ORIGINAL ARTICLE

Multi Drug Resistance (MDR) Urinary Tract Infection: An Evidence Based Study

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ABSTRACT

Background: Urinary tract infections are the most frequently reported infections that drive the use of antibiotics around the world. UTI is the 4th most common healthcare-associated infection. Multidrug-resistant (MDR) organisms are predominantly bacteria that are resistant to one or more classes of antimicrobials. The increasing rise in the incidence of MDR-UTI has resulted in increased morbidity, mortality, and treatment cost of the patients. Thus, it is important to highlight the magnitude of the problem, identify the risk factors that result in MDR-UTI, and to take appropriate measures to control its occurrence.

Objective: To determine the magnitude of the multidrug-resistant bacteria, their antibiotic-resistant profile, andtheir effect on the treatment cost of the patients

Methods: It is a descriptive study conducted in the Department of Urology at the Institute of Kidney Diseases (IKD) from Jan 2019 till 30th March 2020. A total of 54 patients with multi-drug resistant UTI were included in the study irrespective of age and gender. All the data was recorded on a structured pro-forma and was analyzed on SPSS.

Results: A total of 3190 patients were operated on from Jan 2019 till 30th March 2020. Out of which 54 patients (1.6 %) developed MDR-UTI. Among them,38 were male and 16 females. The mean age of the patients was 41 ± 18.4. Urolithiasis with infections was found most frequent, in 32 (59.3%) patients. All patients were on broad-spectrum oral antibiotics and had a history of urethral catheterization before the development of MDR-UTI. The most common procedure was Emergency cystoscopy and DJ stent 15 (27.8%). Followed by Percutaneous nephrostomy in 8 (14.8%). Regarding co-morbidities, 38(68.5%) patients had none, 3 patients had diabetes and 6 patients were having Diabetes and Hypertension. Pseudomonas aeruginosa was found most frequent microorganisms in 34 (63%) patients while E.coli in 10 (18.5%) and Klebsiella in 5 (9.3%) patients. Colistin was found sensitive in 36 patients (66.7%). The mean hospital stay in MDR-UTI is 9.28± 5.17 days as compared to 2.1 days in routine cases. Approximately a 4-fold increase was observed in medicines alone in the management of MDR UTI. We recorded 1 mortality (1.9%), case of MDR urosepsis. Linear regression revealed previous use of antibiotics; catheterization, old age, and endo-urological procedures in an emergency as independent risk factors for MDR-UTI.

Conclusion: MDR-uti is an emerging local problem. pseudomonas aeruginosa is the most frequently found microorganism in the present setup. it is associated with significant morbidity and very high treatment cost.

Keywords: Urinary Tract Infection, Multidrug Resistance, Micro-Organism, Urology, Antimicrobials

INTRODUCTION

Urinary tract Infections (UTI) are the most frequently reported infections that drive the use of antibiotics around the world [1]. UTI is the 4th most common type of healthcare-associated infection [2]. It accounts for all most 8.3 million physician visits, 1million emergency department visits, and 100,000 hospitalizations per annum, with an estimated cost of $1 billion per annum in the United States [3]. The vast majority of UTIs arise in female outpatients, many of whom are treated empirically by their primary physicians [3, 4, 5].

Antimicrobial resistance patterns are continually evolving. The prevalence of multidrug resistance among isolates of E. coli in the United States (7.1%) suggests that these phenotypes be monitored and empirical treatment of UTI is updated. Fluoroquinolones use and urinary tract abnormalities are associated with resistant UTIs in urology [6].Globally more than 100,000 deaths each year are attributable to drug-resistant infections [7], a number that is expected to increase due to the dearth of new antibiotics in development. While urologists confidently prescribe the choice of treatment without having accurate knowledge related to local antibiotic resistance, often choosing antibiotics that are not consistent with published guidelines [8].

