

Antibiotic Susceptibility of *Klebsiella pneumoniae* Isolated from Various Clinical Samples from a Tertiary Care, Chennai, India

Kiran Madhusudhan, Bindu D*

Department of Microbiology, Sree Balaji Medical College and Hospital, Chrompet, Chennai, India

ABSTRACT

The genus *Klebsiella* of *Enterobacteriaceae* family is ubiquitous in nature. They cause many nosocomial and community acquired infections like pneumonia, urinary tract infections, wound infections, bacteremia and septicemia. Multidrug resistance is seen in *Klebsiella* which serves as the most common cause of increased morbidity and mortality. *Klebsiella pneumoniae* is major concern as drug resistance has evolved in them to last resort antibiotics. There are many mechanism that brings about the resistance are ESBL, Amp C beta lactamases and carbapenemases. This study aimed to know the prevalence and antibiotic susceptibility of various antibiotics to *Klebsiella pneumoniae* infections from various samples. This retrospective study was conducted in our tertiary care hospital during the period from January 2022 to May 2022. A total of 573 samples were tested during this period. The samples include blood, sputum, urine, and pus. Out of the 573 total samples tested, 104 samples were identified as *Klebsiella pneumoniae* and the highest rate of isolation of *Klebsiella pneumoniae* was from wound sample (41.7 %) followed by urine (24.3 %) and also the same was reported high in surgical wards. The study showed male preponderance of *Klebsiella pneumoniae* when compared to females. The antibiotic sensitivity pattern was done by Kirby-Bauer's disc diffusion method and the sensitivity was noted to be higher to meropenem, imipenem and piperacillin-tazobactam. Thus, this study shows the prevalence rate of *Klebsiella pneumoniae* and sensitivity pattern of *Klebsiella*, which may help select appropriate antibiotics and prevent overuse and misuse of antibiotics.

Key words: Antibiogram, Antibiotic resistance, *Klebsiella pneumoniae*

HOW TO CITE THIS ARTICLE: Kiran Madhusudhan, Bindu D, Antibiotic Susceptibility of *Klebsiella pneumoniae* Isolated from Various Clinical Samples from a Tertiary Care, Chennai, India, J Res Med Dent Sci, 2022, 10(8):264-266.

Corresponding author: Bindu D

e-mail ✉: mail2bindhu@rediffmail.co.in

Received: 27-July-2022, Manuscript No. JRMDS-22-70493;

Editor assigned: 29-July-2022, **PreQC No.** JRMDS-22-70493(PQ);

Reviewed: 12-August-2022, QC No. JRMDS-22-70493(Q);

Revised: 17-August-2022, Manuscript No. JRMDS-22-70493(R);

Published: 24-August-2022

INTRODUCTION

Klebsiella pneumoniae (*K. pneumoniae*) is opportunistic gram negative pathogen belonging to *Enterobacteriaceae*, which causes various infections ranging from Urinary tract infections, bacteremia, wound infections and pneumonia. It causes both hospital-acquired and community-acquired infections [1]. It carries various genes both in chromosome and plasmid that contributes to the antibiotic resistance. Its resistance profile has increased over the past 20 years leading to Multidrug resistant (MDR) and extremely drug resistant organism (XDR). Resistance to the antibiotics is due to the irrational use which has produced ESBLs and Carbapenemases producing *K. pneumoniae*. Hence the study was aimed to determine the trend of antibiotic profile of *K. pneumoniae*

among the patients attending our tertiary care centre.

MATERIALS AND METHODS

This is a retrospective study conducted in the Department of Microbiology in a tertiary care, Chennai from January 2022 to May 2022. A total of 573 clinical samples including pus, blood, wound swab, tissue, Bronchoalveolar lavage (BAL), bile, urine, pleural fluid, endotracheal aspirates and blood were collected from different departments (General surgery, General medicine, Obstetrics and Gynaecology, Orthopedics, dermatology, urology, Nephrology, Intensive Care unit (ICU),) of Sree Balaji Medical College Hospital. Urine, Pus/wound swab, endotracheal aspirate, sputum, BAL, bile, pleural fluid, tissue were inoculated in Nutrient agar, Blood agar and Mac Conkey agar, For Blood primary inoculation in BacT/Alert followed by subculture in Blood agar and Mac Conkey agar. The colonies were isolated and identified by standard test like Gram staining, Catalase, oxidase, Indole, citrate, urease, Triple sugar agar and Mannitol motility agar.

The isolated *K. pneumoniae* was inoculated in Muller Hinton agar plates following Clinical and Laboratory

Standard Institute (CLSI) guidelines [2]. Escherichia coli ATCC 25922 was used as quality control strain.

RESULTS

Among the 573 culture samples from different department, 325 samples were culture positive. 104 (32%) *K. pneumoniae* were isolated. 56.3% were isolated from male patients and 43.7% were from females. *K. pneumoniae* was isolated more from Pus/wound sample followed by Urine, sputum as shown in the Table 1. The isolation of *K. pneumoniae* was (33.5%) highest in 50-60 years age group as shown in Table 2. The isolation was 64.1% in hospitalized patients than outpatients (Table 3). The isolation of *K. pneumoniae* was high from General

surgery department followed by General medicine (Table 4).

