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Microbial Profile and Antibiogram of Urinary Tract Infection (UTI) in Patients Attending Tertiary Level Mother and Child Hospital of Western Rajasthan

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A B S T R A C T

Background: UTI is predominantly a disease of females as well as in the pediatric population. The incidence of UTI is 1% in boys and 3% in girls in first decade of life. Bacteria gets easily access to female urinary tract due to short female urethra, close proximity to vagina and poor sanitary habits. Early diagnosis and treatment is necessary to prevent rise in antibiotic resistance, morbidity and cost of treatment. Materials and Methods:- The aims of this study were to assess the common microorganisms causing UTI and their antimicrobial resistance patterns in patients attending tertiary level hospital of Western Rajasthan during six month study period (1 January 2021 to 30 June 2021) from the patients attending OPD & IPD in a Tertiary Maternal and Child care Hospital. Urine samples were received in microbiology laboratory and showing CFU>10^5 were further processed as per standard laboratory protocol. Result: Out of 1138 samples received, 450 showed significant growth. 166 (36.88%) Patients were in pediatric age group and 284 (63.11%) patients were adult female who visited Obstetrics and Gynecology department. 206 (45.77%) isolates were Gram negative bacilli (GNB), 194 (43.11%) isolates were Gram positive cocci and 50 (11.11%) isolates were Yeast. *Escherechia coli* 150 (33.33%) and *Enterococcus species* 146 (32.44%) were predominant uropathogens in this study. Most of GNB were resistant to Amoxiclave (67.47%), followed by Ceftazidime (66.50%), Ampicillin (59.60%), Most of the GPC were resistant to Cefazolin (52.08%) followed by Ofloxacin (44.32%). Maximum GPC were sensitive to Vancomycin (100%) and Linezolid (99.48%). Conclusion: Uropathogens were found highly resistant to commonly used antibiotics in UTI. Therefore periodic surveillance and monitoring of local antimicrobial profile and their antibiogram is necessary to update the treatment guidelines and to formulate antibiotic policy.

Introduction

Urinary tract infection (UTI) is an infection which includes any part of urinary system like kidney, bladder, ureters, urethra and may be of two types – lower UTI and upper UTI. Urinary tract infections are among the most common bacterial infections that need medical care, accounting for the second most common infection after respiratory tract infections in the community & is the leading cause

of morbidity and healthcare expenditures in persons of all ages (Apurba S Sastry, 2021).

UTI is predominantly a disease of females (Apurba S Sastry, 2021) as well as in the pediatric population. The incidence of UTI is 1% in boys and 3% in girls in first decade of life (Chang and Shortliffe, 2006). Early Diagnosis and treatment is necessary as untreated or delay in treatment leads to recurrent infection, sepsis, preterm birth and renal damage in paediatric age group (Vijayakumar *et al.*, 2011). The incidence of UTI increases with age in females. The common pathogenic causes of urinary tract infection are *Escherichiae coli,* followed by *Staphylococcus saprophytics, Staphylococcus hemolyticus, Streptococcus agalactiae, Klebsiella species., Pseudomonas aeruginosa, Enterobacter species, Enterococci,Gardnerella vaginalis, Ureaplasma urealyticum* etc. (El-Kashif, 2019).

Materials and Methods

This is a hospital based prospective study done between January 2021 to June 2021 for a period of 6 months from the patients attending OPD & IPD in a Tertiary Care maternal and Child care Hospital. Midstream urine sample were collected and received in Microbiology laboratory were included in the study. Direct urine wet mount microscopy was done for all samples. A loopful of the well mixed urine samples were inoculated on Hichrome agar medium, incubated for 24 hours in incubator at 37^{o}c. Sample showing $>10^5$ colony forming units were considered significant and processed for further identification and susceptibility testing as per standard protocol[6].

Susceptibility testing was done by Kirby-Bauer disc diffusion method and interpreted according to the Clinical and Laboratory Standards institute guidelines-2021 (CLSI, 2021).

Results and Discussion

In study time total 1138 urine samples were received and processed for aerobic pyogenic culture and sensitivity test, 778 samples were from OBG and 360 samples were from Pediatric Deptt. Out of which 450 samples (39.54 %) were culture positive and had significant bacterial count ($>10^5$ viable bacterial counts).

Table 1 showing distribution of positive samples in Gynecology and Pediatric department as well as their gender wise distribution. Out of 360 pediatric samples 166 (46.11%) patients were culture positive, 91 were males and 75 were females. While out of 778 OBG patients 284 were culture positive (36.50%).

