ORIGINAL RESEARCH PAPER

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KEY WORDS:

PREVALENCE OF EXTENDED SPECTRUM BETA LACTAMASE PRODUCING KLEBSIELLA ISOLATES IN A TERTIARY CARE HOSPITAL

Dr. R. Nepoleon MD Prof. and HOD, Dept. of Microbiology, Sree Mookambika Institute of Medical Sciences, Kulasekharam.

Dr. Daya Pauline S* Junior Resident, Dept. of Microbiology, Sree Mookambika Institute of Medical Sciences, Kulasekharam. *Corresponding Author

ABSTRACT

Introduction: Resistance to first line antibiotics creates a situation similar to pre-antibiotic era, for treating any infection using high level antibiotics. Information about the prevailing antibiotic resistance among common pathogens is useful in making an appropriate choice of empiric therapy. Klebsiella is an important pathogen concerning humans causing increased morbidity and mortality. Among Klebsiella, K. pneumoniae is considered as the predominant organism causing multidrug resistance.
Aim: To find out the prevalence of Klebsiella isolates and their antibiotic susceptibility pattern among various clinical isolates.
Methodology: Study design and setting: A cross sectional study conducted in the department of Microbiology, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District.
Study period: One year (January 2018 - December 2018).
Antibiotic susceptibility testing of all isolates was performed by Kirby-Bauer's disc diffusion method and interpretation of the results was done.
Results: During this one-year study period, a total of 1090 cultures were positive for growth, of which 133 (12.2%) were found to be Klebsiella. Among the Klebsiella isolates, 56 were ESBL positive.
Conclusion: The findings of this study emphasized the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used antimicrobial agents. These data may be used to determine trends in antimicrobial susceptibilities, to formulate local antibiotic policies in order to assist clinicians in the rational choice of antibiotic therapy, thereby preventing misuse or overuse of antibiotics.

INTRODUCTION

Resistance to first line antibiotics creates a situation similar to pre-antibiotic era. for treating any infection by using high level antibiotics like 2nd / 3rd generation cephalosporins, even though we know logically that higher generation antibiotic groups should not be prescribed initially without the availability of culture report. Due to lack of rational antibiotic policy in clinical medicine, antibiotics are misused more often leading to emergence of multidrug resistant strains (MDR) of pathogenic bacteria and even the commensals. Spread of any MDR bacterial strain is so fast causing a nosocomial spread[1]. The antibiotic profile of various pathogens has changed dramatically due to the rapid emergence of extended spectrum beta lactamases (ESBL) producing pathogens. Extended spectrum beta lactamases producing Enterobacteriaceae have increased among the clinical isolates, of which ESBL positive Klebsiella has become an important nosocomial infection[2].

ESBLs are primarily produced by gram negative organisms like Klebsiella, Escherichia coli, Acinetobacter baumanii, Proteus sp., Pseudomonas aeruginosa and Salmonella[3]. ESBLs are class A beta lactamases that hydrolyse penicillins, oxyimino cephalosporins and monobactams, but not cephamycins and carbapenems. They are inhibited by clavulanic acid[4].

Information about the prevailing antibiotic resistance among common pathogens is useful in making an appropriate choice of empiric therapy. Delayed reporting of ESBL positive organisms may lead to prolonged hospital stay, increased morbidity, increased mortality and high health care costs[5].

Klebsiella is an important pathogen concerning humans leading to increased morbidity and mortality. Klebsiella is normally found in the bowel of man & animals, water and soil. Klebsiella is a common pathogen causing broncho-pneumoniae, urinary tract infection (UTI) and septicemia. Among Klebsiella, K. pneumoniae was considered as the predominant organism causing multidrug resistance, but now multidrug resistant Klebsiella oxytoca is also being isolated more frequently[6].

The present study was done to find out the prevalence of Klebsiella isolates and their antibiotic susceptibility pattern among various clinical isolates.

METHODOLOGY

Study design and setting: A cross sectional study conducted in the **Department of Microbiology, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District**.

