

A STUDY ON SPECTRUM OF PLEUROPULMONARY INFECTIONS IN DIABETES MELLITUSS. K. N. Uday Manepalli¹, P. Yugandhar², Phaneendra Kumar K. S³, S. Satya Sri⁴**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: The present study is an attempt to understand the spectrum of pleuropulmonary infections in Diabetes mellitus patients. Majority of patients with pleuropulmonary infections in this study have Type 2 DM and there is slight preponderance of males over females. In our study, majority number of patients (accounting for 38%) were diagnosed with diabetes mellitus at the time of diagnosis of pleuropulmonary infection. The peak incidence of pleuropulmonary infections in this study were in the age group of third decade to fifth decade. Thus it would be prudent to screen all patients in this age group presenting with respiratory infection, for diabetes mellitus. Tuberculosis was the most common pleuropulmonary infection in diabetic patients in this study accounting for 59% of the cases followed by bacterial pneumonia and lung abscess. Majority of pleuropulmonary infections of non tuberculous etiology were due to gram negative organisms like Pseudomonas, Klebsiella, H.influenzae (42%) and gram positive organisms like Staphylococcus and Streptococcus (27%). The application of this knowledge is very important in tailoring early appropriate antibiotic therapy for diabetic patients where culture facilities are not available, as even a short delay in initiating treatment may lead to rapid progression of infection leading to increased mortality and morbidity. B/L extensive lesion was the most common radiological pattern in diabetic patients with PTB while consolidation and lung abscess were the commonest patterns in diabetic patients with non tuberculous pleuropulmonary infections. Pulmonary Tuberculosis tends to occur with increased severity in diabetics as evidenced by the occurrence of B/L extensive lesion in around 40% of cases in our study. Further to support this, bacillary loads were high among diabetics with poor glycemic control (as assessed by increased grading of sputum positivity). Risk stratification of bacterial pneumonia in diabetes using CURB 65 scoring system shows that around 57% of patients were categorized under group 2 and group 3 suggesting that bacterial infections tend to be more aggressive in diabetics especially those with uncontrolled hyperglycemia. Association of pulmonary infections with pleural involvement occurs in about 25% of diabetics demanding protracted course of antibiotics and intercostal tube drainage in a good proportion of cases.

KEYWORDS: NIDDM-non insulin dependent diabetes mellitus, OGTT-oral glucose tolerance testing, CURB 65, CAP-community Acquired pneumonia.

INTRODUCTION: Diabetes and pleuropulmonary infections constitute a tale of two troubles. Diabetes Mellitus is a syndrome with disordered metabolism and inappropriate hyperglycemia due to either a deficiency of insulin secretion or to a combination of insulin resistance and inadequate insulin secretion to compensate.¹ It is a chronic metabolic disorder seen in 5 to 10% of the elderly population.²

At the turn of the century many diabetic patients died of overwhelming infections. The introduction of insulin dramatically altered this situation and today non-communicable diseases are

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the major causes of death in diabetic patients. However infections in diabetics still pose a great challenge to physicians.

Clinicians have generally believed that diabetics are more susceptible to infections and that infections are generally more severe in diabetics than they are in non-diabetics. Pulmonary infections (including Tuberculosis as well as other bacterial pneumonia) accounts for about 31% of infections in DM.³ Infections continue to be an important cause of concern in diabetics especially in developing countries like India and there has been few controlled studies that have conclusively shown that certain infections are more common in diabetics as compared to non-diabetics. In this background we conducted a prospective study to analyze the spectrum of pleuropulmonary infections in Diabetes Mellitus.

MATERIALS AND METHODS: A total of 106 cases have been studied in ASRAM Medical College, Eluru, during the period between January 2012 and June 2013. This prospective study was conducted after the approval from the Ethical Committee of the institution.