There are two types of scheme i.e. JSSK (Janani Shishu Suraksha Yojana) and MNJY (Mukhyamantri Nihshulk Jan Kalyan Yojana) enrolled in our Hospital. Out of 450 positive patients 307 (68.22%) were under JSSK and 143 (31.77%) were MNJY. 285 (63.33%) were IPD patients and 165 (36.66%) were OPD patients

Table 3 showing, 206 (45.77%) isolates were Gram negative bacilli (GNB), 194 (43.11%) isolates were Gram positive cocci and 50 (11.11%) isolates were Yeast.

Among Gram negative bacilli, *Escherechia coli* 150 (33.33%), *Klebsiella species* 33(7.33%), *Pseudomonas species* 11(2.44%),*Proteus species* 07(1.55%), *Citrobacter species* 03 (0.66%) and *Acinetobacter species* 02 (0.44%) were isolated from positive Urine samples.

Among gram positive cocci, 146 (32.44%) *Enterococcus species*, 32 (7.11%) *CONS*, 14 (3.11%) *Staphylococcus aureus (MSSA)* and 2 (0.44%) isolates were *MRSA.*

Table 4 showing resistance pattern of Gram negative bacilli, among them maximum resistance was shown against Amoxiclave (67.47%), followed by Ceftazidime (66.50%), Ampicillin(59.60%), Ofloxacin (57.28%), cefepime (36.40%), Piperacillin-Tazobactam (29.12%), Fosfomycin (19.90%), Gentamicin (19.90%), Nitrofurantoin (17.47%), Imipenem (10.19%), Amikacin(9.70%)

Table 5 showing Antibiotic resistance pattern of Gram positive cocci. It was observed that 62.50% of

Staphylococcus aureus and 46.87 % of *CONS* were resistant to Cefazolin. 3 isolates (18.75%) of *Staphylococcus aureus,* 10 isolates (6.84%) of *Enterococcus* and 3 isolates of *CONS* were resistant to drug Fosfomycin. *Enterococcus* species showed Intrinsic resistance against cephalosporins. In this study 2 isolates (12.5%) were detected MRSA. Only 1 isolate (0.68%) of *Enterococcus species* found to be resistant for Linezolid all other GPC isolated were sensitive to Linezolid.

Table 6 showing resistant pattern of Candida species. Maximum resistance was observed against Fluconazole (28%), Clotrimazole (20%), Amphotericin B (16%). Minimum resistance was found against Itraconazole (8%).

Urinary Tract Infection is common health issue among Pediatric & OBG patients. Early Diagnosis and treatment will help in prevention of drug resistance, prolong stay in hospital & Cost of treatment (Vijayakumar *et al.,* 2011; Najar *et al.,* 2009).

Antibiogram of uropathogens vary between hospitals. Therefore periodic surveillance and monitoring of local antimicrobial profile and their antibiogram is needed to formulate antibiotic policy.

The present study showing gender-wise distribution of UTI, their antimicrobial profile and antibiotic resistance patterns of uropathogens in the pediatric and OBG Patients seeking healthcare services in Western Rajasthan.

In this study, among Gram negative bacterial species, *E. coli* (33.33%), was the predominant followed by *Klebsiella spp.* (7.33%). Our finding concords with studies done by Rai *et al.,* 2008; Nachimuthu *et al.,* 2008; Salvatore *et al.,* 2011 and De Miranda *et al.,* 2014. E. coli and K. pneumoniae have emerged as multidrug resistant pathogens worldwide.

In this study, among uropathogens isolated, most common were Gram negative bacteria (45.77%) followed by Gram positive bacteria (43.11%) than *Yeast* (11.11%). This is similar with the study done by Assefa *et al.,* 2008; Alemu *et al.,* 2012; Shazia *et al.,* 2011, they also showed Gram negative bacteria as more prevalent bacteria among all uropathogens. In vaginal and rectal area *E. coli* is found more commonly (Alemu *et al.,* 2012). During Pregnancy, there is physiological changes in the body as well as difficulty in maintaining proper personal hygiene leads to increase risk of getting infection with *E.coli* (Ali, 2009) Stasis of urine during pregnancy leads to higher colonization of female genitourinary system with *E.coli* bacteria (Demilie *et al.,* 2012; Imade *et al.,* 2010). Bacteria gets easily access to female urinary tract due to short female urethra, close proximity to vagina and poor sanitary habits.

In present study, amongst gram negative bacilli maximum isolates showed resistance to Ceftazidime (66.50%), Amoxiclav (67.47%), Ampicillin (51.6%)and Ofloxacin (57.28%). While most of the isolates were sensitive for Imipenem (89.91%), Nitrofurantoin (82.53%), Fosfomycin (80.10%), Amikacin (90.30%) and Gentamicin (80.10%). This is concordance with the study done by Rai *et al.,* 2008; Nachimuthu *et al.,* 2008.

