The isolates included both gram positive and gram negative organisms. Of the 48 isolates, gram negative bacteria accounts for 32 (66.67%) while gram positive bacteria accounts for 16(33.33%). *Escherichia coli* showed the highest prevalence of 29.17% followed by *Klebsiella* species with 22.92%, Coagulase negative *Staphylococci* (16.67%), *Pseudomonasaeruginosa* (12.5%), *Staphylococciaureus*(4.17%), *Acinetobacter*(2.08%). *Escherichia coli* was the predominant isolate among the gram negative organisms and coagulase negative *Staphylococcus* among the gram positive organisms.

Table 4: Summarizes the antimicrobial potency and spectrum of selected antimicrobial agents of different classes against UTI isolates.

Organisms	No. of isolates	Amikacin(30µg)	Cefotaxime(30µg)	Co-trimoxazole(25µg)	Ceftazidime(30µg)	Ceftazidime+ Clavulanic acid(30/10µg)	Ciprofloxacin(5µg)	Gentamycin(10µg)	Norfloxacin(10µg)	Nitrofurantoin(300µg)
Escherichia coli	14	8 (57.14%)	6 (42.86%)	4 (28.57%)	1 (7.143%)	1 (7.143%)	3 (21.43%)	9 (64.29%)	4 (28.57%)	5 (35.71%)
Klebsiella	11	6 (54.54%)	4 (36.36%)	7 (63.63%)	1 (9.09%)	2 (18.18%)	6 (54.54%)	6 (54.54%)	10 (90.9%)	1 (9.09%)
Pseudomonas	6	6 (100%)	4 (66.67%)	1 (16.67%)	1 (16.67%)	1 (16.67%)	4 (66.67%)	3 (50%)	3 (50%)	-
Coagulase negative *Staphylococci*	8	7 (87.5%)	7 (87.5%)	5 (62.5%)	1 (12.5%)	3 (37.5%)	6 (75%)	5 (62.5%)	-	1 (12.5%)
Enterococcus	6	2 (33.33%)	1 (16.67%)	-	-	1 (16.67%)	1 (16.67%)	3 (50%)	-	-
Staphylococcusaureus	2	-	-	-	-	-	-	-	-	-
Acinetobacter	1	-	-	-	-	-	-	1 (100%)	-	-

Table 5: Shows the antibiotics sensitivity and resistance patterns of isolates.

Sl no.	Antibiotic	Total no. of isolates	Sensitive		Moderatelysensitive		Resistant	
			No.	%	No.	%	No.	%
1.	Amikacin(30µg)	48	29	60.42	10	20.83	9	18.75
2.	Cefotaxime(30µg)	47	21	44.68	1	2.13	25	53.19
3.	Co-trimoxazole(25µg)	48	17	35.42	8	16.67	23	47.92
4.	Ceftazidime(30µg)	38	4	10.5	3	7.89	31	81.58
5.	Ceftazidime+ Clavulanic acid(30/10µg)	38	7	18.42	2	5.26	29	76.32
6.	Ciprofloxacin(5µg)	48	24	50.0	2	4.17	22	45.83
7.	Gentamycin(10µg)	48	27	56.25	10	20.83	11	22.97
8.	Norfloxacin(10µg)	30	17	56.67	0	0	13	43.33
9.	Nitrofurantoin(300µg)	29	7	24.13	11	37.93	11	37.93

Table 6: Shows the prevalence of ESBL producers

Sl no.	Isolates	Total no. of isolates	Extended spectrumβ-lactamase producers	
			No. of ESBL	% of ESBL
1.	*Escherichia coli*	14	5	35.71%
2.	*Klebsiella*	11	3	27.71%
3.	*Pseudomonas*	6	1	16.67%
Total		31	9	29.03%

The prevalence of ESBL producers, with a percentage of 35.71%, 27.27% and 16.67% among *Escherichia coli*, *Klebsiella* and *Pseudomonasaeruginosa* being ESBL producing. The overall prevalence of ESBL production was 9 (29.03%).

