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VITEK2 BASED DIAGNOSIS AND CHARACTERIZATION STAPHYLOCOCCI AERUS STRAIN CAUSING URINARY TRACT INFECATION IN FEMAL AND MALE

Salim Abdul Amir Jaber
Al Rifai General Hospital, Dhi-Qar Health Directorate, Iraqi Ministry of Health, Dhi Qar, Iraq

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Abstract: Background, The aim of this study was to assess the clinical presentation, risk factors, and comorbidities of the patients with Staphylococcus aureus bacteriuria, and to analyze the antimicrobial susceptibility data of S. aureus isolated from their urine samples. Methods, A total of 80 isolates of S. aureus were collected from patients with urinary tract infections (UTIs)in hospital Refai. Urinalysis was performed manually, including macroscopic examination of color and appearance, and microscopic examination for the presence of urinary pus cells, and bacteria and culture on MaCconky agar,Blood agar. Full diagnosis and susceptibility testing of S. aureus were performed by the VITEK 2 system (BioMérieux, Marcy-l'Étoile, France) using standard criteria. Results, The majority of the patients were female (50), with a mean age of 30 years and male(30) mean ageof45 years . Most of the patients were inhospatial . Seventy positive urine cultures were associated with UTI symptoms. ButTen negative urine cultures. Conclusion, Although S. aureus UTI is known to be associated with other risk factors such as urinary catheterization, long hospital stay, or complicated UTI, our results show the community-acquired presentation of UTI. Trimethoprim-sulfamethoxazole may be used as an effective treatment for UTI caused by S. aureus. S. aureus UTI could be an alarming sign of more invasive infections such as S. aureus bacteremia, though clinical evaluation and finding the source of S. aureus are crucial for effective treatment and prevention of further complications

Keywords: antibiotic resistance, urine culture, urinary tract infection, bacteriuria, staphylococcus aureus

Introduction

Staphylococcus aureus is a notorious human pathogen that causes a wide range of clinical infections. It is a major cause of bloodstream infections and infective endocarditis as well as osteoarticular, skin and soft tissue, pleuropulmonary, and implant-associated infections [1]. Although S. aureus accounts for only 0.5-6% of urinary tract infections (UTIs), untreated infection can lead to severe life-threatening conditions [2]. Isolation of S. aureus from urine samples must be investigated further to rule out staphylococcal bacteremia arising from elsewhere (e.g., in cases of endocarditis). Nonetheless, in certain patients, S. aureus causes ascending urinary tract colonization and infection. This usually occurs in patients with urinary tract instrumentation and/or the presence of an indwelling catheter [3,4]. Although the majority of S. aureus bacteriuria cases are asymptomatic, when symptoms appear, the most common symptom of S. aureus UTI is fever. Other symptoms include hematuria, altered mental status, dysuria, suprapubic pain, and, less commonly, flank pain [5]. The strong association of catheters with UTI signifies the importance of reducing the use of urinary

catheterization to essential cases only and removal of the device as soon as clinically indicated. Patients with catheter-associated S. aureus UTI, after excluding bacteremia, should be treated for 10 to 14 days with appropriate antimicrobials, as determined by culture and susceptibility results, as well as removal or replacement of the catheter [1].

Methods

1. Blood Agar
2. MacConky Agar
3. Vitek2 system
4. LOOP+Petri dish
5. incubater

methods

Study population and sample collection

A total of 80 patients with S. aureus bacteriuria (positive urine culture for S. aureus) were enrolled in this study from the first of December, 2023 to the end of Jun, 2024. The initial S. aureus isolated from urine culture was included for all the study subjects. If the subsequent S. aureus from urine culture for the same patient showed identical susceptibility results, they were considered as a single isolate, and the second one was excluded. However, if the second isolate had a different susceptibility result, it was considered a different strain and included in the total number of S. aureus isolates (n = 80). Four patients had more than one isolate with different susceptibility results, and all were included. Registries containing patients' demographics and clinical and laboratory data were extracted from the VIDA system (HMG hospital information system).

Urinalysis

Urinalysis was performed manually, including the macroscopic examination (color and appearance) and microscopic examination for the presence of urinary WBCs, RBCs, and bacteria. A chemistry analyzer (CLINITEK Advantus, Siemens Healthineers, Erlangen, Germany) was used to measure nitrates and leukocyte esterase.

