

# Study of Bacteriological and Clinical Profile of Community Acquired Pneumonia in Type 2 Diabetes Patients in Tertiary Care Hospital, Warangal

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## Abstract

**Aim:** In this study we proposed to determine whether the clinical or radiological findings, the causative organisms or the outcome of pneumonia are modified by presence of diabetes mellitus as underlying disease.

**Introduction:** Infections of respiratory tract are perhaps the most common human ailments. They are the source of discomfort, disability and loss of many work days for most adults. They lead to substantial morbidity and mortality in young children and elderly.

**Materials And Methods:** The study was conducted for a period of 1 year, from July 2016 to July 2017. A detailed history was taken in all the patients with respect to presenting complaints predisposing factors and accompanying illness.

**Results:** Study conducted in a group of 60 people of which 30 were diabetics and 30 non diabetics with maximum people between 40-75yrs.

**Conclusions:** In patients with pneumonia, Diabetes mellitus is a significant prognostic factor of mortality. Comorbidities of the patients rather than microbiological findings attribute to adverse outcome.

**Key words:** Blood sugar, Diabetes mellitus, Pneumonia

## INTRODUCTION

Infections of respiratory tract are perhaps the most common human ailments. They are the source of discomfort, disability and loss of many work days for most adults. They lead to substantial morbidity and mortality in young children and elderly. Among the respiratory infections, pneumonia is a common cause of hospital admission, although a majority are treated in out-patient settings. Pneumonia presents as a challenge to physicians, have to decide on therapy without the benefit of definitive etiological diagnosis as the clinical features of pneumonia are neither sensitive nor reliable guide in permitting an etiological diagnosis.

Underlying diseases (COPD, compromised immune system, dementia, GERD, etc.) increase susceptibility of the patients for pneumonia; therefore it is not surprising that epidemiological studies have found one or more of these conditions in a high proportion of such episodes.<sup>1,2</sup> Alternatively habitual pathogens could show particular patterns of antimicrobial resistance.<sup>3</sup> Undoubtedly the knowledge of these microbiological characteristics is critical and represents the basis for empirical treatments. Serious co-existing illness have been identified as modifying factors of severity of pneumonia.<sup>1,4</sup> On the basis of these appreciation,<sup>1</sup> published guidelines on pneumonia advocate specific criteria for antibiotic selection and the management of patients in the presence of co-morbid diseases.<sup>5</sup> Diabetes mellitus is a very prevalent chronic metabolic disorder that is present in about 5-10% of elderly population. Several aspects of immunity such as polymer phonuclear leukocyte function i.e. leukocyte adherence, chemotaxis, phagocytosis and bacterial activity of serum are depressed in patients with diabetes.<sup>6,7</sup> For patients with pneumonia, diabetes mellitus is also one of the most common underlying diseases.<sup>1,2,8</sup>

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In this study we proposed to determine whether the clinical or radiological findings, the causative organisms or the outcome of pneumonia are modified by presence of diabetes mellitus as underlying disease.

### Aims and Objectives

To compare pneumonia in diabetics and non-diabetics in the following aspects Clinical presentation of pneumonia, Bacteriological etiology of pneumonia, Complications and prognosis, Radiological patterns.

## MATERIALS AND METHODS

30 diabetic patients and 30 non-diabetic patients with bacterial pneumonia admitted in Mahatma Gandhi Memorial Hospital, Warangal. The study was conducted for a period of 1 year, from July 2016 to July 2017. A detailed history was taken in all the patients with respect to presenting complaints (like fever, new or increasing sputum production, dyspnoea and chest pain) predisposing factors and accompanying illness.

A diagnosis of diabetes mellitus was based on previous clinical and/or biochemical diagnosis and/or treatment with oral anti-diabetic agents or insulin. Alternatively, diagnosis could be established during this episode of pneumonia when the fasting plasma glucose concentration was  $\geq 126$ mg/dl and/or after ingestion it was  $\geq 200$ mg/dl on two or more separate occasions. A thorough clinical examination was carried out as per proforma.

Laboratory investigation like haemoglobin, total count, differential count, erythrocyte sedimentation rate, blood urea, creatinine, random blood sugars, fasting blood sugars, post prandial blood sugars were done. The investigations were repeated as and when necessary.

In all the patients, chest x-ray PA view was taken on admission and 7 days after antibiotic therapy. In few patients chest x-ray lateral view was also taken. Ultrasound chest was also done in few cases.

Sputum was collected for bacteriological examination after rinsing the mouth with saline before institution of antibiotic therapy and subjected to following tests.

Macroscopic examination: Sputum was examined macroscopically with respect to quantity, colour, odour and evidence of haemoptysis.

Sputum microscopy: All the sputum smears were stained with gram's stain. Those smears which showed more than 25 polymorphs per low power field and less than 10 squamous epithelial cells per low power field was considered as appropriate sample 2 and others as inappropriate. Sputum was also examined for AFB by Ziehl neelson (ZN) stain.

