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Bacterial Spectrum among Urinary Pathogens and Its Antibiogram from January to June 2021 during Second Wave of Covid-19 at a Tertiary Care Hospital

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ABSTRACT:
UTIs are one of the commonest infections among women but can affect all age groups. They lead to irreversible renal parenchymal damage and renal scarring. Empiric antibiotics have to be started as early as possible to prevent chronic UTI and its complications. Resistance profile is crucial for better outcome following UTIs.This is a retrospective study and has got the approval from scientific committee. A total of 1358 urine samples including 884 females and 474 males were studied. These samples were received from various clinical departments of Tertiary Care Hospital during the second wave of COVID-19 from January to June 2021. Laboratory diagnosis was done by routine conventional methods and be Kirby Bauer for antibiogram.Significant growth of organisms was reported in 208 cultures (i.e., 15.3%). UTIS were seen among 134 females (64.4%) and 74 males (35.6%). Gram negative organisms with Escherichia coli being the most common followed by Klebsiella species, Pseudomonas aeruginosa, Proteus and Acinetobacter. Gram positive spectrum includes Staphylococci and Enterococci. Candida species were 68 (32.69%). The overall antibiogram showed that gram negative isolates showed MDR.Suggestions for changes in local antibiotics policy towards selection of UTIs was recommended. There is also a need for a high-volume study and also a multicentric study.

Keywords: UTIs (Urinary Tract Infections), COVID-19,Resistance profile, MDR (Multiple drug resistance), Local antibiotics policy

I. INTRODUCTION:

[1-4].Urinary tract infections are one of the commonest infections among all age groups but more susceptible to women compared to men because of their anatomical structure[5].They can be caused by both gram negative and gram-positive bacteria.The multiplication of these organisms in urinary tract leads to an inflammatory response[6].This study gained importance because if there is improper diagnosis or inadequate treatment of UTI then it may lead to an irreversible renal parenchymal damage and scarring and ultimately renal failure [7].Therefore, empiric antibiotics have to be started as early as possible to prevent chronic UTIs and its complications.Drug resistance in uropathogens have been increased in the past few decades due to unselective use, easy availability and over the counter sale[8-9]. Hence antibiotic resistance profile is crucial for better management of patients because of UTI associated with multiple drug resistance bacteria and it helps us to timely update optimal empirical therapy of UTI.

II. MATERIALS & METHODS:

This is a tertiary care hospital based retrospective study of 6 months i.e., from January to June 2021 after permission from scientific committee. Urine samples sent to microbiology department from various clinical departments of different age and sex were assessed. The patients who already started antibiotics were not taken into consideration. A total of 1358 urine samples including 884 females and 474 males were processed and studied during this period. Midstream urine samples were collected using sterile plastic containers.Each sample was inoculated on blood agar and MacConkey agar plate and incubated at 37ºC for 18-24 hours.Each pure colony was counted as colony forming units.The total colony forming units were converted into cfm/ml of urine to check significant bacteriuria.A patient with $>10^5$ cfu/ml was considered positive for UTI.

For identification of isolates standard microbiological methods were performed such as

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gram staining was done & based on gram reaction various biochemical tests were performed such as:

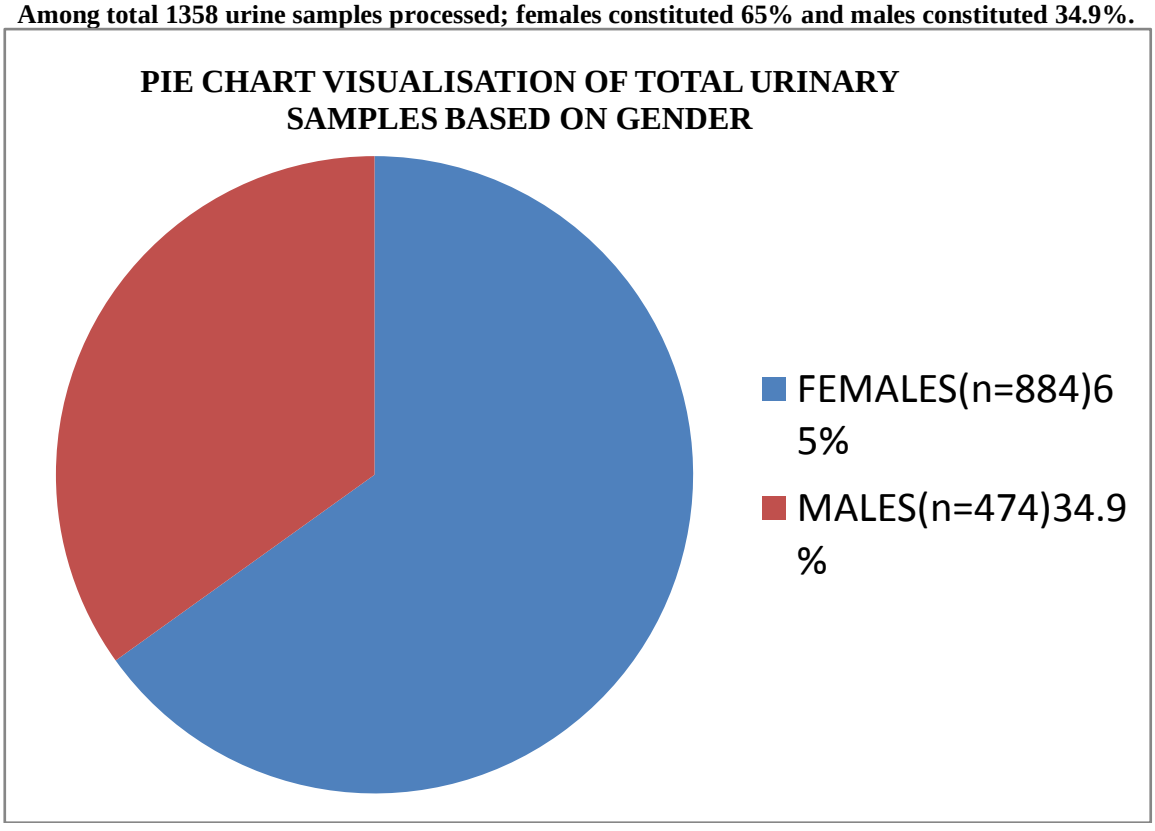
- For gram positives– Catalase, coagulase, bacitracin andnovobiocin were done
- For gram negatives– Glucose and lactose fermentation, indole, motility, TSI, citrate & urease were done

Antimicrobial susceptibility tests were done on modified Kirby-Bauer disc diffusion method on Muller Hinton agar in accordance with CLSI guidelines using criteria of standard zone sizes of inhibition to define sensitivity and resistance. The antimicrobial agents were different for different organisms.The antimicrobial agents tested for Gram negative bacilli wereNalidixic acid , Amoxicillin/Clavulanate , Ciprofloxacin, Imipenem, Amikacin, Nitrofurantoin, Ampicillin, Gentamicin, Norfloxacin, Piperacillin-Tazobactam, Carbenicillin, Cotrimoxazole, Cefpodoxime.The antimicrobials tested for Gram positive bacteria were Ampicillin , Amoxicillin/Clavulanate , Ciprofloxacin, Amikacin, Nitrofurantoin, Gentamicin, Cotrimoxazole, Cefoxitin, Oxacillin, Vancomycin, Penicillin, Erythromycin, Linezolid. The results were determined after incubation at 37ºC for 24 hours as per CLSI guidelines.