4. Discussion

UTI impose a huge burden on health care systems due to high prevalence of infection in both community and nosocomial settings.UTIis caused by variety of pathogens including *E. coli*, *K. pneumonia* and*P.aureginosa*. Continuous surveillance of antibiotic susceptibility patterns of uropathogens at local level is crucial in dealing with emerging problems of antibiotic resistance and provides assistance in managing effective initial therapy.(5)

Amoxicillin (a β-lactam antibiotic) was traditionally used in the first line therapy for UTIs, but with the spread of drug resistance, treatment options have now changed. Complicated cases of UTI usually require a longer course or intravenous antibiotics, and in case symptoms do not

improve in two to three days, further diagnostic testing is needed.(3)

The present study included 120 symptomatic patients.Urine culture was positive in 48(40%) patients which is very similar to study done by ShaistaBano*et al* 2014 (41.18%) and Anup Shah *et al* 2015(43.07%). Women accounted for 30.83%of all positive patients,which is similar to ShaistaBano*et al* 2014 (31.09%).

The gender and age wise analysis showed a higher incidence of urinary tract infection in 21-40yrs age group in females which can be explained by the fact that urinary tract infections are more common in the reproductive age group. Higher incidence of urinary tract infections among males was in the >60 years age group; which could be explained due to co-morbid conditions like prostrate hypertrophy and history of Diabetes mellitus among them.*E. coli* was the most common bacteria (29.17%) in UTI Patients, but with a different rate obtained from other populations(48.21% in Anup Shah *et al* 2015). Percentage of *Pseudomonas* 6(12.92%) was similar to study done by InamUllah Khan *et al* 2015(11.8%). Other isolates included *Klebsiella*11(22.92%), coagulase negative *Staphylococcus* 8(16.67%, *Staphylococcusaureus* 2(4.17%), Enteroccus 6(12.5%) and *Acinetobacter* 1(2.08%).
Antibiotic resistance represents a global challenge to public health. The intense use and misuse of antibiotics have been responsible for emergence of antibiotic resistance together with selection and spread of the antibiotic resistant strains of bacterial pathogens, including uropathogens. Knowledge of the local resistance and surveillance studies to monitor emerging trends of resistance through susceptibility testing of uropathogens,particularly *E. coli* is recommended.(5) This study provides current scenario of antibiotic resistance pattern in Davangere, Karnataka.

In the present study, antibiotic susceptibility patterns showed that more than 50% of the isolates(60.42%)show sensitivity to Amikacin, where all of the *Pseudomonas* isolates and more than 85% of Coagulase negative *Staphylococcus* are sensitive to Amikacin. Also, *E. coli* shows very less sensitivity towards Ceftazidime (7.14%), Ceftazidime + Clavulanic acid(7.14) and Ciprofloxacin (21.14%), which indicates that these drugs should not be chosen for treating UTI and should only be prescribed after the sensitivity report from microbiological laboratory keeping in mind the emerging antimicrobial resistance.

Rama Biswas et al found that 86.36% of all isolates were sensitive to Amikacin and 73.63% were sensitive to Nitrofurantoin. But in this study, it was found out that 60.42% of isolates were sensitive to Amikacin and just 24.13% were sensitive to Nitrofurantoin.

From the present study, it is shown that there is an increased resistance for 2nd and 3rd generation Cephalosporins like Cefotaxime, Ceftazidime and also Ceftazidime and Clavulanic acid. The resistance rates are 53.19%, 81.58% and 76.32% respectively. So, the increasing resistance to Cephalosporins promoted us to search for ESBL producers. The incidence of ESBL strains among clinical isolates have been steadily increasing over the past few years resulting in major problem for clinical therapeutics.
Detection of ESBL isolates is a challenge for microbiological laboratory because these ESBL producing gram negative bacilli appear susceptible in-vitro to certain β-Lactam antimicrobial agents, yet results in treatment failures. So, proper identification is necessary.

