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# Clinico-Epidemiological Profile of Patients of Community Acquired Pneumonia with Diabetes Mellitus

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***Abstract***
***Introduction:*** *Community acquired pneumonia (CAP) is a common but serious problem. Diabetes mellitus (DM) not only puts patients on increased risk of CAP but also results in higher mortality. We aimed to understand the clinico-epidemiological profile of patients who presented to our hospital with bacterial pneumonia and diabetes mellitus.*
***Methodology:*** *After taking approval of the institutional ethics committee, we enrolled all patients of bacterial pneumonia aged 14 years of more with a confirmed diagnosis of DM at the Department of Chest Medicine at MVP's Dr. Vasantrao Pawar Medical College, Nashikfrom August 2014 till December 2016. Using a pre-designed pretested questionnaire, we collected patient related socio-demographic and clinical information. The data were entered in statistical software and analysed using appropriate statistical techniques.*
***Results:*** *We enrolled 50 diabetic and 50 non-diabetic patients with bacteriological pneumonia, majority belonging to 41-50 years of age group and male gender. Mean respiratory rate in diabetics was 27.7±5.7/minute and in non-diabetics was 27.8±4.4/minute, with no statistical difference between the two groups. Mean systolic blood pressure was 133.5±41.1 mm Hg and 124.7±26.9 mm Hg in diabetic and non-diabetic groups respectively. Similarly, average diastolic blood pressure was noted as 81.1±15.7 mm Hg and 78.4±15.9 mm Hg in diabetic and non-diabetic groups respectively, with no statistical difference between the two groups. We noted higher hemoglobin levels in non-diabetic pneumonia patients (10.7±3.2 mg% vs 9.6±2.4 mg%, p value < 0.05).*
***Conclusions:*** *Understanding the differences between diabetic and non-diabetic CAP patients will help us in identifying areas of improvement in their clinical care.*
***Keyword:*** *complications, community acquired pneumonia, diabetes, epidemiology*

## I. Introduction

Community acquired pneumonia (CAP) is a common and potentially serious illness.[1] It is associated with considerable morbidity and mortality, particularly in older adult patients and those with significant comorbidities. The spectrum of potential pathogens known to cause pulmonary infections in immunocompromised individuals has grown as a result of intensified immunosuppression, prolonged patient survival, the emergence of antimicrobial-resistant pathogens, and improved diagnostic assays. Survival has improved with the availability of newer antimicrobial agents, including azole antifungals, macrolides, antivirals, and antiretroviral drugs.[2] Despite these advances, pulmonary infection remains the most common form of documented tissue invasive infection observed in these hosts. Elliott Joslin in 1950 described the increased susceptibility to infections in patients with diabetes[3] but more recent studies have shown that diabetic patients are more prone to certain types of infections, respiratory tract infections and urinary tract infections being one of them.[4]While it is unclear that what are the reasons for this predisposition, animal model studies of diabetes have focused on impaired neutrophil function, but the data are still inconclusive.[5]

In this study we aimed at understanding the demographic and clinical profile of patients who presented to our hospital with bacterial pneumonia and diabetes mellitus and understand the associations between various patient characteristics and clinical findings.

## II. Methodology

**Study design and study setting**

We designed a case control study in which we included 100 consecutive patients of bacteriological pneumonia, 50 of which had diagnosed DM and 50 without DM. These patients were enrolled in the outpatient clinic and inpatient ward of Department of Chest Medicine at MVP's Dr. Vasantrao Pawar Medical College, Nashikfrom August 2014 till December 2016.This tertiary level medial insitutute in Nashik is a major healthcare provider in Nashik as well as neighboring villages and towns.

**Sample population**

We defined community-acquired pneumonia as the presence of an acute illness with features of lower respiratory tract infection (with two or more of the following signs and symptoms: fever; new or increasing cough or sputum production; dyspnea; chest pain; and new focal signs on chest examination) and the presence of a consolidation in the chest radiograph that was consistent with acute infection.A diagnosis of Diabetes Mellitus was based on a 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 more than or equal to 126 mg/dL (7.0 mmol/L), and/or after ingestion it was more than or equal to 200 mg/dL (11.1 mmol/L) on two or more separate occasions.After obtaining approval of the institutional ethics committee we included all diabetic patients with age more than 14 years with confirmed bacterial pneumonia on clinical and radiological examination. We excluded patients with age less than 14 years, those not willing to give written informed consent and those diabetic patients having pneumonia other than bacterial etiology.

