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BACTERIOLOGICAL PROFILE OF URINARY ISOLATES AND ITS PATTERN OF ANTIBIOTIC SENSITIVITY TESTS IN A TERTIARY CARE HOSPITAL IN NAVIMUMBAI.

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Abstract

Urinary tract infection is one of the most common human infections. Furthermore there is rise in the Resistance of causative pathogens against the commonly prescribed antibiotics. Present study was aimed at finding the prevalence of such uropathogens and their antibiogram. Among 1059 suspected urinary samples were processed in the Department of Microbiology, D Y Patil Hospital, Nerul.,Navi-Mumbai. 580 (54.78%) were found to be culture positive. The predominant pathogen was E.coli (37.79%), while Enterococcus (30.30%), Klebsiella spp. (13.55%), Pseudomonas spp. (7.13%), Enterobacter spp. (2.67%), Acinetobacter spp. (2.67%), Citrobacter spp. (1.96%), Proteus spp. (2.14%), Staphylococcus aureus (0.71%), Streptococcus spp. (0.89%), Providentia rettgeri (0.18%) were other uropathogens isolated in this study.

Of the isolated pathogens, 98.58% Gram negative organisms were sensitive only to Colistin and 95.28% to Imipenem except Pseudomonas species, Enterobacter species and Acinetobacter species. More than 95.28% Gram negative organisms showed resistance to Amoxycillin-clavulanic acid. The resistant pattern for other antibiotics was as follows, Ciprofloxacin (83.96% except for Klebsiella, Enterobacter, Citrobacter, Proteus and Pseudomonas aeruginosa), Cephalosporins (73.3% except for Klebsiella, Pseudomonas aeruginosa and Proteus vulgaris).

Amongst Gram positive isolates (Enterococcus faecalis & Staphylococcus aureus), 100% of the isolates showed sensitivity to Linezolid and Vancomycin. Staphylococcus aureus also showed 100% sensitivity to Imipenem. 100% of the Staphylococcus aureus showed resistance to Penicillin by 94.71%. Enterococcus faecalis showed resistance to Penicillin 98.82% and to Co-trimoxazole. Enterococcus showed more multidrug resistant pattern amongst Gram positive isolates.

INTRODUCTION

Urinary Tract infection (UTI) is the second most common infection after respiratory tract infection .UTIs is important cause of illness in humans. It is defined as 'A disease caused by microbial invasion of the genito-urinary tract that extends from the renal cortex of the kidney to the urethral meatus. Although the flow of the urine and sloughing of epithelial cells (the lining of urinary tract) serve to protect the urinary tract from infections. Microorganisms particularly bacteria may enter the urinary tract through the potential pathway of epithelial surface to cause the infection. While whole of the urinary tract may be affected the most common UTIs are those of bladder (Cystitis) and the renal pelvis and the Kidney.

The presence of detectable bacteria in the urine is termed as Bacteriuria and that of pus cells in the urine is called as Pyuria which, most often accompanies UTI. Worldwide about 150 million people are diagnosed with UTI each year, costing the global economy in excess of 6 billion US dollars[1].

Urinary tract infection (UTI), is considered the second most common bacterial infection after respiratory tract infection[2]. It is one of the most commonly occurring medical problems, causing considerable morbidity and healthcare costs. In the United States, UTI account for approximately seven million office visits to physicians each year and over one million hospitalizations annually are attributed to or complicated by UTI[3]. UTIs are classified as community acquired or hospital acquired/ nosocomial infections, of which most of the UTIs are community acquired[4].

Urinary tract infection is generally treated empirically by general practitioners, for which they need to be aware of the locally prevalent strainsand their

sensitivity pattern. Over the last few decades the resistance pattern of urinaryisolates has been showing dramatic changes all over the world [5].

This study was aimed to study the Bacteriological Profile of Urinary Tract Infection, with their Antibiotic sensitivity pattern at D.Y.Patil Hospital, Nerul. Navi Mumbai.

Materials and methods:

Specimen collection: Midstream clean catch Urine Specimen (MSU), Catheter Sample Urine (CSU), Suprapubic Aspirate, Early Morning Urine (EMU), and invasive Urine Samples.

Transportation: The samples were transported at room temperature within half an hour of collection or refrigerated at 4^0C for up to four hours.

