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A comparative study of Prevalence and Antibiogram of Uropathogens in Patients with Urinary tract infection and Renal Stones in Al - Nasiriyah general Hospital

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Abstract

Aims: This study compared the prevalence, diversity, and antibiotic resistance profile of uropathogens in patients with UTI and patients with renal stones.

. Material and Method: mid stream urine spacemen were collected from 150 patients (75 with UTI and 75 with UTI and renal stone). Urine samples were collected from January 2024 to February 2025 from patients attending the Urology department in Al-Nasiriyah General Hospital. Mid-stream urine samples were inoculated directly on MacConkey and Blood agar and then incubated at 37°C for 24 hr Bacterial colonies were determined by standard culture and biochemical characteristics, and their susceptibility to different antibiotics was identified by the disk diffusion method.

Results: The mean age ± SD of the entire population 38.8±14.6, ranging from 13 to 68 years. Bacteriological investigation revealed that only 53 (35.3%) showed positive bacterial growth on culture media., statistical analysis showed no significant difference (P-value =0.494) in the overall bacterial recovery rates between UTI and stone former patients . . Six bacterial species were successfully identified, with E.coli being the most prevalent, 30.19%, followed by K pneumoniae, 22.6%, then P. aeruginosa and S. aureus, 16.9% and 15.09% respectively. E. Faecalis was the lowest prevalent, 5.66%.

In conclusion, no unique microbial signature is strongly associated with the formation of renal stones. and both urease-positive and negative can be isolated from UTI with renal stone

Keywords: UTI , kidney stone , *E.coli*

الهدف من الدراسه هو مقارنة مدى انتشار أنواع البكتيريا التي تسبب التهابات المسالك البوليه ومعرفة تنوعها ومقاومتها للمضادات الحيوية بين مرضى التهابات المسالك البوليه ومرضى حصى الكلى.

جمعت العينات من 150 مريضًا كانوا يراجعون قسم المسالك البوليه في مستشفى الناصرية العام، منهم 75 يعانون من التهاب المسالك البوليه فقط، و75 يعانون من التهاب المسالك البوليه مع وجود حصى في الكلى. جُمعت العينات خلال الفترة من كانون الثاني 2024 إلى شباط 2025.

طريقة جمع العينات كانت عن طريق أخذ جزء من البول أثناء التبول (الجزء الأوسط) لضمان دقة النتيجة. ثم تم وضع العينة مباشرة على وسطين غذائيين يساعدان على نمو البكتيريا، ووضعها في حاضنة بدرجة حرارة 37 مئوية لمدة يوم كامل. بعد ذلك، تم تحديد نوع البكتيريا من خلال شكل المستعمرات والاختبارات المخبرية الخاصة بالكيمياء الحيوية. كما تم اختبار حساسية كل بكتيريا تجاه المضادات الحيوية المختلفة باستخدام طريقة الأقراص.

كان متوسط عمر المرضى 39 سنة تقريبًا، ويتراوح عمريهم بين 13 و68 سنة. أظهرت التحاليل أن 53 حالة فقط من أصل 150 كانت إيجابية أي يوجد بها بكتيريا حية قابلة للنمو، أي بنسبة 35.3%. ولم يُلاحظ فرق كبير من حيث النسبة بين مرضى التهابات البول ومرضى الحصوات.

تم التعرف على 6 أنواع من البكتيريا، وكان أكثرها انتشارًا بكتيريا الإشريكية القولونية بنسبة 30%19.، تلتها بكتيريا كليبسيلا بنسبة 22.6%، ثم الزوائف 16.9 والعنقوديات 15.9. أما بكتيريا الإنتيروكوكس فقد كانت الأقل انتشارًا 5.66%

لا يوجد نوع بكتيري واحد يرتبط بشكل خاص بتكوّن الحصوات الكلوية. فالبكتيريا التي تنتج إنزيم اليوريز، والتي لا تنتجه، قد تُوجد عند مرضى التهابات البول الذين يعانون من حصوات. وهذا يدل على أن العلاقة بين العدوى والحصوات ليست بسيطة، ولا يمكن ربطها بنوع معين من الجراثيم فقط

