SUMMARY

1.1. A concise report of the work done

A total of 201 ESBL producing *Klebsiella* isolates were identified and included in the present study. All the isolates were subjected to antimicrobial susceptibility testing by Kirby Bauer disc diffusion method, and MIC detection was performed for fluoroquinolone antibiotics, i.e., nalidixic acid, ciprofloxacin, levofloxacin, sparfloxacin, and moxifloxacin) by E-strip method, as per CLSI 2016 guidelines. Among these isolates, virulence factors such as biofilm, hemagglutination, and hypermucoviscosity has been analyzed. The detection of plasmid mediated quinolone resistance genes (*qnrA, aac(6')Ib-cr, qepA, oqxA*, and *oqxB*), and hypermucovirulence genes (*rmpA* and *magA*) was done by PCR technique. Among the 201 isolates, 178 (88.6%) were biofilm producers, i.e., 14 (7%) were strong, 61 (30.4%) moderate, 103 (51.2%) were weak; 176 (87.6%) were hemagglutination producers in which 36 (18%) were mannose sensitive hemagglutination (type 1 fimbriae), and 140 (69.6%) were mannose resistant hemagglutination (type 3 fimbriae); and 19 (9.5%) were hypermucoviscosity positive.

This study reiterates the fact that *Klebsiella* has the ability to produce biofilm, and these biofilm producer strains exhibits greater antibiotic resistance, and this might result in treatment failure and reactivation. This study also had reported the type 3 fimbriae were more as compared to type 1 fimbriae, which is also involved to help biofilm formation in *Klebsiella* isolates.

In this study among these 201 ESBL *Klebsiella* isolates were confirmed by double disc synergy test, in which maximum isolates were resistant to AMC, i.e., 184 (91.5%), followed by 184 (91.5%) were resistant to PI, 150 (74.6%) were resistant to PIT, 165 (82%) were resistant to COT, 153 (76.1%) were resistant to all fluoroquinolones antibiotics. Out of these 201 ESBL producing *Klebsiella* isolates, 160 (79.6%) isolates were MDR. Of the 153 fluoroquinolone resistant isolates, MIC values showed that 142 isolates were completely resistant to all fluoroquinolone group of antibiotics by E-strip test. These isolates are used for identification of PMQR genes detection.
Of the 142 isolates analyzed for ESBL gene detection, i.e., *blaCTX-M* were 122 (85.9%), and among PMQR genes detection, maximum number of isolates were positive for *aac(6')Ib-cr* gene, i.e., 135 (96.5%), followed by 130 (91.5%) were positive for *oqxB*, 120 (84.5%) were positive for *oqxA*, 60 (42.2%) were positive for *qnrA*, and only 5 (3.5%) were positive for *qepA* gene. Of the 19 hypermucoviscosity positive isolates, 5.8% (3/19) were positive for *rmpA* gene, and 47.4% (9/19) isolates were positive for both *rmpA* and *magA* genes.

The results of the present study highlights the high frequency of ESBL gene, i.e., *blaCTX-M* type and PMQR genes, i.e., *aac(6')Ib-cr,oqxA* and *oqxB* among fluoroquinolone resistant ESBL producing *K. pneumoniae* isolates, whereas *qepA* gene was detected in only five isolates.