If the sample was from the patient who has no immediate access to the healthcare facility and transport to the facility would exceed four hours special container with 1.8% boric acid is provided. Urine samples were collected as described above and kept for upto 24 hours. Labelling, Collection, transporation,culture and sensitivity tests are done as per protocol of the study.

Approach to diagnosis of Urinary Tract Infection:

For routine diagnostic work semi quantitative techniques were incorporated as it was more convenient. Standard loop technique is widely used, which transfers a fixed small volume of urine on to the culture medium (Blood agar-non-inhibitory medium which gives quantitative measurement of bacteriuria, MacConkey's agar-Indicator medium which gives presumptive diagnosis of the bacterium and CLED agar-Cystein Lactose Electrolyte deficient medium).The isolates are identified by their properties.(Colony morphology, Gram Staining, biochemical reactions, motility etc).

Microscopy: Urine samples were centrifuged and deposits were examined under the microscope for detecting pus cells, epithelial cells, erythrocytes and bacteria. Presence of urinary casts, red cells, epithelial cells or atypical cells indicates non-infective lesions e.g.glomerulonephritis or tumor

Culture:

Uncentrifuged urine was inoculated (semi quantitative cultures are done) on Blood agar and MacConkey's agar/Cysteine Lactose Electrolyte Deficient medium (CLED) with a calibrated loop(Standard loop technique). Culture plates are incubated at 37^0 C for 24 hours. Isolated bacterial colonies were identified.

Standard Loop Technique:

Standard calibrated loop is used to culture a fixed volume of urine, the loop size is 4mm in diameter which can hold 0.005 ml urine (i.e. 200 loopful makes 1ml) .The total number of bacterial colonies multiplied by 200 will give the total bacterial count per ml.Single bacterium would form single colony hence the number of colonies shall be equal to number of bacteria present. Colony count was counted as CFU/mL(Colony forming Unit).

Interpretation of the results:

A Kass criterion was followed for culture culture processing. Counts of more than 10^5 bacteria (CFU/mL) of single species per ml was considered as Significant bacteriuria which indicates active UTI. Count less than 10^4 bacteria per ml (CFU/mL) was considered significant if the patient is on prior antibiotics,if there was obstruction in the urinary tract, if Fungal infection is suspected, if pyelonephritis was present. And also if specimen has been collected by supra pubic aspiration. If ≥ 3 types of organisms were grown, they were considered as contaminants.

Identification of the Organism:

The organisms were identified by their Colony morphology,Gram staining , Motility, Biochemical reactions. All Media for culture sensitivity were purchased from HiMedia Laboratories, Mumbai and prepared whenever needed.

Antibiotic Sensitivity Testing: If the culture is suggestive of infection an antibiotic sensitivity testing is done by Kirby-Bauer disc diffusion technique on Mueller-Hinton agar.

A total of 1059 clinically suspected nosocomial and community acquired UTI cases wereselected from inpatient and outpatient department of D.Y.Patil University Hospital. Out of total 1059 samples, 253 were OPD (out patient department) cases and 806 were IPD (In patient Department) cases.

The patients who fulfilled the inclusion criteria and exclusion criteria were enrolled in this study irrespective of age and sex.

Inclusion Criteria for Community Acquired UTI:

Clinically suspected community acquired UTI cases were selected on the basis offollowing cardinal signs/symptoms (CDC criteria)[6] . Common symptoms of the patients were Urgency, Frequency, Dysuria, Suprapubic tenderness, Fever/PUO (>100.4^{0}C) and or Pyuria

Exclusion Criteria for Community Acquired UTI

Febrile causes other than UTI. All relevant history, clinical findings and laboratory records of every subject was systematically recorded in a pre-designed

data sheet for subsequent analysis by computer programmed SPSS version 12.0.

Examination of urine specimen

Wet Film Preparation for Uncentrifuged Urine. One drop of un-centrifuged urine sample wasexamined. In un-centrifuged urine pusCells >4-6 per HPF is significant. The finding of 1leucocyte per high power fields corresponds with 10^4 leucocytes per ml[7].

Culture Examination:

Measured amount of urine specimen from each urine sample was inoculated separately into following media:

Blood Agar: It was used for the isolation of the fastidious microorganisms and to study the type of haemolysis produced by the organisms. This was a non selective but enriched medium. Almost all the bacteria should be able to grow in this.

Macconkey Agar: For isolation of Gram negative bacilli (enteric bacteria) and to differentiate lactose fermenting organisms from non-lactose fermenting organisms. This is a selective and differential media.

