



Comparative Study of Foot Infections among Diabetic and Non Diabetic Individuals

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Abstract

Background: *Foot infections represent a spectrum of disorders which affects skin, soft tissue, fascia, tendon, bone. These infections are common in patients with comorbidities like diabetes, peripheral vascular diseases and immunocompromised state.*

Here only common infections emphasized and discussed which are cellulitis, paronychia, ulcer, necrotizing fasciitis, tinea pedis, osteomyelitis and gangrene.

Aim: *To compare the incidence, prevalence, magnitude of infection, microbial profile, morbidity, mortality, complications and treatment options among diabetic and non-diabetic individuals.*

Material and Methods: *40 patients with foot infections were taken for retrospective study in CMCH for a period of six months.*

Foot infections are most common in people with diabetes because of compromised vascular supply (microangiopathy), local trauma or pressure in association with lack of sensation because of neuropathy that run in a spectrum from cellulitis to gangrene. In my study also diabetic foot infections contributes 75%.

Results and Conclusion: *The analysis of foot infections conducted in Coimbatore medical college hospital shows infections were common in diabetics (70%). And in non diabetics(30%) followed by in decreasing order of frequency cellulitis in diabetics(12.5%), non diabetics(5%), gangrene in diabetics(12.5%), non diabetics(5%) then other infections paronychia, tinea pedis, necrotizing fasciitis, osteomyelitis.*

Morbidity and mortality rates were also higher in diabetic foot infections. Amputation rates were also higher in diabetics (12.5%), non diabetics(5%) in total(17.5%). In total 100% study population 85% were treated as inpatients, rest 15% were treated as outpatients. This study emphasizes that diabetes mellitus needs to be treated as a holistic approach through dietary adjustments, exercise, medications, educational programmes and self care measures.

Introduction

Foot is a complex structure with many layers of muscles, ligaments, joints, fat, thick plantar fascia, and vascular arches, neurological system which maintains weight bearing gravity, stability and gait.

Foot infections are common in patient with comorbid diseases when compared to normal individuals. Diabetes is a group of metabolic diseases characterized by high plasma sugar level for a long period of time. Symptoms are polyuria, polydipsia, and polyphagia. If left untreated it can

result in many complications one of which is foot infections. Hence adequate glycemic control and foot care is must to prevent further complications. Prevalence of foot infections is growing at epidemic proportions in India and world-wide. Most alarming feature is steady increase in type2 diabetes especially among young and obese people.

Objectives

To study the foot infection among diabetic and non diabetic and to compare the incidence, prevalence, magnitude of infection, microbial profile, morbidity and mortality among those groups.

Inclusion Criteria

- Patients of age more than >18 yrs
- Those undergone surgery for foot infections
- Patients with immunocompromised state and other comorbid illness.

Exclusion Criteria

- Age group t < 18yrs
- Patient not willing for routine investigations
- Patient not willing for regular follow up

Discussion

Diabetes is a prevalent disease worldwide and wound infections are a major complication. Patients with diabetes have impaired wound healing associated with multitude of risk factors, including neuropathy, vascular disease, and foot infections. Metabolic abnormalities of diabetes lead to impaired leukocyte function; inadequate migration of neutrophils in the wound, along with reduced chemotaxis predisposes individuals to wound infection. The background knowledge about incidence, prevalence, pathophysiology, risk factors, management guidelines, screening and foot care in diabetes are essential for prevention of diabetic micro and macrovascular complications.

Classification of Foot Infections

Skin and soft tissue infections

Cellulitis

Paronychia

Onychocryptosis with paronychia

Tinea pedis.

Deep skin and bone infections

Necrotising fasciitis

Acute and chronic osteomyelitis

Gangrene.

Cellulitis

Spreading inflammation of subcutaneous tissue and fascial planes.

Causative Agents

Commonly due to streptococcus organism, and other gram positive organisms

Gram negative organisms like klebsiella, pseudomonas, E-Coli also involved.