III. RESULTS:

A total of 1358 urine samples were obtained from various departments during 6 months study period. Among them female samples constituted 884 (65%) and male samples constituted 474(34.9%). Significant growth of organisms was seen in 208 cultures (15.3%) and no growth or insignificant growth was seen in 1150 cultures (84.6%). Among these positive 208 cultures; females were majority i.e., 64.4% and the rest were males i.e., 35.6%. Of the total bacterial isolates Gram positive organisms were 42(20%), Gram negative organisms were 98(47%) and the rest 68 were candida species (32%).

Among total 1358 urine samples processed; females constituted 65% and males constituted 34.9%.



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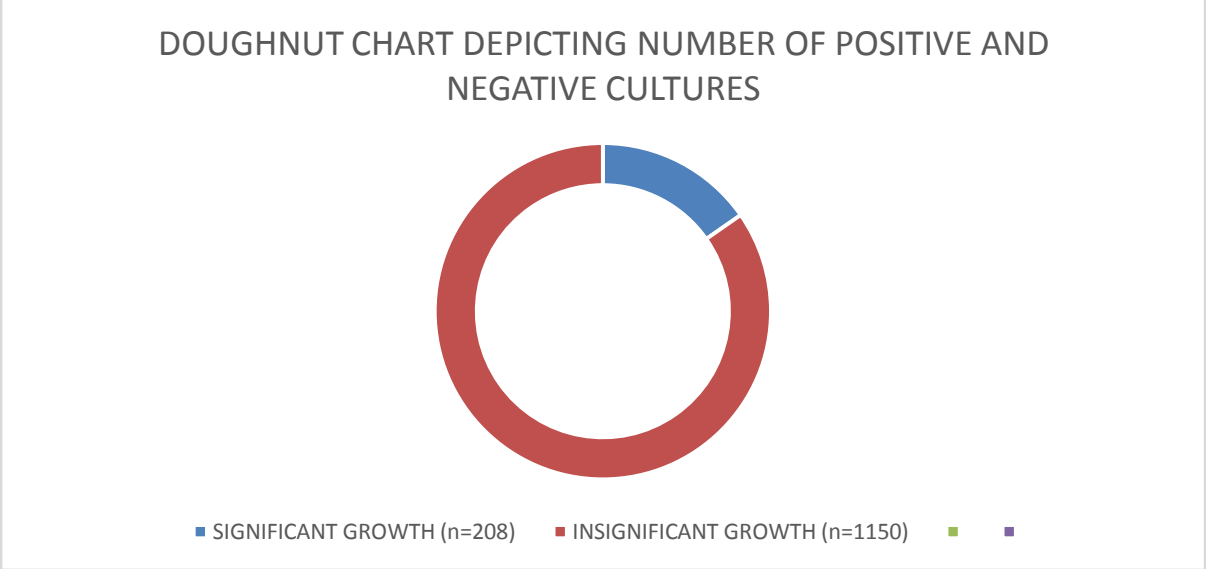

