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A Study of Skin Infections and Their Association with Poor Glycemic Control in Type 2 Diabetes Mellitus

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is a major public health problem associated with increased risk of infections. Skin infections are particularly frequent in poorly controlled diabetes due to impaired immunity, microangiopathy, and hyperglycemia that fosters microbial growth.

Objectives:

1. To determine the prevalence of skin infections among patients with T2DM.
2. To describe the clinical and microbiological spectrum of these infections.
3. To assess the association between skin infections and glycemic control.

Methods: A cross-sectional study was conducted in the Department of Medicine from July 2023 – June 2024. A total of 120 consecutive T2DM patients were enrolled. Glycemic control was assessed using HbA1c levels, categorized as good (<7%), moderate (7–8.9%), and poor (≥9%). Skin infections were clinically diagnosed and confirmed by microbiological investigations when indicated.

Results: Skin infections were present in 46.7% (56/120) of T2DM patients. The most common infections were fungal (38%), followed by bacterial (28%), mixed (22%), and viral (12%). Poor glycemic control (HbA1c ≥9%) was observed in 68% of infected patients compared to 29% without infections ($p < 0.01$). Recurrent and severe infections were significantly associated with higher HbA1c values (10.1 ± 1.8 vs. 7.2 ± 1.4).

Conclusion: Skin infections are common in T2DM and strongly associated with poor glycemic control. Regular monitoring of HbA1c and early treatment of infections are essential to prevent morbidity.

Keywords: Type 2 Diabetes Mellitus, Skin Infections, Glycemic Control, HbA1c

1. Introduction

Type 2 diabetes mellitus (T2DM) affects more than 77 million people in India, with projections to increase further. Poor glycemic control predisposes patients to various infections due to impaired neutrophil function, reduced chemotaxis, vascular insufficiency, and hyperglycemia that promotes pathogen growth.

Among infections, skin and soft tissue infections are particularly common, including bacterial pyodermas, fungal candidiasis, dermatophytosis, and viral infections like herpes zoster. These not only worsen quality of life but also increase risk of hospitalization.

While global studies show a strong link between infections and uncontrolled diabetes, limited data are available from North Indian tertiary centers. Therefore, this study was undertaken to assess the prevalence and patterns of skin infections in T2DM and their correlation with glycemic control.

Methods

Study Design
A cross-sectional observational study.

Study Setting
Department of Medicine ,a tertiary care hospital catering to rural and semi-urban population.

Study Period
July 2023 – June 2024.

Sample Size and Sampling
120 consecutive patients with T2DM were included. Consecutive sampling was used to minimize bias.

Inclusion Criteria

- Age ≥18 years
- Diagnosed T2DM (ADA criteria)
- Willing to give informed consent

Exclusion Criteria

- Patients with Type 1 DM
- Immunosuppressive therapy (steroids, chemotherapy)
- HIV or other immunodeficiency disorders
- Recent antibiotic/antifungal use (within 2 weeks)

Data Collection

- Demographics: age, sex, residence
- Duration of diabetes, comorbidities

- HbA1c levels for glycemic control
- Clinical diagnosis of skin infection, microbiological confirmation (KOH mount, Gram stain, culture)
- Categorization of infections: bacterial, fungal, viral, mixed

Glycemic Control Classification

- Good: HbA1c <7%
- Moderate: HbA1c 7–8.9%
- Poor: HbA1c ≥9%

Statistical Analysis

Data entered in Microsoft Excel and analyzed using SPSS v25. Continuous variables: mean ± SD, Student's t-test. Categorical: frequency & percentage, Chi-square test. Significance set at $p<0.05$.

Ethical Considerations

Institutional Ethics Committee approval obtained. Written informed consent from all participants. Confidentiality maintained.

Results

Table 1. Baseline Characteristics (n = 120)

Characteristic	Value
Mean age (years) ± SD	52.3 ± 10.7
Male : Female ratio	70 (58%) : 50 (42%)
Residence (Rural/Urban)	68 (57%) / 52 (43%)
Mean duration of DM	7.4 ± 4.2 years
Mean HbA1c (%)	8.6 ± 2.1

