

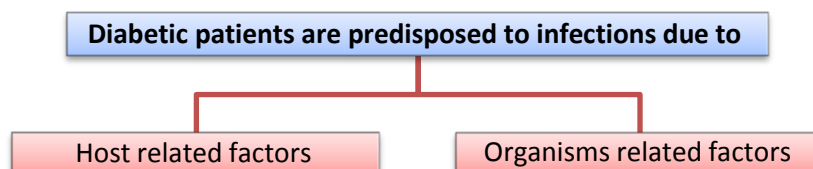
Infections in diabetic patients

Micro Team 429

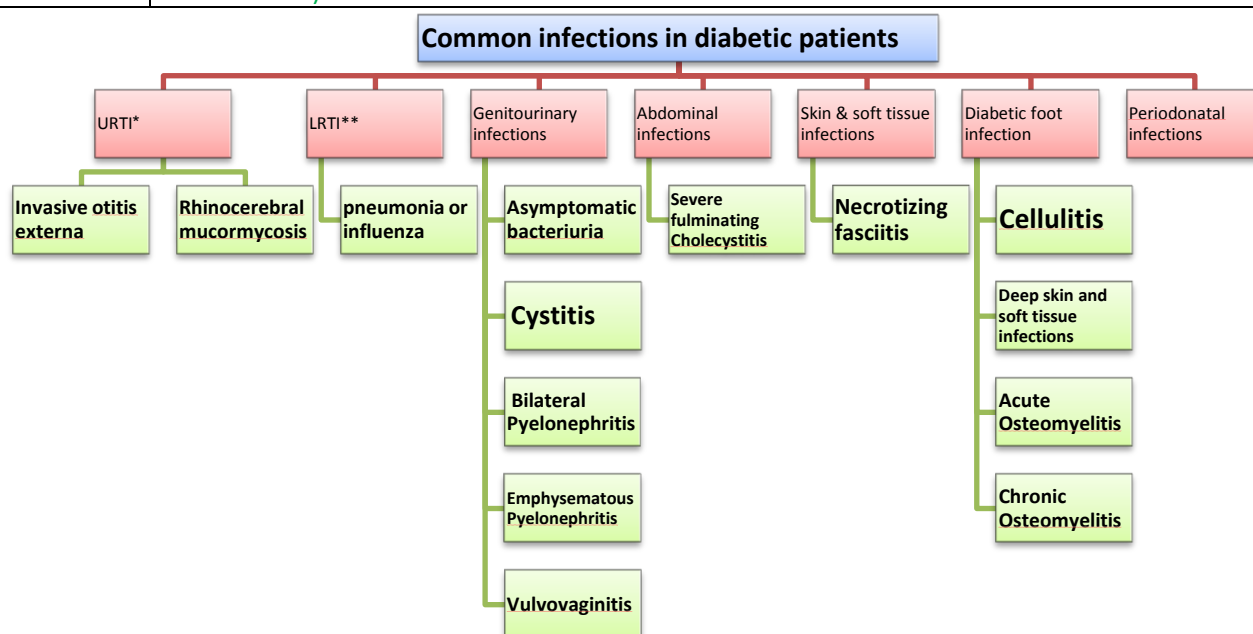
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Host Related Factors	
1- Vascular insufficiency	Result in: 1- Local tissue ischemia → enhances the growth of microaerophilic and anaerobic organisms 2-Depressing oxygen-derived free radicals bactericidal functions of leukocytes. 3-Impairment of the local inflammatory response and absorption of antibiotics.
2- Sensory peripheral neuropathy	Minor local trauma may result in skin ulcers , which leads to diabetic foot infections .
3- Autonomic neuropathy	may develop urinary retention and stasis that ,in turn, predisposes to develop UTIs
4- Hyperglycemia and metabolic derangements	Diabetes may facilitate infection.
5- Immune defects	Such as: 1-Depressed Neutrophil function\ 2-Affected adherence to the endothelium.\ 3- Affected chemotaxis and phagocytosis \4-Compromised bactericidal activity.\ 5-Depressed cell mediated immunity
6- Increased skin and mucosal colonization	-Diabetics on insulin have asymptomatic nasal and skin colonization with <i>S.aureus</i> , particularly MRSA* . →predisposes to skin infection and transient bacteraemia →result in distal sites infection such as damaged muscle . - In type 2 diabetes: mucosal colonization with <i>C.albicans</i> is common. Vulvovaginitis caused by non-albicans <i>Candida</i> spp. is common in patients with poor glycemic control .
7- Surgical site infections	associated with postoperative hyperglycemia which is related to deleterious effect on chemotaxis , phagocytosis and adherence of granulocytes
Organism Specific Factors	
1- <i>Candida albicans</i> (imp.)	Glucose inducible proteins promote adhesion of <i>C.albicans</i> to buccal or vaginal epithelium → impairs phagocytosis , giving the organism advantage over the host.
2- <i>Rhizopus</i> spp (imp.)	ketone reductase allow <i>Rhizopus</i> spp. which cause mucormycosis(zygomycosis) , to thrive in high glucose acidic conditions (this infection common in diabetic pt. especially in ketoacidosis)



