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Original Research Article

Clinical, Microbiological and Radiological Study of Community Acquired Pneumonia in Type 2 Diabetes

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Abstract:

Background and Objectives: It has been suggested that diabetes mellitus is associated with an increased susceptibility to infections, the risk of using more aggressive therapeutic agents and increased mortality and morbidity; however, current evidence supporting these events in the field of pneumonia is scarce. The aim of the present study is to provide informationon clinical and microbiological characteristics and the outcome of pneumonia in patients with diabetes mellitus.

Methods and Materials: A prospective study conducted in GMCH Bettiah, which included 50 patients of pneumonia with diabetes and 50 patients of pneumonia in non-diabetics. The clinical and radiological characteristics, the spectrum of causative agents, microbiological data and the outcome of diabetic patients were analyzed and compared with data obtained from non diabetic patients.

Results: Patients with diabetes were significantly associated with multilobar involvement (P=0.045*), prolonged duration of hospital stay (P = <0.001**), more severe at presentation in form of increased PSI score (P = 0.004**) and more ICU admissions. Bycontrast, there was no significant difference in age, sex, concomitant underlying illness, complications, mortality. In the sub group of patients with diabetes, mortality was associated with multilobar infiltrate, concomitant illness, high PSI score (P=0.078*).

Conclusions: In patients with pneumonia, diabetes is associated with poor prognosis, increased duration of hospital stay and poor outcome. This study suggests that this outcome is moreattributable to underlying circumstances of patients and uncommon microbiological finding.

Keywords: pneumonia, diabetes, pneumonia severity index.

Introduction

Infections of the respiratory tract are perhaps the most common human ailments. Theyare a source of discomfort, disability and loss of too many work-days for most adults. They lead to substantial morbidity and mortality in young children and the elderly. Many of these infections run their natural course in older children and in adults without specific treatment and without complications. However, in young infants, small children, elderly persons with impaired respiratory tract reserves and in immune-compromised individuals; it increases the morbidity and mortality rates. Among the respiratory infection, pneumonia is a common cause of Hospital admission, although a majority is treated in outpatient settings. Pneumonia presents a challenge to Physicians, have to decide on therapy without the benefit of a definitive etiological diagnosis, as the clinical features of pneumonia are neither sensitive nor reliable guides in permitting an etiologic diagnosis. The varied pathophysiologic considerations, the discovery of new causative agents, renaming of some old ones and the influence of co-morbid conditions, makes the study of pneumonia a fascinating one. Underlying diseases increase the susceptibility of the patients for pneumonia; therefore, itis not surprising that epidemiologic studies have found one or more of these conditions ina high proportion of such episodes. [1,2] It has also been reported that some co morbidities can influence the spectrum of causative agents, facilitating unusual and more aggressive microorganisms; alternatively, habitual pathogens could show particular patterns of antimicrobial resistance. [3] Undoubtedly, the knowledge of these microbiological characteristics is critical and represents the basis for empirical treatments. Moreover, serious coexisting illnesses have been identified in studies [1,4] as modifying factors of the severity of the pneumonia; thus, these conditions can increase the risk of bacteremia and empyema and usually provide a poor prognosis. On the basis of these appreciations, published guidelines on pneumonia advocate specific criteria for antibiotic selection and the management of patients in the presence of co morbid diseases. [5] Unfortunately, the real impact of some of these underlying diseases on pneumonia hasnot been fully evaluated.

Diabetes mellitus is a very prevalent chronic metabolic disorder that is present in about 5 to 10% of the elderly population. Several aspects of immunity, such as polymorphonuclear leukocyte function (i.e.) leukocyte adherence, chemotaxis,and phagocytes and bactericidal activity of serum are depressed in patients with diabetes. [6,7] In consequence, some specific infections are very common in these patients, while others occur with more severity or are associated with an increased risk of complications. For patients with pneumonia, diabetes mellitus is also one of the most common underlying diseases [1,2,8], however, it remains uncertain as to whether pneumonia shows particular clinical manifestations, increases morbidity or mortality or involves a predisposition for more aggressive agents in patients with diabetes. In this dissertation, we proposed to determine whether the clinical or radiological findings, the causative microorganisms, or the outcome of pneumonia are modified by the presence of diabetes mellitus as the underlying disease. Patients with diabetes have about twice the risk of infection related mortality compared with those without diabetes. [9] Based on compilation of studies from different parts of the globe, the World Health Organization has projected that the maximum increase in diabetes would occur in India. Considering the large population and the high prevalence of diabetes, the burden ofdiabetes could be enormous. With an estimated 23 million today and the numbers set to increase to 57 million by 2025. [10,11]

Objectives

Bacteriological etiology of pneumonia.
Complications and Prognosis.
Radiological patterns.
Hematological changes in response to pneumonia

Material and methods

50 Diabetic patients and 50 non diabetic patients with pneumonia admitted in Medicine wards in Government Medical College and Hospital bettiah, West Champaran Bihar. The study was conducted for a period of 2 years, 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 of diabetes mellitus and/or treatment with oral antidiabetic agents or insulin. Alternatively, diagnosis could be established during this episode of pneumonia when the fasting plasma glucose concentration was ≥ 126 mg/dl (7.0mmol/l), and/or after ingestion it was ≥ 200mg/dl (11.1mmol/l) on two or more separate occasions. A thorough clinical examination was carried out as per Performa.