In this study, most common GPC isolated was *Enterococcus* (32.44%) followed by *CONS* (7.11%), *Staphylococcus aureus MSSA* (3.11%) and *Staphylococcus aureus MRSA* (0.44%).

Most of the GPC were resistant to Cefazolin (52.08%) followed by Ofloxacin (44.32%). Maximum GPC were sensitive to Vancomycin (100%), Linezolid (99.48%), Gentamicin (93.75%), Fosfomycin (91.75%), Nitrofurantoin (88.14%), Amikacin (81.95%).

Among the gram positive isolates coagulase negative *Staphylococcus* was the commonest coincides with the study by Dajani and Shehabi, 1983.

Table.1 Gender and Department wise distribution of culture positive samples.

S.No.	Sex Wise Distribution	Gynecology		Pediatrics		Total
1	Male	0	0%	91	54.81	91(20.22%)
2	Female	284	100	75	45.18	359 (79.77 %)
	Total	284	63.12%	166	36.88%	450

Table.2 Distribution of patients according to Government Schemes

	JSSK(307)			MNJY(143)		
	Total	IPD	OPD	Total	IPD	OPD
Paediatric (Male) (91)	37 (40.65%)	32 (35.16%)	5 (5.49%)	54 (59.43%)	39 (42.85%)	15 (16.48%)
Paediatric (Female)(75)	24 (32%)	18 (24%)	6 (8%)	51 (68%)	34 (45.33%)	17 (22.66%)
Gyane Female (284)	246 (86.61%)	146 (51.40%)	100 (35.21%)	38 (13.38%)	16 (5.63%)	22 (7.74%)

Table.3 Profile of Microorganism Isolated from Urine Samples in study time

S.No.		Microorganism	Paediatric	Gynecology	Total (%)
1.	GNB (206) (45.77%)	Escherichia coli	65	85	**150 (33.33%)**
		Klebsiella species	19	14	**33 (7.33%)**
		Pseudomonas Species	07	04	**11 (2.44%)**
		Proteus Species	04	03	**07 (1.55%)**
		Citrobacter species	01	02	**03 (0.66%)**
		Acinetobacter species	00	02	**02 (0.44%)**
2.	GPC (194) (43.11%)	Enterococcus species	44	102	**146 (32.44%)**
		CONS	06	26	**32 (7.11%)**
		Staphylococcus aureus (MSSA)	02	12	**14 (3.11%)**
		Staphylococcus aureus MRSA	00	02	**2 (0.44%)**
3.	YEAST(50) (11.11%)	Candida Species	18	32	**50 (11.11%)**

Table.4 Antibiotic Resistance Pattern of Gram Negative Bacilli (GNB)

Drugs	*Escherichia coli*	*Klebsiella* species	*Citrobacter* species	*Proteus* Species	*Pseudomonas* Species	*Acinetobacter* species	Total GNB (206)
Ofloxacin (OF)	97	14	0	01	05	01	118 (57.28%)
Ampicillin (AMP)	107	24	01	04	11	02	149 (59.6%)
Fosfomycin (FO)	29	08	01	01	02	00	41 (19.90%)
Nitrofurantoin(NIT)	11	12	01	04	08	00	36 (17.47%)
Imipenem(IMP)	12	04	00	02	03	00	21 (10.19%)
Piperacillin-Tazobactam(PIT)	45	9	00	03	02	01	60 (29.12%)
Ceftazidime(CAZ)	105	21	1	5	4	1	137(66.50%)
Cefepime(CPM)	62	12	0	5	1	1	75 (36.40%)
Gentamicin(GEN)	28	12	00	00	1	00	41(19.90%)
Amikacin(AK)	13	07	00	00	00	00	20 (9.70%)
Amoxiclave(AMC)	102	19	01	04	11	02	139 (67.47%)

Table.5 Antibiotic Resistance Pattern of Gram's Positive Cocci (GPC)

Antibiotics	Staphylococcus aureus (Total 16)	Enterococcus species (Total 146)	CONS (Total 32)	Total GPC (194)
Cefazolin(CZ)	10 (62.50%)	IR	15 (46.87%)	25(25/48) (52.08%)
Cefoxitin(CX)	02 (12.5%)	IR	00	02 (02/48) (4.16%)
Gentamicin(GEN)	02 (12.50%)	-	01 (3%)	03 (6.25%)
Amikacin (AK)	01 (6.25%)	33	01 (3%)	35 (18.04%)
High level Gentamicin(HLG)	-	40 (27.39%)	-	40 (27.39%)
Vancomycin (VA)	00	00	00	00%
Linezolid (LZ)	00	01 (0.68%)	00	01 (0.51%)
Ofloxacin (OF)	04 (25%)	72 (49.31%)	10 (31.25%)	86 (44.32%)
Fosfomycin (FO)	03 (18.75%)	10 (6.84%)	03 (9.37%)	16 (8.24%)
Nitrofurantoin (NIT)	04 (25%)	15 (10.27%)	04 (12.5%)	23 (11.85%)

