Prevalence Of Klebsiella Pneumoniae Carbapenemase (Kpc) Production By Klebsiella Pneumoniae Isolated From Different Clinical Samples In A Tertiary Care Hospital

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Abstract:

Background: The rapid global expansion of Klebsiella pneumoniae, which generates carbapenemase and plasmid-borne extended-spectrum β-lactamases (ESBLs), metalloproteases (MBLs), and other metallo β-lactamases, possess a significant clinical problem.

Aim and Objective: Purpose of our research is to find out the Klebsiella pneumoniae Carbapenemase (KPC) in a tertiary care Hospital, Indore.

Method: This study is a cross sectional study. 200 isolates were collected from various samples like sputum, pus and urine sample on the basis of exclusion and inclusion criteria. Prevalence was calculated based on our observation and help of previous study.

Result: We have found the prevalence of Klebsiella pneumoniae Carbapenemase (KPC) was 39.0 % from 200 isolates.

Conclusion: The significant frequency of KPC in our strains should raise major alarm. It's crucial to utilise carbapenems carefully to stop the spread of these microorganisms.

Keywords: Klebsiella pneumoniae Carbapenemase, Enterobacteriaceae, blaNDM-1.

Introduction:

The main opportunistic pathogen in the family Enterobacteriaceae is Klebsiella pneumoniae. Klebsiella pneumoniae is a gram-negative bacterium that can spread from person to person or, less commonly, through environmental contamination (1). The increasing prevalence of carbapenem resistance among Enterobacteriaceae members is a major concern for people all over the world because these medications are frequently used today as the final effective line of defence against serious infections brought on by multidrug resistant Enterobacteriaceae. (2) Worldwide, Enterobacteriaceae infections have a significant role in both morbidity and death. The mainstay of such infections' therapy is the use of antibiotic substances. However, the worldwide threat posed by drug resistance has grown significantly (3). The final resort for treating multidrug-resistant (MDR) Gram-negative bacterial infections is a carbapenem, such as imipenem and meropenem (4).
Aim And Objective:

The purpose of this research is to find out the prevalence of Klebsiella pneumoniae Carbapenemase in a tertiary care Hospital, Indore. And objective was to isolate samples for the detection of Klebsiella pneumoniae Carbapenemase and calculate Klebsiella pneumoniae Carbapenemase prevalence.

Material And Methods:

200 samples are the subject of this investigation. 200 isolates in total were recovered during the research period after the clinical samples were processed. The isolates came from sputum, urine, and pus samples. The isolates were recharacterized using common microbiological methods as outlined by the American Society of Microbiology to identify Klebsiella pneumoniae.

Case control research is being done here. We have calculated prevalence using cutting-edge statistical approaches for data analysis.

Result:

The current investigation was carried out by the Microbiology Department of Index Medical College, Hospital and Research Center in Indore, Madhya Pradesh. This research focuses on 200 samples. After the clinical samples were analysed during the research period, 200 isolates were found in total.

Graph chart 1 is showing the distribution of subjects based on sample type. In our study the number of urine samples were higher than sputum sample and pus sample. Number of Urine sample was 150, sputum sample was 11 and pus sample was 39.

<table>
<thead>
<tr>
<th>SAMPLE TYPE</th>
<th>sensitive IMP</th>
<th>Resistant IMP</th>
<th>Sensitive MRP</th>
<th>Resistant MRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUS</td>
<td>29</td>
<td>10</td>
<td>31</td>
<td>8</td>
</tr>
<tr>
<td>SPUTUM</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>URINE</td>
<td>79</td>
<td>71</td>
<td>77</td>
<td>73</td>
</tr>
<tr>
<td>total sample 200</td>
<td>118</td>
<td>82</td>
<td>118</td>
<td>82</td>
</tr>
</tbody>
</table>

Table 1- Number of sensitive and resistant Test in Pus Sample, Sputum & Urine Sample
Graph chart 2- Number of sensitive and resistant Test in Pus Sample, Sputum & Urine Sample

<table>
<thead>
<tr>
<th>SAMPLE TYPE</th>
<th>sensitive IMP</th>
<th>Resistant IMP</th>
<th>Sensitive MRP</th>
<th>Resistant MRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUS</td>
<td>29.39 %</td>
<td>25.64 %</td>
<td>79.48 %</td>
<td>20.51 %</td>
</tr>
<tr>
<td>SPUTUM</td>
<td>90.90 %</td>
<td>9.1 %</td>
<td>90.90 %</td>
<td>9.1 %</td>
</tr>
<tr>
<td>URINE</td>
<td>52.66 %</td>
<td>47.33 %</td>
<td>51.33 %</td>
<td>48.66 %</td>
</tr>
<tr>
<td>Total 200</td>
<td>59.0%</td>
<td>41%</td>
<td>59.0%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Table 2- Prevalence of sensitive and resistant test in Pus Sample, Sputum & Urine Sample

Table 2 and graph chart 2 are showing the number and prevalence of sensitive and resistant Test in Pus Sample, Sputum & Urine Sample. The number of sensitive IMP was 59 % and sensitive MRP was 59 % also.

Prevalence of Klebsiella pneumoniae Carbapenemase (KPC) based on IMP and MRP resistant:

Graph chart 3- prevalence of Klebsiella pneumoniae Carbapenemase (KPC) based on IMP and MRP.
Graph chart 2 and Graph chart 3 are showing the prevalence of Klebsiella pneumoniae Carbapenemase (KPC) based on IMP and MRP resistance. The prevalence of Klebsiella pneumoniae Carbapenemase (KPC) was 39.0 % from 200 isolates.

Discussion:

In this study we found, including the sputum, pus, and urine sample, the prevalence of Klebsiella producing carbapenemase (KPC) was 39.0%. And the frequency of KPC in males was 43.84%, while it was 30% in females.

Farzana Rashid, Rabia Masood and Mariam Faiz (in 2020), were found the prevalence of Klebsiella producing carbapenemase was 63 % (5). In the study of Makieh Koraei, Mojtaba Moosavian and Morteza Saki (in 2018), the prevalence of Klebsiella producing carbapenemase (KPC) was 9.9 %. 72 subjects were positive for KPC out of 726 isolates (6), Farzaneh Firoozeh, Zeinab Mahluji, Ehsaneh Shams, Ahmad Khorshidi and Mohammad Zibaei in 2017, were found the prevalence of Klebsiella producing carbapenemase was 19.9 % (7). In the study of Wafaa Y. Jamal, M. John Albert and Vincent O. Rotimi (in 2016), observed the prevalence of KPC was 8 % (8). Cailin Liu et. al; (in 2015) was found the prevalence of KPC were 33.3 % (9).

In the study of Wafaa Jamal, Vincent O et.al; (in 2013), were reported the prevalence of KPC was 21.4%, 03 isolates were positive out of 14 isolates (10). In the study of M J Struelens et.al; (in 2010), was reported the prevalence of KPC was 54 % (11).

Conclusion:

In our conclusion the detection of Klebsiella producing carbapenemase is due to the presence of \textit{blaNDM-1} gene and \textit{blaKPC-2}. We have suggested, we have to be more aware about the infection of KPC and we should not have overdose of drugs otherwise drugs will resistant for KPC detection.

Reference:

