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DRUG RESISTANCE IN *ESCHERICHIA COLI* AND *KLEBSIELLA PNEUMONIAE* ISOLATES FROM A TERTIARY CARE HOSPITAL OF NORTHERN INDIA AND THERAPEUTIC ALTERNATIVES.

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ABSTRACT

Antimicrobial resistance is a global concern, but a major threat in India where antibiotic policies are either non-existent or poorly implemented at hospital**.** Among the Enterobacteracea family *Escherichia coli* and *Klebsiella pneumoniae* are the major pathogens which are usually isolated from all specimens and also reported as Extended Spectrum β-lactamase producers and muldidrug resistant. In such situation carbapenams serve as the drugs of choice but recently resistance has been reported even to these due to the excessive misuse of these agents. Therefore various therapeutic alternatives such as aminoglycosides and piperacillin/tazobactum which show good susceptibility towards these microbes should be considered to reduce the load of increasing antimicrobial resistance.

KEYWORD: *Escherichia coli* and *Klebsiella pneumoniae.*

INTRODUCTION

The resistance to the antimicrobials has been increasing over the years and is varying from country to country. The intensive care unit (ICU) population has one of the highest occurrence rates of nosocomial infections nearly about 20-30% of all ICU admissions as well as increasing resistance to multiple antimicrobial agents.[1] The frequent use of broad-spectrum antibiotics results in colonization with resistant Gram-negative bacteria and consequently in serious infections.[2] *Escherichia coli* and *Klebsiella pneumoniae* are the most frequently isolated pathogens from wards and the ICUs. These account for most extra-intestinal infections due to Gram negative bacilli and are the most virulent pathogens within this group.[3] The antimicrobial resistance profiles of these organisms vary by species, geographic location, regional antimicrobial use, and hospital site (e.g., intensive care units (ICUs) versus wards). Extended-spectrum β-lactamase (ESBL) producing strains within these isolates are among the most multidrug- resistant pathogens in hospitals and are spreading worldwide.[4,5] These were initially described in hospitals (ICUs > wards) and long term care facilities, however, over the last decade, CTX-M ESBLs have been increasingly described in community-acquired strains.[3]

As reported by ICMR, recently an increasing drug resistance among Enterobacteriacea (*Escherichia.coli* and *Klebsiella*) to both quinolones (upto 80%) and third generation cephalosporins (upto 75% on account of extended spectrum β lactamases) has been documented from various multidisciplinary health institutes of India.[6] In view of this increasing resistance, it is important to re-analyze empirical therapy for infections caused by these organisms.

MATERIAL AND METHODS:

We conducted a cross-sectional prospective study to detect the antimicrobial resistance and ESBL production in *E.coli* and *Klebsiella pneumoniae* isolates obtained from various clinical samples (blood, urine, pus and endotrachial secretions) received in microbiology laboratory at our tertiary care hospital from July 2014 to December 2014. Total isolates obtained were 200 and identification was done by standard biochemical tests.[7]Antibiotic sensitivity testing was carried out on Mueller Hinton Agar(MHA) medium by Kirby Bauer disc diffusion method and interpreted as per the Clinical and Laboratory Standard Institute (CLSI) guidelines.[8] Antibiotic discs used were amoxicillin/clavulanic acid(AMC)(30µg), amikacin(AMK)(30µg), ceftazidime (CAZ)(30µg), gentamicin(GEN)(10µg), ciprofloxacin (CIP)(5µg), piperacillin/tazobactum (PTZ)(100/10µg), imipenam (IMP)(10µg) and meropenam (MRP)(10µg). The ATCC *Escherichia coli* 25922 is the control strain used. All isolates were tested by screening and confirmatory tests for ESBL production by combination discs using CAZ (30µg) and ceftazidime/clavulanic acid(CAC) (30/10µg).[4] Resistance pattern of *E.coli* and *Klebsiella pneumoniae* isolates to various antibiotics

obtained from different ICUs and other wards of the hospital were studied. An isolate was considered multidrug resistant (MDR) if found resistant to three or more antibiotics belonging to different groups of antimicrobials.[9]

RESULTS AND DISCUSSION

Of the total isolates, 142(134 indoor and 8 from ICUs) constituting 71% were *E. coli* and 58(38 indoor and 21 from ICUs) constituting 29% were *K. pneumoniae*. *E.coli* strains exhibited resistance ranging from 11 to 80% for different antimicrobials while *K.pneumoniae* strains showed resistance ranging from 22 to 69 percent [Table1].

TABLE 1: Resistance pattern of *E.coli* and *K.pneumoniae* to various antimicrobials.