Urine culture

The culture results were interpreted based on the colony count, the number of organisms, and the presence of symptoms [8]. Full identification and susceptibility testing of S. aureus were performed by the VITEK 2 system (BioMérieux, Marcy-l'Étoile, France) using the manufacturer’s recommendat. the VITEK 2 system detect S. aureus .

Statistical analysis

Frequency and percentages were used for descriptive analysis, and cross-tabulation was used to identify the relationship between categorical variables. Using the chi-square test, a p-value of 0.05 or less was considered significant. All data analysis was performed with SPSS version 26 (IBM Corp., Armonk, NY).

Results and Discussion

From DECEMBER 2023 to June 2024, we identified and included 80 consecutive patients in the study. A total of 80 S. aureus were isolated from 80 patients, The majority of the patients were female (50%) and the ages ranged from age of 32-55 years. Most of the patients (90%) were inhospital. Of the patients, catheter of some type in place. Some patients had structural and or functional urinary tract dysfunctions such as renal stones, vesicoureteral reflux, and renal cysts. eighty

positive urine cultures were associated with UTI symptoms. The most common presentation was dysuria (40%), associated with other UTI symptoms such as hematuria, suprapubic pain, and frequency. Table Table1 presents the patients' characteristics and underlying medical conditions and symptoms at the time of positive urine culture for S. aureus.

Table 1. Characteristics of 80 patients and symptoms at the time of positive urine culture for Staphylococcus aureus.

Characteristic	Value
Mean age (years)	32-55
Median age (years)	25
Gender (percentage)	
Male	30
Female	50
Patient location at the time of ordering the urine culture (percentage)	
Inpatient	68
Outpatient	12
Underlying condition with the number of patients (percentage)	
Diabetes	10
Hypertension	8
Foley's catheter	14
Recurrent urinary tract infection	9
Renal stones	20
Vesicoureteral reflux	2
Renal cysts	11
Benign prostatic hyperplasia	6

Table 5. Patients' characteristics in relation to outpatient and inpatient settings

	Patient	outpatient	P-value
Age group			0.354
0-15 years	20 (27.8%)	6 (30.8%)	
15-45 years	30 (40%)	4 (30.8%)	
>45 years	16 (22.2%)	5 (38.5%)	
Gender			0.053
Male	30 (30%)		
Female	50 70%		

Discussion

S. aureus is not a frequent UTI pathogen in the general population. Correspondingly, in the present study, the spread rate of S. aureus bacteriuria accounted for only 4% of all urine isolates. Comparably, Goldstein conducted a laboratory-based study in France and found that S. aureus accounted for only 1.3% of isolates from urine specimens submitted from the community [9].

Similarly, in a multicenter community-based study conducted by Barrett et al. in Great Britain, S. aureus comprised only 0.5% of all UTI isolates [10].

It has been previously described that isolation of S. aureus from the urine is almost invariably associated with urine catheterization, or dissemination through a hematogenous route, affecting mainly elderly patients [4]. This fact is also supported by the research of Muder et al., who conducted a longitudinal study of 102 patients at a long-term veteran care facility with documented S. aureus bacteriuria and found that 13% of the patients with S. aureus isolated from their urine were bacteremic and 53% had bladder catheters [5]. The most common symptom associated with S. aureus UTI was fever. Other symptoms were hematuria, altered mental status, dysuria, suprapubic pain, and, less commonly, flank pain [5]. However, in our study, the picture was significantly different. The majority of the patients were female aged from 15 to 45 years. Interestingly, underlying medical conditions, urinary tract manipulations, or abnormalities were uncommon. Only 7% of the patients had indwelling urinary catheters. Blood cultures were not performed for most of the patients, possibly because the majority of the patients presented to the clinics with simple cystitis, and urosepsis was not initially suspected. The most common presentation was dysuria, which may represent simple cystitis rather than pyelonephritis. The possible explanation is our hospital setting where the majority of patients visit the emergency department and a variety of different specialty clinics. As many as 85% of the study subjects were outpatients. Therefore, our study mainly represented community-acquired infections.

Conclusion

Although S. aureus UTI is known to be associated with other risk factors such as urinary catheterization, long hospital stay, or complicated UTI, our results show the community-acquired presentation of UTI. Trimethoprim-sulfamethoxazole may be used as an effective treatment for UTI caused by S. aureus. S. aureus UTI could be an alarming sign of more invasive infections such as S. aureus bacteremia, though clinical evaluation and finding the source of S. aureus are crucial for effective treatment and prevention of further complications.

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