Study period: One year (January 2018 - December 2018).
Inclusion criteria: All the Klebsiella isolates.
Exclusion criteria: All other isolates were excluded.

Processing of Samples:
All clinical samples were cultured on routine culture media by semi-quantitative method as described in World Health Organization (WHO) manual [16]. Isolation and identification of isolates were done following their morphology in Gram's staining, cultural characteristics and biochemical properties, as per the Manual of Clinical Microbiology.

Antimicrobial Susceptibility:
Antibiotic susceptibility testing of all isolates was performed by Kirby-Bauer's disc diffusion method and interpretation of the results was done as described in CLSI 2013 guidelines[7].

Screening of ESBL-Producing Strains:
According to CLSI guidelines, strains showing zone of inhibition of ≤ 25 mm for ceftriaxone and/or ≤ 22 mm for ceftazidime and/or ≤ 17 mm for cefpodoxime and/or ≤ 27 mm for cefotaxime were considered for confirmation test for ESBL.

Confirmation of ESBL-Producing Strains:
ESBL production among potential ESBL producing isolates was confirmed phenotypically using combined disc method. Comparison of the zone of inhibition was made for the ceftazidime (30µg) and cefotaxime (30µg) discs alone vs that of the ceftazidime and cefotaxime discs containing clavulanic acid (10µg), when placed 25 mm apart (center to center).

Isolates showing an increase in zone diameter of ≥ 5 mm around either of the clavulanate combined discs compared to that of the disc alone were considered ESBL producers (7).

Data entry and analysis were done with Microsoft excel software.

RESULTS

During the one-year study period, a total of 1090 cultures were positive for growth, of which 133 was found to be Klebsiella (fig. 1). Prevalence of Klebsiella in culture positive cases was found to be 12.2%.

Out of these 133 isolates, 56 were ESBL positive Klebsiella, giving a prevalence of 42% among the Klebsiella isolates, and accounting for 5.12% of the total culture positive isolates (fig. 2).

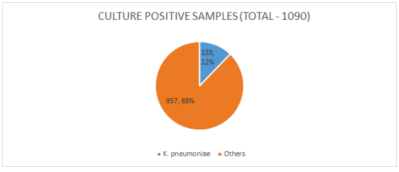

Fig. 1: Prevalence of Klebsiella among culture positive isolates.

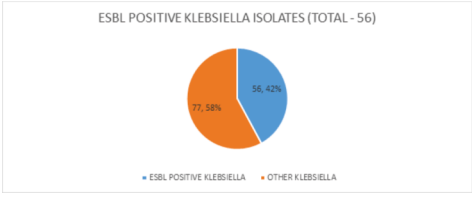

Fig. 2: Prevalence of ESBL positive Klebsiella.

Klebsiella were isolated mainly from urine, pus, sputum, tip, blood, stool and fluid (fig. 3). Maximum isolation was from urine (58) accounting for 58.6 %, followed by pus (38) accounting for 28%, sputum (27) accounting for 20%, blood (5) accounting for 3.75%, stool (2) accounting for 1.5% , tip culture (2) accounting for 1.5% and fluid aspirate (1) accounting for 0.75%.

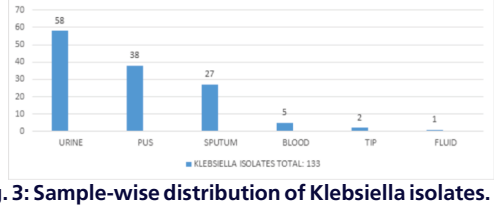

Fig. 3: Sample-wise distribution of Klebsiella isolates.

Of these klebsiella isolates, 56 were found to be ESBL positive which were distributed as follows (fig. 4): 24 from urine (42%), 22 from pus (39%), 5 from sputum (8.9%), 2 from blood (3.5%), 2 from tip culture (3.5%) and 1 from fluid aspirate (1.7%).