الكلمات المفتاحيه :التهاب المسالك البوليه، حصى الكلى، الاشريشيا القولونيه

Introduction

Nephrolithiasis, a kidney stone illness, is the third most prevalent urological condition after urinary tract infection (UTI) and benign prostatic hypertrophy (Razi *et al 2024*). The prevalence of infective stone was estimated to be 15% of all urinary stone diseases (Madhavi,. *et al. 2012*). With higher prevalence in developing countries, its global prevalence varies according to several factors, including genetics, fluid intake, gender, age, and climate. It has been estimated that the prevalence ranges from 7% to 13% in America, 5% to 9% in Europe, and 5% in Asia (Sorokin, I. *et al.2017*, Scales Jr. *et al. 2012*). Many risk factors have been linked to the incidence and formation of renal stone, including age, sex, socio-demographic characteristics, and co-morbidity. However, little is known about the role of bacterial infection in stone formation. Although there is an apparent relationship between renal stone and urinary tract infection, which can be explained in two ways: the urinary tract infection induces stone formation, which is what is called "infection-induced stone," or the renal stone can act as a predisposing factor for UTI (Shah,. *et al. 2020*). Moreover, it has been hypothesized that persistent urinary tract infection is an essential factor that induces stone formation, or the inflammatory process resulting from UTI could facilitate the stone formation (Mohamed,. *et al. 2018*). Previous studies focus on the urea-producing bacteria such as protues, Staphylococcus, and Pesudomonas spp as the main bacterial species linked to the renal stone formation (struvite stone). However, recent studies have indicated that non-urease-producing bacteria can be isolated from the urine of patients with renal stones. An approach to elucidate the role of bacteria in stone formation involves revealing the bacterial species diversity in the renal stone and UTI(Shah *et al. 2020*) . No study has investigated the microbial signature of UTI and renal stone globally, particularly in Iraq. To fill this gap, this study aimed to compare the diversity of bacterial species and their antibiotic resistance profiles in the urine of patients with UTIs and those with renal stones

Material and Methods:

Collection Sample

The study was undertaken at Thi-Qar Province Between January 2024 and February 2025 , 150 midstream urine specimens were collected from patients attending the urology department of Al-Nasiriyah General Hospital undergoing evaluation for urinary system disorders. Of these, 75 (50%) urine samples were collected from patients diagnosed with urinary stone disease, confirmed by ultrasound imaging performed by a physician. An additional 75(50%) urine samples were collected from patients diagnosed clinically with UTI. Demographic information, including age, sex, and residency, was collected directly from patients by interview

Isolation and Identification of Bacteria

One ml of mid-stream urine was centrifuged at 3000 rpm for 5 min. The sediments were inoculated onto prepared and sterilized selective and differential media, including MacConkey agar (MAC) and blood agar (BA), followed by incubation at 37°C for 24 hr. Phenotypic identification was based on colony morphology, pigmentation, Gram staining, and biochemical tests such as oxidase, catalase, urease, indole, methyl red, Voges-Proskauer (VP), and citrate utilization. All isolates were further confirmed by the automatic system VITEK II (bioMérieux, France).

Antibiotic Susceptibility Test

The antibiotic susceptibility assay was performed by the disc-diffusion method (Kirby-Bauer) using Mueller-Hinton agar medium. All isolates were subjected to eight antibiotics: amikacin, cefotaxime, ciprofloxacin, gentamycin, meropenem, levofloxacin, amoxicillin / clavulanic Acid, and sulpha+trimethoprim. The discs were aseptically applied to each plate (five discs per plate). After incubation at 37°C overnight, inhibition zone diameters were measured (mm) and the results were interpreted in terms of resistant, intermediate, and susceptible according to CSLI guidelines (CLSI. 2024)

Statistical analysis

This study employed descriptive statistics. The categorical variables, including age categories, sex, residency, and bacterial isolation, were expressed as percentages (%). Statistical comparison was conducted using the Chi-square test ($\chi 2$) with two-sided. The significance level was Pvalue ≥0.05. All statistical analysis was conducted by SPSS version 19.

Ethical approval and considerations

The study protocol was approved by the scientific committee of the College of Al-Shattrah Veterinary Medicine. Written informed consents were obtained from patients by direct interview, after explaining the purpose of the study and assuring the confidentiality of personal information.