Nutrient Agar Slants: for preservation of organisms for further studies[7].

Culture Procedure: Urine samples were shaken well in their sterile containers for even distribution of organisms. A calibrated wire loop with internal diameter 3.26mm that hold 0.004 ml of urine were inoculated into the above media. The inoculums were spread with the wire loop on the media plate. They were incubated aerobically at 37°C for 24 hours[7].

Reading of The Culture Plates[8,9]:

After completion of incubation, the inoculated culture plates will be observed for the presence of any bacterial growth. If growth occurs, colony count was be done to calculate the number of colony forming unit per ml of urine (CFU/mL)

Interpretation:

$\geq 10^5$ CFU bacteria / ml in asymptomatic patients on two consecutive specimens

$\geq 10^3$ CFU bacteria / ml in symptomatic male

$\geq 10^5$ CFU bacteria / ml in symptomatic female

$\geq 10^2$ CFU bacteria / ml in a catheterized patients

Any growth of bacteria on suprapubic catheterization in symptomatic patients

All significant bacteriuria cases are termed as culture positive.The rest are termed as culture negative.

Identification of The Organism[7,10].

All isolates were subjected to gram staining for initial identification of organism according to their Gram reaction of the growth obtained, colony morphology and finally by biochemical test. Gram negative bacteria were identified by motility test, Indole production, citrate utilization test, urease production and reaction in TSI media. Gram positive bacteria were identified by Catalase test, Coagulase test.

Antibiotic Susceptibility Testing: Susceptibility pattern was studied by using disk diffusion method. All the isolated organisms were streaked by lawn culture/surface plating onto appropriate media for antibiotic susceptibility test by Kirby-Bauer disc diffusion technique. Zone of inhibition were measured and interpreted according to the recommendations of the Clinical and Laboratory Standards Institute (CLSI, 2014).

All tests were performed on Muller-Hinton agar plates (pH 7.2-7.4) and on Blood agar for Enterococcus Spp . The surface was uniformly inoculated by sterile cotton swab stick. Prior to inoculation, the swab stick was dipped into bacterial suspension having visually equivalent turbidity to 0.5 McFarland standards. The swab stick was then taken out and squeezed on the wall of the test tube to discard extra suspension. Inoculated plates were incubatedat 37^0C for 24 hours. On the next day, plates were examined by taking measurement of zone of inhibition, which was measured in millimeter (mm) by using measuring scale/calipers, over the surface of the plate with the lid open. Results were recorded and graded as resistant (R) and sensitive (S), but no intermediate category for developing country according to the reference zone of inhibition of particular antibiotic (NCCLS, 2001).Known control strain ATCC 25922, ATCC 25923 and ATCC 27853 were used for quality control (CLSI, 2007).

Results:

In present study,1059 suspected urinary samples were processed in the Department of Microbiology, D.Y.Patil Hospital, Nerul, NaviMumbai. Out of which 580(54.76%) sample were found positive with significant bacterial counts. Among these 183(31.55%) were adult male patients and 303(52.24%) were adult females. 52(8.96%) were pediatric male patients, 42(7.24%) were pediatric female patients. 153(26.38%) were OPD patients and 427(73.62%) were IPD patients. In our study we isolated 212 (37.79%) E.coli, 170(30.30%) Enterococcus faecalis, 76(13.55%)Klebsiella pneumoniae, 29(5.17%) Pseudomonas aeruginosa, 15(2.67%) Enterobacter aerogenes, 15(2.67%) Acinetobacter baumanii. And rest of the bacteria which were less than 2% were Citrobacter freundii,Citrobacter koseri, Proteus mirabilis, Proteus vulgaris, Providentia rettgeri, Staphylococcus aureus. Along with this 24(4.14%) were identified as Candida

albicans and 52(8.97%) were other Candida Spp. Antibiotic sensitivity tests were done according to CLSI guidelines using Kirby-Bauer disc diffusion technique on Mueller-Hinton agar.

