

SCREENING ANALYSIS OF EXTENDED SPECTRUM BETA-LACTAMASES (ESBLs) PRODUCTION FROM THE KLEBSIELLA ISOLATES OBTAINED FROM THE HOSPITAL

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Abstract

The third most prevalent illness in India is a UTI, which may afflict patients both inside and outside of hospitals and affects individuals of all ages. The prevalence of UTI is steadily rising, which is bad. Antibacterial medicine use increases as a result of Introduction 2 and has an impact on people's socioeconomic lives. Penicillins, oxyminocephalosporins, monobactams, and cephalosporins up to generation 3 and 4 are only a few examples of the practically all -lactam antibiotics that can be hydrolyzed by extended-spectrum -lactamases (ESBLs). ESBLs are found in a variety of bacteria from the "Enterobacteriaceae family, including *Klebsiella pneumoniae*, *E. coli*, *Proteus mirabilis*, and *Salmonella* species". The aim of the investigation is to screen the extended spectrum beta-lactamases (ESBLs) production from the *Klebsiella* isolates obtained from the hospital. Method is to in case of admitted (IPD) patients from various departments urine was collected as freshly voided mid-stream specimen or by catheterization or suprapubic aspiration and sent to the laboratory. Inclusive criteria is 300 non-duplicate pure cultures of *K. pneumoniae* isolated from urine samples of patients > 10yrs of age whereas, exclusive criteria is to Urine samples of patients < 10 years of age were excluded from the study. In the screening test, detection of resistance to one or more of the four of these drugs (ceftazidime, cefotaxime, ceftriaxone and aztreonam) employed were considered to be an ESBL producer 226 (75.3 %) isolates were found to be resistant. A very high resistance of ESBL producers were seen towards ceftazidime, cefotaxime and ceftriaxone.

Keywords: *Extended spectrum beta-lactamases, Klebsiella, patients, resistance*

Introduction

The use of third generation cephalosporins in clinical settings was acknowledged as a significant advance in the "fight against β -lactamase-mediated resistance to antibiotics" (Arora et al., 2023). This anticipation, however, was short-lived, because "extended spectrum beta-lactamases (ESBLs)" were shortly found. By hydrolyzing these antibiotics, ESBLs are β -lactamases that can confer "bacterial resistance to penicillins, first, second", and third subsequent generations "cephalosporins, and aztreonam (but not cephamycins or carbapenems)"; they are prevented by β -lactamase inhibitors like clavulanic acid (Narendrakumar et al., 2023). These enzymes are plasmid-coded, and since they may transmit to other bacteria, their incidence has dramatically increased globally in a relatively short period of time (Amir et al., 2023). In clinical isolates, the proportion of organisms that produce ESBL ranges from 20-71% in India to 8-45% globally (Naas et al., 2023).

"Recurrent UTIs, vesicoureteral reflux", prior antibiotic "exposure, younger age, and *Klebsiella* species" are risk factors for ESBL uropathogens. It is now well acknowledged that using antibiotics during the preceding 1-3 months, particularly as a continuous prophylactic, is an important contributor to the development of tolerant uropathogens (Arslan et al., 2023). Earlier exposure to sunlight, especially to

third generation these antibiotics, as well as underlying illnesses necessitating hospitalization have both been linked to 10–12 AmpC uropathogens. In addition, kids who have already had a UTI caused by an ESBL, AmpC E. coli, or Klebsiella infection are more likely to have another UTI caused future occurrence of comparable or another microbe with extremely resistant characteristics (Bonardi et al., 2023). Travelling to areas where infections are prevalent, using invasive therapies, and staying in hospitals for an extended period of time are indicators of danger for urinary tract pathogen that produce carbapenemase, notably K. pneumonia (Liu et al., 2023). These types of bacteria often cause epidemics in maternity rooms, which may result in an elevated level of illness and death alongside unexpected pathogen colonisation and UTIs month thereafter (Martin et al., 2023).