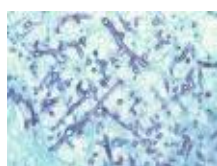
1-Upper Respiratory Tract Infections * In DM lead to:

1-Invasive (malignant) otitis externa		2-Rhinocerebral mucormycosis
Generally:	Uncommon but life threatening.	A life threatening fungal infection.
Causes:	<i>P.aeruginosa</i> (this organism is become new Normal flora in DM but it may become pathogenic as in this case).	<i>Rhizopus</i> , <i>Absidia</i> and <i>Mucor</i> species.
Proliferation:	Slowly invades from the external canal into adjacent soft tissues, mastoid and temporal bone and eventually spreads across the base of the skull.	The infection start in the nose then separate very very fast to (within hours) to the brain → if it reach the brain it become very dangerous.
Clinically:	Severe pain, otorrhea, hearing loss, Intense cellulitis and edema of the ear canal.	Facial or ocular pain and nasal stuffiness, generalized malaise and fever. May be Intranasal black eschars or necrotic turbinates.
Diagnosis:	CT and MRI studies to define the extent of bone destruction.	Biopsy of necrotic tissue.
Treatment:	Surgical debridement & IV antipseudomonas antibiotics {Gentamycine & 3 rd generation of Cephalosporin ((Ceftazidime)) }	Surgical debridement and prolonged IV therapy with Amphotericin B .

2-Lower Respiratory Tract Infections **(imp.)

pneumonia and influenza	
Generally:	Diabetic patients are 4 times more likely to die from pneumonia or influenza than nondiabetic patients.
Common organisms:	Gram positive bacteria: <i>S.aureus</i> , <i>S.pneumoniae</i> . Gram negative bacteria: Enterobacteria and <i>Legionella</i> . Other organisms: Influenza virus & TB.
Vaccination:	Routine pneumococcal vaccination and influenza recommended.

Note: Aspergillus appears wide non branched hyphae under microscope.



3-Genitourinary infections


1- Asymptomatic bacteriuria:	(> 10 ⁵ /ml urine) is common.
2- Cystitis:	- Symptoms/ signs and time of onset: same as nondiabetics, incomplete bladder emptying and high incidence of unsuspected upper UTI. - Microorganisms : Gram negative rods(<i>E.coli</i>) or group B streptococci or <i>Candida albicans</i> .
3- Bilateral Pyelonephritis:	Diabetes predisposes to a more severe infection of the upper urinary tract.
4- Emphysematous Pyelonephritis: (imp.)	Exclusively an infection of diabetics (60%) and carries grave prognosis (30% fatal). Diagnosis: flank mass & crepitus . CT show gas in the renal tissues. Management: supportive & IV antibiotics , nephrectomy may be needed.
5- Vulvovaginitis:	As mentioned earlier: caused by non-albicans <i>Candida</i> spp. is common in patients with poor glycemic control.

4-Abdominal infections

— Severe fulminating Cholecystitis	
Causes:	Enteric Gram negative bacteria and anaerobes.
Clinically:	- Gall stone or peritonitis may be present. - Gas gangrene and perforation may occur.
Management:	Cholecystectomy and broad spectrum antibiotics.

5-Skin and soft tissue infections (imp.)

Risk factors in diabetic patients: (imp.)	<ul style="list-style-type: none"> - Sensory neuropathy: no pain perception. - Atherosclerotic vascular disease - Hyperglycemia : >250 mg/ dl increased risk - H/O(history) of cellulitis, peripheral vascular diseases, Tinea, and dry skin.
Organisms:	<i>S.pyogenes</i> (GAS)** and <i>S.aureus</i> CA-MRSA*** is of concern (77%) of skin and soft tissue infections .