INCLUSION CRITERIA: Known diabetic patients/cases recently diagnosed to have DM during the course of hospital stay and who had features suggestive of pleuropulmonary infections clinically in the form of either fever, cough, expectoration, pleuritic chest pain with or without hemoptysis with radiological features supporting the same, between January 2012 and June 2013 were subjected to evaluation.

EXCLUSION CRITERIA:

Patients with following factors were excluded from this study:

1. Patients with age < 15 yrs.
2. Secondary causes for hyperglycemia (like drug induced, pancreatic pathology, and other endocrine disorders).
3. Other associated immunodeficiency states like retroviral disease, renal/ hepatic failure.
4. Patients on immunosuppressive drugs.
5. Diabetic patients with endobronchial mass lesion.
6. Patients with transudative pleural effusion.

After obtaining a written informed consent from all these patients, a detailed history was taken and a thorough clinical examination was done and then subjected to investigations. Basic hematological and biochemical investigations included total and differential count, fasting and post prandial blood sugar, blood urea, serum creatinine, serum bilirubin, serum electrolytes and complete urine examination. In patients with impaired glucose tolerance, oral glucose tolerance testing (OGTT) was done and the following criteria were used to diagnose diabetes mellitus.¹

	NORMAL GLUCOSE TOLERANCE	IMPAIRED GLUCOSE TOLERANCE	DIABETES MELLITUS
Fasting plasma glucose mg/dl (mmol/l)	<100(5.6)	100-125(5.6-6.9)	≥ 126(7.0)
Two hours after glucose load mg/dl(mmol/l)	<140(7.8)	≥140-199(7.8-11.0)	≥200(11.1)

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Patients, in whom diabetes mellitus was confirmed from above tests, were included in this study and subjected to appropriate investigations as follows:

From all such patients, the following samples were submitted for microbial analysis:

- Sputum (if present)
- Pleural fluid (if present)
- Bronchial wash (in selected cases)
- Blood

Blood, sputum, pleural fluid (if present) were submitted for gram stain, bacterial culture, fungal smear and these patients were started on appropriate parenteral antibiotics. They were followed up with chest radiographs. Patients not responding to antibiotics and those in whom the above samples did not contribute to diagnosis were subjected to Bronchoscopic assessment after computerized tomogram evaluation of the chest.

Bronchial wash was taken from the involved segments as assessed by CT chest and sent for detailed microbial analysis which included AFB smear, AFB culture, Gram stain, Bacterial culture, Fungal smear and Fungal culture and antibiotic therapy was reinstated as per the results. In patients with features suggestive of pneumonia, severity and mortality risk was assessed using CURB 65 scoring and risk stratification system.

Cases with clinical and radiological features suggestive of PTB were subjected to sputum smear examination for AFB. Sputum positive cases were treated with ATT and cases which were sputum negative were evaluated for pyogenic infections. These cases were subjected for bronchoscopy and bronchial wash was sent for AFB smear, AFB culture, gram stain, bacterial culture and fungal smear and culture. Diagnosis was made in accordance with the results of the investigations.

Cases with clinical and radiological findings suggestive of pleural effusions were subjected to thoracentesis and pleural fluid biochemical (ADA, proteins, glucose), cytological (PMN's, lymphocytes, malignant cells), microbial analysis (Gram stain, bacterial culture and sensitivity) was done.

