The study aimed to identify the prevalence of extended-spectrum beta-lactamase (ESBL) producing Escherichia coli from urine specimens and to know the prevalence of Fluoroquinolone resistance among ESBL-producing E. coli isolates.

Methods: The study was conducted on 500 E. coli isolates from urine samples received in the Department of Microbiology, MMIMSR, Mullana, Ambala. The organism isolation and identification were done as per the standard procedures and antibiotic sensitivity testing was done following Clinical Laboratory Standard Institute (CLSI) guidelines. All the strains were screened out for ESBL production as per CLSI guidelines. Ciprofloxacin, Norfloxacin, and Ofloxacin discs were used for the detection of fluoroquinolone resistance.

Results: Out of the total 500 E. Coli isolates from urine samples received in our laboratory, 69% were found to be ESBL producers.

Conclusion: We found a high level of quinolone resistance among ESBL-producing E. coli strains isolated from patients with urinary tract infections. Because of the widespread use of fluoroquinolones in our country, there is a need for sensitive antibiotic stewardship. Further research is needed to ascertain the gravity of quinolone resistance and to swiftly act against its spread among other nosocomial pathogens.

Keywords: Extended-spectrum beta-lactamase, anti-microbial resistance, Fluoroquinolone resistance
the zone diameter for ceftazidime or cefotaxime in combination with clavulanic acid (30/10 μm) than that for ceftazidime/cefoxime was taken positively for ESBL production (Fig. 1).

RESULTS AND DISCUSSION

About 3/4th (370/500) strains of E. coli were isolated from indoor patients while 1/4th (130/500) was from outdoor patients. Among the patients, 289 (59%) were female and 211 (42%) were males. The antibiotic sensitivity pattern of E. coli isolated from urine samples demonstrated high resistance to ampicillin (96%), third-generation cephalosporins such as cefixime (95%), ceftriaxone (92%), and fluoroquinolones (ciprofloxacin 87%, norfloxacin 86%, and ofloxacin 87%). Lower resistance was seen towards amoxicillin-clavulanic acid (35%), amikacin (14%), nitrofurantoin (13%), imipenem (8%), and meropenem (6%). 345 (69%) of strains were found to be ESBL producers using the CLSI-recommended phenotypic confirmatory CDDT.

The highest distribution of ESBL-producing strains was from the department of urology (24.2%), followed by medicine (21%), ICU (15.5%), obstetrics and gynecology (12%), and emergency (11%).

ESBL-producing E. coli is the significant cause of increased morbidity in patients with UTI. Antimicrobial resistance patterns of E. coli continue to pose a great threat to public health worldwide and lead to serious health problems such as prolonged hospitalization and treatment failure. An attempt was made to study the prevalence of fluoroquinolones resistance in ESBL-producing E. coli in urine samples in 500 successive, non-duplicated clinical specimens received in the Department of Microbiology, Maharishi Markandeshwar Institute of Medical Sciences and Research Mullana, Ambala. The majority of the 500 clinical isolates of E. coli in this study, that is, 76% were from indoor patients, whereas just 26% came from outdoor patients. In a study of 200 urine isolates of extended-spectrum-lactamase-producing E. coli, Khodare et al., [10] discovered that (53%) of isolates were obtained from in-patient department (IPD) and (47%) of isolates were obtained from outpatient department (OPD). FarazadehSheikh et al., [11] on the other hand, conducted a study on ESBL-producing E. coli strains isolated from UTI and found that the majority of E. coli isolates were obtained from outdoor patients (59.21%) and in-door patients (40.79%) due to hospital-acquired infection.

In our study, female patients were found to have the highest percentage of E. coli strains (58%), compared to the male patients (42%). In contrast to author Abdulzaimovic et al., [12] prevalence of UTI found that (89.87%) of E. coli were isolated from female patients whereas (10.13%) from male patients. According to another study conducted by Moue et al., [13] on the occurrence of UTIs in both OPD and IPD, females were more prone to have UTI (79.5%) than males (20.5%). UTIs are probably more common in women because their urethras are shorter than men’s, allowing bacteria to migrate upward more easily.

