

Review Article

Diabetic's skin; a storehouse of infections

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Abstract Diabetes mellitus is a major endocrine cause of morbidity and mortality all over the world. The incidence is increasing globally. Estimated number of patients with diabetes mellitus in 2030 is 366 million. In Pakistan, prevalence approaches 10% among adults and even greater number with glucose intolerance. Patients with diabetes mellitus are prone to have cutaneous infections and major underlying cause is hyperglycemia and ketoacidosis leading to immune dysfunction. These infections can get complicated and even can prove fatal if not noticed earlier or treated properly. It is important to recognize signs and symptoms of these and to either treat them appropriately or refer the patient to a dermatologist or diabetologist. This article is a brief review of clinical features, relative occurrence in diabetes mellitus, and general management of several cutaneous infections which occur more commonly, with greater severity; or with a greater risk for complications in patients with diabetes mellitus.

Key words

Diabetes mellitus, hyperglycemia, cutaneous infections

Introduction

Diabetes mellitus (DM) is characterized by state of relative or complete insulin deficiency, leading to gross defects in glucose, fat and protein metabolism.¹ It is a major endocrine cause of morbidity and mortality all over the world. The incidence is increasing globally. Estimated number of patients with diabetes mellitus in 2030 is 366 million.² In Pakistan, prevalence approaches 10% among adults and even greater number with glucose intolerance.³

Recent studies show greater incidence of skin infections in diabetic patients. Incidence ranges from 20-50%,⁴ mostly in type 2 diabetes mellitus and often associated with poor glycemic control.⁵ Infections constitute the main bulk of cutaneous manifestations of diabetes mellitus.⁶

Pathogenesis

Much research has been undertaken on pathogenesis of the immune dysfunction in diabetes mellitus. Studies show that leukocyte chemotaxis, adherence and phagocytosis are impaired, especially during hyperglycemia and diabetic acidosis⁷ and changes are even reversible with lowering glucose level¹⁰. There is also evidence that cutaneous T cell function and response to antigen challenge are also decreased in diabetes mellitus⁸. Diabetic neuropathy and peripheral vascular insufficiency favor the installation and development of skin infection. In other words, the diabetic's skin ends up being an organ open to the most varied forms of affliction, especially of infectious origin. It facilitates complications and/or delays curing of processes that are apparently benign and of short duration.

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Skin infections

Bacterial infections

Diabetics are at higher risk for contracting certain bacterial infections including group A and B streptococcal infections, necrotizing fasciitis and malignant otitis externa.

a) Group B streptococcal infections

Group B streptococcus, a major cause of morbidity in neonates and pregnant women, is also a significant source of invasive bacterial infections in non pregnant adults. Studies show diabetes mellitus to be a risk factor in these infections.⁹ Most common sites of infections are skin, soft tissue and bone (cellulitis, foot ulcers and decubitus ulcers).⁹ Presence of diabetes in young adults increases the risk of group B streptococcal infection 30 fold.³ Despite therapy, approximately 20% of these cases are fatal. In pregnancy, maternal diabetes mellitus (but perhaps not gestational diabetes alone) increases the risk even more.

Group B streptococci remain susceptible to penicillin G, ampicillin, and other semisynthetic penicillins, although the MIC of penicillin is frequently 4-fold to 8-fold higher for group B streptococci than for group A streptococci. Abscess drainage and debridement of devitalized tissue are essential when loculated fluid or necrosis is present⁹

b) Group A streptococcal infections

In a prospective study, risk of skin and soft tissue infections with group A streptococcus was almost 4 fold greater in patients with diabetes¹¹. Soft infections were the most common clinical presentation for all patients.

c) Staphylococcal infections

Although some old recommendations suggest testing the patients with recurrent furunculosis or folliculitis for diabetes mellitus but recent data do not permit estimation risk of staphylococcal infections in diabetes mellitus.

