



## INCIDENCE & CHARACTERIZATION OF *Klebsiella* species IN PATIENTS SAMPLES

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**ABSTRACT**

*Klebsiella* is an important common pathogen for causing community and hospital acquired infection. Considering high virulence & pathogenicity of *Klebsiella*, it is necessary to find out incidence of *Klebsiella* in various clinical samples and their speciation. All the clinical samples were cultured on Blood & MacConkey agar and incubated at 37°C for 24-48hrs. Identification & speciation were done by standard biochemical tests. Incidence of *Klebsiella* species was 11.6% and speciation of *Klebsiella* shown *Klebsiella pneumoniae pneumoniae* were 84.5%, *Klebsiella pneumoniae ozaenae* 3.5% and *Klebsiella oxytoca* 12%.

**KEYWORDS :**

**INTRODUCTION**

*Klebsiella* species are Gram-negative, nonmotile, encapsulated rod shaped bacteria, belonging to the family Enterobacteriaceae. Which is an important common pathogen for nosocomial pneumoniae, septicaemia, urinary tract infection, wound infection, intensive care unit (ICU) infections), and neonatal septicaemias. It also causes bacteraemia and hepatic infections and have been isolated from a number of unusual infection, including peritonitis, acute cholecystitis, pyomosis, necrotizing fasciitis, liver abscess, fascial space infections of head and neck, and septic arthritis<sup>(1)</sup>. *Klebsiella pneumoniae* is most pathogenic to humans among all *Klebsiella* species, followed by *K. oxytoca*, *K. ozaenae* and *K. rhinoscleromatis* causes specific disease in humans<sup>(2)</sup>.

**MATERIALS & METHODS**

This study was prospective & experimental study. This study was carried out over a period of 3 years in Microbiology laboratory of MGM Medical College & Hospital, Kamothe, Navi Mumbai. All clinical samples were collected in a sterile container with aseptic precautions. Samples showing pus cells and bacteria were included in study and samples not showing pus cells were excluded.

Sample were inoculated on Blood agar & MacConkey agar and incubated at 37°C for 24-48 hrs. On next day, Colony characters were examined and noted, regarding the size, shape, elevation, consistency and colour. On Blood agar grey, round, shiny and mucoid colonies (2-3mm in diameter), hemolysis (+/-) and on MacConkey agar round, mucoid, lactose fermenting colonies appeared. Gram Staining showed gram negative bacilli. Hanging drop was carried out in order to find out motility of the bacteria. Identification & speciation of *Klebsiella* species were done by standard bacteriological biochemical test, e.g. Triple sugar iron test, Indole test, Methyl red test, Voges-Proskauer test, Citrate utilization test, Urease test, Malonate utilization test, Decarboxylase test (Lysine & Ornithine).

**Table 1: Speciation Chart of *Klebsiella***

Characteristics	<i>Klebsiella pneumoniae</i>			<i>K. oxytoca</i>
	Subsp. <i>pneumoniae</i>	subsp. <i>Ozaenae</i>	subsp. <i>rhinoscleromatis</i>	
<b>Indole</b>	-	-	-	+
<b>Triple sugar iron test (TSI)</b>	A/A with gas	A/A with gas	A/A with gas	A/A with gas

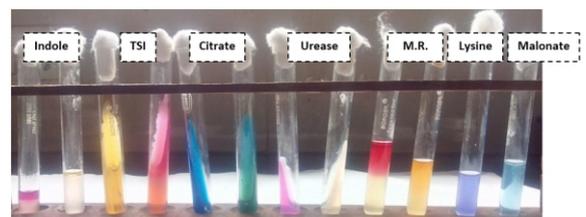
<b>Citrate utilization</b>	+	+	+	+
<b>Urease production</b>	+	+	+	+
<b>Methyl red test (M.R.)</b>	-	+	+	-
<b>Voges-Proskauer reaction</b>	+	-	-	+
<b>Malonate</b>	+	-	+	+
<b>Lysine decarboxylase</b>	+	V	-	+
<b>Ornithine decarboxylase</b>	-	-	-	-
<b>Hanging drop</b>	-	-	-	-

**Note: A = Acid production, "+" = Positive, "-" = Negative, V = "+/-"**

**Photographs of Growth of *Klebsiella* and Biochemical tests**



**Fig 1: Blood Agar Growth of *Klebsiella* MacConkey Agar**



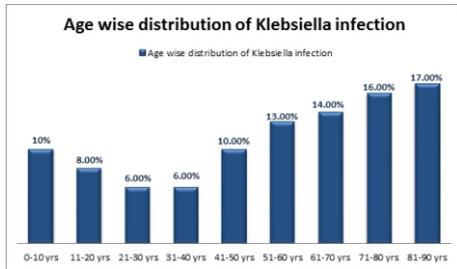
**Fig 2: Biochemical tests**

**RESULT**

**Incidence in Males & Females**

200 isolates of *Klebsiella species* isolated from patients were included in the study. Among which 112 (56%) strains were from male and 88 (44%) from female with the male female ratio 1.27:1.

