

Prevalence of multidrug resistant (MDR) Enterobacteriaceae in rural tertiary care hospital

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Abstract

Multidrug resistant organisms (MDROs) infections have increased in recent years. The antibiotic resistance development in clinical isolates of Enterobacteriaceae is rapid and that spread in the hospital.

Objectives: 1) To detect multidrug resistant Enterobacteriaceae 2) To determine frequency of MDR Enterobacteriaceae isolates by site of infection. 3) To determine antibiotic susceptibility pattern of multidrug resistant Enterobacteriaceae.

Materials and Method: Antibiotic susceptibilities of bacterial isolates from clinical specimens were determined according to standard guidelines. MDRO detection was based on the joint definition given by the European Center for Disease Prevention and Control (ECDC) and the Centers for Disease Prevention and Control (CDC).⁽⁶⁾

Results: Out of 1585 clinical samples, 961(61%) samples had enterobacteriaceae isolates. Out of total 961 Enterobacteriaceae species studied, 648 (41 %) species were MDR. The commonest MDR Enterobacteriaceae species were *E. coli* 364/519 (54%), followed by *Klebsiella sp.* 280/431 (45%). The commonest MDR Enterobacteriaceae infections were urinary tract infections 400/648 (61%), followed by respiratory infections 133/648 (21%). MDR Enterobacteriaceae isolates showed decreased sensitivity towards third generation cephalosporins, aminoglycosides and fluoroquinolones.

Conclusion: The early detection of MDR bacterial species should be started by all microbiology laboratories to give effective treatment to the patients and to reduce the cross infections to other patients in hospital as well as to reduce threat of antimicrobial resistance which is at present a global problem.

Keywords: Enterobacteriaceae, Multidrug resistant organisms (MDROs)

Introduction

Antimicrobial resistance increases nowadays that leads to serious risk to global public health.⁽¹⁾ Antimicrobial resistance leads to a threat to patient's treatment. There is increased morbidity and mortality, increased hospital stay, and financial loss associated with antimicrobial resistance.⁽²⁾

Prevalence of multidrug resistant organisms (MDROs) have increased in the recent years.⁽³⁾

Healthcare institutions worldwide are more and more facing the emergence and transmission of MDROs. Patients were harmed as a result of MDROs infections. If not checked, the spread of MDROs will also increase the burden on the healthcare infrastructure, as well as increase health care costs.⁽⁴⁾

The antibiotic resistance development in the clinical isolates of Enterobacteriaceae is rapid and that spread in the hospital. The health care planners have stated "Health for all by the year 2000." There is increasing number of infectious diseases cases; in many parts of the world is same as preantibiotic era.⁽⁵⁾

This study was done to detect the MDR Enterobacteriaceae isolates.

Objectives

1. To detect multidrug resistant (MDR) Enterobacteriaceae species
2. To determine frequency of MDR Enterobacteriaceae by site of infection.

3. To determine antibiotic susceptibility pattern of MDR Enterobacteriaceae

Materials and Method

The antibiotic susceptibility reports available from January 2016 to December 2016 of microbiology department analyzed.

The data of species of enterobacteriaceae, its antibiotic susceptibility result and type of samples from which Enterobacteriaceae isolated used for analysis.

Enterobacteriaceae isolated from different clinical samples received in microbiology department and were identified as Enterobacteriaceae.⁽⁶⁾

MDRO detection:

Antimicrobial susceptibility test

Antibiotic susceptibilities of bacterial isolates were determined according to standard guidelines.⁽⁷⁾

Isolated and identified colonies of bacteria were inoculated and antibiotic disks were placed on MHA plate. Antibiotic disks used:

1. Aminoglycosides: Amikacin, Gentamicin, Tobramycin
2. Piperacillin- Tazobactam
3. Carbapenem: Imipenem
4. Cephalosporins: Cefotaxim, Ceftriaxone, Cefepime, Ceftazidime
5. Quinolones: Ciprofloxacin, Levofloxacin
6. Trimethoprim- sulphamethoxazole
7. Chloramphenicol
8. Tetracycline

9. Colistin

10. Cefotaxim+ Clavulanic acid

The MHA plate was incubated at 37°C for 18-20 hrs. Result was recorded as sensitive, resistant and intermediate as per standard guidelines.

Detection of MDRO was based on the definition given by the European Center for Disease Prevention and Control (ECDC) and the Centers for Disease Prevention and Control (CDC).⁽⁸⁾ MDR was defined as acquired non-susceptibility to at least one agent in three or more antimicrobial categories.

Extended Spectrum B-lactamases (ESBL) producing Enterobacteriaceae was detected by combined disk method. cefotaxim (30µg) and cefotaxim plus

clavulanic acid (30µg + 10µg) disks were used.⁽⁹⁾ Increase in diameter of ≥5mm with cefotaxim + clavulanic acid as compared to cefotaxim disk alone was considered ESBL detection.