Table.6 Resistance Pattern of Yeast Isolates (TOTAL 50)

Yeast	Fluconazole	Itraconazol	Amphotericin B	Clotrimazole
Candida species	14 (28%)	04 (8%)	08 (16%)	10 (20%)

Escherichia coli was the most common pathogen causing UTI in both pediatrics and OBG patients. Uropathogens were found highly resistant to commonly used antibiotics in UTI. Therefore, periodic surveillance and monitoring of local antimicrobial profile and their antibiogram is necessary to update the treatment guidelines and to formulate antibiotic policy.

References

Alemu A., Moges F., Shiferaw Y., *et al.*, Bacterial profile and drug susceptibility pattern of urinary tract infection in pregnant women at University of Gondar Teaching Hospital, Northwest Ethiopia. *BMC Research Notes.* 2012;5:p. 197. doi: 10.1186/1756-0500-5-197.

Ali J. M. G. I. Asymptomatic urinary tract infection in pregnant women. *Iranian Journal of Pathology.* 2009;4(3):105–108

Assefa A., Asrat D., Yimtubezinash W., Yirgu G., Ahmed A., Tadelle M. Bacterial profile and drug susceptibility pattern of UTI in pregnant women at Tikur Anbessa Specialized Hospital. *Ethiopian Medical Journal.* 2008;46(3):227–235

Chang S L, Shortliffe L D. Pediatric urinary tract infections. Pediatr Clin North Am 2006;53:379-400, vi.

CLSI Performance Standards for Antimicrobial Susceptibility Testing ; CLSI Document M 100 – Ed 31. Clinical and Laboratory Standards Institute 2021; vol 41(3): 68-113.

Çocuk Enfeksiyon Dergisi. Microbiological and Antimicrobial Profile of Urinary Tract Infection in Children from A Teaching Hospital in South India. Journal of Pediatric Infection March 2017;11(1):119-122

Dajani A M, Shehabi A A (1983) Bacteriology and composition of infected stones. Urology 21:351–353.)

De Miranda É J P, De Oliveira G S S, Roque F L, Dos Santos S R, Olmos R D, Lotufo P A. Susceptibility to antibiotics in urinary tract infections in a secondary care setting from 2005-2006 and 2010-2011, in São Paulo, Brazil: data from 11,943 urine cultures. Rev Inst Med trop S Paulo. 2014; 56:313–24.)

Demilie T., Beyene G., Melaku S., Tsegaye W. Urinary bacterial profile and antibiotic susceptibility pattern among pregnant women in North West Ethiopia. *Ethiopian Journal of Health Sciences.* 2012;22(2):121–128.

El-Kashif M. M. L. Urinary Tract Infection among Pregnant Women and its Associated Risk Factors: A Cross-Sectional Study. Biomed Pharmacol J 2019;12(4).

Essentials of Medical Microbiology, Apurba S Sastry 3rd Edition ; 2021: 745.

Imade P. E. I. P., Eghafona N. O., Enabulele O. I., Ophori E. Asymptomatic bacteriuria among pregnant women. *North American Journal of Medical Sciences.* 2010;2:263–266.

Nachimuthu R, Chettipalayam S, Velramar B, Kurumandur R, Velu R. Urinary tract infection and antimicrobial susceptibility pattern of extended spectrum beta lactamase producing clinical isolates. Adv Biol Res. 2008;2(5–6):78–82

Najar M S, Saldanha C L, Banday K A. Approach to urinary tract infections. Indian J Nephrol 2009;19:129-39.

Rai G K, Upreti H C, Rai S K, Shah K P, Shrestha R M. Causative agents of urinary tract infections in children and their antibiotic sensitivity pattern: a hospital based study. Nepal Med Coll J. 2008;10(2):86–90.

Salvatore S, Salvatore S, Cattoni E, Siesto G, Serati M, Sorice P, Torella M. Urinary tract infections in women. Eur J Obstet Gynecol Reprod Biol 2011; 156(2):131–136.

Shazia P. S., Reddy S. V., Rama Rao M. V., Janardhan R. R. Uropathogens and their drug susceptibility patterns among pregnant women in a teaching hospital. *Annals of Biological Research.* 2011;2(5):516–521.

Vijayakumar M, Kanitkar M, Nammalwar B R, Bagga A. Indian Society of Pediatric Nephrology, Revised statement on management of urinary tract infections. Indian Pediatr 2011;48:709-17

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