ABSTRACT

Objectives: Urinary tract infection (UTI) is one of the diseases with a highest prevalence in the world. This study evaluated the antibiotics resistant and the prescription pattern for UTI with the aim to participate as an effective monitoring study that enhances rational antibiotics’ prescription.

Methods: We conducted a retrospective cross-sectional study at King Fahad Specialist Hospital from May 2018 to January 2019. We included a total of 306 patients with UTI. 204 patients diagnosed clinically and empirically treated (Group A), 102 patients underwent urine for culture and sensitivity tests (Group B).

Results: UTI showed higher occurrence in female in both Groups A (61%) and B (65%). The mean age was higher in Group B (55.8 years) than Group A (49.4 years). The most commonly prescribed antibiotics for UTI were Trimethoprim + Sulfamethoxazole (TMP+SMX) (56%) and ciprofloxacin (15%). Escherichia coli was the most commonly isolated organism (36.3%) followed by Klebsiella pneumonia (30%). Although 41.17% of organisms were sensitive to TMP+SMX, 38.2% were resistant to it. The organisms were sensitive to amikacin in 80.4% and to gentamicin in 61.8% whereas, 61.8% were resistant to ampicillin. Luckily, no resistance was reported neither for nitrofurantoin nor for vancomycin.

Conclusion: The study showed significant resistance to the commonly prescribed TMP+SMX and ciprofloxacin compared to absolute sensitivity to the less prescribed nitrofurantoin. This necessitates special consideration for local susceptibility in empirical therapy.

Keywords: Antibiotic, Prescription, Resistance, Urinary tract infection.
The findings in the urine culture and sensitivity tests of Group B patients showed that E. coli was the most commonly isolated organism (36.3%, n=37), followed by K. pneumonia (29.4%, n=30). Enterococcus faecalis (10.8%, n=11), and P. aeruginosa (8.8%, n=9) while Streptococcus, Providencia spp., and Staphylococcus aureus were the least isolated organisms. There was significant association between the type of organisms isolated and the gender as p=0.029 (Table 3). An 80.4% of the organisms isolated were sensitive to amikacin, followed by meropenem (79.4%), imipenem (78.4%), and gentamicin (61.8%). While, the resistant to ampicillin was detected in 61.8%, followed by ciprofloxacin (48%) and only 1% resistance to tigecycline was reported. Although, 41.2% of the organisms were sensitivity to TMP+SMX, 38.2% of them were resistant to it. Intermediated sensitivity was seen in gentamicin (41.2%) and only 1% resistance to tigecycline was reported. Although, 41.2% of the organisms were sensitivity to TMP+SMX, 38.2% of them were resistant to it. Intermediated sensitivity was seen in gentamicin (41.2%) and only 1% resistance to tigecycline was reported. Although, 41.2% of the organisms were sensitivity to TMP+SMX, 38.2% of them were resistant to it. Intermediated sensitivity was seen in gentamicin (41.2%) and only 1% resistance to tigecycline was reported. Although, 41.2% of the organisms were sensitivity to TMP+SMX, 38.2% of them were resistant to it. Intermediated sensitivity was seen in gentamicin (41.2%) and only 1% resistance to tigecycline was reported. Although, 41.2% of the organisms were sensitivity to TMP+SMX, 38.2% of them were resistant to it. Intermediated sensitivity was seen in gentamicin (41.2%) and only 1% resistance to tigecycline was reported. Although, 41.2% of the organisms were sensitivity to TMP+SMX, 38.2% of them were resistant to it. Intermediated sensitivity was seen in gentamicin (41.2%) and only 1% resistance to tigecycline was reported.
and it still higher even at the age of 60 years [7]. Furthermore, Keyhan et al. reported a higher incidence of UTIs in patients aged 36–65 years in female, while in male it was most frequency in age <65 years old [8].

In this study, we noticed that among patients in Group A the UTI was common (47.5%) in young adult (19–36 years) with a mean age of 36.9 years, while in Group B it was common (43.1%) among the elderly (55–72 years) with a mean age of 55.8 years, reflecting the possibility of resistance and high recurrence rate at this age group which justify the need for culture and sensitivity tests. In general, in both studied groups, there was less occurrence of UTIs at the extremities of age; in younger aged patients (1–18 years) (5.5%) and patients more than 72 years (8.8%).

In this study, sulfamethoxazole+ trimethoprim (960 mg) twice daily was the most antibiotic prescribed as empirical antibiotics (56%), followed by ciprofloxacin (15%), ceftriaxone axetil (11%), amoxicillin clavulanic acid (4%), and ceftriaxone (4%). Inversely, we noticed a different result reported by Mohamed et al. as they found that the most antibiotics prescribed empirically were amoxicillin (28%), followed by ciprofloxacin (11%), and co-amoxiclav (10%). As reported in international survey on the antimicrobial resistance of microorganisms causing UTI, there is a wide variability across countries in bacterial susceptibility rates to the antimicrobials [9], so the empirical antibiotic therapy should consider the local susceptibility patterns of uropathogens.

This study showed that most of physician prescribed only one type of antibiotic (n=184, 90.2%) for the treatment of UTI. There are only few cases where two antibiotics were prescribed (n=18, 9.3%) and only one patient received three types of antibiotics (0.5%). These findings largely agreed with the guideline for empirical treatment of UTIs [10,11].