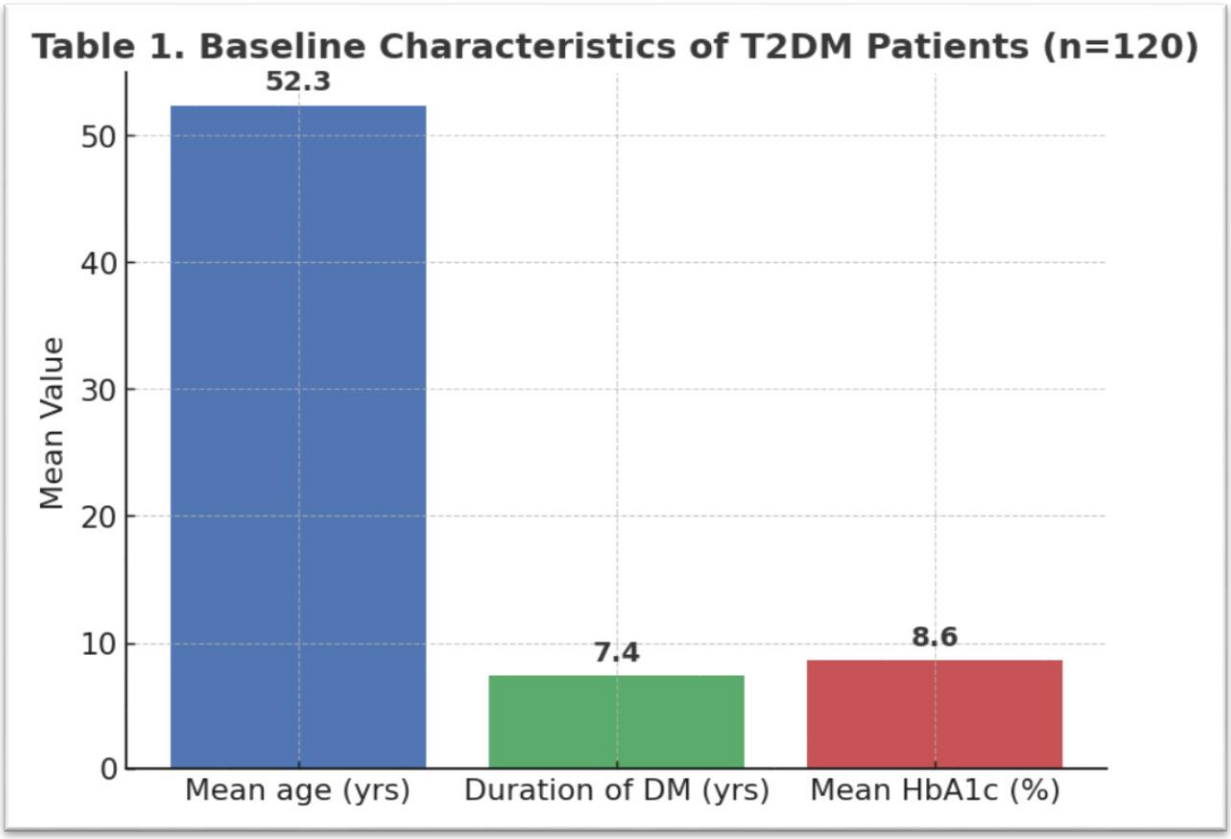


Table 2. Prevalence and Spectrum of Skin Infections

Infection type	Patients (%)
Fungal	21 (38%)
Bacterial	16 (28%)
Viral	7 (12%)
Mixed	12 (22%)
Total infections	56 (46.7%)