Result

The antibiotic susceptibility reports available from January 2016 to December 2016 of microbiology department analyzed. A total number of 1585 antibiotic susceptibility reports of clinical samples with bacterial growth were studied. There was 961(61%) antibiotic sensitivity reports of Enterobacteriaceae isolates were studied.

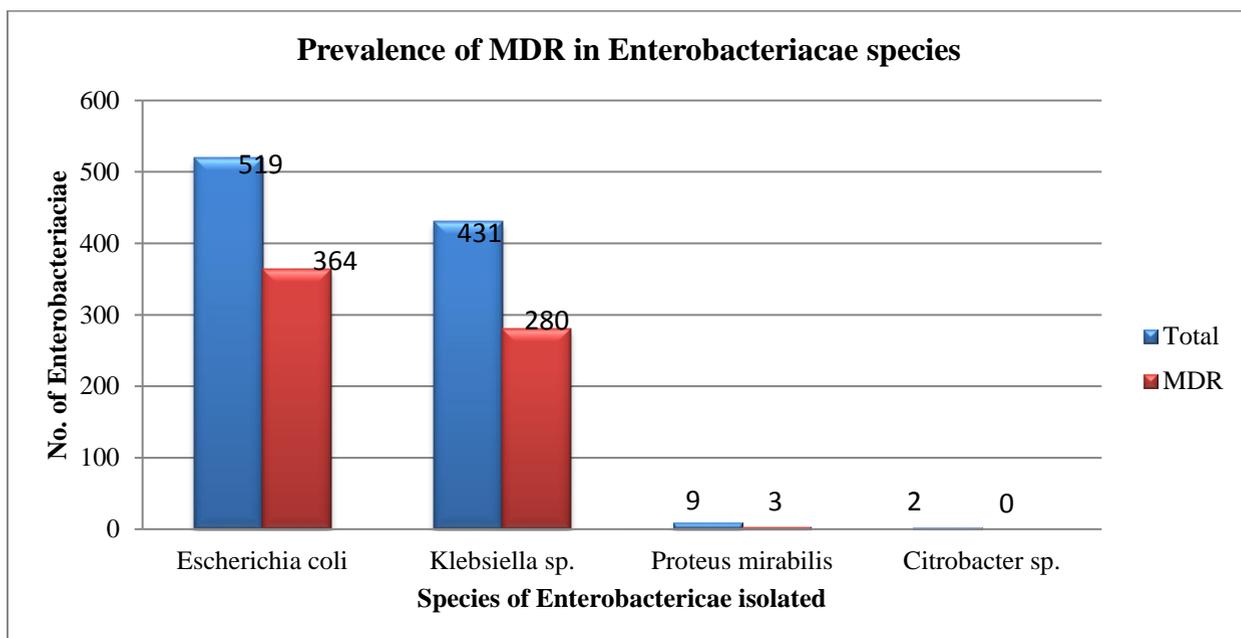


Fig. 1: Prevalence of MDR in Enterobacteriaceae species (n=961)

Fig. 1 shows the prevalence of MDR in Enterobacteriaceae species isolated.

Out of total 961 Enterobacteriaceae species studied, 648 (41%) species were MDR. Amongst 648 MDR Enterobacteriaceae species isolated, the commonest MDR Enterobacteriaceae species were *E. coli* 364/519 (54%), followed by *Klebsiella sp.* 280/431 (45%).

Table 1: Distribution of MDR Enterobacteriaceae isolates by site of infections (n=648)

Distribution of MDR Enterobacteriaceae isolates by site of infections (n=648)		
Site of infections	No.	%
Urinary tract infections	400	62
Respiratory infections	133	21
Wound infections	32	5
Stool	23	4
Others	54	8

Table 1 shows the distribution of MDR Enterobacteriaceae isolates by site of infections

Amongst 648 MDR Enterobacteriaceae species isolated from various site of infection, the commonest infections were urinary tract infections 400/648 (61%), followed by respiratory infections 133/648 (21%).

