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Original Research Paper

Pulmonary Medicine

BURDEN OF COMMUNITY ACQUIRED PNEUMONIA AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Introduction: Community Acquired Pneumonia (CAP) is a leading infectious cause of hospitalization worldwide, particularly among people with diabetes mellitus. The information regarding the clinical features, etiology, and outcomes of Community Acquired Pneumonia (CAP) in patients with Diabetes Mellitus (DM) is scarce. **Aims:** The present study was carried out to evaluate the clinical and microbiological characteristics of patients with pneumonia in type 2 diabetes mellitus. **Methodology:** This prospective cohort study was carried out among 71 adult type 2 diabetes mellitus patients admitted to the tertiary care hospital with a diagnosis of CAP. A structured proforma was used to elicit the demographic particulars and clinical history. Radiological evaluation using chest x-ray PA view was taken on admission and 7 days after the antibiotics therapy. Sputum was collected for bacteriological examination subjected to macroscopic and microscopic examination, followed by culture and sensitivity testing. **Results:** Based on the radiological findings, left lower zone consolidation was the most predominant diagnosis (60.6%) followed by right lower zone consolidation (19.7%). Among all the specimens evaluated, K.pneumoniae was the most frequently isolated organism (19.7%) followed by Streptococcus spp in 15.5% of the samples. Among these, S.pneumoniae, S. mitis/ S. oralis and S. hemolyticus were predominantly seen in 4.2% of the total Streptococcus bacterial isolates. (Table 2) **Conclusion:** When considering the etiology of CAP, it is useful to categorize patients into those who can be treated on an ambulatory basis, those who require hospitalization, and those who require admission to an intensive care unit.

KEYWORDS : Community Acquired Pneumonia, Diabetes mellitus, Streptococcus, Klebsiella pneumoniae, pulmonology

INTRODUCTION

Community-acquired pneumonia (CAP) is a common and potentially serious illness. It is associated with considerable morbidity and mortality, particularly in elderly patients and those with significant comorbidities.[1] Community-acquired pneumonia (CAP) is defined as an acute infection of the pulmonary parenchyma in a patient who has acquired the infection in the community.[2] The overall incidence rate of community-acquired pneumonia (CAP) in adults is approximately 5.16 to 6.11 cases per 1000 persons per year; the rate of CAP increases with increasing age.[3]

Several risk factors of CAP have been identified, including lifestyle factors like smoking, poor oral hygiene, and other co-morbidities like type 2 diabetes mellitus.[4] Prevalence of diabetes is steadily rising. The prevalence of diabetes in India has remained at 11.8% in the last four years. According to the National Diabetes and Diabetic Retinopathy Survey report 2019 released by the health and family welfare ministry, it is estimated that there will be a rise in the number of adults with type 2 diabetes in the next 12 years. The reasons attributed for this increase include aging, urbanization, and associated changes in diet and physical activity. This increase in diabetes prevalence can further lead to a significant increase in patients with community-acquired pneumonia (CAP). [5]

CAP is a leading infectious cause of hospitalization worldwide, particularly among people with diabetes mellitus.[6] Conversely, previous studies have shown that diabetes is a risk factor for a pneumonia related hospitalization. The risk of pneumonia is higher among patients with diabetes compared with non-diabetic patients. Advanced age and comorbidity are associated with increased mortality among adults hospitalized with CAP.[7] Diabetic patients may have increased risk to pneumonia for several reasons like risk of hyperglycemia, decreased immunity, impaired lung function and chronic complications such as heart disease, renal failure and pulmonary microangiopathy.[8] The information regarding the clinical features, etiology, and outcomes of CAP in patients with Diabetes Mellitus (DM) is scarce. With this background, the present study was carried out to evaluate the clinical and microbiological characteristics of patients with pneumonia in type 2 diabetes mellitus.

Methodology

Study Setting And Participants

The present study was carried out as a prospective cohort study among the diabetic patients who were diagnosed with pneumonia in the Department of Pulmonary Medicine of this tertiary teaching institution, Aurangabad for a period of two years between April 2017 and March 2019.

Selection Criteria

All type 2 diabetic patients diagnosed to have community acquired pneumonia and presenting with any one or more of the following symptoms:

High grade fever, Productive Cough, Chest pain when taking breath and coughing, dehydration.

If radiological presentation has

- Lobar or segmental consolidation.
- Non homogenenous infiltrates.
- Cavitatory infiltrates.

