International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Anti Microbial Susceptibility Patterns of Patients with Urinary Tract Infection in a Tertiary Care Hospital, Mangalore

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Abstract: ***Introduction*: Urinary tract infection is a common disease , a clinician comes across and is a major public health problem in terms of morbidity and financial costs incurred. There may be difference between geographical areas in the prevalence of the most common organisms responsible for UTI and susceptibity patterns may vary. *Methods*: This study is to obtain the data regarding the prevalence and antibiotic sensitivity patterns in Father Muller medical college based on the data collected from urine cultures received at microbiology department from April 2018 to October 2018. This is an observational study using urine culture sensitivity reports analysed retrospectively. *Results*: A total of 4733 urine samples were analysed, out of which 29.4% had significant growth that is a total of 1392 identified pathogens were analysed. E.coli (36.8%) was the most common pathogen responsible for UTI followed by Klebsiella (18.5%), Enterococci (9.77%), Staphylococci (8.54%) and pseudomonas (7.18%) in order. E coli was resistant to ampicillin in 78% of cases and cephalosporins in 70% of cases Klebsiella is resistant to ampicillin in 88.2 % of cases and cephalosporins in 60% of cases. E.coli is resistant to ciprofloxacin and levofloxacin in 57.4% and 58.4% of cases. Among klebsiella cultures 48.1 % of growths were resistant to ciprofloxacin and 47.5% of cases to levofloxacin. Among enterococci group fluoroquinolones are resistant up to 60% of cases. Staphylococci have good sensitivity topencillinsand cephalosporins compared to fluoroquinolones. *Conclusion*: Uropathogens monitoring and their antibiotic sensitivity profile is needed on frequent basis according to the regional need , so that appropriate evidence based management of UTI empirically is possible till the urine cultures are available.***

Keywords: UTI-urinary tract infection, *E coli* – Escherichia coli

1. Introduction

Urinary tract infection is a common disease , a clinician comes across and is a major public health problem in terms of morbidity and financial costs incurred. Urinary tract infection is defined by the presence of growth of more than 10^5 CFU per ml of urine.[1]Alternatively , bacterial counts of more $\geq 10^2$ per ml of urine accompanied by pyuria (> 10 wbc/mm^2).[2] International disease society of America gave a definition of 10^3 organisms per ml to diagnose cystitis and 10^4CFU per ml for pyelonephritis.[3]

Urinary tract infections estimates are about 150 million episodes globally per year .UTI affects all age groups with variable incidence and the infection rate also significantly increases with age[4].

Urinary tract infections are initially managed by empirical selection of antibiotics before the lab urine cultures are available.
There may be difference between geographical areas in the prevalence of the most common organisms responsible for UTI and susceptibility pattern of antibiotics may vary according to the type of health care provided .[5,6]

Therefore periodic monitoring of aetiological agents of urinary tract infections and antibiotic resistance pattern in the local clinical settings is needed to prevent the antibiotic resistance and to select efficient empirical antibiotics. Recent studies have shown a changing pattern of uropathogens .[7]

This study is to obtain the data regarding prevalence and antibiotic sensitivity patterns in a tertiary care centre , Managalore.

2. Materials and Methods

This study evaluated retrospectively 1392 urine samples , collected from April 2018 to October 2018 from both the inpatient and out patient samples received at the tertiary care setting, Father Muller medical college, Mangalore ,Karnataka, India.

The pathogens grown from the first sample were considered and repeated samples from same patient who was already included in the study and samples with evidence of perineal contamination were rejected.

The samples with more than one organism as significant growth were not considered for evaluation. The samples were processed for determining colony count, semi-quantitatively on 5% sheep blood and cysteine lactose electrolyte -deficient (CLED) agar medium using calibrated loops as per protocol[8]

Samples showing bacteria growth $>10^5$ colony forming units were considered significant and further identification and susceptibility tests were performed.

Susceptibility testing was done using Kirby-Bauer disk diffusion method and interpreted by clinical and laboratory

standards institute (CLSI) guide lines[9] .

Statistical analysis were performed using SPSS version 16(spss,inc,Chicago, IL,USA). Data were analysed using chi-square test, confidence interval (CI), odds ratio(OR) analysis and p-value, statistical significance was defined when p-value was <0.05.

3. Results

A total of 4733 samples which were received in microbiology department from April 2018 to October 2018 were retrospectively analysed , out of which 1392 samples showed significant growth .

The females were about 66.4% and males about 33.6% of the 1392 samples.

