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ANTIBIOTIC RESISTANCE PATTERN AMONG BACTERIA ISOLATED FROM PATIENTS WITH COMMUNITY-ACQUIRED URINARY TRACT INFECTION

Shakia Khan Niazi, Javeid Iqbal, Marvi Baloch, Sajjad Haider, Fahad Saleem*
Faculty of Pharmacy & Health Sciences, University of Balochistan, Quetta

Abstract:
Objective: *The current study was aimed to document antibiotic resistance pattern among bacteria isolated from patients with community acquired Urinary Tract Infections (UTIs).*
Methods: *A retrospective, time based analysis was conducted. Data was retrieved from Combined Military Hospital (CMH), Quetta city Pakistan for a period of three months. All patients that were diagnosed as positive cases of UTIs were included in the study. In addition to the demographic information, specimen of the isolated bacteria, susceptibility test and resistance pattern of various antibiotics was recorded on an information sheet. The data was analyzed by SPSS with frequencies and percentages of susceptibility and resistance to antibiotics.*
Results: *Over a period of three months, 300 urine samples were received and analysed. Escherichia coli were the most commonly reported causative agent of UTIs (196, 65.3%) followed by Enterococus species (45, 15.0%). A total of 14 different antibiotics were used during the cultural sensitivity analysis. Co-amoxiclav had the highest resistance towards E. Coli (83.0%) followed by Co-trimoxazole (70.0%), Ceftriaxone (60.0%) and Ciprofloxacin (56.3%). Amikiacin showed highest sensitivity 0f 77% that was followed by Meropenem, Nitrofurantoin, Tazocin and Imipenem (57.0, 51.0, 41.3 and 33.0% respectively). Among intermediate acting antibiotics, Tazocin was followed by Amikacin.*
Conclusion:*Our study demonstrated that there is increased resistance to commonly prescribed antibiotics in UTIs and majority of antibiotics are becoming ineffective for empirical treatment of UTI in our population. Overuse of antibiotics should be avoided, prescribing guidelines should be followed and the choice of antibiotic in the treatment of UTI should be based on setting of acquisition.*

Corresponding author:
Fahad Saleem,
Faculty of Pharmacy & Health Sciences,
University of Balochistan, Quetta
Email: fahaduob@gmail.com

QR code

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INTRODUCTION:

Urinary tract infections (UTIs) are one of the most recurrently occurring bacterial infections in both hospital and community settings [1, 2]. UTIs are frequently reported in women as compared to men because of the shorter urethra [3]. In the literature a number of bacterial and fungal isolates are identified; however, Gram-negative Escherichia coli (E. Coli) is the principal pathogen that is reported among patients with UTIs isolated in patients [4]. UTIs are a serious problem and take account of approximately 2.4 days of constrained commotion and 1.2 days of loss of work [5]. Untreated UTIs can result in paraurethral or renal abscesses, hence leading to increased morbidity and frequency of hospitalisation [6].

UTIs are normally treated with antibiotics as widely held cases of UTI are caused by bacteria [7]. In clinical practice, antibiotics are prescribed to the patients and the therapy is reconsidered once the cultural results are provided. This treatment method is a usual practice to commence the treatment before the culture vulnerability is received, or the patients' clinical symptoms are not serious enough to merit taking cultures or appropriate cultural facilities are not available [8]. In spite of the advantages of this practice, which is cost effective, a drawback of this approach results in irrational use of antibiotics which are at times costly and can result in the development of resistance hence the recurrence of infection [9]. An additional issue to be considered is that this choice of treatment and the associated antibiotics are selected on the vulnerability patterns of UTIs causative agents and that is very prone to change. Continuous use of antibiotics based on routine clinical practice results in the development of resistance to the limited agents available for the treatment of UTIs [10]. In the nutshell, treatment of patients becomes difficult, expensive and most importantly the quality of life of the patient is heavily impaired. Worst among all, the duration of treatment is prolonged and may result in loss of life [11]. Nevertheless, because of the delays in culture results, empirical therapy is still preferred and is rated as the gold standard for UTIs treatment, therefore it is urged to keep an eye on of resistance pattern of antibiotics so that the best available evidence based therapy is selected for the patients.