Clinical Features

Fever, toxicity

Swelling is diffuse and spreading in nature

Pain and tenderness

Red, shiny area with stretched warm skin

Tender regional lymph nodes palpable

No edge, no pus. No fluctuation, no limit

Management

Limb elevation

Antibiotics

Dressing if needed

Paronychia

Inflammation of folds of tissue surrounding the nail of fingers and toe.

Causes:

Direct or indirect trauma to the cuticle or nail fold

Clinical features

- Severe throbbing pain
- Tenderness
- Visible pus under nail root

Treatment

- Incision and drainage of pus
- Analgesics
- Antibiotics

Osteomyelitis

Inflammation of bone and bone marrow, due to infection by haematogenous route or following open fracture.

Organisms

Staphylococcus, streptococcus

Clinical features

- Fever,
- Pain,
- Swelling

SIGNS

- Signs of inflammation
- Bony thickening
- Bony irregularity

Treatment

- Systemic antibiotics
- Sequestrectomy

Tinea Pedis (Athlete's Foot)

It is a fungal infection caused by dermatophytes Tinea rubrum. Itching is the commonest symptom.

Common site

Interdigital spaces, in between toes.

Treatment:

Topical antifungals, if unsuccessful systemic antifungals.

Ulcer

Break in the continuity of covering epithelium either in the skin or mucous membrane due to molecular death

Classification**Clinical**

- Spreading
- Healing
- Callous

Pathological

Malignant

Syphilitic

Non Specific

- Venous
- Trophic
- Infections
- Tropical
- Diabetic
- Cortisol
- Martorell's

Wegener's Grading

- Pre ulcerative or healed
- superficial
- ulcer deeper to subcutaneous tissue
- abscess formation underneath
- gangrene of the part of the tissues/limb/foot
- gangrene of the entire area

Diabetic Ulcer

Common ulcer in our country.

Causes

- Sensory,
- Motor neuropathy
- Autonomic neuropathy
- Microangiopathy of vessels
- Impaired wound healing due to defective phagocytic function.

Common Sites

- Plantar aspect of foot
- Leg, upper limb
- Back, scrotum, perineum
- It is usually spreading and deep.

Management

FBS,

PPBS,

RBS,

HbA1C monitoring

Adequate glycemic control

Antibiotics, surgical wound debridement,

Regular cleaning and dressing with EUSOL, patient education

Diabetic foot care-MCR foot wear, avoid local trauma.

Venous (Gravitational) Ulcer**Common Site**

- Around ankle (gaiter's zone).
- It is painless, vertically oval shaped ulcer.

**Treatment**

- Regular cleaning and dressing with EUSOL
- Limb elevation
- Antibiotics
- Specific treatment for varicose veins.

Traumatic Ulcer

It may be due to mechanical, physical, chemical trauma. Ulcer is acute, superficial, painful and tender.

**Trophic (Pressure Sore) Ulcer**

It is due to impaired nutrition, defective blood supply, and neurological deficit.

Common Sites

Over ischial tuberosity

Sacrum, heel

Buttock,

Over the shoulder,

Occiput

Causes

- Diabetic neuropathy
- Leprosy,
- Chronic bedridden patients.

Ulcer is painless,

- Punched out,
- Non mobile,
- Base usually formed by bone

Treatment

- Antibiotics,
- Slough excision,
- Regular cleaning and dressing
- Frequent position changing-air bed/water bed.

**Necrotising Fasciitis**

- Spreading inflammation of skin, deep fascia and soft tissues with extensive destruction resulting in toxaemia, septicaemia, ARF, MODS.

Clinical Features

Sudden swelling and pain in the part with oedema, discolouration, necrotic areas, ulceration

Foul swelling discharge.