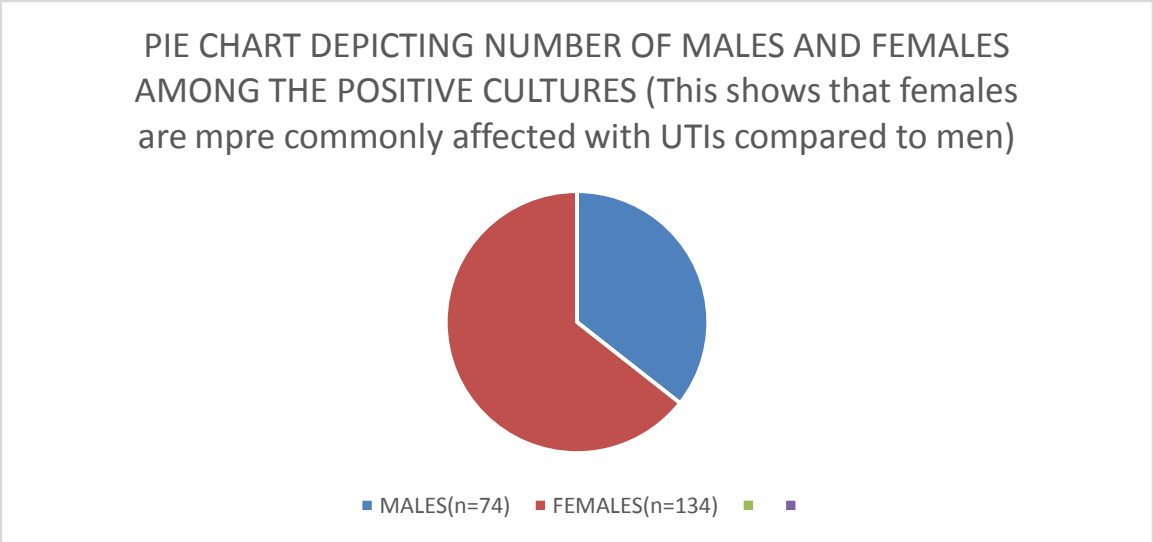

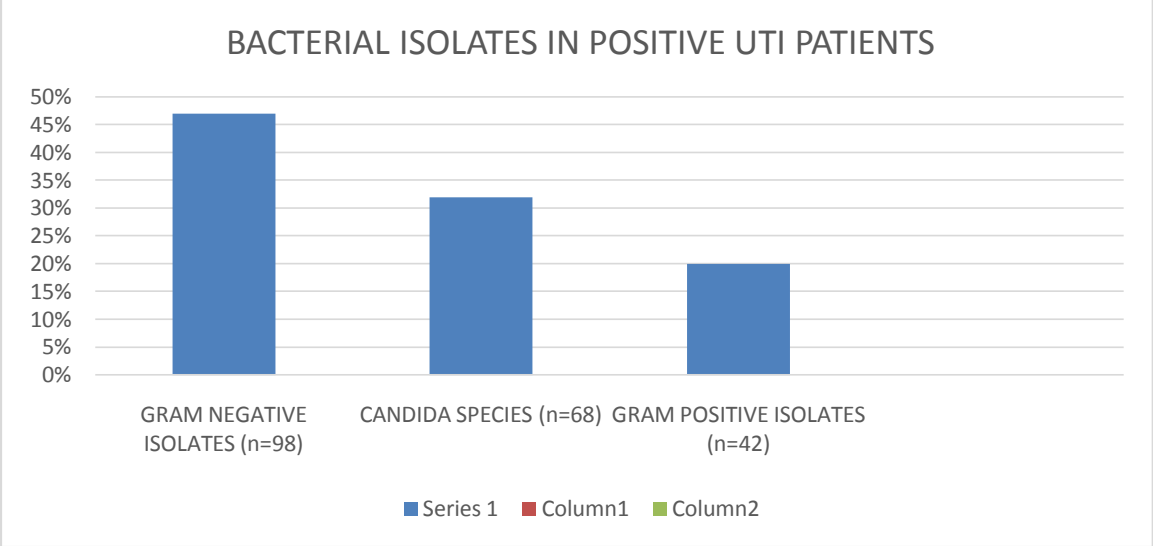

BAR DIAGRAM SHOWING AGE AND SEX DISTRIBUTION

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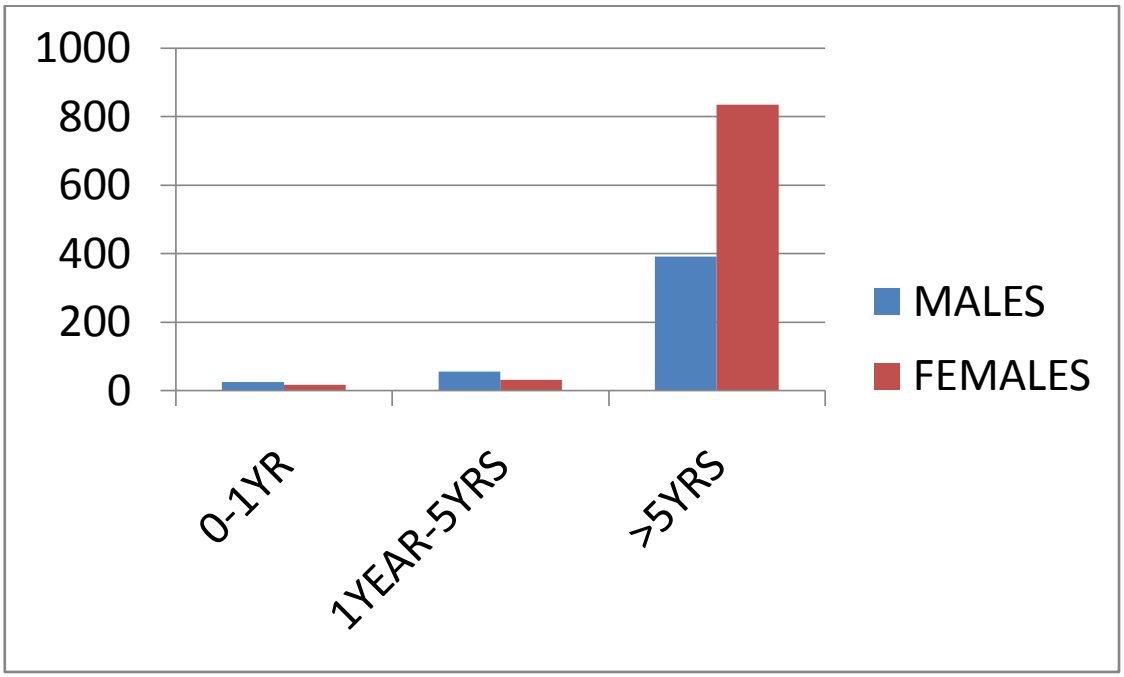

BACTERIOLOGICAL CULTURE RESULTS DISTRIBUTION BY AGE AND GENDER

BACTERIAL CULTURE RESULTS BY AGE	**SIGNIFICANT GROWTH (n=?)**	**%**	**NO GROWTH OR INSIGNIFICANT GROWTH**	**%**	**TOTAL**	**%**
Neonate	n=2	0.96%	n=5	0.43%	n=7	0.5%
29days to 1 year	n=7	3.36%	n=30	2.608%	n=37	2.7%
>1yr to 5yrs	n=22	10.57%	n=66	5.7%	n=88	6.4%
>5yrs	n=177	85%	n=1049	83.2%	n=1226	90.2%
BACTERIOLOGICAL CULTURE RESULTS BY GENDER						
MALE	n=74	35.5%	n=400	34.7%	n=474	34.9%
FEMALE	n=134	64.4%	n=750	65.2%	n=884	65%
TOTAL	n=208	15.3%	n=1150	84.6%	n=1358	