Laboratory investigations like Hemoglobin, total count, differential count, erythrocyte sedimentation rate, blood urea, creatinine, random blood sugar, fasting blood sugars, post prandial blood sugars, glycosylated Hb and urine microscopy were done in all the patients on admission. The investigations were repeated as and when necessary.

Inclusion Criteria

Type 2 diabetic patients and non-diabetic patients who fulfill all the following criteria:

1. Classical symptoms suggestive of pneumonia such as fever, productive or non-productive cough, with or without chest pain or breathlessness.
2. X-ray chest suggestive of pneumonia in the form of unilateral or bilateralhomogenous or non-homogenous opacities.
3. Blood investigation shows presence of leucocytosis with neutrophilia/lymphocytosis, elevated ESR.
4. Sputum gram staining and culture showing pathological organisms.

Exclusion Criteria

1. Patients with Hospital Acquired Pneumonia.
2. Patients with aspiration pneumonia.
3. Patients who are HIV positive or with other immunocompromised states.

Results

The present study was conducted at GMCH, Bettiah A total no. of 100 pneumonia cases were studied, out of which 50 cases were pneumonia in diabetics (Study group SG) and 50 cases were pneumonia in non-diabetics (control group CG).

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

	DM Group		Non DM Group	
Age in years	**No**	**%**	**No**	**%**
30-40	0	0.0	2	4.0
41-50	10	20.0	10	20.0
51-60	21	42.0	18	36.0
61-70	16	32.0	18	36.0
71-80	3	6.0	2	4.0
Total	50	100.0	50	100.0
Mean ±SD	57.72 ±8.25		56.88 ±9.39	

Samples are age matched with P=0.636 The average age in Diabetic group (SG) was

57.72±8.25 yr. and in Non-diabetic group (CG) was 56.88±9.39 yrs. The age span of the patients was between 30 and 75 yrs in bothgroups, while most of the patients (74% in SG and 72% in CG) were between 51 to 70 yr.

Table 2: Comparison of sex between two groups.

Gender	DM Group		Non DM Group	
	No	%	No	%
Male	27	54.0	29	58.0
Female	23	46.0	21	42.0
Total	50	100.0	50	100.0

Patients between two groups are sex matched with
In both groups male patients (58% in CG and 54% in SG) are slightly more compared to female patients.

Table 3: Comparison of clinical manifestations between two groups

Clinical manifestation	DM Group(n=50)		Non DM Group(n=50)		P value
	No	%	No	%	
Fever	44	88.0	43	86.0	0.766
Cough	50	100.0	46	92.0	0.117
Expectoration	50	100.0	46	92.0	0.117
Breathlessness	27	54.0	24	48.0	0.548
Chest pain	10	20.0	7	14.0	0.424
Haemoptysis	2	4.0	1	2.0	0.558

In both the groups' majority of the patients presented with Fever, Cough, and Expectoration. Around half of the patients had breathlessness. Few patients presented with chest pain and hemoptysis.

Table 4: Comparison of Chest x-ray findings between two groups

CXR findings	DM Group		Non DMGroup	
	No	%	No	%
Multi lobe	31	62.0	21	42.0
Uni lobe	19	38.0	29	58.0
Total	50	100.0	50	100.0

Multilobe involvement (> 2 zones involvement in chest x- ray) was more common in SG(42% in CG vs. 62% in SG) which is statistically significant (P=0.045*).

Table 5: Comparison of Sputum gram staining between two groups

Gram	DM Group		Non DM Group		P value
	No	%	No	%	
GNB	21	42.0	15	30.0	0.212
GPC	18	36.0	31	62.0	0.009**
GPC/GNB	12	24.0	4	8.0	0.029*
Total	50	100.0	50	100.0	

On Gram staining, Gram positive cocci were significantly more (P = 0.009**) in CG in comparison with SG (62% vs. 36%) A combination of GPC/GNB was significantly (P=0.029*) more in SG than CG (22% vs. 8%).