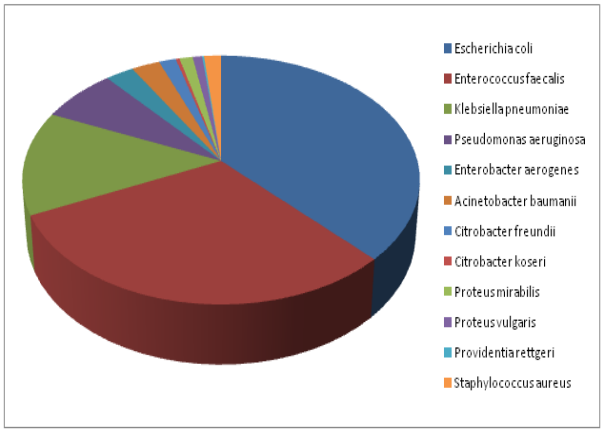
Out of 212 strains of E.coli 209 (98.58%) strains were sensitive to Colistin and 202 (95.28%) strains were sensitive to Imipenem. 202(95.28%) of strains were resistant to Amoxicillin and clavulanic acid and 183(86.32%) of strains were resistant to Cefuroxime. Among 170 Enterococcus faecalis, 170 (100%)strains were sensitive to Linezolid and Vancomycin. 168 (98.82%) strains were resistant to Co-trimoxazole and 161 (94.71%) strains were resistant to Penicillin. Out of 76 Klebsiella pneumoniae, 73 (96.05%) strains were sensitive to Imipenem and 71 (93.42%) strains were sensitive to Colistin. 74(97. 37 %) of strains were resistant to Amoxicillin and clavulanic acid and 61(80.26%) strains were resistant to Nitrofurantoin. Among 40 Pseudomonas aeruginosa, 100% strains were sensitive to Colistin and 39(97.5%) strains were sensitive to Imipenem. 100% of strains were resistant to Aztreonam. Out of 15 Enterobacter aerogenes, 100% strains were sensitive to Colistin and Imipenem. 100% of strains were resistant to Amoxicillin and clavulanic acid, 13(86.67%) were resistant to Nitrofurantoin and 11(73.33 %) strains were resistant to Cefuroxime and Cefipime.

Out of 15 strains of Acinetobacter baumanii, 100% strains were sensitive to Colistin and 11 (73.33%) strains were sensitive to Imipenem. 14 (93.33%) of strains were resistant to Nitrofurantoin and 13 (86.67 %) of strains were resistant to Cefuroxime. Among 09 strains of Citrobacter freundii 08 (88.89%) strains were sensitive to Imipenem,Amikacin & Gentamicin and 09 (100%) strains were resistant to Amoxicillin and clavulanic acid and 08 (88.89%) of strains were resistant to Cefuroxime & Nitrofurantoin. Among 02 strains of Citrobacter koseri 02 (100%) strains were sensitive to Imipenem and 02 (100%) strains were resistant to Cefipime and Gentamicin. Out of 07 Proteus mirabilis strains, 07(100%) were sensitive to Imipenem and 05(71.43%) were sensitive to Ciprofloxacin and Norfloxacin. 06(85.71%) were resistant to Colistin and Nitrofurantoin. Among 05 Proteus vulgaris strains, 05(100%) were sensitive to Imipenem, Amikacin, Gentamicin,Norfoxacin, Nitrofurantoin and Ciprofloxacin. 05(100 %) were resistant to Colistin and Amoxycillin-clavulanic acid. Only one strain of Providentia rettgeri was isolated which was resistant to all antibiotics tested.

Among 09 Staphylococcus aureus, 100% strains were sensitive to Linezolid,Vancomycin, Imipenem, and Oxacillin.100%strains were resistant to Penicillinand 07(77.78%) strains were resistant to Erythromycin. None among the Staphylococci were MRSA.

Table 1: Organism Wise Distribution: (n=561)

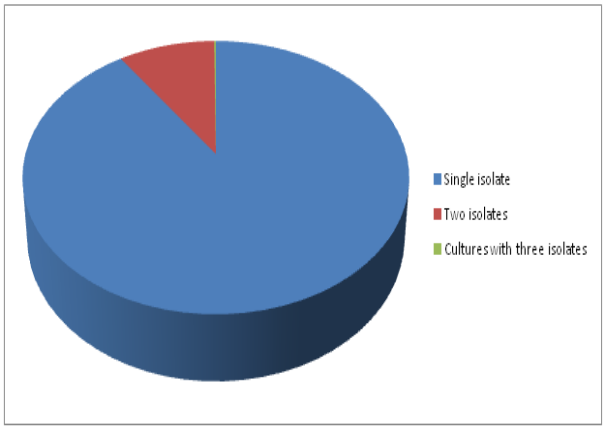
Organism	Total No.	%
Escherichia coli	212	37.79
Enterococcus faecalis	170	30.30
Klebsiella pneumoniae	76	13.55
Pseudomonas aeruginosa	40	7.13
Enterobacter aerogenes	15	2.67
Acinetobacter baumanii	15	2.67
Citrobacter freundii	09	1.60
Citrobacter koseri	02	0.36
Proteus mirabilis	07	1.25
Proteus vulgaris	05	0.89
Providentia rettgeri	01	0.18
Staphylococcus aureus	09	1.60
Total	561	100