Results:

Demographic Characteristics of Study Populations:

The demographi characteristics of the study population are presented in Table 1. This study included 150 patients; 75(50%) had urinary tract infections, and 75 (50%) had renal stones. The mean age ± SD of the entire population (150 patients) was 38.8±14.6, ranging from 13 to 68 years old. The mean age of the UTI group was 38.9 ±14.1, while the mean age of the renal stone group was 39.2± 15.6. Regarding gender, 42 patients (65%) with UTI were male, and 33(44%) were female. On the other hand, among the renal stone group, males constituted 62%, while females made up 37.3%. Concerning residency, the number of patients residing in urban areas was higher than in rural areas for both groups (UTI and renal stones). Statistical analysis revealed that no significant differences (P≥0.05) existed between the UTI and renal stone groups for the three variables Prevalence of urinary tract infection versus Renal stone in different age groups

Tble 2 presents a comparison of the prevalence of UTI and renal stone based on the age groups, both UTI and renal stones appear to share a similar pattern, as the prevalence among adolescents (11-20 years old) was lower (10.7% in the UTI group and 18.7% in the renal stone group) than in the other age groups. However, the highest prevalence of UTI was found in the young age group, 21-35 years old (32%), while the highest prevalence of renal stones was observed in the elderly age group, 51-70 years old, 30.7%. Statistical analysis revealed a significant difference (P-value = 0.03) in the distribution of the infection among the UTI group. However, no such significant differences were observed in the group of renal stone (P-value =0.516).age, gender, and residency).

Prevalence and diversity of Bacterial species in UTI and Renal stone groups

Bacterial isolation showed that out of 150 urine samples from UTI and renal stone groups, only 53 (35.3%) showed positive bacterial growth on culture media. The bacterial recovery rate in the UTI group was 38.7%, higher than the 32% in the renal stone group. However, statistical analysis showed no significant difference (P-value = 0.494) in the overall bacterial recovery rates. Regarding the bacterial diversity, findings of this study indicated that six bacterial species were successfully identified, with *E. coli* being the most prevalent, 30.19%, followed by *K pneumoniae*, 22.6%, then *P. aeruginosa* and *S. aureus*, 16.9% and 15.09% respectively. At the same time, *E. Faecalis* was the lowest prevalent, 5.66%, figure 1. From the current study's findings, illustrated in Table 3, no noticeable difference in the diversity of bacterial species isolated from UTI and renal stone groups, except that *P. mirabilis* was isolated only from the renal stone group, while *E. Faecalis* was found only in the UTI group. Statistical analysis revealed no significant difference in the distribution of each bacterial species between the two groups.

Antibiotic Resistance Profiling of Bacteria isolated from UTI and Renal Stone groups:

E. coli

The antibiotic resistance profile of *E. coli* isolated from UTI and renal stone patients is shown in the table (4) Generally, *E. coli* isolates from UTI group showed higher resistance rates against amikacin 2(20%), cefotaxime, 5(50%), amoxicillin-clavulanic acid 8(80%) and sulfamethoxazole-trimethoprim, 7 (70%), than those in renal stones which recorded the following resistance rate 1(16%, 3(50%), 2(30%) ,3(50%), 0(0%), 1(16%), 5(83%), 4(66%), respectively. However, the isolates from renal stone patients showed a higher resistance rate than isolates of UTI patients, only for ciprofloxacin and gentamycin.

K . pneumonia

Table (5) displays the antibiotics resistance profile of *k .pneumonia* isolates from patient suffering from renal stone and UTI, which recorded the flowing resistance rates .amikacin2(22%), cefotaxime, 4(44%), ciprofloxacin3 (33%) ,gentamycin5 (55%), meropenen1(11%) ,levofloxacin3(33%)amoxicillin-clavulanic acid 7(77%), and sulfamethoxazole-trimethoprim, 7(77%) .to be compered with bacterial isolates resistance from patient with renal stone as flowing.1(33%, 2(66%),1(33%),0(0%),0(0%),0(0%),3(100%) ,3(100%),respectively.Higher resistance rate in isolates from UTI agents sulfamethoxazole-trimethoprim and amoxicillin -clavulanic acid compered to isolates from renal stone patients.

P. mirabilis

Table (6) displays the antibiotics resistance profile of *P. mirabilis* isolates from urine samples of patient suffering from renal stone which was as the flowing: amikacin3(60%), cefotaxime, 1(20%), ciprofloxacin2 (40%), gentamycin2(20%), meropenen0(0%), levofloxacin1(20%) amoxicillin -clavulanic acid 5(0%), and sulfamethoxazole-trimethoprim 4(80%). However, no isolates of (*P. mirabilis*) from patients diagnosed with UTI.