It is, therefore, necessary to conduct properly designed regional surveillance studies, which would help to identify factors that place patients at increased risk for a MDR infection. This will ultimately lead to controlling the further spread of such infections, lessening the morbidity and mortality because of these infections The purpose of this study is to highlight the magnitude of the MDR UTIs in our practice as this issue has not been addressed yet, which leaves our urologist naïve and unprepared for a very serious looming problem.

MATERIALS AND METHODS

Following the institute of kidney diseases and renal transplant research ethics board approval this

observational study identified all patients with multi-drug resistant UTI irrespective of age and gender. The patients data was accessed retrospectively from hospital records and collected on structured Pro-forma from Jan 2019 to March 2020. A total of 54 patients of MDR-UTI were identified. The data collected included Organism cultured, Antimicrobial Sensitivity, Resistance, Diagnosis, and the type of procedure done. Statistical analyses were performed with IBM ® SPSS®, version 20.0.

RESULTS

Total number of 3190 patients were operated from Jan, 2019 till 30th March, 2020. Out of which 54 patient (1.6 %) developed MDR-UTI with mean age of 41 ± 18.4 years. 38 were male and 16 female. The Organisms Cultured were Pseudomonas aeruginosa (n=34, 63%), E. Coli (n=10, 18.5%), Klebsiella (n=5, 9.3%), Proidencia (n=1, 1.9%), Enterobacter (n=1, 1.9%), Enterococcus(n=1, 1.9%), Serratia Marcescens (n=1, 1.9%), Staphylococcus Aureus (n=1, 1.9%). Antimicrobial Sensitivity to colistin (n=36, 66%), Carbapenem (n=7, 13%), Aminoglycoside (n=4, 7.4%), fosfomycin (n=2, 3.7%), Vancomycin (n=1, 1.9%), Tigecycline (n=1, 1.9%) was found while antimicrobial Sensitivity to none was (n=3, 5.6%). Antimicrobial Resistance to Fluoroquinolones and Trimethoprim + Sulfamethoxazol was 100%. The underlying pathology included urolithiasis (n=32, 59.3%), isolated UTI without definite pathology (n=15, 27.81%), NGB (n=3, 5.6%), TCC Bladder in 2 (n=2, 3.7%), Infection with Enlarged Prostate and obstructive uropathy secondary to RPF (n=1, 1.9%) each. The Procedures done in these patients were found Emergency Cystoscopy plus DJS (n=15, 27.8%), PCN (n=8, 14.8%), URS plus ICL and DJS (n=6, 11.1), PCNL (n=6, 11.1%), TURP (n=4, 7.4%), open Surgery (n=4, 7.4%), RIRS (n=3, 5.6%), ESWL (n=3, 5.6%), CIC (n=2, 3.7%), TURBT (n=1, 1.9%), Cystoscopy plus Urethral Dilatation (n=1, 1.9%) and Cystoscopy Followed by Ureterocoele incision (n=1, 1.9%). The mean hospital stay in MDR-UTI was 9.28± 5.17 days as compared to 2.1 days in routine cases. We recorded 1 mortality (1.9%) in patient with MDR Urosepsis. No Co-Morbidity was recorded in 38(68.5%), while Diabetes Mellitus and Hypertension in 6 patients (11.1%), Hypertension in 6 (11.1%), Diabetes in 3 (5.6%), IHD in 1 (1.%) and Hepatitis B Virus in 1 (1.9%) was recorded.
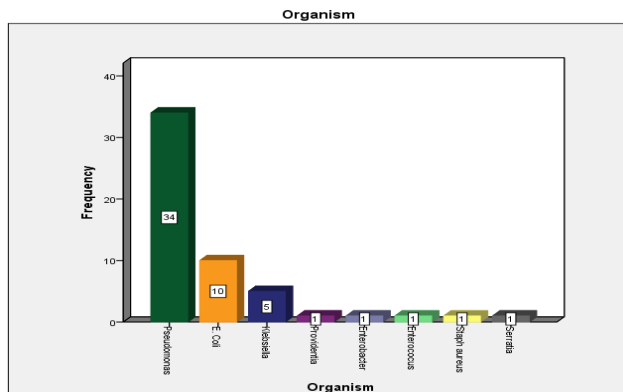
Figure No 1: Frequency of organisms