To date, to the best of our knowledge, there is scarcity of information from Quetta city that reports the resistance patterns of antibiotics over time for community acquired UTIs. Although empirical therapy is practiced, the literature reports high resistance of these drugs. Therefore, the current study was aimed to concentrate on these knowledge gaps and to document antibiotic resistance pattern among bacteria isolated from patients with community acquired UTIs.

METHODS:

Study design and settings

A retrospective, time based analysis was conducted. Data was retrieved from Combined Military Hospital (CMH), Quetta city Pakistan for a period of three months. CMH Quetta is one of a base hospital of Pakistan Armed Forces and is operated by physicians of the Army Medical Corps. CMH Quetta is centrally located and is categorised as class "A" hospital that caters needs of a huge population. Being generalized in nature, the hospital offers a number of services and treatment facility is available twenty four hours.

Study population and sampling

All patients that were diagnosed as positive cases of UTIs were included in the study. The study being retrospective in nature evaluated all samples sent to the laboratory and examined the susceptibility and resistance to various antibiotics being prescribed at the institute. However, cases that were not sent for culture sensitivity were not included in the analysis.

Data analysis

In addition to the demographic information, specimen of the isolated bacteria, susceptibility test and resistance pattern of various antibiotics was recorded on an information sheet. The data was analyzed by SPSS with frequencies and percentages of susceptibility and resistance to antibiotics. Based on the nature of the study, only descriptive analysis was conducted.

Ethical approval

Ethical review board at Faculty of Pharmacy & Health Sciences, University of Balochistan, Quetta approved the study. Additionally, permission to conduct the study was from the Medical Superintendent of the respective hospital. Being retrospective in nature, patient consent was not needed per accordance of Helsinki Declaration.

RESULTS:

Demographic information and the list of isolated bacteria

Over a period of three months, 300 urine samples were received and analysed. Majority of the samples (103, 34.3%) were belonged to patients having age of more than fifty years. As expected and reported in the introduction, 271 (90.3%) of the patients were females. Escherichia coli were the most commonly reported causative agent of UTIs (196, 65.3%) followed by Enterococus species (45, 15.0%) as show in Table 1.

Table 1: Demographic characteristics of study sample and isolated organisms

Characteristics	Frequency	Percentage
Age (years)		
11-20	4	1.3
21-30	78	26.0
31-40	66	22.0
41-50	49	16.3
> 50	103	34.3
Gender		
Male	29	9.7
Female	271	90.3
Isolated organism		
Staphylococcus epidermidis	27	9.0
Escherichia coli	196	65.3
Klebsiella pneumoniae	26	8.7
Enterococus species	45	15.0
Pseudomonas aeruginosa	6	2.0

A total of 14 different antibiotics were used during the cultural sensitivity analysis and are shown in Table 2. Co-amoxiclav had the highest resistance towards E. Coli (83.0%) followed by Co-trimoxazole (70.0%), Ceftriaxone (60.0%) and Ciprofloxacin (56.3%). Amikiacin showed highest sensitivity 0f 77% that was followed by Meropenem, Nitrofurantoin, Tazocin and Imipenem (57.0, 51.0, 41.3 and 33.0% respectively). Among intermediate acting antibiotics, Tazocin was followed by Amikacin.

Table 2: Resistance and sensitivity pattern of antibiotics used in UTIs

Antibiotic	Sensitive		Resistance		Intermediate	
	N	%	N	%	N	%
Amikacin	232	77.3	31	10.3	11	3.7
Amoxicillin / clavulanic acid	25	8.3	249	83.0	3	1.0
Ceftriaxone	59	19.7	180	60.0	1	0.3
Ciprofloxacin	84	28.0	169	56.3	7	2.3
Co-trimoxazole	32	10.7	210	70.0	2	0.7
Imipenem	99	33.0	9	3.0	3	1.0
Nitrofurantoin	153	51.0	64	21.3	10	3.3
Tazocin	124	41.3	63	21.0	35	11.7
Meropenem	171	57.0	2	0.7	1	0.3
Vancomycin	73	24.3	1	0.3	0	0
Polymyxin B	0	0	11	3.8	0	0
Tigecycline	5	1.7	5	1.7	10	3.3
Linezolid	56	18.7	0	0	0	0
Gentamycin	9	3.0	10	3.3	0	0

Note: Not all antibiotics were used for every specimen. Therefore, the cumulative number is not equal

DISCUSSION:

This study provides information about the antibiotic resistance pattern of antibiotics used for the empirical treatment of UTIs. To the best of our knowledge, this is the first study to report the resistance pattern from Quetta city. Our results showed that overall resistance was highest for Co-amoxiclav followed by Co-trimoxazole, Ceftriaxone and Ciprofloxacin. Furthermore, Escherichia coli were the most commonly reported causative agent of UTIs (196, 65.3%) which is also evident from the literature [12-14].

