ORIGINAL RESEARCH PAPER

Volume-8 | Issue-5 | May-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ISOLATION, IDENTIFICATION OF UROPATHOGENS AND MONITORING OF ANTIBIOTIC RESISTANCE TRENDS AT TERTIARY CARE HOSPITAL

Microbiology

Dhaval V Parmar* Ph.D. scholar, M.V.M. Science & Home Science College, Rajkot *Corresponding Author

Anand M Buch Ph.D. scholar, M.V.M. Science & Home Science College, Rajkot

Valentina V Umrania Associate Professor & Head of Microbiology Department, M.V.M. Science & Home Science College, Rajkot

Madhulika A Mistry Associate Professor & Laboratory Director, Department of Microbiology, P.D.U. Medical College, Rajkot

ABSTRACT

Urinary tract infections (UTIs) are a major infection burden globally and antimicrobial resistance can lead to treatment failures as well as upsurge cost of healthcare. Complicated UTIs are always perilous. To know the common isolates and their resistance pattern in urine, 609 samples with suspected UTI patients were studied. Out of 609 samples, 44.1% found positive for the presence of significant bacteriuria. 44.8% of samples of female found positive whereas 43.4% of samples of the male were found positive during the study period. Escherichia coli was the most common isolate followed by Klebsiella pneumoniae and Pseudomonas aeruginosa. All antibiotics found more or less resistant against various organisms which are quite alarming. Most trusted antibiotic against UTI, Nitrofurantoin found 29.3% resistant overall. E. coli found resistance to ampicillin (43%), ampicillin/sulbactam (56%), cefuroxime (86%), levofloxacin (84%), meropenem (15%), nitrofurantoin (7%), tobramycin (60%), and cefazolin (85%). It is advisable to conduct periodic assessments of antibiotic usage and monitoring of resistance pattern locally. In vivo and in vitro difference should be compared and studied in the future.

KEYWORDS

Urinary tract infection, Urinary pathogens, antibiotic resistance trend

In developing countries, UTIs are one of the foremost diagnosed diseases among the patient seeking medical service and being treated with empirical antibiotics which causes resistance. (Pradhan & Pradhan, 2017) Antimicrobial resistance poses grave concerns for antimicrobial effectiveness in treating infections such as UTI. (Fasugba et al., 2016) While UTIs are a major infection burden globally, the growing problem of antimicrobial resistance (AMR) can lead to treatment failures as well as the upsurge cost of healthcare. (Howard, Scott, Packard, & Jones, 2003) Measuring and comparing the levels of AMR in both hospital-acquired and community-acquired UTIs is essential because although effects of AMR are mainly felt in hospitals and most antibiotics are used by community. (Coxeter, Looke, Hoffmann, Lowe, & Del Mar, 2013) Obtaining this information is important because it not only provides knowledge about the health status of a population but also contributes to disease management decisions. (Büttner & Muller, 2015) It has been estimated that symptomatic UTI occurs in as many as 7 million visits to emergency units and 100,000 hospitalizations annually. UTI has become the most common hospital-acquired infection, accounting for as many as 35% of nosocomial infections, and it is the second most common cause of bacteremia in hospitalized patients. (Akhtar, 2000) UTIs are often treated empirically and susceptibility tests are often carried out only when the patient has failed one or more courses of antibiotics. (Patel, Taviad, Sinha, Javadekar, & Chaudhari, 2012) Increasing resistance has become the main concern due to misuse of antibiotics. General Practitioners should consider about the microbiological profile and the antibiotic sensitivity pattern during management. (Hummers-Pradier et al., 2004) So, it is necessary to look for the most sensitive antibiotics for proper treatment for the UTIs in general practice.(S. Raza, S. Pandey, & C. J. K. U. M. J. Bhatt, 2011) The distribution of bacteria is different in different parts of the world and studying the influencing factors that cause this infection in unassociated geographical regions, indicates their dissipation. (Benachinmardi, Padmavathy, Malini, & Navaneeth, 2015) The purpose of this study is to summarize the laboratory diagnoses of routine UTI and the antimicrobial susceptibility pattern of isolates.

Materials and Methods

Clean-catch midstream urine samples were collected maintaining the sterile condition and as per the sampling protocol of hospital. (Baron, Finegold, Bailey, Scott, & Baron, 1990) As per CLSI guidelines, samples were streaked on Blood agar and MacConkey's agar. After 24 hours if any growth was observed then it was carried for identification procedure. If no growth observed then re-incubated and observed for growth after a total of 48 hours. Identification of organism and antibiogram was done by using automated system Autoscan. Data obtained after Antibiotic sensitivity testing were analyzed with the help of WHONET5 software.

