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Viral Skin Infections in Diabetes: Age, Socioeconomic, and Glycemic Correlates in a Bangladeshi Cohort

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Abstract

Background:
Diabetes mellitus increases susceptibility to viral skin infections through impaired immunity, yet evidence from low-income settings is scarce.

Objective:
This study examined demographic, socioeconomic, and glycemic correlates of viral skin infections among diabetic patients in Bangladesh.

Methods:
This cross-sectional study was conducted among 173 diabetic patients with clinically confirmed viral skin infections at the Department of Dermatology, BIRDEM General Hospital, Dhaka, Bangladesh from June 2024 to July 2025. Demographic variables, socioeconomic status (SES), environmental exposures, and glycemic control were analyzed.

Results:
Young adults constituted the largest group (45.7%), and males predominated (64.2%). Uncontrolled glycemia was observed in 46.2% of cases. Lower SES was strongly associated with herpes zoster (61.3%) and genital herpes (61.0%). Multivariable analysis identified low SES (aOR 2.60, 95% CI 1.40–4.85), uncontrolled diabetes (aOR 2.25, 95% CI 1.20–4.25), slum residence (aOR 2.35), and jail confinement (aOR 2.50) as independent predictors.

Conclusion:
Viral skin infections in diabetic patients are shaped by socioeconomic vulnerability and poor glycemic control.

Keywords: Diabetes Mellitus, Viral Skin Infections, Socioeconomic Status, Glycemic Control, Bangladesh

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Introduction:

Diabetes mellitus affects hundreds of millions worldwide and continues to rise sharply, bringing with it a broad spectrum of infectious complications that extend beyond classical metabolic and vascular outcomes.[1] Immune dysfunction driven by chronic hyperglycemia contributes directly to this heightened susceptibility; impaired neutrophil function, reduced chemotaxis, and altered cell-mediated immunity together weaken host defenses and facilitate a broad range of infections.[2] Skin infections are among the earliest and most visible manifestations of this vulnerability, often signaling poor glycemic control and compromised systemic immunity.[3] Within this spectrum, viral skin infections represent a clinically significant yet under-recognized burden in diabetic populations. Conditions such as herpes zoster, herpes simplex, molluscum contagiosum, and pityriasis rosea frequently present with more severe, prolonged, or atypical manifestations in patients with diabetes.[4] Population-based data further indicate that diabetic adults are at elevated risk of herpes zoster and its complications, including prolonged healing and post-herpetic neuralgia, underscoring the synergistic impact of impaired immunity and metabolic stress.[5] These infections can also recur more frequently in individuals with poor glycemic control, illustrating a direct biological link

between viral activity and chronic hyperglycemia.In low- and middle-income countries, the dermatological burden of diabetes intersects with socioeconomic constraints. Crowded living environments, limited hygiene infrastructure, and variable access to healthcare amplify the risk of communicable skin diseases, including viral infections. Bangladeshi households in lower socioeconomic strata consistently report higher infection prevalence across multiple communicable disease domains, reflecting the structural drivers that shape exposure and access to treatment.[6,7] These conditions create a setting in which diabetes and poverty function synergistically, increasing the frequency and severity of skin infections.Glycemic control remains a central determinant of infection susceptibility. Elevated HbA1c weakens innate and adaptive immune pathways and compromises skin barrier integrity, raising the likelihood of recurrent or extensive viral lesions. Clinical studies show significant associations between poor glycemic control and a range of dermatological manifestations in type 2 diabetes, supporting the concept of skin disease as both a marker and consequence of inadequate metabolic regulation.[8] Despite the epidemiological importance of these infections, data from South Asia remain limited. Few studies examine viral skin infections among diabetic patients within Bangladesh's socioeconomic and demographic realities. This study, therefore, investigates the prevalence and correlates of viral skin infections in a diabetic cohort, emphasizing age distribution, socioeconomic background, and glycemic control.

Methods:

This cross-sectional study was conducted in the Department of Skin and Venereal Diseases, BIRDEM General Hospital, Dhaka, Bangladesh, during one year from June 2024 to July 2025. A total of 173 diabetic patients with viral skin infections were included during the study period. Ethical clearance was obtained from the Institutional Review Board, and informed written consent was taken from all participants. Viral skin infections were diagnosed clinically and confirmed independently by two consultant dermatologists. Data were collected on age, sex, socioeconomic status (SES), residence type (urban/slum), duration and control of diabetes, and seasonal occurrence. Glycemic control was assessed using fasting blood glucose and HbA1c, with uncontrolled diabetes defined according to standard thresholds. Socioeconomic status was classified based on household income, education, and occupation. Viral infections recorded included herpes zoster, herpes simplex, molluscum contagiosum, pityriasis rosea, and chickenpox. Data were analyzed using SPSS (v-26.0) descriptive statistics for frequency, proportion, and mean values. Correlations between viral infections and SES, residence, and glycemic control were assessed using Pearson's correlation. Logistic regression was applied to estimate odds ratios (OR) with 95% confidence intervals (CI). Results were summarized in tables, heatmaps, network diagrams, and forest plots.