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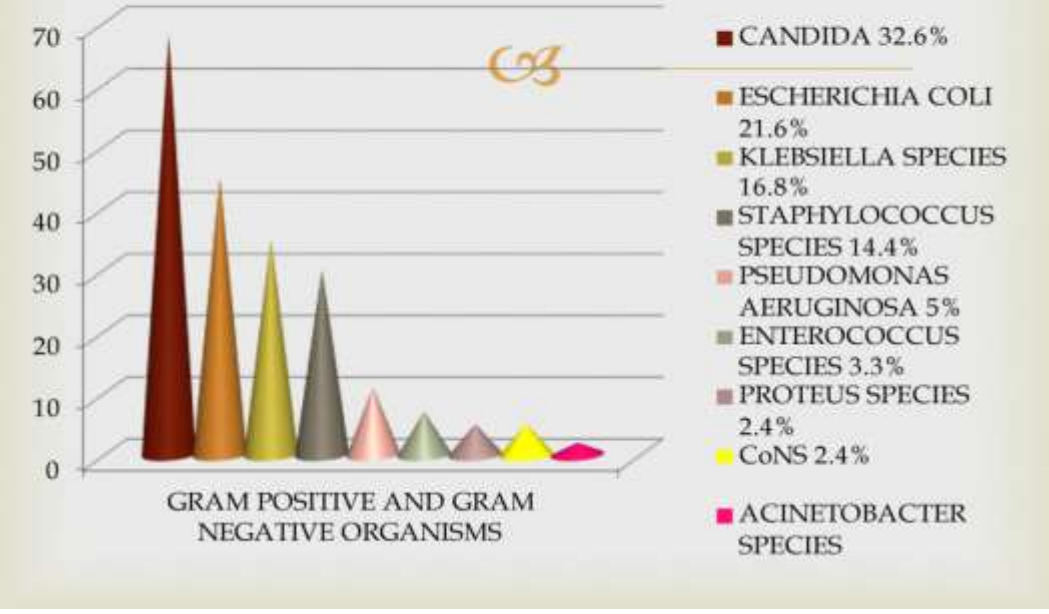
ORGANISMS OR ISOLATES IDENTIFIED IN POSITIVE(n=208) URINE CULTURES

	ORGANISM	(n=?)	%
1	*CANDIDA*	68	32.6%
2	*Escherichia coli*	45	21.6%
3	*Klebsiella spp*	35	16.8%
	a) Klebsiella pneumoniae	33	15.8%
	b) Klebsiella oxytoca	02	0.96%
4	*Staphylococcus spp*	30	14.4%
	a) Staphylococcus aureus	23	11%
	b) Methicillin-resistant Staphylococcus aureus (MRSA)	7	3.3%
5	*Pseudomonas aeruginosa*	11	5%
6	*Enterococcus spp*	7	3.3%
7	*Proteus spp*	5	2.4%
	a) Proteus mirabilis	3	1.4%
	b) Proteus vulgaris	2	0.96%
8	*CoNS*	5	2.4%
9	*Acinetobacter spp.*	2	0.96%

Among the significant bacteriuria, both gram negative and gram positive organisms were isolated. Gram negative organisms with *Escherichia coli* being the most common followed by *Klebsiella species, Pseudomonas aeruginosa, Proteus species and Acinetobacter*. Gram positive spectrum includes *Staphylococci and Enterococci. Candida* species were (n=68) 32.69%.



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ANTIBIOTIC RESISTANCE PATTERN OF GRAM POSITIVE ISOLATES

ANTIBIOTICS	*STAPHYLOCOUUS SPP*		*ENTEROCOSSUS SPP*		*CoNS*	
	Sensitive n(%)	Resistance n(%)	Sensitive n(%)	Resistance n(%)	Sensitive n(%)	Resistance n(%)
AMPICILLIN	0(0%)	30(100%)	6(85.7%)	1(14.2%)	NP	NP
NITROFURANTOIN	27(90%)	3(10%)	6(85.7%)	1(14.2%)	NP	NP
GENTAMICIN	25(83.3%)	5(16.6%)	2(28.5%)	5(71.4%)	1(100%)	0(0%)
CEFOXITIN	24(80%)	6(20%)	NP	NP	1(100%)	0(0%)
CIPROFLOXACIN	20(66.6%)	10(33.3%)	NP	NP	1(100%)	0(0%)
OXACILLIN	23(76.6%)	7(23.3%)	NP	NP	NP	NP
VANCOMYCIN	30(100%)	0(0%)	30(100%)	0(0%)	1(100%)	0(0%)
PENICILLIN	6(20%)	24(80%)	0(0%)	7(100%)	0(0%)	1(100%)
ERYTHROMYCIN	NP	NP	0(0%)	7(100%)	NP	NP
LINEZOLID	NP	NP	7(100%)	0(0%)	1(100%)	0(0%)
AMOXICILLIN CLAVULANATE	NP	NP	2(28.5%)	5(71.4%)	1(100%)	0(0%)