Material and method

A total of 300 Klebsiella pneumoniae strains isolated from urine samples were incorporated in the study. These urine samples were procured from patients attending various OPD's or admitted in the various wards of Chattrapati Shivaji Subharti hospital. Both masculine and female patients have isolated bacterial strains. All of the study's participants were older than eleven years old. The study's treatment participants were supplied with safe to use dry containers and asked to provide 10- to 20-ml specimens. At the start of the day, the patient's fresh catch transitional pee was taken in for analysis. The female patient was instructed to clean the region surrounding the urethral entrance with water that is clean, dry that region, and collect the urine from their knees open inside the OPD, whereas men were given the instructions to wash their hands thoroughly before receiving the samples.

Statistical data analysis

The statistical approaches were carried out using SPSS for Windows, & data was entered in MS-Excel (version 22.0). Statistics by using the Pearson's "Chi-square test and a p value of less than 0.05 was considered as statistically significant under categorical variables".

Result and Discussion:

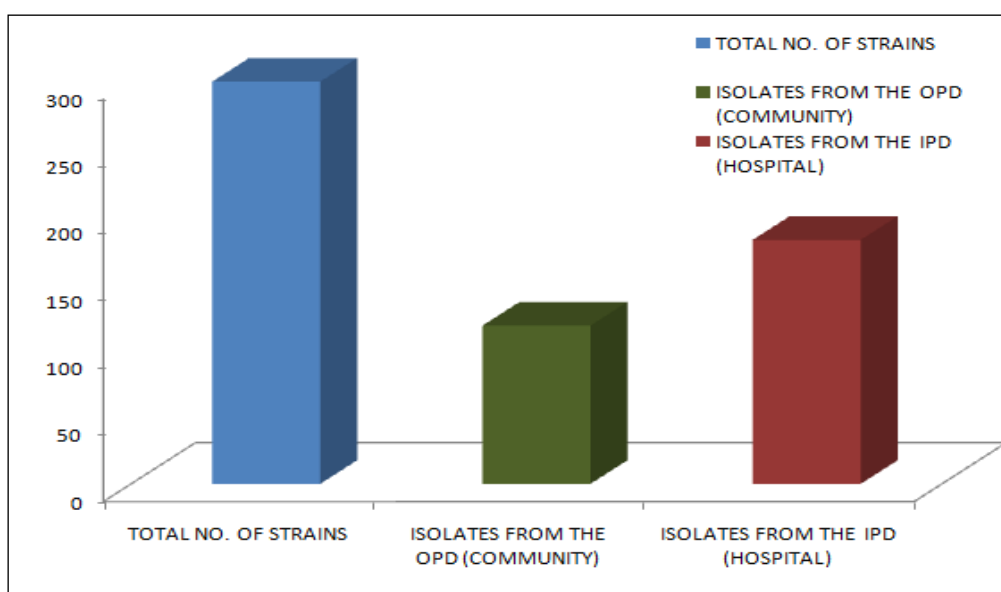
Table 1: Distribution of patients in the OPD and the IPD (n=300)

OPD/IPD	FREQUENCY (N=300)
GYNAECOLOGY OPD	46
GYNAECOLOGY WARD	34
MALE SURGICAL WARD	33
MEDICAL OPD	33
MALE MEDICAL WARD	22
LPH OPD	8
LPH IPD	13
FEMALE SURGICAL WARD	20
SKIN INTENSIVE CARE UNIT	15
SURGICAL OPD	14
FEMALE MEDICAL WARD	15
PAEDIATRIC WARD	10
MEDICAL INTENSIVE CARE UNIT	7
EMERGENCY WARD	6
SKIN OPD	6

INTENSIVE CRITICAL CARE UNIT	5
INTENSIVE CARE UNIT	5
LABOUR ROOM	4
PRIVATE WARD	3
SKIN WARD	1

Table 2: Distribution of isolates obtained from the community and hospital (n=300)