P. aeruginosa

Table 7 presents the antibiotic resistance profile of *P. aeruginosa* isolated from UTI and renal stone groups. The isolates from UTI groups showed a higher resistance rate than those in renal stone groups for 6 out of 8 antibiotics, amikacin and ciprofloxacin 60% for each, versus 25% and 50% respectively, in the renal stone group. Also, the resistance rate of UTI isolates was higher against ciprofloxacin and sulphamethoxazole-trimethoprim, which was 80% for each. Similarly, the resistance against gentamycin and amoxicillin clavulanic acid was 100% in UTI isolates, higher than those in renal stone isolates. On the other hand, resistance rate against meropenem and levofloxacin was higher in the renal stone group than in the UTI group.

Table 8 shows the resistance profile of *S. aureus* in UTI and renal stone groups. Results of this study indicated that isolates from UTI showed higher resistance rate than those from renal stone for the following antibiotics; amikacin 66%, cefotaxime 66%, gentamycin 33%, levofloxacin 66% and amoxicillin 100%, while those from renal stone group showed 60%, 40%,20%, 40%, and 80% respectively. However, isolates from the renal stone group showed higher resistance than those of UTI for the ciprofloxacin 40% vs.33% and meropenem 40% vs.0%. The resistance against sulphamethoxazole-trimethoprim was 100% in both groups

Discussion

The current study's mean age was 38.8 years (range 13–68), similar to an Iraqi study (Habeeb Al-Athari *et al., 2017*). The mean age of renal stone patients was 39.2 years, while UTI patients averaged 38.9 years, showing no significant difference, consistent with other reports (Xie et al., 2020; García-Agudo et al., 2020). Renal stones were more common in males (62.7%) than females (37.3%), which agrees with previous studies (Kadir *et al., 2010*). Differences across studies may relate to region, diet, sample size, or study duration (Ismael, *2021)*. Chi-square analysis showed no significant association between UTI and renal stone populations regarding age, gender, or residency ($p \geq 0.05$), in line with findings by Jabbar *et al. (2025)*. Kidney stone is a common and rising health problem. In this study of 150 individuals, adolescents (11–20 years) accounted for 10.7%

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of UTI cases, consistent with Al-Joudi *et al. (2025*). The highest incidence was in adults (21–35 years, 32%), likely linked to sexual activity or socio-environmental factors, in line with Al-Tulaibawi *et al. (2024)*. Elderly patients (51–70 years) also showed high UTI prevalence, probably due to immunosenescence and comorbidities, supporting A. *Mohammed et al 2025*). Regarding kidney stones, prevalence increased with age, from 8.7% in adolescence to 24% in the 36–50 group, consistent with Alaya *et al. (2012*). However, unlike Jan *et al. (2008*), who reported peak incidence in the 3rd–4th decades, our findings showed most cases in the 51–70 age group. Variations may be due to methodological differences, diagnostic criteria, or population characteristics (Moftakhar et al., 2022).

In this study, 53 of 150 samples (35.3%) showed microbial growth, consistent with Mahmood *et al. (2024*). Six bacterial species were identified, with Escherichia coli being the predominant organism in both urine and stone cultures, in line with Al-Tulaibawi *et al. (2024).* Among 75 UTI samples, 38.7% showed bacterial growth, while 61% were negative, consistent with A. Mohammed (2025). In renal stone patients, 32% had UTIs, which contrasts with Kadir *et al. (2010*). Other identified species included K. pneumoniae, P. mirabilis, S. aureus, and P. aeruginosa. Notably, P. mirabilis was mainly associated with renal stones (9.43%) due to urease activity causing epithelial crystallization, supporting findings by Salama *et al. (2025).*

All E. coli isolates were highly resistant to Augmentin and trimethoprim-sulfamethoxazole but highly susceptible to levofloxacin and meropenem, consistent with Polse *et al. (2016*). Previous studies in Iraq also reported resistance to amoxicillin/clavulanic acid and sensitivity to amikacin and imipenem (Naqid, Balatay, Hussein, Saeed, *et al., 2020*). Moderate resistance to ciprofloxacin and levofloxacin has been observed in 63.8% of isolates (Hasan et al., 2023). In this study, antibiotic resistance was generally higher in UTI samples than in renal stone samples, possibly due to overuse of antibiotics, aligning with findings by E. J. Mohammed *et al. (2021*).