ANTIMICROBIALS	*Escherichia coli*n (percentage resistance)	*Klebsiella pneumoniae* n (percentage resistance)
CIP	64/124(51.6)	16/55(29)
AMK	14/124(11.2)	13/57(22.8)
AMC	100/124(80.6)	40/58(68.9)
CAZ	85/142(59.8)	32/58(55.1)
GEN	33/124(23.8)	25/57(43.8)
MRP	46/142(32.3)	33/58(56.8)
PTZ	10/116(8.6)	19/58(32.7)

n= isolates resistant /total isolates in which the antibiotic was tested. CIP=ciprofloxacin, AMK=amikacin, AMC=amoxicillin/clavulanic acid, CAZ=ceftazidime, GEN=gentamicin, MRP=meropenam, PTZ=piperacillin/tazobactum

ESBL isolates were 30 (15%) and out of these, 28(19.7%) were *E.coli* and 2 (3.4%) were *K.pneumoniae*. All ESBL isolates were obtained from indoor patients. Our finding is corroborated by earlier studies which have reported ESBL production significantly more with *E.coli* than *K.pneumoniae* strains.[10,11,12]

We found highest resistance for amoxicillin /clavulanic acid (80.6 percent). High rates of resistance for AMC have also been reported from other Indian studies.[9,13] As documented by the latest antimicrobial resistance data reported by ICMR we also observed higher resistance for CIP(64% for *E.coli*) and CAZ (59%) in our study. For MRP, *E.coli* and *K. pneumoniae* exhibited 32.3% and 56.8% resistance which highlight's the future increasing resistance in carbapenams for these isolates.

59(41.5%) of 142 *E.coli* and 43 of 58(74.1%) *K.pneumoniae* isolates were multi drug resistant All ESBL isolates were 100% sensitive to AMK and PTZ. High susceptibility to PTZ and AMK has been reported in other studies also.[13]

Keeping in view the high resistance to penicillins, cephalosporins and fluoroquinolones, carbapenems serve as the drug of choice in severely ill patients especially those infected with ESBL producing strains. A major concern in this regard is the widespread use of and subsequent emergence of carbapenemase producing strains. To overcome such selection pressure, alternative therapies must be available. As lower level of resistance was observed for aminoglycosides especially amikacin, we also recommend these drugs as an alternative therapy in patients with normal renal functions while in case of renal impairment piperacillin/tazobactum which showed high susceptibility in our study serves to be a good choice.

Thus, judicious use of available therapeutic options is the key to defeat the resistant *E. coli*, *K. pneumoniae* and other common pathogens.

REFERENCES

1. Brusselaers N, Vogelaers D, Blot S. The rising problem of antimicrobial resistance in the intensive care unit. *Ann Intensive Care*, Nov 23, 2011; 1: 47.
2. Kucukates E. Antimicrobial resistance among Gram-negative bacteria isolated from intensive care units in a Cardiology Institute in Istanbul Turkey. *Jpn J Infect* Dis., 2005; 58: 228-31.
3. Thomas A. Russo, James R. Johnson. Diseases Caused by Gram-Negative Enteric Bacilli In: Hauser SL, Fauci AS, Kasper DL, Braunwald E, Jameson JL and Longo DL et al, editors. Harrison's principles of internal medicine. 19thed.USA: McGraw-Hill Companies, Inc., 2015; 1025-36.
4. Ben-Ami R, Rodríguez-Baño J, Arslan H, Pitout JD, Quentin C, Calbo ES, et al. A multinational survey of risk factors for infection with extended-spectrum β-lactamase–producing *Enterobacteriaceae* in nonhospitalized patients. Clin Infect Dis., 2009; 49: 682–90.
5. Kader AA, Kumar A, Kamath KA. Fecal carriage of extendedspectrum beta-lactamase–producing *Escherichia coli* and *Klebsiella pneumoniae* in patients and asymptomatic healthy individuals. Infect Control Hosp Epidemiol, 2007; 28: 1114–6.
6. Management of Community- onset Acute Undifferentiated Fever in Adults. Treatment Guidelines for Antimicrobial Use in Common Syndromes. Indian Council of Medical Research. Department of Health Research New Delhi, India, 2017; 5-14.
7. Collee JG, Marmion BP, Fraser AG, Simmons A. *Mackie and McCartney's practical medical*

microbiology. 14thed. New York: Churchill Livingstone, 1996; 978.
8. Clinical and Laboratory Standards Institute 2012. Performance standards for antimicrobial susceptibility testing. 22nd international supplement. M100-S22. Wayne, PA, USA: CLSI, 2012.
9. Niranjan V. & Malini A. Antimicrobial resistance pattern in *Escherichia coli* causing urinary tract infection among in patients. Indian J Med Res., 2014; 139(6): 945-48.
10. Rao SP, Rama PS, Gurushanthappa V, Manipura R, Shrinivasan K. Extended-Spectrum Beta-Lactamases Producing *Escherichia coli* and *Klebsiella pneumoniae*: A Multicentric study Across Karnataka. J Lab Physicians, Jan, 2014; 6(1): 7-13.
11. Tankhiwale SS, Jalgaonkar SV, Ahamad S, Hassani U. Evaluationof extended spectrum beta lactamase in urinary isolates. Indian J Med Res., 2004; 120: 553-6.
12. Babypadmini S, Appalaraju B. Extended spectrum – lactamases in urinary isolates of Escherichia coli and Klebsiella pneumoniae prevalence and susceptibility pattern in a tertiary care hospital.Indian J Med Microbiol, 2004; 22: 172-4.
13. Umadevi S, et al. Prevalence and antibiogram of ESBL producers. Journal of Clinical and Diagnostic Research, Apr, 2011; 5(2): 236-39.