Results

In this study, 1381 urine samples were tested out of which 44.1% of urine samples showed significant bacteriuria. Distribution according to gender is given in table 1 which shows a marginal increase in the positivity of urine culture especially in case of female. 609 isolates were isolated from the urine sample. Out of total isolates, 34 (5.6%) were Gram positive organisms, 9 (1.5%) were *Candida* species and 566 (92.9%) were Gram negative organisms. *E. coli* was isolated very frequently followed by *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Enterococcus faecium*, *Candida tropicalis*, *Proteus mirabilis*, *Enterobacter cloacae*. (Table 2). We had excluded all *Candida* species in this study. Out of 326 isolates of *E. coli*, 103 isolates of *Klebsiella pneumoniae* and 103 isolates of *Pseudomonas aeruginosa* only 29 (8.9%), 10 (9.7%) and 16 (15.5%) were not multidrug resistant respectively. Antibiotic resistance trends for different isolates are given in Table 3.

Table 1 Gender wise distribution (n=609)

Gender	Total samples	Total culture positive	% positivity
Male	684	297	43.42
Female	697	312	44.76
Total	1381	609	44.09

Table 2 Organisms isolated from urine cultures (n=609)

Organism	Number of isolates	%
Escherichia coli	326	53.5
Klebsiella pneumoniae ss. pneumoniae	103	16.9
Pseudomonas aeruginosa	103	16.9
Enterococcus faecalis	15	2.5
Enterococcus faecium	14	2.3
Candida tropicalis	7	1.1
Proteus mirabilis	7	1.1
Enterobacter cloacae	6	1.0
Others	28	4.7

Table 3 Antibiotic resistance pattern in urinary pathogens

Name of antibiotics	*E. coli* %R	*K.pneumoniae* %R	*P.aeruginosa* %R	*E. faecalis* %R	*E. faecium* %R
Ampicillin	43	78	100	0	100
Ampicillin/ sulbactam	56	81	100	0	-

Linezolid	-	-	-	0	7
Cefuroxime	86	90	100	-	-
Levofloxacin	84	76	82	80	100
Meropenem	15	53	66	-	-
Nitrofurantoin	7	49	87	7	15
Tobramycin	60	78	77	0	0
Cefazolin	85	88	94	-	-
Erythromycin	-	-	-	100	100

Discussion

This study provides the details about the urinary bacterial isolates responsible for UTIs as well as also gives their antibiotic resistance patterns. It also proffers the cognizance about the importance of selection of antibiotics in the UTI treatment.

Our study shows 44.1% culture positivity; however, Subedi et al study shows 17.4% (Subedi & Pudasaini, 2017), Raza S et al study shows 19.7% (S. Raza, S. Pandey, & C. P. Bhatt, 2011), Pondei K et al study shows 37.4%. (Pondei, Oladapo, & Kunle-Olowu, 2012) In our study we did not found any significant gender difference whereas Pradhan et al., 2017 and Patel et al., 2012 study shows that the prevalence of UTI is more in female than male.

E. coli remains the most common organism as a causative agent of UTI which is found common in other studies too. (Butaye et al., 2016; Patel et al., 2012; Pradhan & Pradhan, 2017; Price et al., 2016; Shah, Vaghela, & Mahida, 2015; Tajbakhsh, Tajbakhsh, & Khamesipour, 2015). In our study, Nitrofurantoin found 29.3% resistant to overall isolates which replicates the results of Pradhan et al (Pradhan & Pradhan, 2017) whereas Subedi et al found 40.6% resistance. (Subedi & Pudasaini, 2017) Raza et al study found amikacin as a highest sensitive antibiotic (S. Raza et al., 2011) whereas the study by Subedi et al and this study shows opposite results. This shows the importance of local analysis of antibiotics.

Most isolated organism *E. coli* shows resistant to ampicillin, ampicillin/sulbactam, cefuroxime, levofloxacin, meropenem, nitrofurantoin, tobramycin, cefazolin in Patel et al study (Patel et al., 2012) which is quite lower than the current study except Nitrofurantoin. Similar results are seen in *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* except for nitrofurantoin for *K. pneumoniae,* where resistant pattern remains similar. Antibiotics advised under empirical treatment by a government body are also showing a certain level of resistance in different studies (Venkatesh et al., 2016).

Conclusion

Urinary tract infection is most common and can convert into a complicated life-threatening outcome if not treated properly. It was observed that antimicrobial resistance mechanisms have been reported for all known antibiotics that are currently available. The in-vivo and in-vitro difference should be studied. Continuous monitoring of the usage of antibiotics and its resistance pattern is inevitable.