The antibiotic susceptibility of Klebsiella pneumoniae isolates was tested using the Kirby-Bauer method against eight common antibiotics. Most isolates showed strong resistance to beta-lactams and sulfonamides, with 77% resistance to Augmentin and sulfamethoxazole-trimethoprim, slightly lower than the 82.8% reported by A. N. Mohammed *et al. (2023).* Resistance to meropenem and amikacin was lower (22% and 11%, respectively), consistent with Ahmed Hasan *et al. (2021).* Moderate sensitivity was observed for ceftriaxone, ciprofloxacin, and gentamicin, aligning with Naqid, Balatay, Hussein, Ahmed, *et al. (2020).* In renal stone patients, K. pneumoniae showed 33% sensitivity to ciprofloxacin and 100% to levofloxacin, while meropenem was the most effective drug, followed by cefotaxime and gentamicin; the isolates remained highly resistant to amoxicillin/clavulanic acid.

All Proteus mirabilis isolates were tested against Cefoxitin , Amikacin, Ciprofloxacin, Gentamicin, Levofloxacin, Sulphamethoxazole-Trimethoprim, Cefotaxime , and Amoxicillin-Clavulanic acid using the disc-diffusion method. The highest resistance was observed to Augmentin, followed by trimethoprim-sulfamethoxazole. Moderate resistance was recorded for ciprofloxacin and cefotaxime, while low resistance was noted for amikacin and meropenem, consistent with Salama *et al. (2025*). Unlike Abed Gumar *et al. (2022*), who reported aminoglycoside-modifying enzyme-mediated resistance, this study found only moderate resistance to amikacin and gentamicin.

Most Pseudomonas aeruginosa isolates showed high resistance to Amoxicillin-Clavulanic acid, while resistance to meropenem was low, identifying it as the most effective treatment, consistent with Driscoll *et al. (2007)* and Al-Makhzoomy *et al. (2025*). Unlike other reports of rising carbapenem resistance due to β-lactamases and multidrug resistance (Hussein *et al., 2025)*, our study found ciprofloxacin resistance at 80% and levofloxacin resistance at 60%, aligning with Owaid & Al-Ouqaili *(2025).* High resistance was also observed for gentamicin, similar to findings in Libya (Abdelaziz *et al., 2025*).

High antibiotic resistance was observed in most clinical samples, particularly from renal stones, consistent with Thari *et al. (2024).* Staphylococcus aureus isolates showed high resistance to cefoxitin and amoxicillin-clavulanic acid, with intermediate resistance to gentamicin and amikacin, aligning with Sami Awayid & Qassim Mohammad (2022) and Alwash & Aburesha (2021). Variations in resistance patterns may be due to genetic mechanisms (AL-Salihi *et al., 2023*). Overall, Gram-negative bacteria, especially Escherichia coli, were the most common cause of UTIs, with meropenem being the most effective antibiotic. High resistance to Augmentin and other commonly used drugs highlights the need for continuous surveillance and proper antibiotic stewardship.

Conclusions: The current study concludes that there is no difference in the bacterial species diversity between UTIs and renal stones. Additionally, Gram-negative bacteria, especially Escherichia coli, were the most frequently isolated from UTIs and renal stones. Meropenem was the most effective antibiotic. High resistance to Augmentin and other commonly used drugs was also observed. Consequently, consistent surveillance of resistance patterns is essential for therapeutic efficacy.

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Table1 : Demographic Characteristics of Patients with UTI and Renal Stones.

Character	Groups	UTI (%)	Stone (%)	P
Age: mean ± SD		38.9 ±14.1	39.2± 15.6	
Gender	Male	42 (56%)	47(62.7%)	0.506
	Females	33(44%)	28(37.3%)	
Total		75	75	
Residency	Rural	27(36%)	33(44%)	0.404
	Urban	48(64%)	42(56%)	
Total		75	75	

Table 2: Distribution of UTI and Renal Stone Cases According to Age Groups:

Age groups	UTI	Renal stone	Total
11-20	8(10.7%)	14(18.7)	22(14.6)
21- 35	24(32%)	18(24)	42(28)
36-50	23(30.7%)	20(26.6)	43(28.7)
51-70	20(26.6)	23(30.7)	43(28.7)
Total	75	75	150
P-value	0.03	0.516	
X2	8.680	2.280	
DF	3	3	