**Fig 3: Bar Diagram showing age wise distribution of *Klebsiella* infection**



**IPD/OPD wise distribution of *Klebsiella***

24% cases were from the OPD which is community acquired infection (CAI) while 76% were from IPD in which 50% were community acquired infection (CAI) & 26% hospital acquired infection (HAI).

**Ward wise distribution of *Klebsiella species***

Ward wise distribution of *Klebsiella* infections were as follows 44 (22%) from Respiratory medicine, 24 (12%) Urology, 21 (10.5%) Surgery & Paediatrics each, 18 (9%) Orthopaedics & OBGY each, 17 (8.5%) General Medicine, 15 (7.5%) Medical ICU, 8 (4%) Surgical ICU & PICU each, 3 (1.5%) Neurosurgery, 2 (1%) ENT and 1 (0.5%) Skin.

**Table 2: Distribution of *Klebsiella* strain in various clinical specimens**

Specimens	Total no. of Specimens	Sterile specimens	Grow th (Bacterial)	No. of <i>Klebsiella</i> isolates out of bacterial growth in the particular sample
Endotracheal aspirate	140	9	131	25 (19%)
Sputum	710	358	352	51 (14.5%)
Accessory devices Foley's catheter, Central line tip	126	77	49	6 (12.2%)
Urine	1405	940	465	53 (11.4%)
Throat swabs	119	71	48	5 (10.4%)
Pus	607	203	404	37 (9.16%)
Blood	944	758	186	17(9.14%)
Stool	257	204	53	4 (7.5%)
Vaginal swabs	132	98	34	2 (5.8%)
<b>Total</b>	<b>4440</b>	<b>2718</b>	<b>1722</b>	<b>200 (11.6%)</b>

**Speciation of *Klebsiella***

169 (84.5%) were *Klebsiella pneumoniae pneumoniae*, 7 (3.5%) were *Klebsiella pneumoniae ozaenae* 24 (12%) were *Klebsiella oxytoca*.

**Table 3: Species wise distribution of *Klebsiella* in various samples**

S.No.	Sample	K. pneumoniae pneumoniae	K. p. ozaenae	K. oxytoca	Total
1	Endotracheal aspirate	23 (14%)	1 (14%)	1 (4%)	25
2	Sputum	44 (26%)	2 (29%)	5 (21%)	51
3	Accessory devices Foley's catheter, Central line tip	6 (4%)	0	0	6
4	Urine	46 (27%)	1 (14%)	6 (25%)	53
5	Throat swabs	5 (3%)	0	0	5
6	Pus	26 (15%)	1 (14%)	10(42%)	37
7	Blood	15 (9%)	2 (29%)	0	17
8	Stool	2 (1%)	0	2 (8%)	4

9	Vaginal swabs	2 (1%)	0	0	2
<b>Grand Total</b>		<b>169 (100%)</b>	<b>7 (100%)</b>	<b>24 (100%)</b>	<b>200</b>

**DISCUSSION**

Differences were noticed in results of our study and those of other researchers. Some results were similar to ours, some researchers reported higher values, others reported lower values. These differences in relation to incidence, age, sex, sample, species, IPD/OPD wise distribution can be because of a) Environmental conditions climate, temperature, humidity, air pollution. b) Patients education, habits, living, conditions, socioeconomic conditions. c) Regarding factors related to hospital It depends on type of hospital (general/speciality), cleanliness, patient doctor nurses ratio. Hospital infection control practices etc.

**INCIDENCE**

The incidence of *Klebsiella* infections vary from place to place. In our study the incidence of *Klebsiella species* is 11.6% which is similar with study from other author Asati Rakesh Kumar et.al.(15.4%)<sup>(3)</sup>. The lower values were given by Rugved Kulkarni et.al. (7.93%)<sup>(4)</sup>, Priyadarshini M. Deodurg et.al. (7.1%)<sup>(5)</sup>, Sarita Nayak et.al. (6.5%)<sup>(6)</sup>, Kritu panta et.al. (8.8%)<sup>(7)</sup> and Philip O. Orhue et.al. (9.17%)<sup>(8)</sup>. Whereas higher values were shown by Renuka et.al. (36.09%)<sup>(9)</sup>, Pradip kumar Das et.al. (29.5%)<sup>(10)</sup>, K.N. Ravichitra et.al. (25.6%)<sup>(11)</sup>, Iroha lfeanyichukwu et.al. (38.5%)<sup>(12)</sup>, Jesmin Akter et.al. (19.72%)<sup>(13)</sup> & Sajad Babakhani et.al. (16.6%)<sup>(14)</sup>.