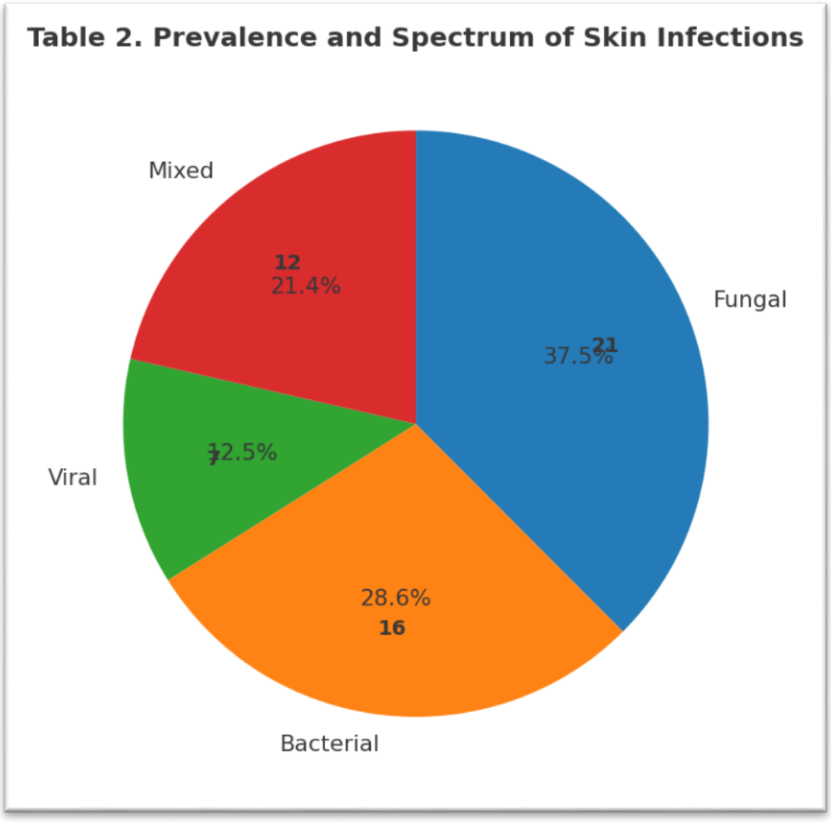
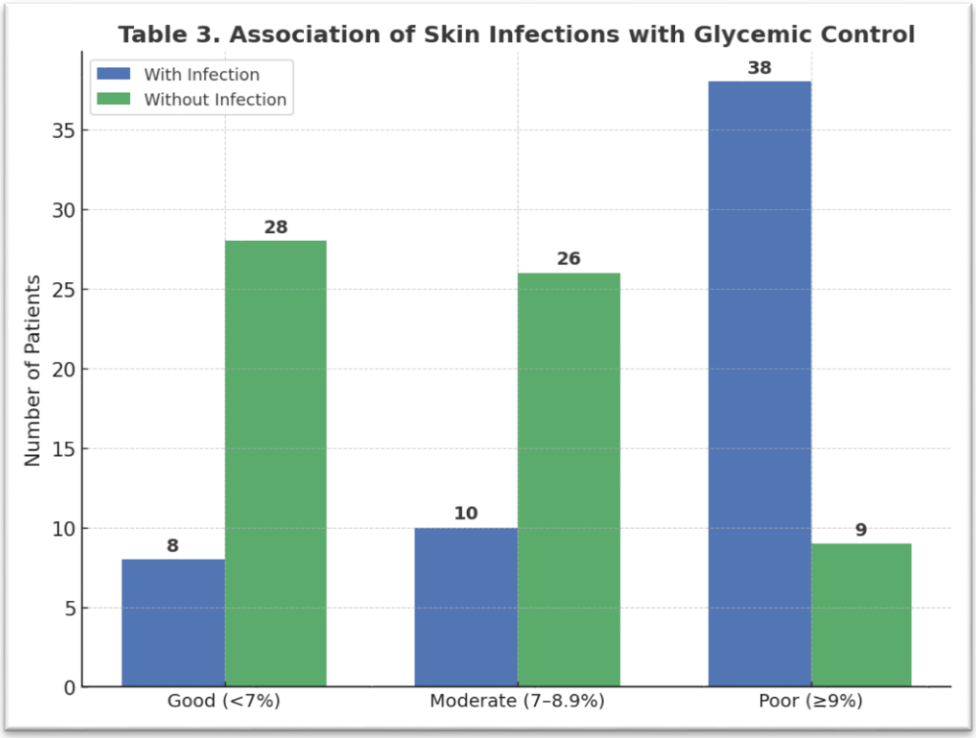


Table 3. Association with Glycemic Control

HbA1c Category	With Infection (%)	Without Infection (%)
Good (<7%)	8 (14%)	28 (44%)
Moderate (7–8.9%)	10 (18%)	26 (41%)
Poor (≥9%)	38 (68%)	9 (15%)

($p < 0.01$, Chi-square test)



Discussion

This study demonstrates that nearly half (46.7%) of T2DM patients had skin infections, consistent with international reports (40–50%). Fungal infections were most common, likely due to persistent hyperglycemia and moist environments favorable for Candida and dermatophytes.

A strong correlation was found between poor glycemic control and risk of skin infections. Patients with HbA1c ≥9% had almost threefold higher infection rates compared to those with HbA1c <7%. This supports earlier studies highlighting HbA1c as a predictor of infection risk.

Bacterial infections (impetigo, cellulitis, carbuncles) and viral infections (herpes zoster) were also notable in uncontrolled diabetes. Recurrent infections and mixed etiologies were strongly linked to chronic hyperglycemia.

Clinical implications: Strict glycemic control reduces risk of infections, prevents hospitalizations, and improves quality of life. Screening for skin infections should be routine in diabetic clinics.

Limitations: Single-center study, modest sample size, cross-sectional design (no causal inference). Future multicenter, longitudinal studies are needed.

Conclusion

Skin infections are common in patients with T2DM, particularly those with poor glycemic control. Regular HbA1c monitoring, patient education, and timely treatment of infections are crucial in reducing complications.

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