In this study, the frequency of ESBL producing organisms among gram negative bacterial isolates was found to be 9 (29.03%). A similar frequency of ESBL producing organisms (27.67%) was observed by Dugal *et al* 2013. The present study showed ESBLs production prevalence in 35.71% *Escherichia coli* followed by 27.27% *Klebsiella*species and 16.67% *Pseudomonas*. In comparison, study by Rama Biswas*et al* 2014 showed 46.87% of *E. coli* and 25% of *Klebsiella* species to be ESBL producers.

Many of the isolates were observed to be multidrug resistant. So the present study gives an idea about the common trend of increasing antibiotic resistance of uropathogens in this region which could be due to indiscriminate or under dose of antibiotic use. Thus this data may help the physician in proper treatment of urinary tract infections and avoid use of resistant antibiotics.

5. Conclusion

It was concluded that the incidence of UTI infections are higher among females with more prevalence in 20-30yrs age group.The study revealed that *E. coli* was the predominant bacterial pathogen of UTIs followed by *Klebsiella*. An increasing trend in production of ESBLs among UTI pathogens were noted which is more prevalent in *E.coli*, followed by *Klebsiella* and *Pseudomonas*. In the current study, a majority of isolates were sensitive to Amikacin, Gentamycin and Norfloxacin. Bacterial isolates showed more resistance against Ceftazidime and Ceftazidime + Clavulanic acid. So these drugs should not be used as first line treatment drugs and instead should be used only after antibiotic sensitivity testing.
For prevention of UTIs, implementation of strict infection control guidelines, effective hand washing and judicious use of antimicrobials is mandatory which to prevent the emergence of drug resistance among uropathogens.

References

[1] InamUllahKhan,Irfan Ali Mirja,AamerIkram, AmnaAfzal, Shamshad Ali AamirHussain et al. Antimicrobial susceptibility pattern of bacterial isolates from patients with urinary tract infection. Journal of the College and Physicians and Surgeons Pakisthan 2014;24(11):840-844.
[2] Naveen Gupta, ShailjaKundra, Anuradha Sharma, VikasGoutam, Arora DR. Antimicrobial susceptibility of uropathogens in India .Journal of infectious disease and anti microbial agents 2006; 24: 3-8
[3] Varsha Rani Gajamer, Hare KrishnaTiwari, PremDorjeeBhutia, SankhaSubraSen, RanadeepGhosh, ArunabhaSarkar. Detection of antibiotic resistance pattern with ESBL producers and MRSA among uropathogens at tertiary health care centre, North

Bengal. International Journal of Pure and Applied Bioscience 2015 April;3(2):522-533.

[4] ZinnatShahina, Md. Jahedul Islam, JesminAbedin, A.H.M. IshaqueChowdhary, Md. Arifuzzaman. A study of antibiotic susceptibility and resistance pattern of *E. coli* causing urinary tract infection in Chittagong, Bangladesh. Asian Journal of Biological Sciences 2011;4(7):548-555.

[5] ShaistaBano, Sarfraz A Tunio, AmeerAfzalMenom, Hakim Detho,RozinaBano, KalpanakumariEvaluation of antibiotic susceptibility patterns of uropathogens circulating in Hydrabad, Pakisthan. Khyber Med Univ J 2014;6(3):110-115.

[6] Rama Biswas, RaihanRabbani, HasanShahrear Ahmed, Mohammed AbdusSatterSarkar, NahidaZafrin, Md. MotlaburRahman. Antibiotic sensitivity pattern of urinary tract infection at a tertiary care hospital. Bangladesh Crit Care J 2014 March;2(1):21-24.

[7] Dr. AlkaNerurkar, Dr. PritiSolanky, Dr. Shanta S. Naik. Bacterial pathogens in urinary tract infections and antibiotic susceptibility pattern. Journal of Pharmaceutical and Biomedical Sciences 2012;21(21).

[8] Singhal A, Sharma R, Jain M, Vyas L. hospital and community isolates of uripathogens and their antibiotic sensitivity pattern from a tertiary care hospital in North West India. Ann Med Health Sci Res 2014;4(1):51-6.

[9] SmitaSood, Ravi Gupta. Antibiotic resistance pattern of community acquired uropathogens at a tertiary care hospital in Jaipur, Rajasthan. Indian Journal of Community Medicine2012 jan-mar;37(1):39-44.