In Group B patients, the urine culture results showed that E. coli was the most commonly isolated organism (36.3%), followed by K. pneumonia (29.4%), E. faecalis (10.8%), P. aeruginosa (8.8%), and P. mirabilis (3.9%), while, Streptococcus (1%), providencia spp. (1%), and staphylococcus aureus (1%) were the least. In study done by Cunha et al., showed a highest frequency of E. coli (60.4%) and followed by Klebsiella spp. (14.2%) [3]. Furthermore, Wong et al. study found out that the most common pathogen isolated was E. coli (75.9%) [12].

We compared the type of organisms isolated with the patients’ age and gender and we concluded that there was no association with age as p=0.17. In contrast, there was significant association with gender as p=0.029 and we consider p value significant at <0.05.

In Group B patients, the organisms isolated were highly sensitive to amikacin (80.4%), followed by meropenem (79.4%), imipenem (78.4), and gentamicin (61.8%), while TMP/SMX although it showed (41.2%) sensitivity, the resistance was significantly high (38.2%). Luckily, the organisms were found to be absolute sensitive and no reported resistance in all tested cases for nitrofurantoin (10 cases) and vancomycin (14 cases). The organisms were highly resistant to amoxicillin (61.8%), followed by ciprofloxacin (48%), piperacillin (42%), and less resistance to tigecycline (1%); however, there was intermediated effect to gentamicin (5.9%). We observed that there is a significant resistance among the commonly empirically prescribed antibiotics (TMP/SMX and ciprofloxacin) while no reported resistance among the less prescribed one (nitrofurantoin) which reflects overuse among empirical prescription of antibiotics and necessitate special consideration for local susceptibility patterns when prescribing the antibiotics empirically for UTI patients. In Cunha et al. study, they found that aminoglycosides, nitrofurantoin, and third-generation cephalosporins were highly susceptible over (90%) while TMP-SMX and quinolones reported highly resistance [3].

**CONCLUSION**

The study of UTI at KFSH showed UTIs pattern aligned with international studies as UTI was most common in female and commonly caused by E. coli. However, significant resistance to the highly empirically prescribed antibiotics (TMP+SMX and ciprofloxacin) was noted, beside absolute sensitivity to nitrofurantoin which should be considered in the empirical therapy for UTI with regard to the local susceptibility pattern.

**AUTHORS’ CONTRIBUTIONS**

1. Norah R. A Lnqer; collect data, managed the analyses of the study and wrote the first draft of the manuscript.
2. Areej Al Jasser; managed the literature searches and interpreted the data
3. Mughind A. Mobark; designed the study, performed the statistical analysis, and wrote the protocol.

This manuscript has been read and approved by all the authors, and the requirements for authorship have been met, and we believe that this manuscript represents honest work.

**CONFLICTS OF INTEREST**

No any conflicts of interest to disclose.

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**Table 4: The antibiotics sensitivity and resistance patterns in isolated organisms**

| Antibiotics tested          | Sensitive % (n) | Resistant % (n) | Intermediate % (n) | Not tested % (n) |
|-----------------------------|-----------------|-----------------|--------------------|-----------------|
| Ampicillin                  | 22.5 (23)       | 61.8 (63)       | 0 (0)              | 15.7 (16)       |
| Cefuroxime                  | 31.4 (32)       | 40.2 (41)       | 5.9 (6)            | 24.5 (25)       |
| Ceftazidime                 | 43.1 (44)       | 42.2 (43)       | 0 (0)              | 14.7 (15)       |
| Gentamicin                  | 61.8 (63)       | 18.6 (19)       | 5.9 (6)            | 13.7 (14)       |
| Amikacin                    | 80.4 (82)       | 2.9 (3)         | 2.0 (2)            | 14.7 (15)       |
| Imipenem                    | 78.4 (80)       | 2.9 (3)         | 2.9 (3)            | 15.7 (16)       |
| Meropenem                   | 79.4 (81)       | 4.9 (5)         | 0 (0)              | 15.7 (16)       |
| Piperacillin                | 33.3 (34)       | 42.2 (43)       | 0 (0)              | 24.5 (25)       |
| Cefotaxime                  | 42.2 (43)       | 41.2 (42)       | 0 (0)              | 16.7 (17)       |
| Tazocin                     | 33.3 (34)       | 23.5 (24)       | 1 (1)              | 42.5 (43)       |
| TMP-SMX*                    | 41.2 (42)       | 38.2 (39)       | 0 (0)              | 20.6 (21)       |
| Tetracycline                | 30.4 (31)       | 36.3 (37)       | 0 (0)              | 33.3 (34)       |
| Amoxicillin + clavulanate   | 32.4 (33)       | 42.2 (43)       | 2.9 (3)            | 22.5 (23)       |
| Ciprofloxacin               | 45.1 (46)       | 48 (49)         | 4.9 (5)            | 2 (2)           |
| Cefotaxime                  | 33.3 (34)       | 38.2 (39)       | 0 (0)              | 28.4 (29)       |
| Tigecycline                 | 56.9 (58)       | 1 (1)           | 4.9 (5)            | 37.3 (38)       |
| Nitrofurantoin              | 9.8 (10)        | 0 (0)           | 0 (0)              | 90.2 (92)       |
| Vancomycin                  | 13.7 (14)       | 0 (0)           | 0 (0)              | 86.3 (88)       |

*TMP-SMX: Trimethoprim/sulfamethoxazole*
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