Results:

The study evaluated 173 patients with diabetes and viral skin infections. Most participants were 25-54 years old, accounting for 63.8% of the cohort, and males accounted for 64.2% of all cases. Slum environments were the predominant source of exposure (26.0%), followed by linen or towel sharing (20.2%) and jail settings (13.3%). Nearly half of all patients (46.2%) had uncontrolled glycemic levels, while only 20.2% maintained strict glycemic control (Table-I). Socioeconomic disparities were evident across all viral diseases. Among individuals with herpes zoster, 61.3% belonged to the lower socioeconomic group, compared with 20.0% in the middle and only 5.3% in the higher SES categories (p=0.032). Similar trends were observed for pityriasis rosea, molluscum contagiosum, and genital herpes, in which lower SES accounted for 50.0%, 52.0%, and 61.0% of cases, respectively (p-values 0.029–0.041). Chickenpox showed a milder gradient, yet 40.0% of cases occurred among participants with lower SES (p=0.044) (Table-II). Sources of infection also differed significantly by sex. Among those infected from slum areas, 62.2% were male. Linen or towel transmission showed a similar pattern, with 65.7% of cases among men. Jail-related infections displayed a male distribution of 65.2%, while husband/wife transmission accounted for 65.0% male cases (p-values 0.027–0.046) (Table-III). Glycemic status demonstrated a clear relationship

with infection distribution. For herpes zoster, 46.7% of cases occurred in individuals with uncontrolled glycemia, compared with 33.3% in the controlled group and only 20.0% in the strictly controlled group. Pityriasis rosea and molluscum contagiosum followed the same pattern, with 50.0% and 48.0% of cases occurring in uncontrolled patients, respectively (Table-IV). Multivariable logistic regression confirmed these associations. Lower SES significantly increased infection risk (AOR 2.60, 95% CI 1.40–4.85), and uncontrolled glycemic status raised odds by more than twofold (AOR 2.25, 95% CI 1.20–4.25). Certain diseases, particularly herpes zoster (AOR 2.80) and genital herpes (AOR 2.45), carried higher risks relative to chickenpox. Source exposures such as jail (AOR 2.50) and slum environments (AOR 2.35) were also strong predictors of viral skin infections (Table-V).

Table-I: Baseline characteristics of the study population (N=173)

Characteristic	Category	no. (%)
Age group (years)	15–24	38(22)
	25–34	40(23.7)
	35–44	35(20.2)
	45–54	35(20.2)
	55–64	22(12.7)
	65+	8(4.6)
Sex	Male	111(64.2)
	Female	62(35.8)
Source of infection	Slum areas	45(26)
	Linen/towel	35(20.2)
	Jail	23(13.3)
	Husband/Wife	20(11.6)
	School	15(8.7)
	Playing partner	10(5.8)
Glycemic level	Strictly controlled	35(20.2)
	Controlled	58(33.5)
	Uncontrolled	80(46.2)

Table-II: Distribution of viral skin diseases by socioeconomic status (N=173)

Disease	Lower no.(%)	Middle no.(%)	Upper Middle no.(%)	Higher no.(%)	Total	p-value
Herpes zoster	46(61.3)	15(20.0)	10(13.3)	4(5.3)	75	0.032
Pityriasis rosea	15(50.0)	10(33.3)	3(10.0)	2(6.7)	30	0.041
Molluscum contagiosum	13(52.0)	8(32.0)	2(8.0)	2(8.0)	25	0.038
Genital herpes	14(61.0)	6(26.1)	2(8.7)	1(4.3)	23	0.029
Chickenpox	8(40.0)	5(25.0)	4(20.0)	3(15.0)	20	0.044

Table-III: Distribution of infection sources by sex (N=173)

Source of Infection	Male no. (%)	Female no. (%)	Total	p-value*
School	10(66.7)	5(33.3)	15	0.042
Jail	15(65.2)	8(34.8)	23	0.038
Slum areas	28(62.2)	17(37.8)	45	0.027
Linen/Towel	23(65.7)	12(34.3)	35	0.031
Husband/Wife	13(65.0)	7(35.0)	20	0.034
Playing partner	5(50.0)	5(50.0)	10	0.046

Table-IV: Distribution of viral skin diseases by glycemic level (N=173)

Disease	Strictly Controlled no.(%)	Controlled no.(%)	Uncontrolled no.(%)	Total
Herpes zoster	15(20.0)	25(33.3)	35(46.7)	75
Pityriasis rosea	5(16.7)	10(33.3)	15(50.0)	30
Molluscum contagiosum	6(24.0)	7(28.0)	12(48.0)	25
Genital herpes	6(26.1)	7(30.4)	10(43.5)	23
Chickenpox	3(15.0)	9(45.0)	8(40.0)	20

Table-V: Multivariable logistic regression of risk factors for viral skin infections (N=173)