In the present study, the antibiotic susceptibility pattern of the E. coli isolates was found to be variable. The maximum sensitivity was found for imipenem (94%), meropenem (92%), and nitrofurantoin (87%). In contrast to author Jia et al., [14] study on community-acquired UTIs, they reported that the maximum susceptibility to E. coli was reported for ertapenem (98.9%), nitrofurantoin (96%), and Fosfomycin (95.4%). Another study done by Cebeci and Keskin [15] on the prevalence of ESBL among E. coli isolates and their susceptibility mentioned that the maximum susceptibility rate to E. coli was to ertapenem (93.7%), nitrofurantoin (91.6%), Fosfomycin (89.5%), respectively. While amoxicillin-clavulanic acid was found effective in 61% of strains. Of the other antibiotics used, maximum resistance was detected against ampicillin (96%) followed by the third-generation cephalosporins, cefixime (95%), and fluoroquinolones like ciprofloxacin (87%). In similarity with author Noor et al., [16], the study reported a resistance rate against ampicillin, ciprofloxacin, and cefotaxime (83.4%). Another study by Madani et al., [17] reported that the E. coli strain showed resistance to ampicillin (91.4%) and cefixime (61%), ciprofloxacin (66.7%), respectively.

In the present study, ESBL production was observed in (69%) of E. coli strains while (31%) were non-ESBL producers using the recommended double disc diffusion test. Furthermore, the prevalence of ESBL-producing E. coli was high, especially in hospitalized patients. According to a study conducted by Nimri and Azaizeh [18] showed that ESBL-producing E. coli were (80.7%). Another study was done by author Park et al., [19] on the classification and occurrence of E. coli and Klebsiella pneumonia isolates producing ESBL, which reported the prevalence variability in different years 17.7% (2003) and 84% (2009) of ESBL-positive E. coli strains, respectively. A study conducted by Pakzad et al., [20] reported a lower prevalence (28%) of ESBL. A similar study was done by author Tayebi et al., [21] which reported that the prevalence of ESBL differs depending on species and environmental regions. Another study by Singh and Singh [22] reported a minimum (27%) ESBL producers in isolates of E. coli. The prevalence of ESBL production in gram-negative bacilli varies widely among different geographical regions and in different clinical settings. Plasmids responsible for ESBL production tend to be large and frequently encode for resistance to other classes of antimicrobials also, thus limiting the choice of antimicrobials available for the treatment of infections. The most common cefreresistance found in ESBL-producing organisms are aminoglycosides, fluoroquinolones, tetracyclines, chloramphenicol, and sulfamethoxazole-trimethoprim.

A high proportion of our isolates (91.3%) showed resistance to fluoroquinolones. Our results showed that resistance to tested fluoroquinolones in ESBL isolates was higher than in non-ESBL-producing isolates. Another study done by Hassan and Jamal [23] demonstrated resistance to ciprofloxacin to 85%.

Table 1: Antibiotics susceptibility pattern of fluoroquinolones sensitivity in ESBL Producing E. coli isolates versus non-ESBL producing E. coli

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Susceptibility (%) among ESBL-producing strains n=345</th>
<th>Susceptibility (%) among non-ESBL-producing strains n=155</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>34 (10.1%)</td>
<td>22.5%</td>
</tr>
<tr>
<td>Ofloxacin</td>
<td>34 (10.1%)</td>
<td>22.5%</td>
</tr>
<tr>
<td>Norfloxacin</td>
<td>34 (10.1%)</td>
<td>25.8%</td>
</tr>
</tbody>
</table>

E. coli: Escherichia coli; ESBL: Extended-spectrum beta-lactamase

Fig. 1: Depict positive ESBL production
In our study, non-ESBL producing *E. coli* isolates showed resistance to ciprofloxacin (77.5%), ofloxacin (77.5%) and norfloxacin (74.2%), respectively, which is by the study done by the author Ahmed et al. [24] which showed resistance to ciprofloxacin (55%). In another study, done by Jamil et al. [25] 46% resistance to ciprofloxacin was found.

**CONCLUSION**

In our study, we found a high level of quinolone resistance (more than 91.3%) among ESBL-producing *E. coli* strains isolated from patients with UTI. Because of the widespread use of fluoroquinolone in our country, its resistance is increasing, and the coexistence of ESBL and fluoroquinolone resistance can aggravate the problem of UTI treatment further exhausting the treatment options. A judicious and culture-sensitivity-based approach might help in overcoming this problem. Rational use of antimicrobial policy as well as stopping the unnecessary prescription and non-prescription sales in retail pharmacies can be performed as strategies to prevent the increase of quinolone resistance. There is need for sensitive antibiotic stewardship. Further research is needed to ascertain the gravity of quinolone resistance and to quickly act against its spread among other nosocomial pathogens.

**CONFLICTS OF INTEREST**

The authors declare no conflicts of interest.

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**REFERENCES**