Antibiotic susceptibility of *K. pneumoniae*

The susceptibility pattern of *K. pneumoniae* isolates is shown in the Figure1. These *K. pneumoniae* isolates were least resistant to piperacillin-tazobactam (29.1%), Imipenem (33.3%), Meropenem (24.2%), Ciprofloxacin (33%), Gentamicin (33%). All the isolates were resistant to ampicillin. About 46.6% of the isolates were ESBL producers.

DISCUSSION

Klebsiella pneumoniae is one of major species in Enterobacteriaceae family causing infections in both immunocompetent and immunocompromised patients. It causes infections in elderly people which are shown in our study. The total number of *Klebsiella* isolates from various clinical samples in this study is 104 (32 %). It is similar to the isolation rate seen in the studies [3-5].

Table 1: Prevalence of *K. pneumoniae* in various samples.

S. No	Sample	Number of <i>Klebsiella pneumoniae</i>	Percentage
1	Urine	25	24.30%
2	Pus/wound sample	43	41.70%
3	Sputum	24	23.30%
4	Blood	1	0.97%
5	Endotracheal aspirate	3	2.90%
6	Bronchoalveolar lavage	3	2.90%
7	Tissue	2	1.90%
8	Bile	1	0.97%
9	Pleural fluid	1	0.97%

Table 2: Isolation of *K. pneumoniae* in different age group.

S.No	Age group (years)	No of isolates
1	20-30	05 (4.8%)
2	31-40	06 (5.8%)
3	41-50	14 (13.5%)
4	51-60	35 (33.6%)
5	61-70	26 (25%)
6	71-80	18 (17.3%)

Table 3: Frequency of *K. pneumoniae* in different samples.

S.No	Samples from source	Number of isolates
1	Inpatients	66 (64.1%)
2	Outpatients	37 (35.9%)

Table 4: Isolation of *Klebsiella pneumoniae* in different wards.

S.No	Department	Number of <i>Klebsiella pneumoniae</i> isolated	%
1	General surgery	38	36.89
2	General Medicine	22	21.35
3	Nephrology	3	2.91
4	Urology	4	
5	Respiratory medicine	17	16.5
6	Obstetrics and Gynecology	2	1.94
7	ICU	11	10.67
8	Dermatology	1	0.97
9	Orthopedics	5	4.85

Chart Title

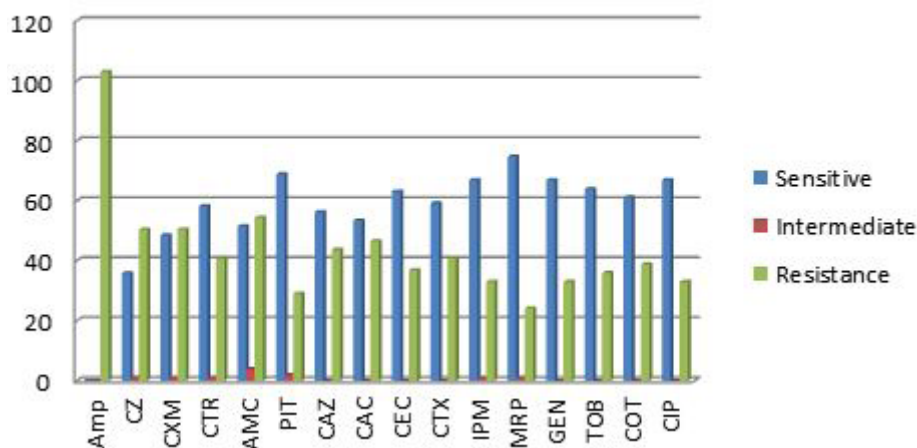


Figure 1: AMP-Ampicillin, CZ-Cefozolin, CXM-Cefuroxime, AMC-Amoxycillin, PIT-Piperacillin, CAZ-ceftazidime, CAC-Ceftazidime/Clavulanic acid, CEC-Cefotaxime/Clavulanic acid, CTX-Cefotaxime, IPM-Imipenem, MRP-Meropenem, GEN-Gentamicin, TOB-Tobramicin, COT-Cotrimoxazole, CIP-Ciprofloxacin.

In this study, *Klebsiella* species were isolated more from males compared to females. This study is similar to the work conducted by Anu sharma, et al. [6] (males 57% and females 42%).

In our study the prevalence of *K. pneumoniae* was more in age group 51-60, followed by 60-70 age group which is similar to study by Sharanya, et al. [6] Susethira, et al. [7] but in contrast to the study by In this study, *K. pneumoniae* were isolated more from inpatients and from surgery wards, which is similar to study by Anu sharma, et al. [6] which showed that these infections are nosc.

CONCLUSION

In this present study, *K. pneumoniae* was isolated from Pus followed by urine similar to study by Anu sharma, et al. 46.7% were found to be ESBL producers.

In this *K. pneumoniae* was the predominant isolate from various samples. IT was isolated more from inpatients and from surgical wards. In this study, multidrug resistant isolates were found. Hence the it is important formulate antibiotic stewardship programme. Constant monitoring of the infection control policies is necessary to combat the antibiotic resistance.

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