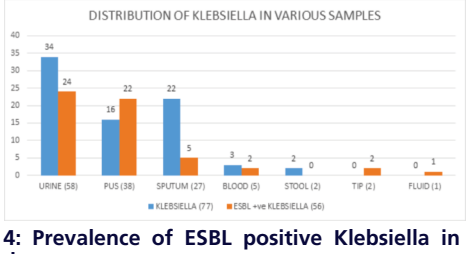

Fig. 4: Prevalence of ESBL positive Klebsiella in various samples.

Antibiogram of the Klebsiella Isolates

It was found in the present study (table 1) that Klebsiella isolates are most sensitive to amikacin (76%), followed by cefepime (71%), nitrofurantoin (64%) and gentamycin (61%).

Drug	Sensitive	Resistant	% of resistance
Cefotaxime / Sulbactam	70	63	47%
Cefotaxime	70	63	47%
Ceftazidime	71	62	46%
Ceftazidime / Clavulanic acid	71	62	46%
Cefepime	91	43	29%
Aztreonam	70	63	47%
Cefoxitin	71	62	46%
Ceftriaxone	30	26	46%
Cotrimoxazole	74	59	44.4%
Amikacin	101	32	24%
Gentamycin	81	52	39%
Piperacillin	50	26	34%
Piperacillin / Tazobactam	92	41	30%
Norfloxacin	29	29	50%
Ofloxacin	29	29	50%
Nitrofurantoin	40	18	36%
Ciprofloxacin	41	32	43%

Table 1: Antibiogram of Klebsiella isolates

DISCUSSION

In a study by Vemula sarojamma et al., it was noticed that the prevalence of ESBL producing Klebsiella was 17%, of which majority were from blood culture (57.4%) followed by sputum (19.04%)[8]. In the present study, the prevalence of ESBL positive Klebsiella was 5.13% of the total culture positive cases. Of this, the majority were from urine (42%), followed by pus (39%), sputum (8.9%) and blood (3.5%).

A study by V. Gupta et al., from Aligarh tertiary care centre reported 30.18% of ESBL positive Klebsiella, from the various clinical samples[3].

Ananthan and Subha from Chennai reported 23.6 % of ESBL positive klebsiella. Another study from Chennai by Menon et al. reported 25.65% of ESBL positive Klebsiella[9]. A significant increase in ESBL producing Klebsiella was also reported from China, Taiwan, Turkey, Spain, Canada and also from USA[2]. There is a high prevalence of ESBL positive Klebsiella in our study, with a significant percentage, indicating the need for periodic surveillance of pathogens, since empiric therapy is a common practice in clinical management.

Active surveillance of gram-negative pathogenic bacteria, K. oxytoca and K. pneumoniae that produce ESBL is an essential function of hospital laboratories. Further, these organisms have shown reduced sensitivity to widely used common antibiotics, increasing the burden of such infections[10].

Monitoring of antimicrobial susceptibility can aid clinicians for prescribing appropriate antibiotics and in prevention of development of drug resistance. In our study, resistance to antibiotics like ciprofloxacin, cotrimoxazole, and third generation cephalosporin (eg. ceftriaxone) was very high. Such findings are attributed to excessive use of antibiotics in both community and hospital settings, uncontrolled prescription practices and incomplete dosage consumption by patients.

The oral antibiotic nitrofurantoin was found to be more effective in treatment of UTI in our case and the findings are in agreement with similar surveillance studies by Sasirekha & Khameneh[11], and other Indian studies, which have demonstrated nitrofurantoin as an appropriate agent for first line treatment of community acquired UTI. Low antimicrobial resistance for nitrofurantoin can be attributed to its localized action on urinary tract and not being exposed outside the urinary tract [12].

The findings of this study emphasized the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used antimicrobial agents. These data may be used to determine trends in antimicrobial susceptibilities, to formulate local antibiotic policies in order to assist clinicians in the rational choice of antibiotic therapy to prevent misuse, or overuse, of antibiotics.

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