Necrotizing fasciitis	
Definition:	A deep –seated, life threatening infection of subcutaneous tissue with progressive destruction of fascia, fat, and muscle.
Causes:	10% associated with GAS (Group A streptococcus),with or without <i>S.aureus</i> , anaerobes may be involved.
Clinically: (imp.)	-Pain of proportion of skin, anaesthesia of overlying skin. -Violaceous discoloration of skin that evolves into vesicles and bullae, crepitus ,soft tissue gas seen in radiograph or CT. <div style="text-align: center;">  </div> (severe pain + fever + mild redness)
Diagnosis:	Biopsy, it cannot be diagnosed clinically.
Management:	Aggressive surgical debridement & IV antibiotics.

6-Diabetic foot infection(imp.)

The most common and most important soft tissue infection in diabetic patients, why??	it is related to peripheral neuropathy and compromised microvascular circulation which limits the access of phagocytic cells to the infected area and poor concentration of antibiotics in the affected area.
Pathophysiology	<p>-microvascular disease limits blood supply to the superficial and deep structures.</p> <p>-Pressure from ill fitting shoes ,trauma compromises local blood supply predisposing foot to infection.</p>
Factors that increases the development of Osteomyelitis	<p>1-grossly visible bone or ability to probe to bone</p> <p>2- ulcer size >2x2 cm</p> <p>3- ulcer depth > 3mm</p> <p>4- ulcer duration longer than 1-2 wks</p> <p>5- ESR >70 mm/hr</p>
Points on foot infection	<p>Complicated by : chronic Osteomyelitis, gas gangrene, amputation and death</p> <p>The spectrum of foot infection: ranges from superficial cellulitis to chronic Osteomyelitis.</p> <p>Combined infection involving: bone and soft tissue may occur</p> <p>-Infection may involve the skin, soft tissues, bone ,or all.</p> <p>-Diabetic neuropathy may lead to incidental trauma that goes unrecognized.</p> <p>- Sinus tract may be present</p>

Diabetic foot infections	Organisms	Clinical presentations
Cellulitis	-beta-hemolytic streptococci (group A,B streptococi) -S.aureus -Enterobacteriaceae (E.coli, Klebsiella, Proteus spp.) in chronic ulcers	-Tender, erythematous nonraised skin lesion on the lower limb -may be accompanied with lymphangitis which suggests GAS. -Bullae suggests S.aureus occasionally GAS.
Macerated ulcer or nail injury (sinus)	P.aeruginosa	———
Deep soft tissue infections (necrotizing Fascitis, myositis)	GAS & gas producing gram positive bacilli (Clostridium).	-patient acutely ill, with painful induration of the limb especially the thigh . -Foot may be involved. -Wound discharge suggest anaerobes *these presentations not only in deep soft tissue infection , but also in deep skin infections*
Chronic Osteomyelitis	-GAS and Group B.streptococci -S.aureus -Enterobacteriaceae (E.coli ,Proteus mirabilis , K.pneumoniae.) -Bacteroides fragilis	fever ,foul discharge ,may be pain, no lymphangitis, deep penetrating ulcer ,and sinuses on the planter surface of the foot
Acute Osteomyelitis	———	pain at the involved bone, fever, adenopathy.

Diabetic foot infection	
Diagnosis	<p>-Thorough examination to evaluate the patient's vascular and neurological status.</p> <p>-Radiological examination including doppler ultrasonography ,transcutaneous oxymetry, MR angiography.</p> <p>-CT scan ,MRI and gallium -67 scan for soft tissue and bone evaluation.</p> <p>-Exploration of ulcer to determine its depth and presence of sinus tract.</p> <p>-Deep specimens (tissues) for culture and susceptibility testing. IMP !!</p>
Management & treatment	<p>-Control blood sugar and hydration</p> <p>-Evaluation of neuropathy and vasculopathy</p> <p>- Mild cases:</p> <p>Debridement of necrotic tissues and use of antibiotics according to the causative bacteria eg. Cloxacillin,cephradine,clindamycin (CA-MRSA) TMP-SMX), aminoglycosides, quinolones.</p> <p>- Moderate to severe cases :</p> <p>places the foot at risk of amputation. Needs hospitalization ,IV antibiotics and surgical intervention if needed.</p>
Prevention	<p>- is the cornerstone of diabetic foot care.</p> <p>-It is multidisciplinary including family physician, social worker, home care nurse and specialist.</p> <p>-Patient education about the control and complication of diabetes.</p> <p>-Blood sugar should be controlled promptly(shift to insulin if oral hypoglycemic agents were not effective), Weight reduction, diet low in fat and cholesterol.</p> <p>-Proper foot care, using protective footwear and pressure reduction.</p> <p>-Self and family member examination of foot.</p>

Notes:

*MRSA: Methicillin Resistant Staphylococcus aureus

**GAS : Group A Streptococcus

***CA- MRSA : community Acquired MRAS