NP=NOT PERFORMED

ANTIBIOTIC RESISTANCE PATTERN OF GRAM NEGATIVE ISOLATES

ANTIBIOTICS	*Escherichia coli*		*Klebsiella spp*		*Pseudomonas aeruginosa*		*Proteus spp*		*Acinetobacter spp.*	
	Sensitive n(%)	Resistance n(%)	Sensitive n(%)	Resistance n(%)	Sensitive n(%)	Resistance n(%)	Sensitive n(%)	Resistance n(%)	Sensitive n(%)	Resistance n(%)
NALIDIXIC ACID	7(16%)	38(84%)	NP	NP	NP	NP	3(60%)	2(40%)	NP	NP
AMOXICILLIN-CLAVULANATE	7(16%)	38(84%)	7(20%)	28(80%)	2(18%)	9(82%)	4(80%)	1(20%)	NP	NP
CIPROFLOXACIN	NP	NP	28(80%)	7(20%)	11(100%	0(0%)	2(40%)	3(60%)	NP	NP
IMIPENEM	44(98%)	1(2%)	35(100%	0(0%)	11(100%	0(0%)	NP	NP	NP	NP
AMIKACIN	42(94%)	3(6%)	35(100%	0(0%)	11(100%	0(0%)	NP	NP	NP	NP
NITROFURANTOIN	39(86%)	6(14%)	7(20%)	28(80%)	NP	NP	NP	NP	NP	NP
AMPICILLIN	5(11%)	40(89%)	7(20%)	28(80%)	9(82%)	2(18%)	1(20%)	4(80%)	NP	NP
GENTAMICIN	32(71%)	13(29%)	28(80%)	7(20%)	11(100%	0(0%)	3(60%)	2(40%)	NP	NP
NORFLOXACIN	32(71%)	13(29%)	28(80%)	7(20%)	11(100%	0(0%)	3(60%)	2(40%)	NP	NP
Piperacillin-Tazobactum	NP	NP	28(80%)	7(20%)	10(91%)	1(9%)	NP	NP	NP	NP
Carbenicillin	NP	NP	NP	NP	11(100%	0(0%)	NP	NP	NP	NP
Cotrimoxazole	NP	NP	NP	NP	NP	NP	2(40%)	3(60%)	NP	NP

NP=NOT PERFORMED

IV. DISCUSSION:

[1-4,8,10]. In this study most of the samples were received from females and also most of the positive urine cultures were females[1,2].Gram negative bacteria were dominant isolates compared to gram positive bacteria.The results show MDR & among them the most common & important organisms are Escherichia coli &Klebsiella species which is showing a universal pattern.Because the number of samples are more in females so may be resistance of prevalence is more among females but the understanding part is that there is development of MDR bacteria among people irrespective of age and gender.Of course, a little variation may be seen.This is in agreement and conformity with previous studies done in India and various other countries[4] Similar such findings were found in India[3,8], and all around the world (i.e., nationally & internationally in countries like Ethiopia[11,12].turkey, Greece, Nigeria &Kuwait). My findings correlate nationally with findings of Pooja et al and LokBahadur et al done in oddanchatram of south India.[13,14].My findings also correlate internationally with findings of Demir et al in Turkey and Vazouras et al in Greece &Kiber et al.

V. CONCLUSION:

This study showed that UTI is one of the common health problems mostly among females of reproductive age group. Majority of the isolates exhibited high level antimicrobial resistance to the routine antibiotics and also development of MDR bacteria. This study further emphasis the need for continued antimicrobial surveillance. Continuous monitoring of the changing antibiotic resistance is required at local, regional and national levels. Strict adherence to Infection control practices and regular updating of the antibiotic policies and local SOPs will play a crucial role in the prevention of UTIs.

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