Sputum culture: The purulent portion of the sputum was inoculated on blood agar, MacConkey's medium and heat blood agar. These were read after overnight incubation.

### Inclusion Criteria

Type 2 diabetic patients and non-diabetic patients who fulfill all the following criteria Fever, productive or non-productive cough with or without chest pain or breathlessness. X-ray chest PA view showing homogenous or non-homogenous opacities. Sputum gram staining and culture showing pathological organisms.

### Exclusion Criteria

Features suggestive of viral and fungal pneumonia and culture showing fungal growth. Patients diagnosed to have tuberculosis. Patients who are HIV positive or with other immunocompromised states. Patients with upper respiratory tract infections.

## RESULTS

**Table 1: Comparison of age in years between two groups**

Age in years	Non-diabetic		Diabetic	
	Number	Percent	Number	Percent
21-30	3	10	1	3.3
31-40	6	20	5	16.7
41-50	11	36.7	13	43.3
51-60	10	33.3	11	36.7
Total	30	100	30	100
Mean±SD	44.3±9.37		46.43±8.65	

Samples are age matched with  $P=0.3641$ . The average age in SG was  $46.43 \pm 8.65$  yrs and in CG were  $44.3 \pm 9.37$  yrs. Most of the patients (80% in SG and 70% in CG) were between 40 to 60 years.

**Table 2: Comparison of sex between two groups**

Sex	Non-diabetic		Diabetic	
	Number	Percent	Number	Percent
Male	20	66.7	24	80
Female	10	33.3	6	20
Total	30	100	30	100

Samples are age matched with  $P<0.250$ . Most of the patients in both groups were males (66.7% in CG and 80% in SG). There was no statistically significant difference regarding sex in both the groups.

**Table 3: Comparison of concomitant underlying illness between two groups**

Concomitant underlying illness	Nondiabetic		Diabetic	
	Number	%	Number	%
Asthma	1	3.3	2	6.7
COPD	5	16.7	7	23.3
IHD	3	10	6	20

The commonly associated co-morbidities in CG and SG were Asthma (3.3% vs 6.7%), COPD (16.7% vs 23.3%) and IHD (10% vs 20%). There was no statistically significant difference of associated co-morbidities in between two groups ( $p=0.207$ ).

**Table 4: Comparison of habits between two groups**

Habits	Nondiabetic		Diabetic		P value
	Number	%	Number	%	
Smoking	6	20	9	30	0.371
Alcohol	2	6.7	4	13.3	0.389

There was no statistically significant difference of habits (smoking and alcohol) between two groups.

**Table 5: Comparison of RR, SBP, DBP and SPO2 between two groups (results are presented in Mean±SD)**

Parameters	Non-diabetic	Diabetic	P value
RR (bpm)	24.7±3.27	26.43±2.96	0.035
SBP (mmofHg)	124.1±18.04	112.56±20.11	0.022
DBP (mmof Hg)	81.83±9.85	78.2±9.84	0.158
SPO2 (%) (25,75 percentile)	86.96±6.17	84.76±7.03	0.202

There was statistically significant difference in the vital signs (RR, SBP) between two groups.

**Table 6: Comparison of chest X-ray findings**

Chest X-ray findings	Non-diabetic		Diabetic	
	Number	%	Number	%
Unilobe	21	70	12	40
Multi lobe	9	30	18	60
Total	30	100	30	100
Inference	P=0.019*			

Multi lobe involvement is more in Diabetic group (60%) than in Non-diabetic group and the difference is found to be statistically significant

## DISCUSSION

In the present study I have compared following parameters like age, sex, clinical features, concomitant underlying diseases, vital data, investigations, complications and PSI class between diabetic and non diabetic patients with pneumonia

### Age

Present study	Miquel et al.		Pradeep.et.al		
	SG	CG	SG	CG	
46.43±8.65 yrs	44.3±9.37 yrs	62yrs	54yrs	57.93±9.71yrs	56.90±11.83yrs

Pradeep *et al.* reported that diabetic patients with pneumonia were significantly older than 57yrs.in a study conducted in a group of 60 people of which 30 were diabetics and 30 non diabetics.with maximum people between 40-75yrs.

Miquel *et al.* also observed that most patients were older than 62yrs.in a study conducted on 106 diabetic patients with pneumonia and 554 non diabetic patients with pneumonia

Akbar DH has also reported a higher age incidence.

In the present study average age of presentation was 46yrs with maximum people between 40-60yrs(80%).

### Sex

Sex	Present study	Miquel et al.	Pradeep et al.
Male	80%	60%	66.7%
female	20%	40%	33.3%

Miquel *et al.* reported that patients were predominantly males. Pradeep *et al.* also reported male predominance.<sup>50</sup> In the present study also males were predominant.

