

# Prevalence of Bacterial Agents Causing Lower Respiratory Tract Infections in Patients Attending Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat: A Cross-Sectional Study

Krupali Kothari<sup>1</sup>, Jigar Gusani<sup>2</sup>

## Author Affiliation

<sup>1</sup>Assistant Professor, Department of Microbiology, Gujarat Adani Institute of Medical Sciences, Bhuj, Gujarat 370001, India. <sup>2</sup>Associate Professor, Department of Microbiology, Dr. N.D Desai Faculty of Medical Science and Research, Nadiad, Gujarat 387001, India.

## Corresponding Author

Jigar Gusani,

Associate Professor, Department of Microbiology, Dr. N.D Desai Faculty of Medical Science and Research, Nadiad, Gujarat 387001, India.

E-mail: [researchguide86@gmail.com](mailto:researchguide86@gmail.com)

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## Abstract

**Aim:** The Current research was performed to find out the prevalence of bacterial agents responsible for LRTI and to find out the associated risk factors. **Material and Methods:** Present cross sectional study was performed in the department of Microbiology, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. Total 200 samples including expectorated sputum and Endotracheal tube (ET) aspirates were collected from both OPD and IPD patients with clinically diagnosed Lower Respiratory Tract Infection. Expectorated sputum was collected into a sterile container with a screw cap that is tightly secured following proper instructions given to the patient. ET aspirates were transferred to a sterile screw cap container with the cap tightly secured before transport. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. **Results:** Among the 200 samples processed, sputum and ET aspirates were 190 and 10 respectively. Out of these 38.5% samples acquiesced noteworthy development and rest of 61.5% demonstrated either no growth or modest growth which was measured as no growth. Gender and age wise allocation showed maximum number, (35.25%) of culturally confirmed LRTI cases were in the 61 - 71 years of age group. *Klebsiella pneumoniae* (55%) was the predominant pathogen, followed by *Pseudomonas aeruginosa* (20%), *Acinetobacter* spp (10%), *Citrobacter freundii* (8%), *Staphylococcus aureus* (2%), *Streptococcus pneumoniae* (3%). **Conclusion:** LRTIs are frequently analyzed clinically, but etiological analysis could be completed by culturing different samples from patients which will assist clinician to set up precise treatment.

**Keywords:** Kutch; Lower Respiratory Tract Infections; Risk Factors; Sputum.

## Introduction

Lower respiratory tract infections (LRTIs) are leading cause of illness and death in children and adults across the world. Acute LRTI comprise pneumonia, and other infections disturbing the airways such as acute bronchitis and bronchiolitis, influenza and whooping cough [1]. LRTIs are accountable for 4.4% of all hospital admission and 6% of all general practitioner consultation [2]. multiplicity of organisms are frequently caught up in etiology of LRTI. Gram positive bacteria like *Staphylococcus aureus*, *Streptococcus pneumoniae* etc. and

Gram negative bacteria like *Klebsiella* spp., *Pseudomonas* spp., *Hemophilus influenzae*, *Acinetobacter* spp., have been recovered from LRTIs [3].

Clinically LRTI is defined as an acute ill health usually for a period of 1-3 wks, presenting with symptoms of cough, expectoration, dyspnoea, wheeze & chest pain/discomfort [4]. Various predisposing factors which may lead to LRTI are smoking, alcohol, immunosuppressive conditions. Diabetes mellitus, COPD, Bronchial asthma etc. [5]. The present study was performed to know the prevalence of bacterial agents causing LRTI and to find out the associated risk factors.

## Material and Methods

Present cross sectional study was conducted in the department of Microbiology, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. Total 200 lower respiratory tract samples including expectorated sputum and Endotracheal tube (ET) aspirates were collected from both OPD and admitted patients with clinically diagnosed LRTI after taking detailed history of the patient. Expectorated sputum was collected into a sterile container with a screw cap that is tightly secured following proper instructions given to the patient. ET aspirates were transferred to a sterile screw cap container with the cap tightly secured before transport. Following compilation of the sample, it was transported to Bacteriology section [6].

There are mainly three steps in the Procedure:

1. Direct microscopy by Gram stain [7].
2. Criteria for assessing quality sputum sample:
3. Culture & isolation [8,9]

### Statistical analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. The variables were assessed for normality using the Kolmogorov-Smirnov test. Descriptive statistics were calculated.