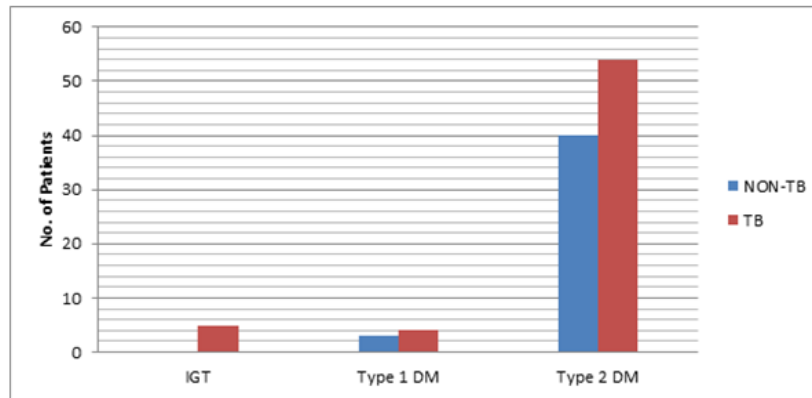
Sputum AFB smear was done for cases of pleural effusion with underlying parenchymal disease. If Sputum AFB/ pleural fluid ADA was positive then patient was diagnosed as a case of TB. In sputum smear/Pleural fluid ADA negative cases, CT chest was done. If the nature of the underlying parenchymal disease was suggestive of TB, these patients were started on ATT and those with CT features suggestive of pyogenic infection (in the form of consolidation/ lung abscess) were started on parenteral antibiotics and followed up with serial chest radiographs.

RESULTS:

TYPES	NO OF CASES OF NON-TB INFECTIONS	NO OF CASES OF TB	PERCENTAGE
IMPAIRED GLUCOSE TOLERANCE(IGT)	-	5(5%)	5%
TYPE 1 DM	3(3%)	4(4%)	7%
TYPE 2 DM	40(37%)	54(51%)	88%
TOTAL	43(40%)	63(60%)	100%

**TABLE1: PLEUROPULMONARY INFECTIONS
GROUPED ACCORDING TO TYPE OF DIABETES**

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Majority of pleuropulmonary infections occur in Type 2 DM accounting for about 88% and only 7 cases out of 106 cases were Type 1 diabetics contributing to only about 7%.

ETIOLOGY	NO. OF CASES	PERCENTAGE
Tuberculosis	63	59%
Bacterial infections	40	38%
Fungal infections	3	3%
TOTAL	106	100%

TABLE 2: ETIOLOGICAL DISTRIBUTION OF PLEUROPULMONARY INFECTIONS IN DIABETES

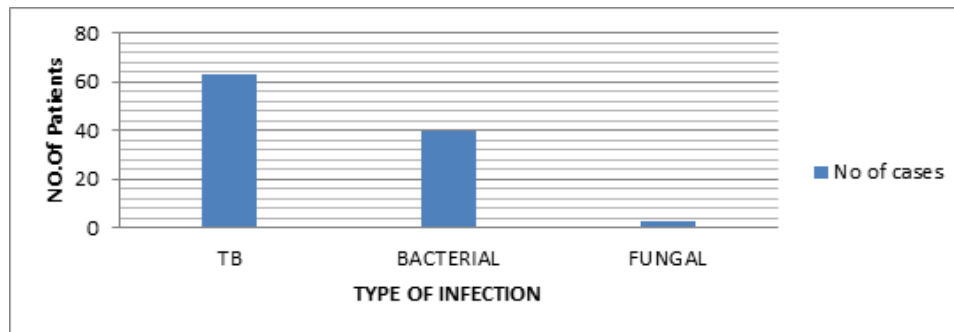


Table 2 shows that Tuberculosis was the major cause (59% cases) of pleuropulmonary infections in diabetes followed by bacterial (38%) and fungal (3%).

SPUTUM SMEAR FOR AFB	SPUTUM/BRONCHIAL WASH AFB CULTURE	NO. OF CASES	PERCENTAGE
Positive	Not done	30	51.7%
Negative	Positive	7	12%
Negative	Negative	21	36.2%
TOTAL		58	100%

TABLE 3: METHODS OF DIAGNOSIS OF PTB

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Sputum smear was positive in about 51% of PTB cases and diagnosis was established by AFB culture in 12% of cases. In 36% of cases diagnosis was made on clinical, radiological grounds and therapeutic response to a trial of ATT.