**Data collection and analysis**

Detailed clinical history and examination findings were entered in a pre-designed proforma. Every enrolled patient underwent investigationslike complete hemogram with platelet count, peripheral blood smear, reticulocyte count, renal function tests, liver function tests, blood sugar level, glycosylated hemoglobin, routine urinary tests, sputum for gram staining, sputum for culture, sputum for acid fast bacilli on day one, day two and day three, chest X-Ray and serum electrolytes.Patients were treated as per standard hospital protocol and were followed up after 2 weeks to assess symptomatic improvement and for repeating chest radiograph.All the data was entered in Microsoft Excel sheet and then transferred to SPSS software for statistical analysis. Appropriate tests were applied according to type and distribution of data. A 'p' value less than 0.05 was considered as statistically significant.

## III. Results

During the study period, we enrolled 50 diabetic and 50 non-diabetic patients with bacteriological pneumonia. Majority of them belonged to 41-50 years of age group and male gender (Table 1). Next most common age group was 51 to 60 years. No consolidation was seen on chest xray findings in 40% of the patients. Co-morbidities were present in 41% of the patients and there were a total of 27 smokers, 12 of them were diabetics and 11 acoholics, 3 of them being diabetics. On clinical examination, we noted their vitals, like respiratory rate, systolic (SBP) and diastolic blood pressure (DBP). Mean respiratory rate in diabetics was 27.7 ± 5.7 per minute and in non-diabetics was 27.8 ± 4.4 per minute, with no statistical difference between the two groups (Table 2). Mean SBP was 133.5 ± 41.1 mm of Hg and 124.7 ± 26.9 mm of Hg in diabetic and non-diabetic groups respectively. Similarly, average DBP was noted as 81.1 ± 15.7 mm of Hg and 78.4 ± 15.9 mm of Hg in diabetic and non-diabetic groups respectively, with no statistical difference between the two groups. We also noted the total leucocyte count of all patients, which was statistically similar in diabetic as well non-diabetic group. We noted higher hemoglobin levels in non-diabetic pneumonia patients. The noted levels were 10.7 ± 3.2 mg% and 9.6 ±2.4 mg% in non-diabetic and diabetic group respectively (p value < 0.05).

## IV. Discussion

Although the first accurate description of diabetes was given by Aretaeus of Cappadocia in the second century[6], it was not until the nineteenth century that the initial descriptions of diabetic complications started to appear in the literature.[7]We performed an observational hospital based study to understand various clinico-epidemiological variables in patients of bacterial pneumonia and diabetes. Several studies have reported that patients with diabetes were significantly older with average age of 55 to 60 years [8,9], which is in congruence to our findings. Because of the inability to limit microbial invasion with effective polymorphonuclear leukocytes and lymphocytes diabetic patients are more susceptible to complications of infections. As a result, they are particularly susceptible to infections such as tuberculosis, candidiasis, intertrigo, mucormycosis, soft tissue infections, osteomyelitis, and malignant Pseudomonas otitis externa.For pneumonia, studies have been performed which looked at the etiological agents. Falguera et al reported that there was no significant difference

in microbiological results in patients with diabetes and non-diabetes.[8] Present study has also shown that there is no significant difference in microbiological results in between both the groups. However, we observed that 20% had polymicrobial infection as compared to 6% in non-diabetics.

Numerous studies have been conducted to identify independent predictors of adverse medical outcomes for the purpose of objectively assessing the severity of illness for patients presenting with CAP. CURB-65 scale uses five easily measurable factors, blood urea nitrogen being one of them.[10]The severe community-acquired pneumonia (SCAP) score was developed as a simplified method for predicting in-hospital mortality, need for mechanical ventilation, and risk for septic shock.[11] In this scale BUN more than 30 mg/dL is a minor criteria for high severity of CAP. The 2007 Infectious Diseases Society of America (IDSA)/American Thoracic Society (ATS) consensus guidelines identified BUN more than 20 mg/dL as a major criteria for indicating severity of CAP.[12]In our study population, we found significantly higher blood urea nitrogen levels in diabetics as compared to non-diabetics. Patients with severe hypovolemia often have elevated blood urea nitrogen (BUN) concentrations.[13] This finding at presentation may have predictive value since it is an important risk factor for cerebral edema during therapy.