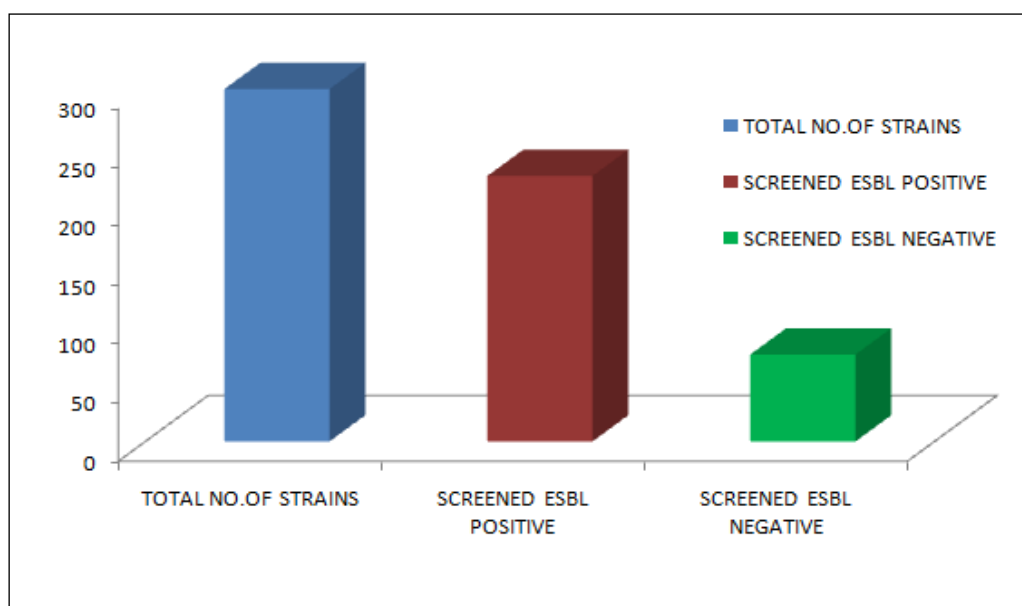
TOTAL NO. OF STRAINS	ISOLATES FROM THE OPD (COMMUNITY)	ISOLATES FROM THE IPD (HOSPITAL)
300	118(39.3%)	182(60.6%)

**Figure 1: Distribution of isolates obtained from the community and hospital (n=300)**

In the study strains isolated included 39.3% from the community patients and 60.6% from the hospitalized patients. “In the screening test, detection of resistance to one or more of the four of these drugs (ceftazidime, cefotaxime, ceftriaxone and aztreonam)” employed were considered to be an ESBL producer 226 (75.3 %) isolates were found to be resistant.

Table 4: Preliminary screening for ESβLs.

TOTAL NO.OF STRAINS	SCREENED ESBL POSITIVE	SCREENED ESBL NEGATIVE
300	226	74

**Figure 2: Preliminary screening for ESβLs.**

Resistance to Cefotaxime was observed in 211 (70.3%), Aztreonam in 200 (66.6%), Ceftazidime in 218 (72.6%) and Ceftriaxone in 193 (64.3%) isolates. A total of 246 out of 300 *K. aeruginosa* isolates, or 82.0%, had MDR (multidrug resistant) characteristics. This investigation discovered significant differences in the antibacterial response patterns of *K. burg* populations to various β -lactam and non- β -lactam drugs. Out of the 300 total isolates, only 4 (1.3%) (all from inpatients) exhibited antibiotic resistance. A total of 226 individuals (75.3%) out of 300 isolated strains of *K. pneumoniae* were presumed positive in the first test conducted for the synthesis of ESβLs. Although 179 (59.6%) of the strains were confirmed by phenotype testing to be producing ESβLs. Aljanaby et al., (2017) This study revealed a higher rate of 28% in *K.pneumoniae* isolates, higher being the ESβL producers (p value 0.03). But a similar study from northern part of the country reported a high susceptibility rate of 93.48% to Nitrofurantoin. In this study approximately 65-73% resistance was seen in the isolates to all the three cephalosporins that being higher in ESβLs.

Conclusion

The results obtained from this study have revealed the following conclusions: Of the 300 *Klebsiella pneumoniae* isolates ESβLs were detected in 246 which in the present scenario is a significantly high number. About 82.0% of the isolates of *K.pneumoniae* were multi drug resistant. A very high resistance of ESβL producers were seen towards ceftazidime, cefotaxime and ceftriaxone.

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