[10] Muhammad Ilyas, Shabeer Ahmad, Muhammad Khurram, KanwalMazhar, Abdul Sajid. Susceptibility pattern of extended spectrum B-lactamase positive *Escherichia coli* isolate from a tertiary care hospital of Pesssshawer, Pakisthan. World Applied Science Journal2014;30(3):253-257.

[11] SavithaNagaraj, BhuveneshSukhlalKalal, NiveditaKamath, SethumadhavanMuralidharan. Microbiological and antimicrobial profile of pathogens associated with pediatric urinary tract infection: one year retrospective study from a tertiary care teaching hospital. National Journal of Laboratory Medicine 2014 March;3(1):4-7.

[12] Elo-Ilo JC, Iroezindu MO, Ezechukwu CC, Chukwaka JO. Prevalence of asymptomatic bacteriuria among pre-school children in Nnewi, South-east Nigeria. Niger J Paed 2013:40(3):278-283.

[13] AnupSaha, TapanMajumdar, ArunabhaDasgupta, PurnimaSaumandal. Prevalence of extended spectrum beta-lactamase [ESBLs] among uropathogens at a tertiary care hospital in Tripura. The Health Agenda 2015 April;3(2):555-62.

[14] D.H. Tambekar, D.V. Dhanorkar, S.R. Gulhane, V.K. Khandelwal, M.N. Dudhane. Antibacterial susceptibility of some urinary tract pathogens to community used antibiotics. African Journal of Biotechnology 2006 Sep;5(17):1562-1565.

[15] Atul Kothari, Vishal Sagar. Antibiotic resistance in pathogens causing community-acquired urinary tract infections in India:a multicenter study. J Infect Developing Countries 2008;2(5):354-358.

[16] Mandira Mukherjee, Shreyabasu, Sandeep Kumar Mukherjee, MonalisaMajumder. Multidrug resistance and extended spectrum beta-lactamase production in uropathogenic*E. coli* which were isolated from hospitalized patients in Kolkata, India. J ClinDiagn Res.2-13 Mar;7(30:449-453.

[17] Eugenie Anago, Lucie Ayi-Fanou, Casimir D Akpovi, Wilfried B Hounkpe, MichelineAgassounon-DjikpoTchibozo, Honore S Bankole et al. Antibiotic resistance and genotype of beta –lactamase producing *Escherichia coli* in nosocomial infections in Cotonou, Benin.Annals of Clinical Microbiology and Antimicrobials 2015;14(5):1-6.

[18] Hussein NS. Clinical, etiological and antibiotic susceptibility profile of community-acquired urinary tract infection in a Baghdad Hospital. Med SurgUrol 2014;3(2)

[19] S. Dugal, H. Purohit. Antimicrobial susceptibility profile and detection of extended spectrum beta-lactamase production by gram negative uropathogens. International journal of Pharmacy and Pharmaceutical Sciences 2013;5(4):434-438.

[20] Clinical and Laboratory Standards Institute. Performance Standards for antimicrobial susceptibility testing. Twenty Third informational supplement. Clinical and Laboratory Standards Institute Wayne P A.2014:M100-S23.

[21] District laboratory practice in tropical countries. Part-2, Monica Cheesbourgp*p.* 106-115.

[22] Topley and Wilson's microbiology and microbial infections. p*p.*677-680.

[23] Gradwohl's clinical laboratory methods and diagnosis. Volume 2, Part VII, page 1136-1139.

[24] Koneman Color Atlas and Textbook of Diagnostic Microbiology. Part-1, p*p.*20-25.

[25] Colle J.G, Marimon BP, Fraser AG, Simmons A, Mackie and McCartney practical Medical Microbiology, 14th ED, London, Elesvier 1996.

[26] Azra S. Hasan, D.Nair, J Kaur, G. Baweja, M Deb, *P.*Aggarwal. Resistance patterns of urinary isolates in a tertiary Indian hospital. J Ayub Med Coll Abbottabad 2007;9(1):39-41.