Like in our patient populaiton, the risk of infection with resistant pathogens is higher in patients who have a major comorbidity (eg. chronic obstructive pulmonary disease, renal disease, diabetes, alcoholism, or immunosuppression) or have used antibiotics within the prior three months.The mortality associated with community-acquired pneumonia (CAP) in adults was evaluated in a 1996 meta-analysis of 127 studies that reported medical outcomes in over 33,000 patients.[14]The mortality rate ranged from 5% for combined ambulatory and hospitalized patients to 14% in hospitalized patients to 36% in patients admitted to the intensive care unit. In a prospective study of 1284 patients discharged from a tertiary hospital after treatment for CAP, it was found that chronic obstructive pulmonary disease, diabetes mellitus, cancer, dementia, re-hospitalization within 30 days of hospital discharge, and residence in a long-term care facility were independently associated with one-year mortality.[15]

## V. Conclusion

Patients of community acquired pneumonia with diabetes mellitus are at risk of worse clinical outcomes and our study has presented the clinico-epidemiological profile of such patients. Understanding the differences between diabetic and non-diabetic CAP patients will help us in identifying areas of improvement in their clinical care. Future research should focus on long term clinical outcomes of such patients and multi-centric randomized trials for effective therapy.

**Table 1.** Baseline demographic characteristics of patients with bacteriologic pneumonia enrolled in the study

| **Patient variable** | **Diabetics (n=50)** | **Non-diabetics (n=50)** | **Total** |
|---|---|---|---|
| Age group (years) | | | |
| 41-50 | 18 | 18 | 36 |
| 51-60 | 15 | 14 | 29 |
| 61-70 | 10 | 9 | 19 |
| More than 70 | 7 | 9 | 16 |
| Gender | | | |
| Males | 39 | 30 | 69 |
| Females | 11 | 20 | 31 |
| Type of presentation | | | |
| No consolidation | 28 | 32 | 60 |
| Consolidation | 22 | 18 | 40 |
| Presence of comorbidity | | | |
| Yes | 22 | 19 | 41 |
| No | 28 | 31 | 59 |
| Personal history | | | |
| Smoking | 12 | 15 | 27 |
| Alcohol | 3 | 8 | 11 |

**Table 2**. Clinical characteristics of patients with bacteriologic pneumonia enrolled in the study

| Clinical findings | Diabetes | n | Mean | Standard Deviation | p- value |
|---|---|---|---|---|---|
| Vitals | | | | | |
| Respiratory Rate (per minute) | No | 50 | 27.8 | 4.4 | 0.96 |
| | Yes | 50 | 27.7 | 5.7 | |
| Systolic Blood Pressure (mm of Hg) | No | 50 | 124.7 | 26.9 | 0.325 |
| | Yes | 50 | 133.5 | 41.1 | |
| Diastolic Blood | No | 50 | 78.4 | 15.9 | 0.517 |

| | | | | | |
|---|---|---|---|---|---|
| Pressure (mm of Hg) | Yes | 50 | 81.1 | 15.7 | |
| Investigations | | | | | |
| Total Leucocyte Count (per mL) | No | 50 | 11515.2 | 134.6 | 0.756 |
| | Yes | 50 | 12002.1 | 156.8 | |
| Hemoglobin (mg%) | No | 50 | 10.7 | 3.2 | <0.05 |
| | Yes | 50 | 9.6 | 2.4 | |
| Blood Urea Nitrogen (mg/dL) | No | 50 | 16.3 | 8.1 | <0.05 |
| | Yes | 50 | 25.3 | 7.7 | |

**Table 3.** X ray findings of the patients in the study

| **X ray findings** | **Non Diabetics** | **Diabetics** | **Total** |
|---|---|---|---|
| Uni-lobe | 30 | 15 | 45 |
| Multi-lobe | 20 | 35 | 55 |
| **p- value <0.05** | | | |

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