**GENDERWISE**

Our results are similar with study of Priyadarshini M. Deodurg et.al. (Male-56.67% & Female-43.33%)<sup>(5)</sup> and Renuka et.al. (Male-57% & Female-43%)<sup>(9)</sup>. However our study did not match with Asati Rakesh Kumar et.al. (Male-34% & Female-66%)<sup>(3)</sup>, Jesmin Akter et.al.<sup>(13)</sup>.

**SAMPLEWISE**

**In sputum sample**, findings of our study is similar with Philip O. Orhue et.al.(11.11%)<sup>(8)</sup>. However lower values were shown by Renuka et.al. (10.15%)<sup>(9)</sup>, and higher values were shown by Pradip Kumar Das et.al. (46.7%)<sup>(10)</sup>, Iroha lfeanyichukwu et.al. (50%)<sup>(12)</sup>.

**In Urine sample**, our study resembles with Asati Rakesh Kumar et.al. (15.4%)<sup>(3)</sup> and Philip O. Orhue et.al. (11.36%)<sup>(8)</sup> where as lower values were given by Renuka et.al. (7.33%)<sup>(9)</sup> & Kritu panta et.al. (4.72%)<sup>(7)</sup> and higher values were given by Pradip kumar Das et.al.(19.7%)<sup>(10)</sup>, K.N. Ravichitra et.al. (22.9%)<sup>(11)</sup> & Iroha lfeanyichukwu Romanus et.al. (57.14%)<sup>(12)</sup>.

**In Blood sample**, As comparison with our study, Renuka et.al.<sup>(9)</sup> showed lower value (4.7%), however higher values were shown by Pradip Kumar Das et.al. (31.3%)<sup>(10)</sup>.

**In Pus sample**, As comparison with our study Renuka et.al.<sup>(9)</sup> showed lower values (4.7%) & Kritu panta et.al.<sup>(7)</sup> (0.79%) whereas higher values were shown by K.N. Ravichitra et.al. (29.09%)<sup>(11)</sup>, Pradip Kumar Das et.al.(24.2%)<sup>(10)</sup> and Iroha lfeanyichukwu Romanus et.al. (17.8%)<sup>(12)</sup>.

**In Stool sample**, As comparison with our study, Renuka et.al.<sup>(9)</sup> showed lower value (2.26%) whereas higher value was shown by Philip O. Orhue et.al.(20%)<sup>(8)</sup>.

**In High vaginal swab**, Our study is similar to Philip O. Orhue et.al. (5.88%)<sup>(8)</sup> whereas Iroha lfeanyichukwu et.al. shown higher value of (17.65%)<sup>(12)</sup>.

**SPECIESWISE**

**For *Klebsiella pneumoniae***, findings of our study is similar with Shalley Dahiya et.al.(88%)<sup>(15)</sup>. Lower value was shown by Namratha KG et.al (79%)<sup>(16)</sup> and higher values were shown by Sajad Babakhani et.al. (91.3%)<sup>(14)</sup>.

**For *Klebsiella oxytoca***, our study is similar with Shalley Dahiya et.al. (12%)<sup>(15)</sup> „ Lower values were shown by Sajad Babakhani et.al. (5%)<sup>(14)</sup>. However, higher value was shown by Namratha KG et.al. (21%)<sup>(16)</sup>.

**For *Klebsiella pneumoniae ozaenae***, Our study is similar to Sajad Babakhani et.al. (1.2%)<sup>(14)</sup>.

### AGEWISE DISTRIBUTION

Our study revealed higher incidence of *Klebsiella* infection in the age group 0-10yrs (10%). The infection rate decreased in 10-40 yrs then increased again 41-90 yrs. However higher values were reported Pradip Kumar Das from Tripura<sup>(10)</sup>, India (46-60 yrs 26.4%, >60 yrs 22.8%)

### IPD/OPD WISE

Our study resembles with Pradip Kumar Das et.al.<sup>(10)</sup>.

### CONCLUSIONS

- Incidences of *Klebsiella species* in clinical samples were 11.6%.
- Elderly patients above 40yrs age and male were more prone to *Klebsiella* infection.
- 74% of *Klebsiella* infections were community acquired & 26% hospital acquired infections.
- Among 200 isolates 169 (84.5%) were *Klebsiella pneumoniae pneumoniae*, 7 (3.5%) were *Klebsiella pneumoniae ozaenae* and 24 (12%) *Klebsiella oxytoca*.
- Highest *Klebsiella oxytoca* were found in Pus followed by Urine, Sputum, Stool and Endotracheal aspirate.
- Highest *Klebsiella pneumoniae pneumoniae* were found in Urine followed by Sputum, Pus, Endotracheal aspirate, Blood, Accessory devices, Throat swabs, Stool & Vaginal swabs each.
- Highest *Klebsiella pneumoniae ozaenae* were found in Sputum & Blood each followed by Endotracheal aspirate, Urine & Pus each.
- *Klebsiella pneumoniae pneumoniae* were dominant species among all clinical samples than other species of *Klebsiella*.

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