The mean age of males were 58.2 years and females were 48.22 years.

The frequency distribution of organisms according to age group.

Antibiotic resistance patterns among E.coli showed resistance to ampicillin in 80% of cases and cephalosporins in 65% of cases.

E coli showed resistance to ciprofloxacin and levofloxacin in 57.4% and 58.4% of cases respectively.

Klebsiella showed resistant in 88.2 % cases to ampicillin and 60% of cases to cephalosporins.

Ciprofloxacin and levofloxacin are resistant to klebsiella in 485 and 47.5% of cases.

Pseudomonas showed significant resistance to pencillins, cephalosporins nitrofurantoin and 48.7% cases in ceftazidime. Both klebsiella and pseudomonas showed good sensitivity patterns to higher antibiotics such as cefaperazone-sulbactum, piperacillin-tazobactum and carbapenem group.

Enterococci are resistant in about 50% of cases to cephalosporins , 56.3% of cases to amikacin and about 60% cases to fluoroquinolones.

But have sensitivity to nitrofurantoin in about 69.8% of cases.

Staphylococci has good sensitivity patterns to pencillins and cephalosporins but showed resistance to ciprofloxacin in 46.5 % of cases.

Table 1: Age and Sex Prevalence For Each Organism

				AGE									
				<20		21-40		41-60		61-80		>80	
				Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Growth	E Coli		Male	1	7.1%	22	16.8%	63	36.0%	64	39.3%	10	33.3%
			Female	13	92.9%	109	83.2%	112	64.0%	99	60.7%	20	66.7%
	Klebsiella		Male	0	0.0%	17	19.5%	31	40.3%	38	50.7%	4	40.0%
			Female	9	100.0%	70	80.5%	46	59.7%	37	49.3%	6	60.0%
	Pseudomonas		Male	0	0.0%	5	27.8%	19	59.4%	27	62.8%	1	16.7%
			Female	1	100.0%	13	72.2%	13	40.6%	16	37.2%	5	83.3%
	Group B Streptococci		Male	0	0.0%	2	8.7%	3	20.0%	3	50.0%	0	0.0%
			Female	1	100.0%	21	91.3%	12	80.0%	3	50.0%	2	100.0%
	Enterococci		Male	2	66.7%	7	17.9%	13	33.3%	19	38.8%	3	50.0%
			Female	1	33.3%	32	82.1%	26	66.7%	30	61.2%	3	50.0%
	Staphylococci		Male	0	0.0%	4	8.3%	17	44.7%	11	42.3%	1	50.0%
			Female	5	100.0%	44	91.7%	21	55.3%	15	57.7%	1	50.0%
	Acinetobacter		Male	0	0.0%	3	20.0%	5	41.7%	10	83.3%	0	0.0%
			Female	2	100.0%	12	80.0%	7	58.3%	2	16.7%	2	100.0%
	Citrobacter		Male	0	0.0%	2	15.4%	5	31.2%	13	61.9%	4	66.7%
			Female	1	100.0%	11	84.6%	11	68.8%	8	38.1%	2	33.3%
	Chresiobacter		Male	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
			Female	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Serratia Marsceneses		Male	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
			Female	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Proteus Species		Male	0	0.0%	3	50.0%	1	20.0%	2	40.0%	2	100.0%
			Female	1	100.0%	3	50.0%	4	80.0%	3	60.0%	0	0.0%

Table 2: Organisms and resistance patterns

	E Coli		Klebsiella		Pseudomonas		Group B Streptococci		Enterococci		Staphylococci		Acinetobacter	
	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage
AMPI	379/486	78.00%	216/245	88.20%	11/13	84.60%	4/43	9.30%	40/123	32.50%	42/109	38.50%	26/41	63.40%
AMOXCL	299/446	67.00%	155/231	67.10%	6/12	50.00%	3/38	7.90%	25/92	27.20%	19/99	19.20%	27/41	65.90%
CEFAZO	332/475	69.90%	163/241	67.60%	7/9	77.80%	3/34	8.80%	33/68	48.50%	24/111	21.60%	30/39	76.90%
CEFUROX	324/465	69.70%	145/231	62.80%	8/9	88.90%	3/33	9.10%	35/65	53.80%	25/114	21.90%	27/36	75.00%