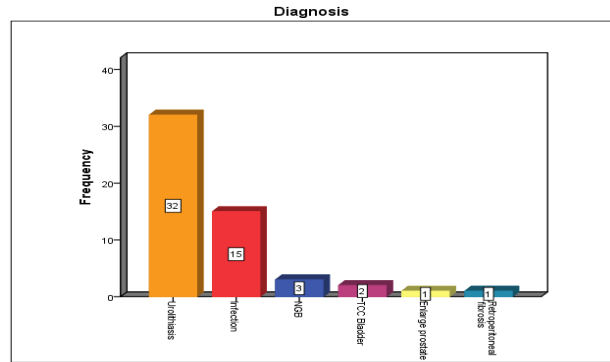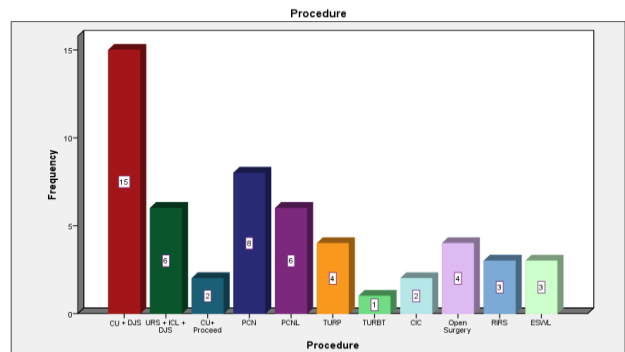Figure No 2: Different diagnosis among all the included patients

Table No 1: Antimicrobial sensitivity

Sensitive to		
Formula	Frequency	Percent
Colistin	36	66.7
Tigecycline	1	1.9
Carbapenem	7	13.0
Aminoglycoside	4	7.4
None	3	5.6
Fosfomycin	2	3.7
Vancomycin	1	1.9
Total	54	100.0

Figure No 3: Frequency of Procedures

DISCUSSION

The emergence of high rates of antibiotic-resistant organisms and MDR-phenotypes causing urinary tract infections has become a public health concern worldwide. In our study, the most frequently cultured organism in MDR-UTI isPseudomonas aeruginosa (P. aeruginosa.) with an incidence of 63% followed by E-coli noted to be 18.5%. Our statistics in terms of the predominant organism and its incidence rate appears to differ from international studies. In the study by Durgesh D. Wasnik et al. [9], the incidence ofP. aeruginosa was 15% and that of E.Coli 31%, while the prevalence of P. aeruginosa. in another European study was 6.9%. (11). In Kashmir, P.aeruginosa. infection accounted for 7.6% of the urine samples (12) while in Nepal, P. Aeruginosa accounted for 1.20% of the total cultures (13).A study from India showed a prevalence of P. AERUGINOSA to be 9.3% (14) and in a Palestinian study(15) 9% of the P.aeruginosagrowth was noted in the cultures.

One study in Pakistan showed E. Coli the most predominant organism (42.9%) while P. aeruginosa in only

5.4% [10]. In another Pakistani study, the prevalence of the P.aeruginosa was noted to be 9.2% and E-Coli 3.27%(16,17). It shows the P. aeruginosa Is the commonest MDR organism in our practice, contrary to the findings of other studies, in which E-coli appears as the leading cause of MDRUTI. Knowing that all of our patients had urethral procedures performed in hospitals, we can infer that the infection in our studied patients had hospital-acquired organisms.

