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Original Article

Community-Acquired Pneumonia in Patients with Diabetes Mellitus: A Retrospective Cross-Sectional Observational Study.

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Abstract

Background:

One well-known risk factor for greater severity and death from community-acquired pneumonia (CAP) is diabetes mellitus (DM). Due to immune system impairment, hyperglycemia puts diabetes patients at risk for serious infections and unfavourable outcomes.

Aim: To assess the mortality, severity, and clinical characteristics of community-acquired pneumonia in individuals with diabetes mellitus.

Methods:

Over the course of a year, 100 diabetic patients with CAP were included in a retrospective analysis. Information was gathered about mortality, complications, severity grading, and demographics. CAP severity was divided into three categories: mild, moderate, and severe. The chi-square test was used for statistical analysis, and a p-value of less than 0.05 was deemed significant.

Results:

Of the 100 patients, 25% had severe CAP, 35% had moderate CAP, and 40% had mild CAP. Severity was associated with a significant increase in mortality: 5% in mild instances, 17% in intermediate cases, and 48% in severe cases ($p = 0.00012$). Higher mortality was significantly correlated with severe CAP.

Conclusion:

Community-acquired pneumonia mortality and severity are strongly impacted by diabetes mellitus. To lower mortality, diabetic patients with severe CAP must be identified early and treated aggressively.

Recommendation:

Early risk stratification, strict glycemic control, and timely intensive care management should be prioritized in diabetic patients with severe CAP to reduce mortality.

Keywords: *Community-acquired pneumonia, mortality, diabetes, patients, hyperglycemia.*
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Introduction

With a significant annual hospitalization and healthcare burden, community-acquired pneumonia (CAP) continues to be one of the world's leading causes of morbidity and mortality. Some patient populations continue to have inferior results in spite of advancements in supportive care and antimicrobial medication. Among these, those with diabetes mellitus are a particularly vulnerable demographic.

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Patients with diabetes are more susceptible to infections because of several immunological and physiological changes. (1).

Reduced chemotaxis and phagocytosis are two examples of impaired neutrophil activity that impair the body's capacity to successfully fight off invasive invaders. Furthermore, the inflammatory defense mechanism is weakened by changed cytokine responses. Diabetes-related microvascular problems lower tissue perfusion and slow healing, while poor glycemic control further encourages microbial growth and compromises immune function. All of these elements work together to make people more vulnerable to serious respiratory illnesses. (2).

Clinically, more severe disease symptoms are frequently seen in diabetic patients with CAP. Comparing them to people without diabetes, they had higher rates of intensive care unit admissions, longer hospital stays, a higher chance of complications, including sepsis and respiratory failure, and a higher overall mortality rate. Early risk assessment and customized treatment strategies depend on an understanding of these variations. Optimizing management methods, improving prognosis, and lowering mortality in this susceptible population all depend on an understanding of the clinical profile and outcomes of CAP, particularly in diabetic patients. (3).

Materials and methods

Study Design and Setting

This was a **retrospective cross-sectional observational study** conducted at **Government Medical College and Hospital (GMCH), Purnea, Bihar**, a tertiary care referral center catering predominantly to a rural and semi-urban population. The hospital provides comprehensive secondary and tertiary healthcare services, including emergency care and intensive care facilities for managing critically ill patients.

Study Duration

The study was conducted over a period of one year from 14 Januar**y 2025 to 14 January 2026**.

Study Population

The study included **100 adult patients (aged ≥18 years)** with known Type 2 Diabetes Mellitus who were diagnosed with community-acquired pneumonia (CAP) and admitted to the hospital during the study period.

Inclusion Criteria

- Patients aged ≥18 years
- Known cases of Type 2 Diabetes Mellitus
- Radiologically confirmed community-acquired pneumonia
- Onset of symptoms prior to hospital admission

Exclusion Criteria

- Hospital-acquired pneumonia
- Patients with immunocompromised states other than diabetes mellitus
- Patients with incomplete or missing medical records
- Patients diagnosed with tuberculosis or other chronic lung infections

Variables Assessed

Independent Variable:

- Severity of community-acquired pneumonia (classified as mild, moderate, and severe)

Dependent Variable:

- Mortality outcome (survived or died)

Other Variables:

- Age
- Gender
- Clinical presentation
- Presence of complications
- Duration of hospital stay

Operational Definitions

- **Community-Acquired Pneumonia (CAP):** Presence of clinical features such as fever, cough, sputum production, and radiological evidence of pneumonia acquired outside the hospital setting.
- **Severity Classification:** CAP severity was categorized into mild, moderate, and severe based on clinical presentation and physician assessment.
- **Mortality:** Death occurring during hospital stay.