CEFOTAX	268/402	66.70%	127/204	62.30%	7/12	58.30%	3/26	11.50%	31/57	54.40%	20/99	20.20%	24/33	72.70%
COTRIM	248/465	53.30%	112/230	48.70%	53/61	86.90%	17/33	51.50%	22/61	36.10%	35/106	33.00%	16/37	43.20%
GENTA	141/407	34.60%	62/207	30.00%	32/80	40.00%	17/33	51.50%	34/96	35.40%	24/91	26.40%	19/37	51.40%
AMIK	75/443	16.90%	45/214	21.00%	28/81	34.60%	11/22	50.00%	40/71	56.30%	10/73	13.70%	18/37	48.60%
CIPROF	280/488	57.40%	116/241	48.10%	41/92	44.60%	11/42	26.20%	76/128	59.40%	52/114	45.60%	14/36	38.90%
LEVOFL	281/481	58.40%	114/240	47.50%	38/88	43.20%	10/41	24.40%	74/121	61.20%	42/109	38.50%	15/36	41.70%
CEFTAZ	24/29	82.80%	7/12	58.30%	38/78	48.70%	1/2	50.00%	9/11	81.80%	5/8	62.50%	0/3	0.00%
NITRO	93/474	19.60%	97/229	42.40%	61/87	70.10%	2/34	5.90%	37/120	30.80%	24/102	23.50%	29/38	76.30%
PIPTAZ	80/500	16.00%	69/255	27.10%	29/98	29.60%	0/2	0.00%	2/9	22.20%	0/1	0.00%	18/43	41.90%
CEFAPSUL	73/498	14.70%	64/256	25.00%	39/99	39.40%	0/2	0.00%	2/10	20.00%	0/3	0.00%	12/42	28.60%
IMIPEN	56/498	11.20%	57/256	22.30%	41/98	41.80%	0/18	0.00%	28/119	23.50%	0/2	0.00%	16/41	39.00%
MEROP	56/495	11.30%	56/251	22.30%	39/98	39.80%	0/18	0.00%	41/118	34.70%	0/2	0.00%	19/42	45.20%
VANCO	0/3	0.00%	0/0	0.00%	0/0	0.00%	1/39	2.60%	5/124	4.00%	1/110	0.90%	0/0	0.00%
TEICOP	0/4	0.00%	0/1	0.00%	0/0	0.00%	0/40	0.00%	5/126	4.00%	3/109	2.80%	0/0	0.00%
COLISTIN	6/170	3.50%	4/85	4.70%	5/42	11.90%	0/1	0.00%	1/7	14.30%	1/4	25.00%	0/9	0.00%
LINEZOL	0/8	0.00%	0/2	0.00%	0/0	0.00%	0/40	0.00%	2/126	1.60%	3/110	2.70%	0/1	0.00%
BACITRACIN	0/5	0.00%	0/4	0.00%	0/0	0.00%	12/17	70.60%	17/23	73.90%	17/26	65.40%	0/0	0.00%
NOVO	0/1	0.00%	0/0	0.00%	0/0	0.00%	0/3	0.00%	2/5	40.00%	4/24	16.70%	0/0	0.00%
AZTREO	2/3	66.70%	0/0	0.00%	8/33	24.20%	0/1	0.00%	0/0	0.00%	2/4	50.00%	0/0	0.00%

Table 2: Continued

	Citrobacter		**Chresiobacter**		**Serratia Marsceneses**		**Proteus Species**	
	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage	resistant/ total	percentage
AMPI	39/50	78.00%	0/0	0.00%	0/0	0.00%	8/16	50.00%
AMOXCL	31/45	68.90%	0/0	0.00%	0/0	0.00%	6/16	37.50%
CEFAZO	34/48	70.80%	0/0	0.00%	0/0	0.00%	8/19	42.10%
CEFUROX	31/47	66.00%	0/0	0.00%	0/0	0.00%	7/18	38.90%
CEFOTAX	24/42	57.10%	0/0	0.00%	0/0	0.00%	6/16	37.50%
COTRIM	27/55	49.10%	0/0	0.00%	0/0	0.00%	4/16	25.00%
GENTA	17/43	39.50%	0/0	0.00%	0/0	0.00%	5/13	38.50%
AMIK	14/50	28.00%	0/0	0.00%	0/0	0.00%	6/17	35.30%
CIPROF	22/54	40.70%	0/0	0.00%	0/0	0.00%	7/18	38.90%
LEVOFL	21/54	38.90%	0/0	0.00%	0/0	0.00%	7/17	41.20%
CEFTAZ	1/4	25.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%
NITRO	18/53	34.00%	0/0	0.00%	0/0	0.00%	12/19	63.20%
PIPTAZ	10/56	17.90%	0/0	0.00%	0/0	0.00%	3/18	16.70%
CEFAPSUL	10/56	17.90%	0/0	0.00%	0/0	0.00%	3/18	16.70%
IMIPEN	9/57	15.80%	0/0	0.00%	0/0	0.00%	2/18	11.10%
MEROP	8/57	14.00%	0/0	0.00%	0/0	0.00%	3/18	16.70%
VANCO	0/1	0.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%
TEICOP	0/1	0.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%
COLISTIN	1/18	5.60%	0/0	0.00%	0/0	0.00%	1/4	25.00%
LINEZOL	0/1	0.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%
BACITRACIN	0/1	0.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%
NOVO	0/0	0.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%
AZTREO	1/2	50.00%	0/0	0.00%	0/0	0.00%	0/0	0.00%