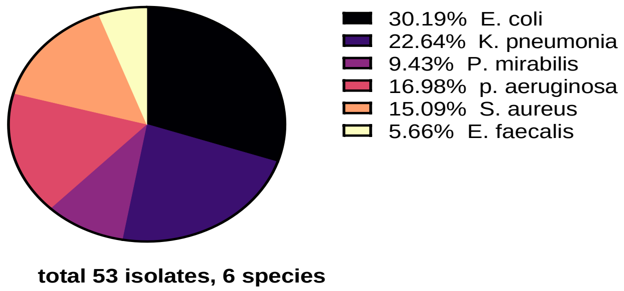

Figure 1: The prevalence of different bacterial species isolated from the urine of UTI and renal stone groups

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Table 3: Distribution of Bacterial Isolates Among UTI and Renal Stone Patients:

Bacterial Species	No. isolates	UTI n(%)	Renal stone	P
E. coli	**16(30.2)**	**10(34.5)**	**6(25)**	**0.332**
K. pneumonia	**12(22.6)**	**9(31)**	**3(12.5)**	**0.146**
P. mirabilis	**5(9.4)**	**0(0)**	**5(20.8)**	**----**
p. aeruginosa	**9(16.2)**	**4(13.8)**	**5(20.8)**	**0.999**
S. aureus	**8(15.1)**	**3(10.3)**	**5(20.8)**	**0.726**
E. faecalis	**3(5.7)**	**3(10.3)**	**0(0)**	**------**
Total	**53(35.3)**	**29(38.7)**	**24(32)**	**0.4946**

Table 4: Antibiotic resistance profiling of *Escherichia coli* Isolates from UTI and Renal Stone groups

Antibiotics	UTI N (%)	Renal Stone N (%)
Amikacin	2(20%)	1(16%)
Cefotaxime	5(50%)	3(%50%)
Ciprofloxacin	1(10%)	2(30%)
Gentamycin	2(20%)	3 (50%)
Meropenem	0(0%)	0(0%)
Levofloxacin	1(10%)	1(16%)
Amoxicillin / Clavulanic Acid	8(80%)	5(83%)
Sulpha+Trimethoprim	7(70%)	4(66%)

Table 5 : Antimicrobial Susceptibility Patterns of Klebsiella pneumoniae Isolates from Patients with Renal Stones.

Antibiotics	UTI n(%)	Renal stone. n(%)
Amikacin	2(22%)	1(33%)
Cefotaxime	4(44%)	2(66%)
Ciprofloxacin	3(33%)	1(33%)
Gentamycin	5(55%)	0
Meropenem	1(11%)	0
Levofloxacin	3(33%)	1(33%)
Amoxicillin / Clavulanic Acid	7(77%)	3(100%)
Sulpha+Trimethoprim	7(77%)	3(100%)

Table 6: Antimicrobial Susceptibility Patterns of Proteus mirabilis Isolates from Patients with Renal Stones.

Antibiotics	UTI n(%)	Renal Stone n(%)
Amikacin	-	3(60%)
Cefotaxime	-	1(20%)
Ciprofloxacin	-	2(40%)
Gentamycin	-	2(20%)
Meropenem	-	0(0%)
Levofloxacin	-	1(20%)
Amoxicillin / Clavulanic Acid	-	5(0%)
Sulpha+Trimethoprim	-	4(80%)

Table 7: Antibiotic resistance profiling of *Pseudomonas aeruginosa* Isolates from UTI and renal stone groups.

Antibiotics	UTI n(%)	Renal Stone n(%)
Amikacin	3(60%)	1(25%)
Cefotaxime	3(60%)	2(50%)
Ciprofloxacin	4(80%)	3(75%)
Gentamycin	5(100%)	2(50%)
Meropenem	1(20%)	1(25%)
Levofloxacin	3(60%)	3(75%)
Amoxicillin / Clavulanic Acid	5(100%)	3(75%)
Sulpha+Trimethoprim	4(80%)	2(50%)

Table 8. Antibiogram Profiling of *Staphylococcus aureus* Isolates from UTI and renal stone groups

Antibiotics	UTI n(%)	Renal Stone n(%)
Amikacin	2(66%)	3(60%)
Cefotaxime	2(66%)	2(40%)
Ciprofloxacin	1(33%)	2(40%)
Gentamycin	1(33%)	1(20%)
Meropenem	0(0%)	2(40%)
Levofloxacin	2(66%)	2(40%)
Amoxicillin / Clavulanic Acid	3(100%)	4(80%)
Sulpha+Trimethoprim	3(100%)	5(100%)