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Data Collection Procedure

Data were collected retrospectively from hospital medical records and electronic databases. A **structured data extraction form** was used to ensure uniformity and accuracy. Information recorded included demographic details, clinical features, severity of CAP, laboratory findings, complications, and outcomes.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software.

- Continuous variables were expressed as mean ± standard deviation (SD)
- Categorical variables were presented as frequencies and percentages
- The **Chi-square test** was used to assess the association between CAP severity and mortality
- A **p-value <0.05** was considered statistically significant

Bias and Confounding

Potential sources of bias, such as selection bias and information bias, were minimized by including all eligible consecutive patients and using standardized data extraction methods. However, as a retrospective study, the possibility of residual confounding cannot be completely excluded.

Ethical Considerations

The study was conducted after obtaining approval from the **Institutional Ethics Committee of Government Medical College and Hospital, Purnea**. The study adhered to ethical principles outlined in the Declaration of Helsinki.

Informed Consent

As this was a retrospective study using existing medical records, a **waiver of informed consent** was obtained from the Institutional Ethics Committee.

Results

A total of 100 patients were included in the study. The majority were middle-aged to elderly individuals, with a higher proportion of males. Most patients presented with moderate to severe disease at admission.

Table 1: Severity Distribution

Severity	Number (n=100)	Percentage (%)
Mild	40	40%
Moderate	35	35%
Severe	25	25%

Table 2: Mortality Based on Severity

Severity	Total Cases	Deaths (n)	Mortality (%)	p-value
Mild	40	2	5%	
Moderate	35	6	17%	
Severe	25	12	48%	<0.001

Discussion

This study shows a significant correlation between diabetic patients' mortality and the severity of community-acquired pneumonia (CAP). Despite making up only 25% of cases, severe CAP has a dire prognosis because over half of these patients died from it. According to statistical research, the intensity of the disease was a strong predictor of unfavorable outcomes, and mortality was nearly ten times higher in severe cases than in moderate ones. These results highlight how important CAP severity is for people with diabetes. (4). Diabetes has several pathophysiological pathways that lead to worse CAP results. The body's innate immune response is weakened by persistent hyperglycemia, which also decreases phagocytic activity and hinders neutrophil chemotaxis. (5). Exaggerated systemic inflammation can also result from dysregulated inflammatory responses and elevated cytokine release. Additionally, complications including sepsis, acute respiratory distress syndrome

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(ARDS), and multi-organ failure are more common in diabetic patients and greatly raise the chance of death. (6).
Early risk assessment is crucial from a clinical standpoint for diabetic patients who present with CAP. Prioritizing strict glycemic control will boost immunity and lower complications. Survival rates may be enhanced by early ICU referral for patients with severe illness and prompt introduction of broad-spectrum antibiotics. (7).
These findings are in line with earlier research that found diabetic patients had greater rates of intensive care unit admissions, longer hospital stays, and higher fatality rates than non-diabetics. All things considered, our results are consistent with international data showing diabetes mellitus to be a separate risk factor for severe CAP and worse clinical outcomes. (8).

Generalizability

The findings of this study can be generalized to similar tertiary care settings, particularly in developing countries. However, caution is required when applying results to primary care or non-diabetic populations.

Conclusion

The severity and mortality of community-acquired pneumonia are considerably increased by diabetes mellitus. Severe CAP is linked to a significantly greater death rate in diabetic patients than mild or moderate illness.

Limitations

This study has certain limitations, including its retrospective design, single-center setting, and relatively small sample size. Additionally, detailed data on glycemic control and long-term outcomes were not available.

Recommendations

Early identification of high-risk diabetic patients with cap, strict glycemic control, and timely initiation of intensive care support are essential to reduce mortality.

Acknowledgment

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Abbreviations

- Cap – community-acquired pneumonia
- Dm – diabetes mellitus
- ICU – intensive care unit

Funding

No funding was received for this study.

Conflict of interest

The authors declare no conflict of interest.

Author contribution

Dr. Mujtaba Ashraf contributed to data collection and manuscript drafting.
Dr. Prem Prakash contributed to the study design, supervision, and final manuscript review.

Author biography

Dr. Mujtaba Ashraf is a senior resident in general medicine with an interest in infectious diseases.
Dr. Prem Prakash is an associate professor with expertise in internal medicine and clinical research.

Data availability

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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