Graph 1: Pie diagram showing Organism wise distribution: (n=561)

Table 2: Growth In 580 Culture Positive Samples with One /Two/Three Isolates:

Culture positive samples with	Total	Percentage (%)
One isolate	524	90.35
Two isolates	55	9.48
Three isolates	01	0.17



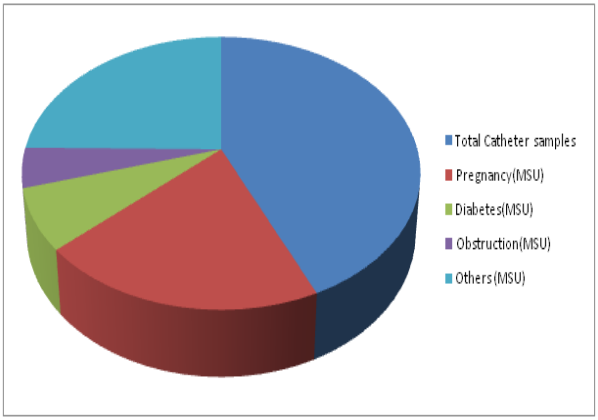
Graph 2: Pie diagram showing growth in 580 culture positive samples with one /two/three isolates:

Table 3: Distribution of Positive Growth Samples

No. of Patients with positive growth	580
One isolate	524 (524x1=524)
Two isolates	55(55x2=110
Three isolates	01(1x3=03)
Total bacterial isolates	561
Total Isolates of Candida Spp.& C.albicans	76
Total isolates(Bacteria + Candida)	637

Table 4: Distribution of Samples of IPD patients (n=806) with Suspected UTI:

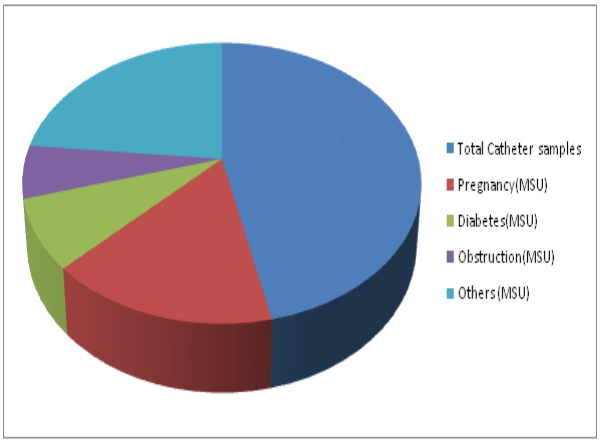
Factors	Numbers of patients	Percentage
Total MSU samples	457	56.70
Total Catheter samples	349	43.30
Pregnancy(MSU)	161	19.98
Diabetes(MSU)	58	7.19
Obstruction(MSU)	38	4.71
Others (MSU)	200	24.81



Graph 3: Pie diagram showing distribution of total IPD patients (n=806) with suspected UTI:

Table 5: Distribution of Samples of IPD Patients with Positive Urine Cultures/Confirmed UTI (N= 427):

Factors	Numbers of patients	Percentage
Total MSU	228	53.40
Total Catheter samples	199	46.60
Pregnancy(MSU)	68	15.93
Diabetes(MSU)	34	7.96
Obstruction(MSU)	26	6.09
Others (MSU)	100	23.42



Graph 3: Pie diagram showing distribution of samples of IPD patients with positive urine culture /Confirmed UTI (n=427):

Table 6: shows the age sex distribution among the srudy group:

Age-Sex Distribution						
Age (years)	**Gender**				**Total**	
	Male		**Female**			
	n	**%**	**n**	**%**	**n**	**%**
<10	75	15.4	73	12.7	148	14.0
10-20	38	7.8	46	8.0	84	7.9
20-30	78	16.0	140	24.4	218	20.6
30-40	71	14.6	75	13.1	146	13.8
40-50	59	12.1	69	12.0	128	12.1
50-60	77	15.8	65	11.3	142	13.4
60-70	54	11.1	64	11.2	118	11.1
>=70	34	7.0	41	7.2	75	7.1
Total	**486**	**100.0**	**573**	**100.0**	**1059**	**100.0**

Table 7: Shows the distribution of participants according to the source of urine samples collected. out of 1110 samples, 718 (64.7%) were mid stream urine samples and 347 (31.35) were catheter samples.