As reported in literature, antibiotics usually are the first line treatment for UTIs. The selection of drugs depends upon the health status of the patient and the type and pathogenicity of the bacteria found in urine. For simple UTIs, commonly used drugs in clinical practice are Trimethoprim/sulfamethoxazole, Fosfomycin, Nitrofurantoin, Cephalexin and Ceftriaxone [15]. However, the choice of antibiotics varies among various healthcare systems. For example, in Australia, trimethoprim, cephalexin, amoxycillin-clavulanate or nitrofurantoin are

recommended for first line treatment of UTI [16]. The Infectious Diseases Society of America (IDSA) and European Society for Microbiology and Infectious Diseases recommend trimethoprim-sulphamethoxazole as an appropriate treatment choice if local resistance rates do not exceed 20%. The IDSA guidelines also recommend that amoxycillin or ampicillin should not be used alone for empirical treatment because of the relatively poor efficacy and the relatively high prevalence of antibiotic resistance to these agents worldwide [17]. Shifting our concerns to the results of the current study, high levels of resistance to Co-trimoxazole was identified and the suitability of this antibiotic in the management of UTIs in our patient population should be assessed thoroughly. Additionally, The IDSA suggests that beta-lactam antibiotics such as including amoxycillin-clavulanate are appropriate choices for therapy when other recommended agents cannot be used [17]. However, from the results of our study, it is reported that amoxycillin-clavulanate is highly resistant in our population and in fact eight percent of the isolated bacteria is resistant to amoxycillin-clavulanate. One key reason for this sensitivity is the irrational and off prescription use of amoxycillin-clavulanate in the local settings. Antibiotic as like other developing countries are freely available from the pharmacies and amoxycillin-clavulanate being the most famous antibiotic is used frequently without prescription, clinical need and healthcare professional advice. This irrational use has become a major healthcare issue because the antibiotic is not effective and the prescribers have no choice then to switch to other options that are costly and have more adverse effects as compared to amoxycillin-clavulanate.

Based on our findings, the majority of UTIs had high resistance to Ciprofloxacin. In contrast to our study, Ciprofloxacin, which is recommended in Australia for complicated UTIs was reported to have to low resistance [18]. One major reason is linked to low resistance is the National Pharmaceutical Subsidy Scheme of Australia that restricts the use of Quinolone use in Australia hence resulting in decreased resistance in the community. However, higher resistance towards Ciprofloxacin is also reported from other studies [19, 20]. With mixed results, it can be concluded that resistance may vary geographically and is also supported by a meta-analysis [21]. The description for the shifting of resistance pattern is not clearly understood but possible reasons have been postulated. Whatever the reasons are, the irrational use of antibiotics is the most commonly reported and agreed reason of resistance and that is evident from the practice of medication use in developing countries.

The increasing resistance trend noted in our study for the antibiotics is consistent with previously reported data [22, 23]. The increasing trend may be attributable to antibiotic overuse or misuse as discussed earlier. The literature also suggests a possible seasonality with UTI incidence but this was not objective of our study. However, Quetta being a valley normally receives cold weather and higher use of antibiotics in winter months results in the increased incidence of respiratory tract infections. Therefore, the frequent use of Co-trimoxazole and Quinolones may result in the development of resistance and should be explored in future studies.

CONCLUSION:

UTIs are one of the most common infectious diseases which have been most extremely studied in the field of clinical practices. However, antibiotic resistance poses serious concerns of effectiveness in treating infections such as UTIs. Our study demonstrated that there is increased resistance to commonly prescribed antibiotics in UTIs and majority of antibiotics are becoming ineffective for empirical treatment of UTI in our population. Overuse of antibiotics should be avoided, prescribing guidelines should be followed and the choice of antibiotic in the treatment of UTI should be based on setting of acquisition.

Disclosure

The authors have no interest to declare. No funding was received for this study.

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