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Study of Antimicrobial sensitivity pattern of Klebsiella Pneumoniae isolated from various clinical samples in a Tertiary Care Hospital

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Abstract

Background & Methods: The aim of the study is to Study of Antimicrobial sensitivity pattern of Klebsiella Pneumoniae isolated from various clinical samples. Isolates of Klebsiella were identified by their colony morphology as it forms large dome shaped colonies on Blood agar and lactose fermenting mucoid colonies on MacConkey agar. Gram staining was performed on the growth obtained in positive cultures which showed Gram negative, short, plump, straight rods. Isolates were further identified to species level by Vitek-2 Compact (Biomerieux) using Gram negative identification cards

Results: Imipenem shows 100% resistance, making it completely ineffective against the bacteria. Ciprofloxacin and Piperacillin-Tazobactum also show very high resistance (75% and 82%, respectively). Meropenem and Levofloxacin have moderate susceptibility but still a high rate of resistance. Nitrofurantoin and Norfloxacin show lower levels of resistance but also have relatively low susceptibility.

Conclusion: High antibiotic resistance of K. pneumoniae towards antibiotics that were used caused an increased in the progression of infections and become difficult to be treated. K. pneumoniae was found to be most sensitive to Amikacine, Gentamicine, Ciprofloxacine, zithromaxe, Imipeneme and ceftriaxone. Considering that these antibiotics should be preferred drugs for the infections

Keywords: Antimicrobial, sensitivity, Klebsiella, Pneumoniae & clinical.

Study Design: Observational Study.

Introduction

Klebsiella pneumonia is Gram-negative bacteria and medically important because it is very difficult to treat, especially those contracted in hospitals due to their ability too resistant to different types of antibiotics[1]. Klebsiella species are found in worldwide in nature and associated with biochemical adaptations that make them better suited to a particular environment.

Eight species of Klebsiella are identified. In that, K. pneumoniae, K. oxytoca, and K. granulomatis areassociated with human illness. K. ozaenae and K. rhinoscleromatis are related to specific disease. Klebsiella pneumoniae is a gram-negative, encapsulated, a nonmotile bacterium that causes infection among hospitalized individuals who are immunocompromised [2]. It is responsible for various infections, including urinary tract infections, pneumonia, bacteremia, meningitis, wound infections, and purulent abscesses [3]. Beyond human hosts, this bacterium finds its niche in a variety of environments, including animals, sewage, drinking water, surface waterways, polluted water, industrial effluents, and

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vegetation [4].The widespread use of antimicrobials in clinical practice has led to the emergence of resistant bacterial pathogens contributing to the increased morbidity and mortality observed worldwide [5]. One study indicates that antimicrobial resistance level of the gram-negative bacteria ranges from 20 to 100%.

It can be found in water, soil, plants, insects, animals, and humans. Also it can be found as a normal florakin mouth, skin, and intestinal tract and the patient who administered a course of broadspectrum antibiotic treatment. It is considered to be high risk due to the disruption of the normal flora in the body, deeming tumore susceptible to pathogens[6].

The different pathogenic virulence factors are the genetic, biochemical, orustructural features that enable an organism to produce disease. The clinical outcome of an infection depends on the virulence of the pathogen and they opposing effectiveness of the host defense mechanisms. Multidrug resistant bacteria cause serious nosocomial and community acquired infections that are hard to eradicate using available antibiotics[7].

Material and Methods

Present study was conducted at VIMSAR, Burla, Odisha on 100 clinical for 01 Year, samples including pus, blood, wound swab, tissue, Bronchoalveolar lavage (BAL), bile, urine, pleural fluid, endotracheal aspirates and blood were collected, 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. Ological The techniques for aerobic cultures. They were inoculated on to Blood agar and Mac Conkey agar plates and incubated at 370C for 24-48 hours.

INCLUSION CRITERIA

1. Klebsiella species isolated from clinical specimen received for culture and sensitivity and Patients those provide written informed consent for the study.

EXCLUSION CRITERIA

1. Repeat isolation of Klebsiella species from the same patient and patients who not provide consent for the study.

Urine, sputum, pus swab, and miscellaneous samples collected were inoculated on blood agar and MacConkey agar and incubated overnight at 37°C.Colonies were read after overnight incubation.

Isolation and identification of Klebsiella spp. was done using colony characteristics and standard biochemical tests.

Antimicrobial susceptibility testing was performed for all isolated organisms on Mueller-Hinton agar by the modified Kirby-Bauer disc diffusion method and for Colistin using broth dilution method.

Table No. 1: Gender Distribution

S. No.	Gender	No.	Percentage	P Value
1	Male	37	37	.322705

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2	**Female**	**63**	**63**	

- Male: There are 37 males in the sample, making up 37% of the total.
- Female: There are 63 females in the sample, making up 63% of the total.
- The chi-square statistic is 0.1909. The *p*-value is .322705. The result is *not* significant at $p < .05$.

In summary, the sample consists of 37% males and 63% females. The gender distribution is skewed towards females, as there are more females than males in this particular group.