Antibiotics represented in vertical column are sequentially AMP-ampicillin,AMOXCL-amoxyclavulanate,CEFAZO-cefazolin,CEFUROX-cefuroxime,CEFOTAX-cefotaxime, COTRIM- cotrimoxazole, GENTA-gentamycin,AMIK-amikacin,CIPROF-ciprofloxacin,LEVOFL-levifloxacin,CEFTAZ-ceftazidime, NITRO-nitrofurantoin,PIPTAZ-piperacillin-tazobactum,CEFAPSUL-cefaperazone-sulbactum,IMIPEN-imipenam, MEROP-meropenam, VANCO-vancomycin,TEICOP-teicoplanin,COLISTIN-colistin,LINEZOL-linezolid, BACITRACIN-bacitracin, NOVO-novobiocin, AZTREO-aztreonam.

4. Discussion

Urinary tract infection if correctly diagnosed and treated may have good results on patients health, avoidance of resistance to antibiotics and avoiding health care costs[10].

The local monitoring of aetiology and resistance patterns of UTI is useful as the prevalence and resistance patterns may change periodically and accordingly empirical treatment initiation is better to avoid resistance[11].

The present study showed higher prevalence of UTI among females compared to males agreeing with earlier studies, females might be more susceptible because of short urethra and its proximity to the anal orifice resulting in ascending

infection[12] .

The most common bacterial pathogen isolated in this study was E.coli similar to the results in previous studies[13,14,15,16.17] . The other organisms most frequently isolated after E.coli in this study are klebsiella,enterococci,staphylococci and pseudomonas in the order of frequency.

The studies from other regions of country showed different rates of isolation due to variation of geographical places, difference in sample size and population.

Antimicrobial susceptibility patterns vary because of above reasons and resistance has increased over the years.

Resistance to ampicillin and cephalosporins was seen most commonly with gram negative bacilli.

Fluroquinolones are resistant in up to 57% cases in E.coli cultures , this is contrast to previous studies which showed more than 74% resistance to fluoroquinolones.

Klebsiella showed high level resistance to ampicillin (88%) and cephalosporins(60-65%) but resistance to fluoroquinolones in less than 70%.

Among pseudomonal growths along with higher levels of resistance to ampicillin cephalosporins it also showed resistance to cotrimoxazole and nitrofurantoin in 86.9% and 70.1% of cultures respectively.

Among staphylococci growths good sensitivity to ampicillins and cephalosporins are noticed.

Most of the organisms showed good sensitivity to carbapenams with susceptibility rates ranging from 70% to 80% of cultures except for pseudomonas and acinetobacter where resistance varied from 40-45% of cultures.

Local antimicrobial susceptibility patterns are to be considered before starting empirical guided therapy as UTI associated with multidrug resistant bacteria might increase hospital stay, morbidity and mortality along with increased economic burden.

Clinical correlation and culture results of catheter samples should be correlated before choosing antibiotic therapy especially to multidrug resistant bacteria.

This study provides important data on antimicrobial resistance among pathogens in our area and such regional surveillance programmes done on frequent basis would benefit in updating the treatment guidelines.

5. Limitations of the Study

This study is limited to cases for which cultures are requested and information on antibiotics administered prior to cultures or data on subsequent treatment and outcome would have allowed better understanding of practice of diagnosis and treatment of UTI.

The rate of resistance to carbapenams among pseudomonas and Acinetobacter in this centre may be because many patients had prior contact with other health care institutions and history of antibiotic use and possibly our institute being a reference centre.

6. Conclusion

This study stresses the need for continuous regional surveillance of antimicrobial resistance and the use of same for empirical treatment of UTI should be considered andtherapy should only be advocated as far as possible after culture sensitivity has been performed.

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