MICRO ORGANISM	NO. OF CASES	PERCENTAGE
Staph. aureus	9	23%
Pseudomonas	8	20%
Klebsiella	7	17%
Strep.pneumoniae	2	5%
H.influenzae	2	5%
Nocardia	1	2%
GPC+GMR, MIXED	4	10%
Not identified	7	18%
TOTAL	40	100%

TABLE 4: MICROBIAL DISTRIBUTION OF BACTERIAL PLEUROPULMONARY INFECTIONS IN DM

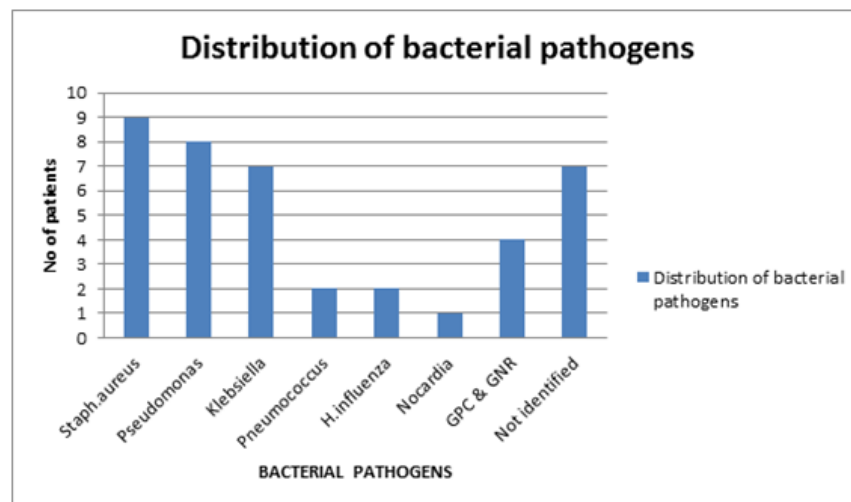


Table 6 shows that Staph.aureus, Pseudomonas and Klebsiella are the etiological agents in majority no of cases (60%) and the causative organism could not be identified in 18% of cases.

MICROBIAL AGENT	PLEURAL DISEASE	NO UNDERLYING PARENCHYMAL DISEASE	UNDERLYING PARENCHYMAL DISEASE
Non-Tuberculosis infection	Parapneumonic effusion	Nil	4
	Empyema	Nil	5
Tuberculosis	Pleural effusion	5	1
	Pneumothorax	Nil	2
	Hydro/Pyopneumothorax	Nil	10

TABLE 4: PLEURAL MANIFESTATIONS IN DIABETES MELLITUS

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Out of 106 patients analyzed, 27 patients had pleural involvement accounting for about 25%. Among 63 patients with TB, pleural disease was observed in 18 cases (about 29%) and among 43 patients with non TB infection pleural involvement seen in 9 cases (about 21%).

SPUTUM SMEAR FOR AFB	SPUTUM/BRONCHIAL WASH AFB CULTURE	NO. OF CASES	PERCENTAGE
Positive	Not done	30	51.7%
Negative	Positive	7	12%
Negative	Negative	21	36.2%
TOTAL		58	100%

TABLE 5: METHODS OF DIAGNOSIS OF PTB

Sputum smear was positive in about 51% of PTB cases and diagnosis was established by AFB culture in 12% of cases. In 36% of cases diagnosis was made on clinical, radiological grounds and therapeutic response to a trial of ATT.

DISCUSSION: With the advent of the world wide epidemic of diabetes mellitus, the risk population is susceptible to infections especially lower respiratory tract infections. This fact has been proved in the study done by Muller LM et al⁴ where both type 1 and type 2 DM are at risk of infections of skin, upper and lower respiratory tract, gastro intestinal tract, urinary tract etc. An increased risk of developing lower respiratory tract infection with pneumonia accounting for 7% was noted.

Hence a detailed study of pleuropulmonary infections in diabetes mellitus was conducted in 106 cases attending our out-patient, in patient and ICU blocks from January 2012 to June 2013.