## Results

Among the 200 samples processed, sputum and ET aspirates were 190 and 10 respectively. Out of these 38.5% samples yielded significant growth and rest of 61.5% showed either no growth or commensal growth which was considered as no growth. Sputum culture positive cases were 36.9% and ET aspirates culture positive cases were 67.01%. Age and gender wise distribution showed highest number, (35.25%) of culturally confirmed LRTI cases were in the 61–71 years of age group. Overall 71.28% cases were found in Male, whereas in female it was 28.72%. Single gram negative bacilli was isolated in 90.10% cases, while single gram positive cocci was isolated in 6.12% cases.

From 98 culture positive samples a total of 100 isolates were recovered, out of which *Klebsiella pneumoniae* (55%) was the predominant pathogen, followed by *Pseudomonas aeruginosa* (20%), *Acinetobacter* spp (10%), *Citrobacter freundii*

(8%), *Staphylococcus aureus* (2%), *Streptococcus pneumoniae* (3%) and 1% each of *Enterobacter* spp., *Edwardsiella* spp., *Escherichia coli*. On further analysis of sample wise distribution of bacterial isolates, *Klebsiella pneumoniae* was found to be predominant in both sputum and ET aspirates samples [Table 1].

Thirty five percentage % culturally confirmed LRTI cases were associated with either single risk factor or multiple comorbidities i.e more than one risk factor. Out of which Multiple comorbidities (14.01%) were predominant followed by Hypertension (9.20%), Diabetes (4.9%), Smoking (4.12%), COPD (2.12%) and Alcohol (1.10%)

**Table 1:** Distribution of Bacterial isolates from Sputum and ET aspirates

Bacteria	Sputum(N)	ET aspirates (N)	Total (%)
<i>Klebsiella pneumoniae</i>	52	3	55 (55)
<i>Pseudomonas aeruginosa</i>	16	4	20 (20)
<i>Acinetobacter</i> spp.	9	1	10 (10)
<i>Citrobacter freundii</i>	7	1	8 (8)
<i>Staphylococcus aureus</i>	2	Nil	2 (2)
<i>Streptococcus pneumoniae</i>	3	Nil	3 (3)
<i>Enterobacter</i> spp	1	Nil	1 (1)
<i>Edwardsiella</i> spp.	1	Nil	1 (1)
<i>Escherichia coli</i>	1	Nil	1 (1)

## Discussion

Two Hundred samples were collected from patients with LRTI within a period of 3.5 years. Overall culture confirmed cases were found to be 38.5%. Previous studies from various places reported culture positivity rate ranges from 21.5% to 83% [2,10]. Mishra S et al. 2012 [11] too demonstrated superior positivity in ET aspirates than sputum samples. In this present study LRTI cases are more widespread in Males compared to females which are analogous to findings of other researches done by Panda S. et al. 2012 [2] and Akingbade OA. et al. 2012 [12]. sixty one to seventy year age group exhibits uppermost percentage of LRTI cases which was in agreement with study done by Tripathi P. et al. 2014 and Panda S et al. 2012 [2,3].

In this study, *Klebsiella pneumoniae* was found to be predominant isolated organism followed by *Pseudomonas aeruginosa*, *Acinetobacter* spp, *Citrobacter freundii*. Finding of this study was similar to studies done by Tripathi P. et al. 2014,

Shrivastava P. et al. 2013, Biswas P. et al. 2013 [3,13,14]. Percentage of Staphylococcus aureus and Streptococcus pneumoniae were 2% and 3% correspondingly. Mannur S et al. 2015 reported incidence of Staphylococcus aureus as 5%, while incidence of Streptococcus pneumonia were 8.5% and 8.6% respectively in the studies done by Biswas P et al. 2013 and Mishra S et al. 2012 [5,13,11]. small figure of gram positive cocci in present research may be due to hospital based study and complexity in separating such a fragile organisms like Streptococcus pneumonia. The risk factors connected with LRTI cases are Smoking, Alcohol, COPD, Diabetes, Hypertension and multiple co morbidities.

### Conclusion

LRTIs are mostly diagnosed clinically, but etiological diagnosis could be done by culturing various samples from patients which will help clinician to start specific therapy. Therefore regular surveillance is necessary in our hospital as there is a probability of changing trends of etiological agents and associated predisposing factors. Short duration might be the limitation of the study which could not determine the exact prevalence as well as the risk factors of LRTI.

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