### Concomitant Underlying Illness

Present study	Miquel et al.	Pradeep et al.
25%	56%	27%

Miquel *et al.* reported that 56% of the patients with diabetes had concomitant underlying disease along with diabetes. Pradeep *et al.* showed that 27% of patients had concomitant underlying disease. Present study had 25% of patients with concomitant disease in the form of COPD, asthma and CVA.

### Organisms

Miquel *et al.*, Pradeep *et al.* have reported that there was no significant difference in microbiological results in patients with diabetes and non diabetes.

The present study also showed no statistically significant difference in microbiological results in two groups.

Spomenka *et al.* reported that staph aureus and gram negative organisms such as klebsiella, E. coli, enterobacter, pseudomonas and acinetobacter are common organisms in diabetes.

Palmar DL reported that gram positive cocci such as strep pneumoniae are responsible for majority of infections in diabetic patients followed by agents such as H influenza.

The present study has shown that common organisms are strep pneumonia (30%) pseudomonas (16%) and polymicrobial (16%).

### Complications

Koziel H *et al.* reported that the most common complications of pneumonia in diabetics were pleural effusion,empyema and bacteremia. Miquel *et al.* reported that pleural effusion was significantly more in diabetic patients and there was difference between other risk factors.

Sayali bhambar *et al.* in a study conducted in pneumonia patients of which 50 were diabetics and 50 were non diabetics observed pleural effusion (6% vs 6%) and septic shock (20% vs 14%).

In the present study patients had complications in the form of septic shock (16%), pleural effusion (13%), renal failure (3%) and MODS (3%) which was more compared to non diabetics.

### Chest X-Ray

Multilobe involvement in diabetics

Present study	Pratik <i>et al.</i> study
60%	64%

In a study by Pratik ranjan *et al.* in Kolhapur, D.Y. Patil medical college conducted on 50 CAP patients of which 25 were diabetic and 25 non-diabetic, it was observed that 64% of diabetics had multilobar involvement. Saibal *et al.* showed that on comparison of chest X-Ray, unilateral lobe infiltration was more in non-diabetic patients.

In the present study patients showed statistically significant multilobar involvement in diabetics.

### PSI - Class

Miquel *et al.* reported that majority of non diabetics presented with PSI class 1 in comparison with diabetics who in majority presented with class 4 which was statistically significant.

Pradeep *et al.* reported that majority of non diabetics presented with PSI class 1 in comparison with diabetics who in majority presented with class 4 and 5 which was statistically significant.

In the present study, majority of diabetics presented in class 4 and 5 which was significant. Diabetes mellitus has been associated with many alterations of the immune system. In a review of the subject by Joshi *et al.*, the most significant changes were identified within humoral-mediated immunity, particularly related to the polymorphonuclear function.

## CONCLUSION

In patients with pneumonia, Diabetes mellitus is a significant prognostic factor of mortality.

Polymicrobial etiology, multilobe involvement and increased severity in the form of high PSI score are associated with poor prognosis.

Comorbidities of the patients rather than microbiological findings attribute to adverse outcome.

Associated comorbidities like CVA, IHD, COPD and asthma had poor outcome in both the groups. However, diabetics had worse outcome compared to non diabetics. Thus emphasizing on the fact that more efforts are needed to increase awareness of impact of uncontrolled DM on the clinical outcome of CAP.

The clinical and bacteriological study of 30 cases of pneumonia in diabetics and 30 cases of pneumonia in non diabetics conducted in Mahatma Gandhi Memorial Hospital, attached to Kakatiya Medical College, Warangal during a period from July 2016 to July 2017. Cases were selected randomly and enrolled for study, literature on etiopathogenesis, bacterial flora, clinical features, investigations and management of pneumonia in diabetics and non diabetics were reviewed.

Results were analysed and compared between diabetic and non diabetic group with reference to age, sex, underlying concomitant disease, clinical features, complications, organisms, PSI scoring. Clinical data was compared with the observation of various workers. The important observation made during this study are summarized as follows:

Males are affected more than females in both the groups, although it was statistically not significant. The average age group of patients in diabetics was 46 yrs in comparison with non diabetics which was 44. Most of the patients were in the age group of 40-60 yrs. The concomitant underlying illness were COPD, IHD, asthma and CVA in both the groups there was no statistically significant difference of associated comorbidities in both groups. There was no statistically significant difference in habits like smoking and alcoholism. In comparison between two groups. On chest X-ray multilobe involvement was significantly more in diabetics (60%) than in non diabetics (30%). On sputum gram staining, GPC were significantly more detected in non diabetic (36.7%) when compared to diabetics. Although there was no statistically significant difference. Polymicrobial organisms were at a higher rate in diabetics compared to non diabetics. Complications were more common in diabetic group, like pleural effusion, septic shock, renal failure and MODS. Majority of non diabetics presented under PSI class 1 when compared to diabetics where majority of them were under PSI class 3 and 4. No statistically significant difference was found in sex distribution in two groups.

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