Sample Size And Sampling

Based on the available literature, the prevalence of CAP with S.aureus was found to be 32%.[9] at 95% confidence limits and 12% absolute precision, the sample size was calculated as 60. Accounting 10% for non-response, the sample size was finalized at 66 and rounded off to 70. The study participants were selected by convenient sampling.

Ethical approval and informed consent

Institutional Ethics Committee approval was obtained prior to the commencement of the study.[ref no] Informed consent was obtained prior to the data collection from each participant.

Data collection

A structured proforma was used to elicit the demographic particulars and clinical history. Confirmation of the presence of type 2 diabetes mellitus was made based on previous clinical and biochemical diagnosis of diabetes mellitus or treatment with oral antidiabetic agents or insulin. Alternatively, diagnosis was established during this episode of pneumonia when the fasting plasma glucose concentration was more than 126 mg/dl (7.0mmol/l) and / or after ingestion it

was more than 200mg/dl (11.1mmol/l) on two or more separate occasions. Clinical examination was carried out as per protocol.Laboratory investigations like hemoglobin, total count, differential count, erythrocyte sedimentation rate, blood urea, creatinine, random blood sugar, fasting blood sugars post prandial blood sugars, and urine for albumin, urine microscopy was done on patients at admission. The investigations was repeated as and when necessary. Radiological evaluation using chest x-ray PA view was taken on admission and 7 days after the antibiotics therapy. Sputum was collected for bacteriological examination after rinsing the mouth with saline before institution of antibiotic therapy and subjected to macroscopic and microscopic examination, followed by culture on blood agar, Mac Conkey's medium and heat blood agar.

Data Analysis

Data was entered in Microsoft Excel Spreadsheet 2013 and analyzed using SPSS ver.23. Difference in proportions were tested using chi square test. A p value <0.05 was considered statistically significant.

RESULTS

Overall 71 diabetic patients diagnosed with CAP were included in this study. Majority of the participants in this study belonged to the age of >65 years (49.3%) and males (67.6%). Majority were unskilled laborers (coolie) by occupation (23.3%). (Table 1) Fever and productive cough was present among all the participants (100%) followed by breathlessness (40.8%), chest pain (36.9%) and dehydration (36.9%). (Figure 1)

Table-1: Demographic Characteristics Of The Study Participants

S No.	Characteristics		Frequency (n=71)	Percent
1	Age (in years)	35- 40	3	4.2
		41-50	10	14.1
		51-60	23	32.4
		>60	35	49.3
2	Occupation	Farmer	42	59.2
		Coolie	17	23.3
		Teacher	5	6.8
		Driver	3	4.9
		Others	4	5.8
3	Gender	Males	48	67.6
		Females	23	32.4
4	BMI	Under weight (< 18.5)	14	20.4
		Normal (18.5-24.9)	40	56.3
		Over weight (25- 29.9)	17	23.3
5	Educational status	Literate	28	39.2
		Illiterate	43	60.8

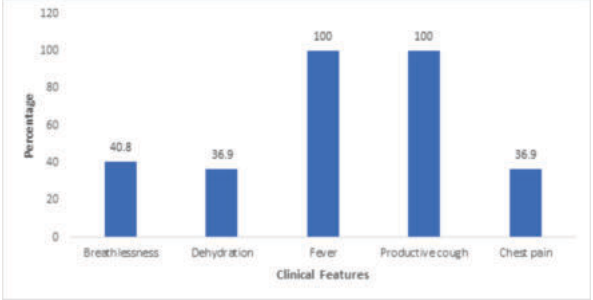

Figure-1: Clinical symptomatology of the study participants:

Based on the radiological findings, left lower zone consolidation was the most predominant diagnosis (60.6%) followed by right lower zone consolidation (19.7%). (Figure 2) Among all the specimens evaluated, *K.pneumoniae* was the most frequently isolated organism (19.7%) followed by *Streptococcus spp* in 15.5% of the samples. Among these, *S.pneumoniae, S. mitis/ S. oralis and S. hemolyticus* were predominantly seen in 4.2% of the total *Streptococcus* bacterial isolates. (Table 2)