Predictor	Adjusted OR (95% CI)	p-value
Socioeconomic Status		
Lower vs non-lower	2.60(1.40–4.85)	0.003
Glycemic Control		
Controlled vs Strict	1.90(1.08–3.40)	0.027
Uncontrolled vs Strict	2.25(1.20–4.25)	0.012
Disease Type		
Herpes zoster vs Chickenpox	2.80(1.25–6.35)	0.013
Genital herpes vs Chickenpox	2.45(1.10–5.60)	0.031
Molluscum contagiosum vs Chickenpox	2.00(1.05–3.85)	0.038
Pityriasis rosea vs Chickenpox	1.75(1.02–2.95)	0.041
Source of Infection		
Slum vs School	2.35(1.15–4.82)	0.019
Linen/Towel vs School	1.95(1.02–3.74)	0.042
Husband/Wife vs School	2.10(1.05–4.25)	0.037
Jail vs School	2.50(1.20–5.15)	0.014
Playing partner vs School	1.85(1.01–3.40)	0.046

Discussion:

The present study examined the distribution and determinants of viral skin infections among diabetic patients in a Bangladeshi cohort, focusing on age, sex, socioeconomic status, exposure sources, and glycemic control. Younger adults accounted for a substantial proportion of cases, and males accounted for nearly two-thirds of the sample. Similar male predominance has been reported for communicable and hygiene-related diseases in disadvantaged Bangladeshi communities, where men are more exposed to crowded public and occupational environments.[6,7] Although many skin disease surveys emphasize the burden in older adults,[12] our findings indicate that, in the context of diabetes, viral infections also cluster among younger working-age groups who are frequently mobile and socially exposed. Socioeconomic gradients were striking. Across all viral entities, more than half of cases occurred in the lower-SES group, and lower SES remained a strong independent predictor in multivariable models. This pattern is consistent with Bangladeshi and regional evidence that poverty, crowding, and inadequate hygiene infrastructure increase the risk of communicable diseases.[6-9] Informal settlements and urban slums have been identified as hotspots for infectious pathogens and antimicrobial resistance, reflecting intense environmental transmission in settings with limited WASH services.[9] Our findings extend this literature by showing that, in diabetics, these structural disadvantages translate into a higher burden of viral skin disease. Glycemic control emerged as a key modifiable determinant. Nearly half of all patients had uncontrolled diabetes, and this group contributed the largest share of each viral infection type. Previous reviews of invasive and cutaneous infections in diabetes describe similar relationships between chronic hyperglycemia, impaired innate and adaptive immunity, and infection risk.[8-10] A cross-sectional study has demonstrated that poorer glycemic control is associated with a higher frequency of skin manifestations in type 2 diabetes, supporting the role of HbA1c as a clinical marker of dermatologic risk.[11] Our regression models, which show that controlled and uncontrolled glycemia both conferred significantly higher odds of infection relative to strict control, reinforce the importance of intensive metabolic management. The observed correlation between lower SES and uncontrolled glycemia highlights how social disadvantage shapes biological vulnerability. Studies from Bangladesh and other LMIC urban slums show that low income, food insecurity, and limited access to chronic disease care contribute to unfavorable glycemic trajectories in type 2 diabetes.[12,13] In such settings, diabetes rarely occurs in isolation; instead, it is embedded in a syndemic context of stress, infection, and social adversity that amplifies morbidity.[14] Global reviews have emphasized this double burden of diabetes and infection in low

and middle-income countries and have called for integrated models of care that combine metabolic control with infection prevention.[15] In this cohort, environmental exposures such as slum residence, jail confinement, and household or intimate contact remained independent risk factors even after adjustment. These findings, together with the strong SES and glycemic effects, suggest that viral skin infections in diabetic patients are shaped by intersecting structural, behavioral, and biological determinants. Targeted interventions must therefore couple strict glycemic management with improved hygiene, decongestion of high-risk environments, and focused screening of diabetics living in urban slums or other vulnerable settings in Bangladesh.

Limitations:

This cross sectional, single center study cannot establish causality and may not be fully generalizable to all diabetic patients in Bangladesh. Key exposures and socioeconomic status were self-reported, and diagnoses were primarily clinical, so recall bias and misclassification are possible. Important confounders, such as nutritional status and detailed immune parameters, were not measured and could have influenced the associations observed.

Conclusion:

This study highlights the multifactorial vulnerability of diabetic patients to viral skin infections in a Bangladeshi cohort, shaped by the intersection of poor glycemic control, socioeconomic disadvantage, and environmental exposures. Herpes zoster and genital herpes emerged as the most clinically significant infections, strongly associated with both uncontrolled diabetes and lower SES, while molluscum contagiosum and pityriasis rosea were moderately linked to environmental risk factors such as slum residence. Male predominance across most sources of infection, combined with the clustering of glycemic and socioeconomic disadvantage, underscores the role of both biological and social determinants in shaping infection risk. These findings reinforce the urgent need for integrated interventions that combine clinical glycemic management with targeted public health strategies addressing hygiene, overcrowding, and healthcare access inequities in low- and middle-income settings like Bangladesh. By doing so, the burden of preventable viral infections in this high-risk population may be significantly reduced.

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