Treatment

- Iv fluids,
- Fresh blood transfusion if needed, slough excision
- Appropriate antibiotics depends on culture and sensitivity

Gangrene

It is macroscopic death of tissue in situ (in continuity with other tissues) with or without putrefaction. It can occur in sites like limbs, appendix bowel, testis, gall bladder.

Causes

Secondary to arterial occlusive diseases

- Diabetes
- Venous

Among these diabetes is the commonest cause for gangrene, amputation and death. Over 50% of amputations in UK happens to people with diabetes and within three years of amputation 50% die. Diabetic foot ulcer form a major factor in 84% of these amputations and delay in treatment of ulcers leads to gangrene and amputation.

**Diabetic Gangrene**

It is due to loss of blood supply to the particular area. Dry gangrene > wet gangrene

Pathogenesis

Microangiopathy causes blockade of microcirculation leading to hypoxia.

High glucose level is a culture media for pathogens

Atherosclerosis itself reduces blood supply and causes gangrene.

**Clinical Features**

Pain in the foot

Ulceration

Absence of sensation

Absence of pulsation

Loss of joint movements

Abscess

Change in temperature and color when gangrene sets in.

Investigations

Blood urea,

Serum creatinine

Blood sugar,

Urine ketone bodies

X-ray of the part

Doppler study

Angiogram

Ultrasound abdomen

Treatment

- Foot can be saved only if there is good blood supply
- Antibiotics decided by pus c/s
- Regular dressing
- Drugs-vasodilators
- Diabetic control
- Surgical debridement of wound
- Chiropody (care of feet)
- Amputation of gangrenous area

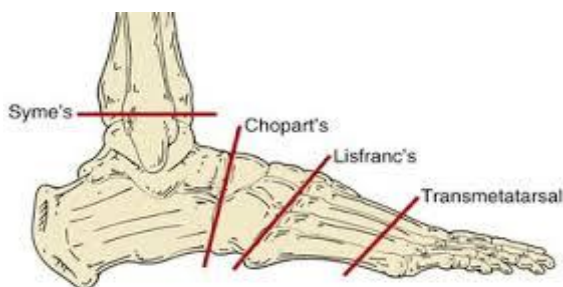
Toe amputation



Fore Foot Amputation



Hind foot amputation



Data Analysis

Table 2 Incidences Of Foot Infections:

Diabetic	28(70%)
Non Diabetic	12(30%)
Total	40(100%)

Incidence of foot infections

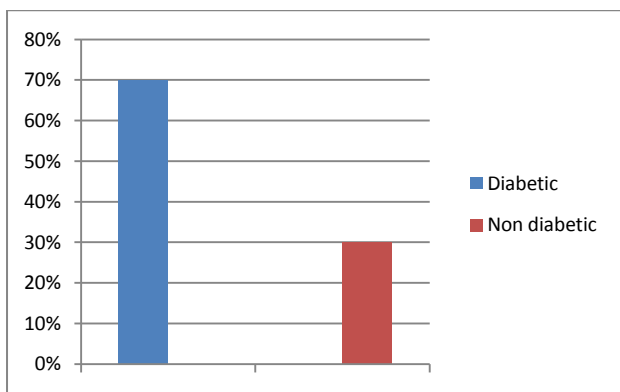


Table 3: Gender Wise Distributions of Foot Infections

Gender	Population
Male	29(73%)
Female	11(27%)
Total	40(100%)