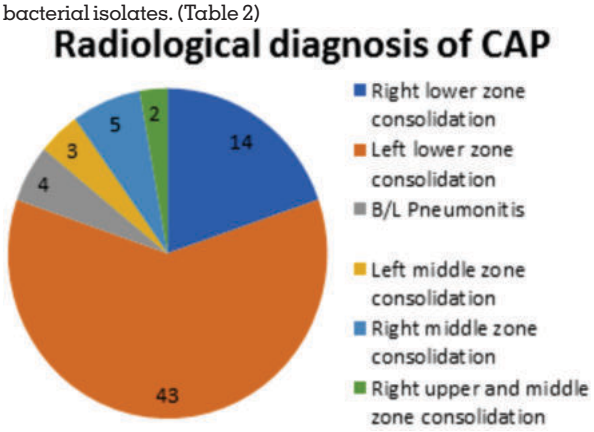

Figure-2: Radiological diagnosis of CAP among the study participants

Table-2: Organism Isolated From The Specimens

S No.	Organism		Frequency	Percent
1	Contaminated sample		3	4.2
2	No growth		13	18.3
3	Klebsiella pneumonia		14	19.7
4	Escherichia Coli		6	8.5
5	Acinetobactor		7	9.9
6	Streptococcus	Streptococcus Pneumoniae	3	4.2
		Streptococcus Parasanguinis	2	2.8
		streptococcus mitis /streptococcus Oralis	3	4.2
		Streptococcus hemolyticus	3	4.2
7	Staphylococcus		5	7
8	Pseudomonas aeruginosa		6	8.5
9	Others*		6	8.5

DISCUSSION

Majority of the study participants in the present study are in the age group of more than 60 years (52.4%). But a study done by Martins et al suggests the impact of DM in hospital mortality was mainly contributed by the 20–39 age group which showed higher mortality.[10] Their results are also supported by Kornum et al. also reported similar findings that diabetes increases the risk of hospitalisation for pneumonia.[11] McDonald et al. observed that pneumonia incidence was 6–8 times higher among patients aged ≥85 years than patients aged 65–69 years which is similar to the present study.[12] The present study shows male sex preponderance (67.6%) which is supported by a study done by Hamilton et al. where most of the participants were elderly males.[13] A study done by Martins et al. shows the prevalence of CAP in type 2 DM was higher among men than women, the male/female ratio was significantly different between the two groups (p<0.0001).[10]

There are very few studies in literature assessing the clinical presentation of CAP in type 2 DM. Di Yacovo et al. shows the classical clinical triad of bacterial pneumonia with cough, purulent sputum, and pleuritic chest pain is less common in patients with DM than general population.[9] This explanation of lower rate of cough and expectoration may be due to the disturbances in pulmonary host defense leading to decreased pulmonary inflammatory function associated with DM.[14]But in the present study fever and productive cough was the most common clinical presentation (100% each). The low rate of chest pain is probably due to the less common occurrence of

pleural effusion.[15] The finding that patients with DM were less likely to report pleuritic pain than other patients may also reflect a poor inflammatory response in these patients. This data supports the lower presentation rate of chest pain (37%) in the present study.

In this study around 80% of the study population were in the normal range of BMI according to WHO classification and rest 20% of the study population were in the underweight range. This data is supported by a study done by Ana López-de-Andrése et al. and Hamilton et al., in patients with Type 2DM obesity was not associated with a higher mortality risk for CAP.[13, 16, 17] A recent meta-analysis concluded that overweight and obesity were significantly associated with reduced risk of pneumonia mortality and suggests that an 'obesity survival paradox' exists for pneumonia.[18]

Majority of the patient (60.6%) of the study population was diagnosed with Left lower zone consolidation. Di Yacovo et al. found 29.4% patients with diabetes had multi lobar infiltrates. Similar findings were seen in a study done by Falguera et al. (14%).[19]]Maximum number of organisms isolated in culture and sensitivity belongs to the klebsiella pneumonia (19.7%) followed by streptococcus family (14.6%). These findings are supported by Ana López-de-Andrése et al., which shows growth of streptococcus pneumoniae 14%. Among the streptococcus family, S. Aureus (31%), S. Pneumoniae and S. Hemolyticus(19% each) were most common organism isolated in culture and sensitivity test. Despite the trends observed the low incidence of S aureus (0.57% in patients with T2DM and 0.56% in those without T2DM), perhaps suggests that S aureus is not routinely searched for and detected for patients with CAP.[20,21]

CONCLUSION

Hospitalization for CAP in patients with T2DM increased significantly in the recent years. The presenting clinical manifestations cannot reliably differentiate between different etiologies, but there are a few epidemiologic and/or clinical clues that can be helpful and must be taken into account when considering the etiology of CAP. The results of the study also suggest that streptococcal organism are more common in the patients with DM and CAP. When considering the etiology of CAP, it is useful to categorize patients into those who can be treated on an ambulatory basis, those who require hospitalization, and those who require admission to an intensive care unit.

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Declaration

Conflict of interest – nil

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Ethical approval –obtained

Author's contribution

Kolaparthi R has been responsible for the conceptualization, collection and compilation of the data and manuscript writing

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