In our study of 106 cases, 88% were Type 2 diabetics and 7% of the cases were grouped under Type 1 DM. This apparent high prevalence of pleuropulmonary infections in NIDDM may be due to the fact that Type2 DM constitutes to about 90 to 95% of DM and Type 1 DM sums only upto 5 to 10%.

India being a developing country is endemic for tuberculosis. Hence all pleuropulmonary infections are grouped as tuberculous and non tuberculous infections. In our study, among 7 cases of Type 1 DM, 3 have non tuberculous infections and tuberculosis accounted in 4 cases. Among the 94 cases of pleuropulmonary infections with Type 2 DM, 40 were of non TB etiology and TB accounted in 54 cases. Thus the increased prevalence of TB in our study has highlighted that TB is endemic in India.

The association of PTB with impaired glucose tolerance was between 2 to 41% as reported by various research workers. As mentioned by K R L Surya Kiranani et al⁵ among 100 diabetics, 30% has PTB and of 50 PTB cases, 12% have IGT. The same was observed in our study that PTB was associated with IGT in 8% of cases (5 of 63 cases). But apart from TB infection per se leading to alteration in glucose tolerance, the effect of other factors like fever, bed rest, malnutrition and drugs might have contributed to such high associations between PTB and IGT.

In a developing country like India where many people are still reluctant to seek early medical care, a high proportion of patients are found to have diabetes incidentally at the time of diagnosis of pulmonary infection. This fact is evident from our study where highest number of patients accounting for 38% were diagnosed with diabetes mellitus at the time of diagnosis of pulmonary infection. In

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contrast, Shibu Balakrishnan et al⁶ in their study on TB patients found 44% of them to have DM and nearly half of them were diagnosed of DM newly at the time of their study. This emphasizes the necessity of screening all patients with pulmonary infections irrespective of the etiology (TB or Non TB infection) for diabetes mellitus. Lung is a “Mirror” reflecting most of the systemic disorders and Diabetes Mellitus is “No Exception to this Rule”.

The peak incidence of non TB pleuropulmonary infections is observed in 3rd to 5th decade, accounting for 30%. Though pleuropulmonary infections are not very common in elderly age group in our study, they tend to occur with increased severity. The same was observed by Miquel Falguera et al² in non TB infection with DM, especially CAP.

The incidence rates of tuberculous pleuropulmonary infections in DM also reflected the same. Highest incidence is noted between 35 to 54 yrs. accounting for 39%. This is supported by the data from the study done by Kim S J et al⁷ where a greater relative risk was observed in those at the age of 30 to 49 yrs. than in those of 50yrs or more.

Pleural involvement in TB was seen in around 29% (18 among 63) of patients. Out of these, pleural effusion accounts for about 28% and have no underlying parenchymal involvement and diagnosis was made based on pleural fluid analysis. Remaining majority of patients (around 72%) were associated with underlying parenchymal disease.

On the whole, among all the lower respiratory tract infections, gram negative organisms are predominant causative organisms in our study accounting for 45%, followed by gram positive cocci noted in 25% of cases and fungal etiology noted only in 3 cases. This is supported by the finding of the study done by A O Okesola where 48% of the cases had gram negative etiology.

The causative organism could not be identified in 18% of the cases. This may be due to lack of adequate facilities for detection of atypical, anaerobic organisms and viruses.

Our study has finally stirred up a hornet’s nest by revealing that diabetes makes a substantial contribution to pleuropulmonary infections. The current diabetes epidemic had led to the resurgence of pleuropulmonary infections especially tuberculosis and is responsible for potentially serious implications. There is growing evidence of one disease fuelling the other. There are numerous issues of basic, applied and operational research waiting for the solutions. It is time that the “unhealthy partnership” of pleuropulmonary infections and diabetes receives the attention it deserves, in all aspects of diagnosis and treatment.

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