Urine Sample	**Frequency**	**Percent**
Mid-stream urine	718	64.7
Catheter Sample	347	31.3
Total	**1110**	**100.0**

Table 8: shows distribution of samples according to Place of sample collection. Maximum number of samples 246 (22.0%) were collected from OPD followed by MICU (98, 8.8%), Pediatrics (96, 8.6%) and female medicine ward (92 (8.2%).

Distribution of samples according to Place of collection		
Place of sample collection	**Frequency**	**Percent**
OPD	246	22.0
MICU	98	8.8
Paeds	96	8.6
Female Medicine Ward	92	8.2
Male Medicine Ward	62	5.6
OBGY	60	5.4
Male Surgery Ward	57	5.1
Female Surgery Ward	55	4.9
D' Wing	45	4.0
ICU	42	3.8
Male Ortho ward	22	2.0
Old Female Medicine Ward	21	1.9
CCU	19	1.7
New Male Medicine Ward, PICU & Old Male Medicine Ward	18	1.6
Female Ortho Ward	17	1.5
SICU	16	1.4
New Female Medicine Ward	15	1.3
Pulmonary Medicine Ward	9	.8
5th Floor	5	.4
Labour Ward	4	.4
ENT OPD & NICU	3 each	.3
Nephrology (Surgery Ward), Old Male Surgery & Paeds OPD	2 each	.2
Casualty & all other wards	1 each	.1
Total	**1116**	**100.0**

- All other wards : Casualty, ENT, ER, Female Surgery Ward (D-Wing), ICCU, Medicine OPD,OBGY OPD, Old Female Surgery Ward
- OPD (Urology),OPD OBGY and OT

Table 9: The above table shows distribution of samples according to the Organisms.

Sr. No.	Organisms	Frequency	Percent
1	No Growth	422	37.8
2	*E. coli*	212	19.0
3	*Enterococcus faecalis*	170	15.2
4	*Klebsiella pneumoniae*	76	6.8
5	*Candida spp.*	52	4.7
6	*Polymicrobial flora*	29	2.6
7	*Pseudomonas aeruginosa*	40	3.6
8	*Candida albicans*	24	2.2
9	*Insignificant Bacteriuria*	15	1.3
10	*Acinetobacter baumanii*	15	1.3
11	*Enterobacter aerogenes*	15	1.3
12	*Citrobacter freundii*	9	0.8
13	*Staphylococcus aureus*	9	0.8
14	*Proteus mirabilis*	7	0.6
15	*Contaminants Grown*	6	0.5
16	*Non Pathogenic Growth*	6	0.5
17	*Proteus vulgaris*	5	0.4
18	*Citrobacter koseri*	2	0.2
19	*Diphtheroids Grown*	1	0.1
20	*Providencia rettgeri*	1	0.1
Total		**1116**	**100.0**

Table 10: shows Cross tabulation of Organisms & Sensitivity (multiple responses)

Cross tabulation of Organisms & Sensitivity																					
	AK	**CIP**	**CL**	**COT**	**IPM**	**LZ**	**Nil**	**NIT**	**CPM**	**NX**	**PIT**	**TOB**	**VA**	**G**	**OX**	**AMC**	**CXM**	**CTR**	**CAZ**	**E**	**Total**
Acinetobacter baumanii	6	22	5	11	0	0	1	5	7	0	0	0	6	0	4	2	0	0	0	0	15
Candida albicans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
Candidaspp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
Citrobacter freundii	9	12	4	10	0	0	3	7	7	0	0	0	8	0	0	1	0	0	0	0	11
Contaminants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Diphtheroids	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
E.coli	181	245	58	202	0	0	157	48	41	0	0	0	157	0	9	31	0	0	0	0	212
Enterobactera erogenes	7	23	5	13	0	0	3	4	9	0	0	0	7	0	1	4	0	0	0	0	15
Enterococcus faecalis	41	33	3	0	170	0	77	0	0	0	0	170	48	25	0	0	0	0	25	8	170
Insignificant Bacteriuria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Klebsiella pneumoniae	62	120	41	73	0	2	16	44	49	0	0	0	55	0	2	32	0	0	0	0	76
NoGrowth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	422
Non Pathogenic bacterial Growth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Polymicrobialflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
Proteus mirabilis	8	13	6	12	0	0	3	6	9	0	0	0	9	0	4	6	0	0	0	0	12
Providencia rettgeri	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Pseudomonas aeruginosa	18	42	0	23	0	7	0	15	0	19	19	0	0	0	0	0	13	14	0	0	40
Staphylococcus aureus	6	7	3	9	9	0	7	0	0	0	0	9	9	9	0	0	0	0	6	4	9
Total	**338**	**517**	**125**	**353**	**179**	**10**	**267**	**129**	**122**	**19**	**19**	**179**	**299**	**34**	**20**	**76**	**13**	**14**	**31**	**12**	**1116**