Table No. 2: Specimens Source

S. No.	Source	No.	Percentage	P Value
1	**Urine**	**51**	**51**	**.045141**
2	**Wound**	**38**	**38**	
3	**Ear**	**05**	**05**	
4	**Blood**	**03**	**03**	
5	**Pus**	**03**	**03**	

The table shows the distribution of different types of samples and their respective counts and percentages:

- Urine: There are 51 samples of urine, making up 51% of the total samples.
- Wound: There are 38 wound samples, making up 38% of the total samples.
- Ear: There are 5 ear samples, making up 5% of the total samples.
- Blood: There are 3 blood samples, making up 3% of the total samples.
- Pus: There are 3 pus samples, also making up 3% of the total samples.

In summary, the majority of the samples are urine (51%) and wound (38%), while ear, blood, and pus make up a smaller portion, with ear, blood, and pus each contributing 5%, 3%, and 3%, respectively.

The chi-square statistic is 0.5578. The *p*-value is .045141. The result is significant at $p < .05$.

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Table No. 3: Culture positivity of klebsiella pneumoniae in various clinical samples.

S. No.	Clinical samples	No.	Percentage	P Value
1	E. Coli	33	33	.00483
2	Kleb Pneu	14	14	
3	Ser mars	13	13	
4	Pro mir	11	11	
5	Ent Cloa	10	10	
6	Pseu Aeru	11	11	
7	Aci baum	06	06	
8	Ent Faecalls	13	13	
9	Ent Faeclum	01	01	
10	MRSA	27	27	
11	MSSA	06	06	

E. Coli is the most common sample, representing 33% of the total.

Other common bacteria include MRSA (27%), Klebsiella pneumoniae (14%), and Serratia marcescens (13%).

There are smaller numbers of samples for Acinetobacter baumannii, Enterococcus faecium, and MSSA, each contributing smaller percentages of the total.

The chi-square statistic is 12.9125. The *p*-value is .00483. The result is significant at $p < .05$.

Table No. 4: Antimicrobial susceptibility pattern of Klebsiella pneumoniae

S. No.	Antibiotics	Susceptible	Resistance
1	Cotrimoxazole	31%	66%
2	Ciprofloxacin	22%	75%
3	Levofloxacin	34%	64%
4	Piperacillin –Tazobactum	16%	82%
5	Imipenem	00%	100%
6	Meropenem	36%	63%
7	Amikacin	28%	71%
8	Nitrofurantoin	18%	21%
9	Norfloxacin	19%	19%

Imipenem shows 100% resistance, making it completely ineffective against the bacteria.

Ciprofloxacin and Piperacillin-Tazobactum also show very high resistance (75% and 82%, respectively).

Meropenem and Levofloxacin have moderate susceptibility but still a high rate of resistance.

Nitrofurantoin and Norfloxacin show lower levels of resistance but also have relatively low susceptibility.

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Discussion

Klebsiella species are responsible for a broad spectrum of clinical infections in immuno-competent or immunocompromised people. An extensive use of broad spectrum antibiotics in hospitalized patients has led to the increased prevalence as well as development of multidrug resistant strains of Klebsiella[8].

The incidence of Klebsiella isolates from various clinical samples in this study was 32%. It is similar to the Vijayashree V, et al [9] and Kashaf J, et al [10], isolation rate were 32% and 38% respectively.

The nosocomial infections caused by Klebsiella species that leading to high percentage of morbidity and mortality among worldwide. In addition to being the primary cause of respiratory tract infections like pneumonia, rhinoscleroma, ozaena, sinusitis and otitis media. They were also frequently associated with the infections of urinary tract, genital tract and the eyes[11].

The study showed that more females were infected by this pathogen (66.66%) than males (33.33%). The reason for this may refered to the fact that women were more sensitive to respiratory infections because the changes in menstrual hormones concentrations that have been played a big role in influencing the severity of the inflammation. This infection occurred through changes in the mucous membranes and mucous secretions in response to female hormones and this has been observed in pregnant women as a result of thickening of the membrane and increase the secretions of the mucous membranes of the body in general and particularly the nose, leading to vasomotor rhinitis[12].

The present study also revealed that's K. pneumoniae infections was predominant in winter with a rate of (37.04%) and less commonly in Autumn with rate of (11.11%) because this bacteria was environmental distributed, many studies have reported that humans may possible acquire K. pneumoniae directly from natural environments. Human pathogenic K. pneumoniae strains are not necessarily distinct from environmental soil strains[13-14].

The variations in the percentage of isolation between different studies could be due to the percentage of distribution of isolates, which varied according to the place of clinical specimens collection and number of clinical specimens, environmental factors and personal hygiene[15].

Conclusion

High antibiotic resistance of K. pneumoniae towards antibiotics that were used caused an increased in the progression of infections and become difficult to be treated. K. pneumoniae was found to be most sensitive to Amikacine, Gentamicine, Ciprofloxacine, zithromaxe, Imipeneme and ceftriaxone. Considering that these antibiotics should be preferred drugs for the infections

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