antibiotics were nitrofurantoin (95%) and vancomycin (86%). *Conclusions:* The present study showed increased resistance to different antibiotics by *S. aureus*, which is a serious warning for treatment of *S. aureus* infections in the area. Therefore, in order to prevent increased resistance to other antibiotics, it is necessary to refrain from unnecessary administration of available antibiotics.

Keywords: *Staphylococcus aureus*, Urinary Tract Infection, Antibiotic Resistance.

INTRODUCTION

Staphylococcus aureus, Gram-positive and coagulase-positive from the *Staphylococcus* family and an opportunistic infectious agent in humans [1-4]. *Staphylococcus aureus* is a multivalent pathogen and one of the causative agents of disease in hospitals and community level [5, 6]. It can range from relatively mild infections to life-threatening systemic infections. Due to the genome structure of this bacterium, pathogenic and resistant strains are expanding [7-9]. These infections include soft tissue infections, skin infections, scabies, endocarditis, osteomyelitis and food poisoning [10, 11]. At present, the development of methicillin-resistant strain of *Staphylococcus aureus* has become one of the major therapeutic challenges. This strain is one of the leading causes of skin and tissue infections in the United States and is primarily responsible for post-surgical infections that produce toxins and sometimes shock [12]. The continued emergence of multidrug-resistant bacteria in many health care institutions has challenged the efficacy of clinical antibiotics, most of which are beta-lactam antibiotics such as penicillin, methicillin, oxacillin and cephalosporins [13, 14]. Recent studies have estimated that 12 to 8% of hospitalized patients suffer from the side effects of infection. Identification and treatment of colonized individuals can reduce the incidence of MRSA [15-17]. Given the importance of awareness of the pattern of susceptibility and resistance of common infectious agents in hospitals to their antibiotic treatment and lack of investigation in Tabriz hospitals, the aim of this study was to evaluate the antibiotic resistance pattern in *S. aureus* isolated from hospitalized patients and health centers in Tabriz.

MATERIALS AND METHODS

This descriptive cross-sectional study was performed on 100 *S. aureus* isolates. The isolates were isolated from urinary tract infection using standard laboratory methods. Kirby Bauer disk diffusion method was used to evaluate drug

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sensitivity. Bacteria grown on Blood Agar medium (37 ° C for one day) were used to prepare a suspension of equivalent half-McFarland tube. Antibiogram testing for antibiotic discs (antibody therapy) including discs with standard concentrations of vancomycin (30 µg), cefexime (30 µg), ciprofloxacin (5 µg), nitrofurantoin (30 µg), azithromycin (15 µg), clindamycin (2 µg), Ceftriaxone (30 µg), imipenem (10 µg), penicillin (10 µg), methicillin (5 µg), erythromycin (15 µg), gentamicin (10 µg) and tetracycline (10 µg) were performed.

RESULTS

Of 100 *S. aureus* isolates, 59% belonged to women and 41% to men. The mean age of the subjects was 41.15 ± 21.15. Based on the antibiotic resistance pattern of the samples, the highest antibiotic resistance was observed to methicillin and penicillin (91%), erythromycin (86%) and gentamicin (75%). Nitrofurantoin (95%) and vancomycin (86%) had the highest sensitivity. All of the clinical isolates had multiple antibiotic resistances. The pattern of antibiotic resistance in *S. aureus* isolates isolated from clinical samples of Tabriz is presented in Table 1.

Table-1: Frequency of antibiotic resistance pattern of *S. aureus* strains isolated from urinary tract infections

antibiotic	sensitive	intermediate	Resistant
Vancomycin	86	3	11
Cefexime	48	9	43
Ciprofloxacin	58	30	12
Nitrofurantoin	95	1	4
Azithromycin	18	11	71
Clindamycin	5	40	55
Ceftriaxone	18	22	60
Imipenem	20	11	69
Penicillin	2	7	91
Methicillin	2	7	91
Erythromycin	4	10	86
Gentamicin	12	13	75
Tetracycline	14	20	66

DISCUSSION AND CONCLUSION

Antibiotic resistance is one of the most important microbial threats in the 5th century and the treatment of staphylococcal infections has always been one of the slippery slopes in the treatment of microbial infections. These organisms are of great importance due to the potential of emerging antibiotic resistance in the management of nosocomial infections [18]. Therefore, the highest antibiotic resistance was observed in methicillin and penicillin (91%), erythromycin (86%) and gentamicin (75%). The highest sensitivity was related to nitrofurantoin (95%) and vancomycin (86%) antibiotics. Nourbakhsh and Momtaz showed in a 2015 study that the highest antibiotic resistance to methicillin (90.2%), erythromycin (89.7%), ciprofloxacin (89.5%), penicillin (88%), tetracycline (82.4%), gentamicin (75.8%) and the lowest resistance to antibiotics were nitrofurantoin (2%) and vancomycin (10%)[19]. In 2014, Saadat *et al.* studied the antibiotic resistance pattern of *S. aureus*, the highest susceptibility of the strain to ciprofloxacin, rifampin, linezolid, and sinerside antibiotics (91.1%) and the lowest sensitivity to penicillin antibiotics (4.7%) reported [20]. Vaez *et al.* showed the highest resistance of MRSA strains to penicillin in 104 strains (100%), co-amoxiclav 102 strains (97.6%), cefotaxime 74 strains (71.4%) and erythromycin 67 strains, respectively (64.3%), respectively[21]. Tabaei *et al.* by analyzing the antibiotic resistance pattern of the isolates, showed that the highest resistance to penicillin antibiotics was 68.3%, erythromycin 52.5%, clindamycin 42.6% and gentamicin 24%, respectively [22]. Similar to Haghgu *et al.*'s 2012 study in Tabriz, resistance to aminoglycoside and ciprofloxacin antibiotics was low [23], and the highest resistance to penicillin was observed, similar to other studies in the country [24]. The difference of resistance in this study compared to other studies can be related to the difference of resistance in different areas or even in one area hospitals, differences in routine laboratory methods and quality of discs produced by different types of domestic and foreign company's Different studies. There have been reports of rapid spread of resistant strains in hospitals. The present study also highlights the risk of these infections in hospital systems. Because of the high clinical significance of these infections, the need for physicians' knowledge and planning to improve the methods of identifying and controlling such infections is a top priority in medical systems.

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