Table 11: The above table shows Cross tabulation of Organisms & Resistance (multiple responses)

Cross tabulation of Organisms & Resistance																						
	AK	AMC	AT	CAZ	CIP	CIP	CL	COT	CPM	CTR	CXM	IPM	NIT	NX	OP	OX	PIT	TOB	E	G	B	
Acinetobacter baumanii	8	10	0	0	8	0	9	10	0	12	4	14	8	0	0	0	0	0	9	0	0	15
Candida albicans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
Candidaspp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
Citrobacter freundii	2	11	0	0	4	6	7	4	0	9	1	7	4	0	0	0	0	0	3	0	0	11
Contaminants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Diphtheroids	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
E.coli	29	202	0	0	170	3	153	163	0	178	9	27	171	0	0	0	0	0	44	0	0	212
Enterobacter aerogenes	8	14	0	0	6	0	10	9	0	11	0	11	6	0	0	0	0	0	8	0	0	15
Enterococcus faecalis	121	0	0	0	129	0	163	0	0	0	170	58	0	167	145	0	0	137	122	167	162	170
Insignificant Bacteriuria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Klebsiella pneumoniae	14	74	0	0	27	5	33	32	0	39	3	51	27	0	0	0	1	0	20	0	0	76
NoGrowth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	419
Non Pathogenic Growth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Polymicrobialflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
Proteus mirabilis	3	8	0	0	3	8	6	6	0	6	0	8	3	0	0	0	0	0	3	0	0	12
Providencia rettgeri	1	0	0	0	1	1	0	1	0	1	1	1	1	0	0	0	0	0	1	0	0	1
Pseudomonas aeruginosa	20	0	39	25	21	11	0	25	26	0	16	0	0	0	0	21	20	0	0	0	0	40
Staphylococcus aureus	0	0	0	0	0	0	6	0	0	0	0	1	0	0	0	0	0	3	0	0	5	9
Total	206	319	39	25	369	34	387	250	26	256	204	178	220	167	145	21	21	140	210	167	167	1112

Discussion:

In the present study 1059 urine samples were collected from the OPD and IPD patients of D Y Patil hospital (of all age groups above 1 year of age) clinically diagnosed as urinary tract infection, over the period of seven months. 26.37% (n=580) of positive cultures were from OPD and 73.62% (n=580) were from IPD which is comparable with the study by Gupta et al (2002)[11] in which 57.30% were from IPD and 42.70% from OPD, but not matching with the study by Kiran K Mokta et al [12] . where OPD percentage is 78.89% and that of IPD is 21.15%.

Among the total (n=561) bacterial isolates, 68.09% (382) were Gram Negative Bacteria and 31.91% (179) were Gram Positive Bacteria, which is near about comparable with the study by Hari P Kattel et al (2008)[13] who found the percentage of Gram Negative Bacteria was 79% and that of Gram Positive Bacteria was 21%. This result is also matching with the study done in Japan by Okada et al 1994[62], who found 70.2% isolates were Gram Negative Bacteria and 29.8% were Gram Positive Bacteria. Female dominance (59.49%) was observed among the UTI cases taken in this study as compared to male patients which was 40.51% which was near about similar when compared with the study by C. Manikanandan 2014[14], where prevalence of UTI in females (69.8%) was higher as compared to males (30.2%).