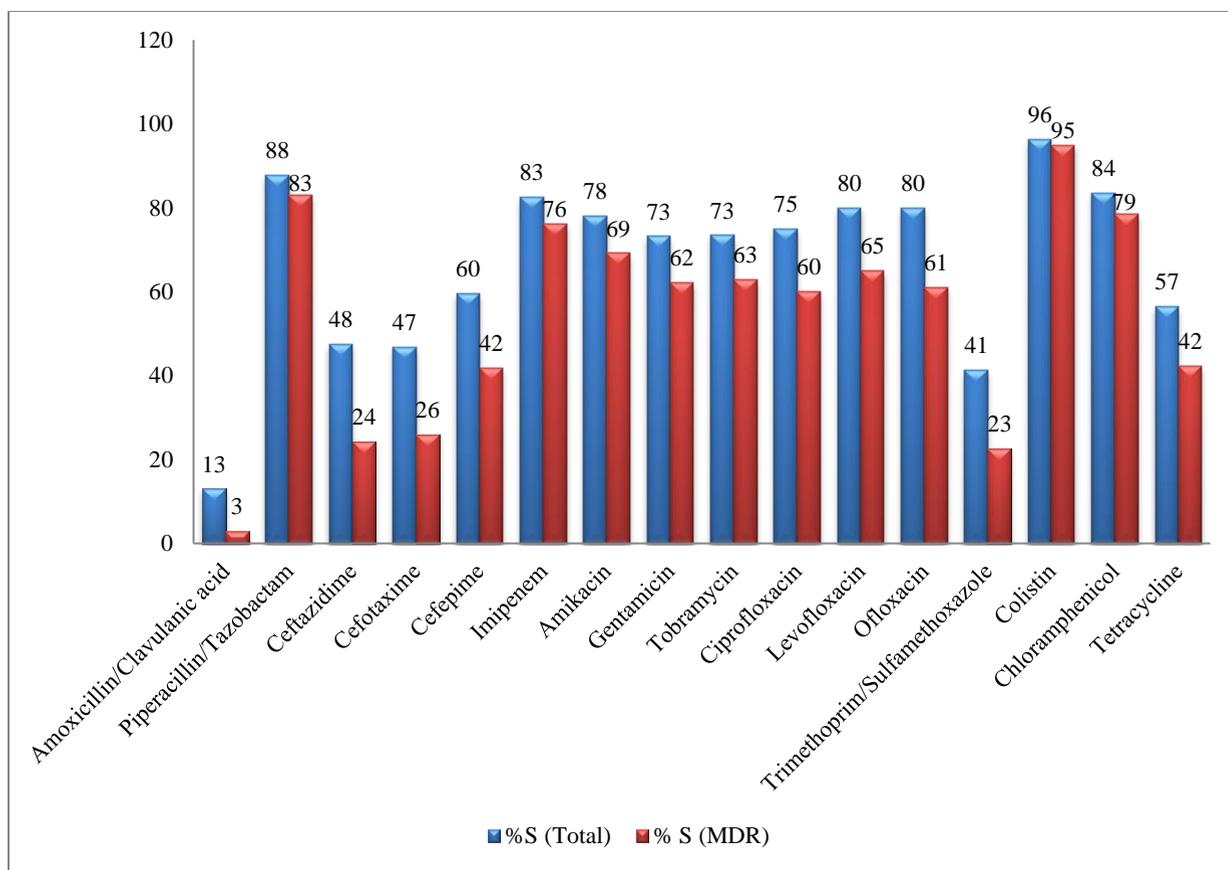


Fig. 2: Antibiotic susceptibility pattern of MDR Enterobacteriaceae isolates

Amongst all Enterobacteriaceae species isolated, 86% and in MDR isolates 76% species were imipenem (carbapenem) sensitive. 95% MDR Enterobacteriaceae isolates were sensitive to colistin. MDR Enterobacteriaceae isolates showed decreased sensitivity towards third generations cephalosporins, aminoglycosides and fluoroquinolones.

In the present study, 121 (13%) ESBL producing Enterobacteriaceae species were isolated.

Discussion

Prevalence of MDROs varies temporally, geographically, and by hospital setting.⁽¹⁰⁾ There is increased hospital days financial burden, and mortality related to MDROs and multidrug-resistant gram-negative bacilli.^(11,12)

In present study, 648(41%) Enterobacteriaceae were MDR. Shilpi et al study reported 37.1% isolates were MDR.⁽⁵⁾

In present study, the commonest MDR Enterobacteriaceae species were *E. coli* 364/519 (54%), followed by *Klebsiella sp.* 280/431 (45%). Shilpi et al and Aly et al study also reported the prevalent MDR Enterobacteriaceae species was *E. coli* followed by *Klebsiella sp.*^(5,13) Riyadh et al study reported the most common MDR pathogens were *P. aeruginosa* followed by *E. coli*.⁽¹⁴⁾

In present study, the urinary tract infections 400/648 (61%) and respiratory infections 133/648 (21%) were the most common infections caused by MDR Enterobacteriaceae isolates. Abdullah et al study reported blood stream infection (24.6%) and pneumonia (24.3%) were the most common infections, followed by urinary tract infection (18.8%) caused by MDROs.⁽¹⁵⁾

Amongst all Enterobacteriaceae species isolated, 86% and in MDR isolates 76% species were imipenem (carbapenem) sensitive. MDR Enterobacteriaceae isolates showed decreased sensitivity towards third generation cephalosporins, aminoglycosides and fluoroquinolones. 95% MDR Enterobacteriaceae isolates were sensitive to colistin.

The study was done to identify the common types of MDR Enterobacteriaceae isolates. The commonest MDR Enterobacteriaceae isolate in this study is *E. coli*, followed by *Klebsiella sp.* The most frequent site of infection by MDR Enterobacteriaceae is urinary tract infections followed by respiratory infections. 76% MDR Enterobacteriaceae isolates are sensitive to imipenem. The most effective antibiotic for MDR Enterobacteriaceae isolates are colistin.

The early detection of MDR bacterial species should be started by all clinical microbiology laboratories to give effective treatment to the patients and to reduce the cross infections to other patients in

hospital as well as to reduce threat of antimicrobial resistance which is at present a global problem.

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