In contrast with global trends, our results reveal most of our patientshaving multidrug-resistant urinary tract infections being male rather than females [18-21].This may be due to the lower number of female patients presenting to our urology set up.In our overall cultured organisms, 66% were sensitiveto colistinand13% to Carbapenem. P.aeruginosa was mostly sensitive to colistin(79.4%)and E-coli to Carbapenems (50%). Studies in India showed P. aeruginosa species were 65% susceptible to colistin. [22]Mahfoud M et al noticed 89.1% response of P. aeruginosa to colistin [23]. Thestudy by Toniolo A. et al says Highly aggressive multi-drug-resistant (MDR) P. aeruginosa strains were widespread, although colistin remained effective in 100% of cases. [24].The relatively higher Colistin resistance noted in Pakistan and India could reflect the indiscreet use of the antibiotics, even that of the last line drugs among them. The most common misuse of such medications occurs when infections are treated empirically, in improper dosage, and with no clear indications e.g. in patients with long-term symptomatic catheterized patients, etc.In another study by Falagas ME et al, they mentioned that in Recent studies of patients who received intravenous colistin for the treatment of serious P. aeruginosa infections of various types, including urinary tract infections, colistin is both effective and has less toxic in contrast to previous studies [27]. In a study in India, they found 98.9% of E. Coli Strains Sensitive to Carbapenems. [25]. Zhang, H. et al in 2014 and 2015 identified Susceptibilities of Escherichia coli in UTI strains to carbapenems of > 90% [26]. Additionally, ourstudy also showed 100% isolates resistance to Fluoroquinolones and trimethoprim-sulfamethoxazole (TMPSXT), which is recommended as the first choice for UTI treatment [21]. Previous studies reported similar results [21, 28]Three organisms identified wereresistant to all available antimicrobials, out of the one case is E. coli (ESBL) and two cases of pseudomonas aeruginosa. The findings of our study when compared to the quoted regional studies, points out that during the last 10 years, there has been an increased bacterial resistance to fluoroquinolones

In a study by Mahfoud M et al resistance of Pseudomonas aeruginosa to TMP + SMX was 88.3% [23].Aypak C et al noticed Resistance to TMP-SMX(41.1%) and to Fluoroquinolones it was (25.2%)[29]. Mandal, J et al identified Seventy-three percent of all E.coli isolates were found to be resistant to ciprofloxacin. Ciprofloxacin resistance was comparatively less in Pseudomonas aeruginosa.[30]. These rates of resistance vary, depending upon whether the study sample consists of primarily simple UTI or complicated UTI, hospital or community-acquired.

Presently, recommended antibiotics against Enterobacteriaceae are fosfomycin, carbapenems, and aminoglycosides. Quinolones, trimethoprim, and sulfamethoxazole are inappropriate for empirical therapy due to the high incidence of resistance. Among aminoglycosides, Amikacin is more effective.It may very effective, in complicated cases when usingit in combination with fosfomycin and Carbapenems [31]

It has been observed that our urologists tend to treat suspected UTIs empirically. The reasons cited by them for this practice is, poor patient compliance to do cultures for monetary and logistic reasons.

Such practice of the clinicians, adds to other factors outlined above, in predisposing to the emergence of resistant bacterial strains.

Our in-patient hospital stay for UTI patients is more than 3 times as compared to other admitted cases. All these patients had failed to respond to previously administered antibiotics and thus needed intravenous last-line antibiotics. Urine culture and sensitivity were performed when they were not on antibiotics. The increase in the duration of hospital stay strained our already overstretched resources and understandably seriously affected patients financially and psychologically.

CONCLUSION

Multi resistant pseudomonas aeruginosa is the most frequently found microorganism in our present setup. This organism is sensitive to limited antibiotics, mostly to colistin as is the case in neighboring india, which has somewhat similar standards of medical practices. The high incidence of the reported bacteriaresulted in a longer duration of treatment, prolonged hospital stay clearly suggests overstretching of our scarce public-sector hospital resources, which is of utmost importance to bear in mind, especially with the ever-increasing patient workload. to make certain the causes for reported MDR pseudomonas aeruginosa infections in our study, its observed predominance in our males patients, the possible psychological impact on the affected patients by it and also to compare our findings with that of the similar regional hospitals, more in-depth and broad-based study is required.

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