REFERENCES

1. Akhtar, N. J. T. P. (2000). Urinary tract bacterial pathogens; their antimicrobial Susceptibility patterns at Bahawalpur. 7(2), 131-137.
2. Baron, E. J., Finegold, S. M., Bailey, W. R., Scott, E. G., & Baron, E. J. (1990). Bailey and Scott's diagnostic microbiology. St. Louis; Baltimore: C.V. Mosby.
3. Benachinmardi, K., Padmavathy, M., Malini, J., & Navaneeth, B. (2015). Microbiological profile and antibiogram of uropathogens in pediatric age group. 4(1), 61-64. doi:10.4103/2278-344x.149280
4. Butaye, P., Fasugba, O., Mitchell, B. G., Mnatzaganian, G., Das, A., Collignon, P., & Gardner, A. (2016). Five-Year Antimicrobial Resistance Patterns of Urinary Escherichia coli at an Australian Tertiary Hospital: Time Series Analyses of Prevalence Data. Plos One, 11(10). doi:10.1371/journal.pone.0164306
5. Büttner, P., & Muller, R. (2015). Epidemiology. South Melbourne, Vic.: Oxford University Press.
6. Coxeter, P., Looke, D., Hoffmann, T., Lowe, J., & Del Mar, C. (2013). The antibiotic crisis: charting Australia's path towards least resistance. Aust N Z J Public Health, 37(5), 403-404. doi:10.1111/1753-6405.12137
7. Fasugba, O., Mitchell, B. G., Mnatzaganian, G., Das, A., Collignon, P., & Gardner, A. J. P. o. (2016). Five-year antimicrobial resistance Patterns of urinary Escherichia coli at an Australian Tertiary hospital: time series analyses of prevalence data. 11(10), e0164306.
8. Howard, D. H., Scott, R. D., 2nd, Packard, R., & Jones, D. (2003). The global impact of drug resistance. Clin Infect Dis, 36(Suppl 1), S4-10. doi:10.1086/344656
9. Hummers-Pradier, E., Ohse, A., Koch, M., Heizmann, W., Kochen, M. J. I. j. o. c. p., & therapeutics. (2004). Urinary tract infection in men. 42(7), 360-366.
10. Patel, S., Taviad, P. P., Sinha, M., Javadekar, T., & Chaudhari, V. P. J. N. J. o. C. M. (2012). Urinary tract infections (UTI) among patients at GG hospital & medical college, jamnagar. 3(1), 138-141.
11. Pondei, K., Oladapo, O., & Kunle-Olowu, O. E. J. A. J. o. M. R. (2012). Anti-microbial susceptibility pattern of micro-organisms associated with urinary tract infections in a tertiary health institution in the Niger Delta Region of Nigeria. 6(23), 4976-4982.
12. Pradhan, B., & Pradhan, S. J. B. J. o. H. S. (2017). Prevalence of Urinary Tract Infection and Antibiotic Susceptibility Pattern to Urinary Pathogens in Kathmandu Medical College and Teaching Hospital, Duwakot. 2(1), 134-137.
13. Price, T. K., Dune, T., Hilt, E. E., Thomas-White, K. J., Kliethermes, S., Brincat, C., . . . Schreckenberger, P. J. J. o. c. m. (2016). The clinical urine culture: enhanced techniques improve detection of clinically relevant microorganisms. JCM. 00044-00016.
14. Raza, S., Pandey, S., & Bhatt, C. J. K. U. M. J. (2011). Microbiological Analysis of the Urine Isolates in Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal. 36(4), 295-297.
15. Raza, S., Pandey, S., & Bhatt, C. P. (2011). Microbiological analysis of isolates in Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal. Kathmandu Univ Med J (KUMJ), 9(36), 295-297.
16. Shah, L. J., Vaghela, G. M., & Mahida, H. J. N. J. M. R. (2015). Urinary tract infection: Bacteriological profile and its antibiotic susceptibility in western India. 5(1), 71-74.
17. Subedi, N., & Pudasaini, S. J. J. o. P. o. N. (2017). Bacteriological profile and antibiotic sensitivity pattern in patients with Urinary tract infection. 7(1), 1066-1069.
18. Tajbakhsh, E., Tajbakhsh, S., & Khamesipour, F. (2015). Isolation and Molecular Detection of Gram Negative Bacteria Causing Urinary Tract Infection in Patients Referred to Shahrekord Hospitals of Iran. Iranian Red Crescent Medical Journal, 17(5). doi:10.5812/ircmj.17(5)2015.24779
19. Venkatesh, S., Chauhan, L., Gadpayle, A., S. Jain, T., Wattal, C., Aneja, S., . . . Jain, S. (2016). National Treatment Guidelines for Antimicrobial Use in Infectious Diseases.