Most culture positive samples were found to be from the medical ward (27.41%) followed by MICU (14.48%), then surgical ward (7.24%), then gynecology ward (6.03%) and orthopedic ward(4.14%). Culture positive samples from CCU, SICU, PICU, NICU, ER and OR were found to be less than 2%.

We have found that among 580 culture-positive samples 520 were with the single isolate. 55 culture positives were with two isolates and 1 culture positive sample was with three isolates. Among total 1059 samples, 76 isolates were Candida Spp. (Candida albicans and other Candida Spp.)

In our study, the organisms which we found were as follows in decreasing order of percentage: E.coli (37.79%) , Enterococcus faecalis (30.30%), Klebsiella pneumoniae (13.55%),Pseudomonas aeruginosa (7.13%), Enterobacter aerogenes (2.67%), Acinetobacter baumanii (2.67%), C. freundii & C. koseri (1.96%) , Proteus mirabilis and Proteus vulgaris (2.14%), Staphylococcus aureus (1.60%) and Providentia rettgeri (0.18%).

Incomparison to our study, an article shows similar findings except few, which is by A.Acharya et al[15], which shows that UTI is more in young females and E.coli (68.77%) is the predominant bacteria followed by Enterobacter Spp (13.92%),Klebsiella Spp (5.90%) and Enterococci were (0.84%). Our study is matching with the study done by C.Manikandan and A.Amsath, which shows E.coli(54.6%), K.pneumoniae (11.2%)[14]. Also our study matches with the Study of Aija Zileviea in 2005[16] which shows E.coli (68.23%) and Klebsiella (16.47%). One of the studies from Dhaka done by Afsana Fatema Noor et al in 2013[65] also shows similar results comparable to our study. In one of the studies by Tony Maazzulli et al shows that 91.8% of the isolates were E.coli, 3.9% were Klebsiella and 2% were Proteus Spp[17] which is not at par with our study.

An American study done between 1991 to 1997 shows that the prevalance of E.coli in the current decade has risen significantly, which shows 69% of positive cultures in 1991, that has increased upto 75% in 1994 and 81% in 1997[18].

In our study in NaviMumbai, prevalence of E.coli is 37.79%, Enterococcus faecalis (30.30%), Klebsiella pneumoniae (13.55%), Pseudomonas aeruginosa (7.13%), Enterobacter aerogenes (2.67%), Acinetobacter baumanii (2.67%), C. freundii & C. koseri (1.96%) , Proteus mirabilis and Proteus vulgaris (2.14%), Staphylococcus aureus (1.60%) and Providentia rettgeri (0.18%), which is approximately matching the study carried out in Turkey by Leblebicioglu and Esen, 2003[19], except Enterococci, which shows Escherichia coli (32.4%) was the most common reported pathogen, followed by Klebsiella spp. (17.0%), Candida spp. (12.8%), Pseudomonas aeruginosa (11.7%) and Enterococci 8.5%. In the first article of the study in Germany done by Gastmeier revealed *E.coli* as the causative agent of NUTI by 35.6% (Gastmeier, 2001)[20] which is near to our study.

Conclusion:

Our study cocludes that Gram negative bacteria, E.coli in particular is the most common uropathogen, followed by Enterococcus, Klebsiella, Pseudomonas, Enterobacter, Acinetobacter, Proteus, Citrobacter, Staphylococcus and Streptococcus. Candidial prevalence was 7.18%. One of the major risk factors of UTI appears to catheterization (43.30%).

Our study also concludes that E.coli and other Gram negative isolates were mainly sensitive to Imipenem, Colistin, Amikacin, Gentamicin, and Nitrofurantoin in case of E.coli (74.06% were sensitive) and these can be The Drug of Choice for UTI treatment in our Hospital, whereas they showed resistance to Ampicillin-Clavulanate, Nitrofurantoin (except E.Coli), Cephalosporins, Co-trimoxazole, and Ciprofloxacin.

For Enterococcal UTI, Linezolid and Vancomycin are the drugs of choice. For Staphylococcal UTI, we have many sensitive drugs, e.g. Linezolid, Vancomycin, Imipenem, Erythromycin, Amikacin, and Gentamicin. No MRSA was isolated in this study.

There is increasing resistance to routinely used antibiotics, which are used indiscriminately and irrationally especially in community. One of the reasons to this resistance is self medication and over the counter dispensing of antibiotics without prescription, prior & proper investigation. And if it is not stopped then UTI can become major cause of mortality and morbidity, then possibly we might lose the last weapon to fight against it.

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