Table 6: Comparison of type of complications between two groups

Type of complications	DM Group		Non DMGroup		P value
	No	%	No	%	
Pleural effusion	5	10	3	6	0.461
Septic shock	11	22	7	14	0.299
Renal failure	4	8	1	2	0.169
MODS	4	8	1	2	0.169
Cardiac arrest	3	6	0	0	0.079

The complications in diabetic group were pleural effusion (10%), septic shock (22%),renal failure, MODS (8%), and cardiac arrest (6%). In comparison with CG were pleural effusion (6 %), septic shock (14%).

Table 7: Comparison of PSI Score between two groups

PSI score	DM GroupN=50	Non DM GroupN=50
Range	46-194	35-170
Mean ± SD	97.17±37.15	83.1±36.22
Inference	There is higher PSI score in Diabetic group with P=0.078*	

PSI score was significantly more in diabetic group (93.43±38.14) in comparison with non-diabetic group (80.27±38.14), (P = 0.078*).

Discussion

In the present study I have compared the following parameters like age, sex, clinical features, concomitant underlying diseases, habits, investigations, ICU admissions, complications, duration of hospital stay, mortality and PSI scoring between Diabetics and non Diabetic patients with pneumonia.

Age:

Present Study		Miquel et al	
Diabetic	Non Diabetic	Diabetic	Non Diabetic
57.72 ±8.25	56.88 ±9.39	62yrs	54yrs

Miquel et al has reported that patients with diabetes were significantly older with average age of 62 yrs. Akbar DH has also reported a higher age incidence. In the present study average age of presentation was 58 yrs with maximum people between 51-70 yrs (74%).

Sex:

Sex	Present Study	Miquel et al.
Male	54%	60%
Female	46%	40%

Miqel et al reported that patients with diabetes were predominantly males (60%). Akbar DH also reported male predominance in diabetics. [12] But in the present study there was no statistically significant difference regarding sex in both the groups.

Spomenka et al reported that Staph. auerus and Gram negative organisms such as Klebsiell, E coli, Enterobacter, Pseudomonas and Acinectobacter are common organismsin diabetes. Palmar DL reported that Gram positive cocci such as Strep. pneumonia are responsiblefor majority of infections in diabetic patients, followed by agents such as H. influenza. In the present study the common organisms on sputum culture in non diabetics were Strep pneumonia (42%), Stap auerus (20.0%), Klebsiella (10%). In diabetics, Strep pneumonia (28%), Klebsiella (14%), Polymicrobial (24%). Staph aureus growth is significantly more in non-diabetics (P=0.03*) and polymicrobial growth is significantly more in diabetics (P=0.029*)

Complications:

	Present Study		Miquel et al	
Complications	Diabetic	Non Diabetic	Diabetic	Non Diabetic
Pleural effusion	10%	6%	31%	20%
Septic shock	22%	14%	-	-
Renal failure	8%	2%	-	-
MODS	8%	2%	-	-
Cardiac arrest	6%	-	-	-

Koziel H et al reported that the most common complications of pneumonia in diabeticswere pleural effusion, empyema and bacteremia. Miquel et al reported that pleural effusion was significantly more in diabetic patients andthere was difference between other risk factors. Present study showed that there was no significant difference in complications betweenthe two groups.

Mortality

Present Study		Miquel et al	
Diabetic	**Non Diabetic**	**Diabetic**	**Non Diabetic**
16%	6%	17%	8%
P = 0.110 Not significant		Significant (P=0.002)	

Miquel et al reported that mortality was more common in diabetic patients which wasstatistically significant. Akbar DH reported that there was no significant difference in mortality between both the groups. The present study has also reported that there is no difference in mortality between thetwo

groups. Miquel et al reported that multilobar infiltrate (P = 0.003) and the simultaneous presenceof co morbidities (P = 0.029) were found to be independently associated with mortality. The present study has reported that multilobar involvement, elderly (>60yrs), associatedco morbidities, polymicrobial infection were associated with mortality independently. Miquel et al has shown that there was no relation found with sex, length of disease,bacteremia, empyema, pleural effusion with mortality. [11] Koziel et al reported that Acinectobacter pneumonia has been associated with a mortality rate exceeding 60% in diabetics. [12] Present study showed that there is no mortality in diabetic patients with Acinectobacter pneumonia.

Conclusions

In patients with pneumonia, Diabetes Mellitus is associated with poor prognosis, polymicrobial etiology, multilobe involvement, increased requirement of intensive care (ICU admissions), increased severity in the form of higher PSI score, increased durationof hospital stay and mortality. This study suggests that this adverse outcome is more attributable to the underlying circumstances of patients and uncommon microbiological findings. Certainly, age, prior co morbidities, as well as multilobe infiltrates have already been related to poor prognosis; however, in this study, diabetes also remained a significant prognostic factor of mortality in patients with pneumonia.

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