Pyodermic infections such as impetigo, folliculitis, carbuncles, furunculosis, ecthyma, and erysipelas if present can be more severe and widespread in diabetic patients.⁴ Therapy consists of adequate diabetic control and, if necessary, adequate systemic antibiotic therapy; deeper infections require intravenous antibiotics.

d) Malignant otitis externa

Invasive malignant otitis externa is an uncommon life-threatening infection of external auditory canal with potential cranial bone and intra cranial involvement. *Pseudomonas aeruginosa* is usually implicated and preceding aural irrigation with tap water may play an etiologic role. This painful infection, which occurs in older patients with diabetes mellitus, is characterized by purulent discharge, unilateral facial swelling, hearing loss, and granulation tissue in the ear canal. Approximately 70-94% of patients with malignant otitis externa have underlying diabetes⁷. Laboratory studies generally reveal normal WBC count but raised ESR. CT and MRI are essential for defining the extent of bone and soft tissue involvement. Treatment consists of irrigation and drainage of the ear canal, antibiotics, and sometimes debridement. Diagnosis is often delayed and mortality rates as high as 20-40% despite appropriate antibiotic therapy.⁸

e) Necrotizing fasciitis

10-60% of all cases of necrotizing fasciitis occur in patients with diabetes mellitus.^{12,13} It is a life threatening bacterial infection of the soft tissue with spread along facial planes. The perineum, trunk, abdomen and upper extremities are most commonly involved⁷. Clinical presentation includes erythema, swelling, induration, necrosis and possible

bullae formation. Degree of pain and toxicity are out of proportion to the severity of the findings. Although most cases result from polymicrobial facultative gram negative bacilli such as *Escherichia coli* and anaerobes such as bacteroids, peptostreptococcus and clostridium species, approximately 10% cases are monomicrobial often due to streptococcal species. Treatment includes urgent surgical debridement and appropriate antibiotics. Mortality rates of 40% have been reported.

Fungal and yeast infections

a) Candidal infections

Mucocutaneous *Candida* infections occur more frequently among patients with diabetes mellitus, especially those with poorly controlled disease³. Candidal infection (moniliasis) can be an early sign of undiagnosed diabetes. Perlèche is a classic sign of diabetes in children, and localized candidal infection of the female genitalia (vulvovaginitis) has a strong association with diabetes. It is important to remember that in men, *Candida* balanitis, and intertrigo (axillary, inguinal web space), can be presenting signs of diabetes.⁴ Paronychia, onychomycosis and glossitis are also common. Treatment for candidal infections includes topical and oral antifungals. Patients with candidal paronychia should avoid wetting of the nails and use drying agents.

b) Dermatophyte infections

Association of dermatophyte infection with diabetes is controversial but recent data shows a statistically significant relationship¹⁴. Common superficial infections are caused by *Trichophyton rubrum*, *T mentagrophytes*, and *Epidermophyton floccosum*. In diabetic patients, onychomycosis or tinea pedis should be monitored and treated, as it can be a port of

entry for infection. This is especially true for patients with neurovascular complications and intertrigo.

Signs of *T. rubrum* infection are noninflamed, white, powdery scaling of skin creases on the palms and soles, often with nail involvement. *T. mentagrophytes*-associated intertrigo or interdigital infection presents as maceration and superficial scaling with an active red border. Treatment of choice is drying the local area and applying one of the newer topical imidazole antifungal agents.⁴

c) Rhinocerebral mucormycosis

Rhinocerebral mucormycosis (RCM) is caused by zygomycetes (*Mucor* and *Rhizopus* species) which often presents with headache, fever and lethargy in addition to nasal congestion and facial-ocular pain and swelling. Subsequent findings include unilateral proptosis, ophthalmoplegia and palate or nasocutaneous necrosis. 75-80% of all cases occur in patients with diabetes mellitus, with diabetic ketoacidosis as the most important risk factor.^{3,15,16} Early diagnosis, aggressive surgical debridement, high dose amphotericin B and good control of blood sugar are the most important factors to decrease the morbidity and mortality from this fungal disease. Mortality rates of RCM range from 15-34%.³ In addition to RCM, mucor species have also been observed complicating skin ulcers on legs and hands of diabetic patients.

Conclusion

Diabetic's skin is more susceptible to skin infections uncommon in non-diabetics. Many of these infections require quick diagnosis and immediate treatment if severe complications or even fatal outcome is to be averted.

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Erratum

In the case report '*A case of acrogeria - a rare premature ageing syndrome*' published in the October-December 2008 issue of the Journal of Pakistan Association of Dermatologists, page 235-237, the name of one of the authors was misprinted as Noor Ilahi. The correct reference should be read as "Tahir Shehzad, Naveed Ilahi. A case of acrogeria - a rare premature ageing syndrome. *J Pak Assoc Dermatol* 2008; **18(4)**: 235-237."