Incidence among male and female

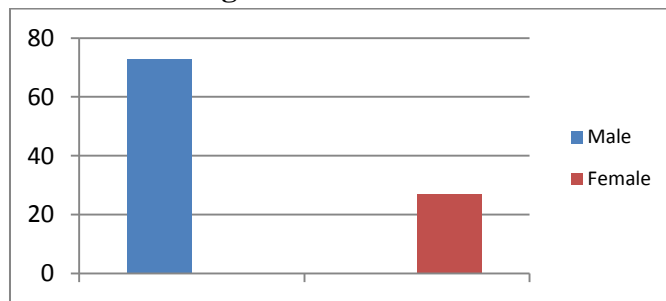
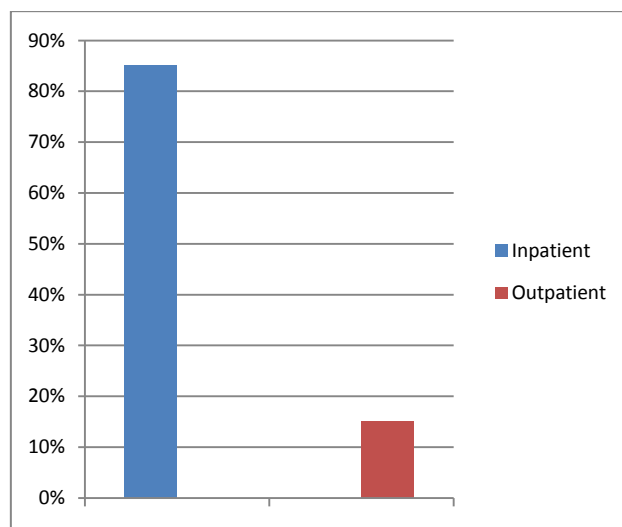


Table 4: Inpatient Versus Outpatient

Type Of Patients	Population
Inpatient	34(85%)
Outpatient	6(15%)
Total	40(100%)



Age group wise distribution of foot infections

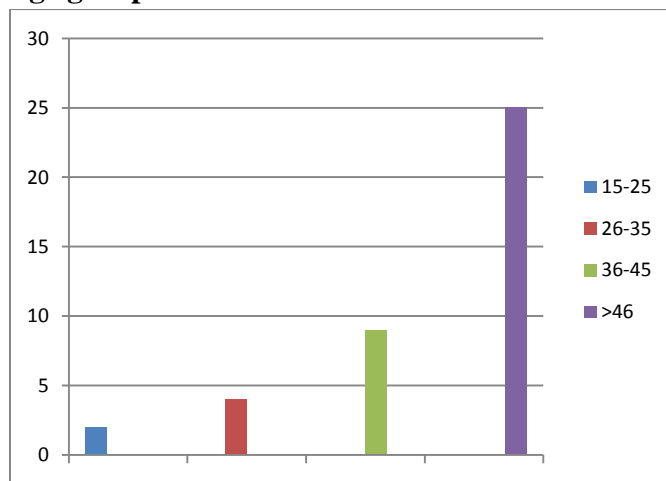


Table 5: Various Foot Infections among Diabetic and Non Diabetic

Foot Infections	Diabetic	Non Diabetic
Cellulitis	5	2
Ulcer	12	5
Osteomyelitis	2	0
Gangrene	5	2
Paronychia	1	3
Necrotising Fascitis	1	0
Tinea Pedis	1	0
Onychocryptosis+Paronychia	1	0
Total	28(70%)	12(30%)

Prevalence of foot infections among diabetic and non-diabetic

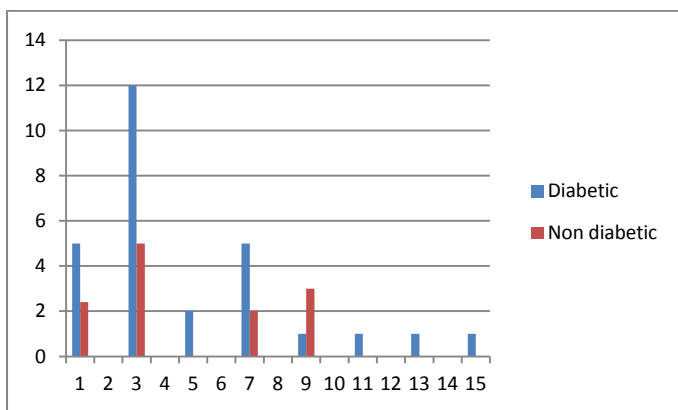
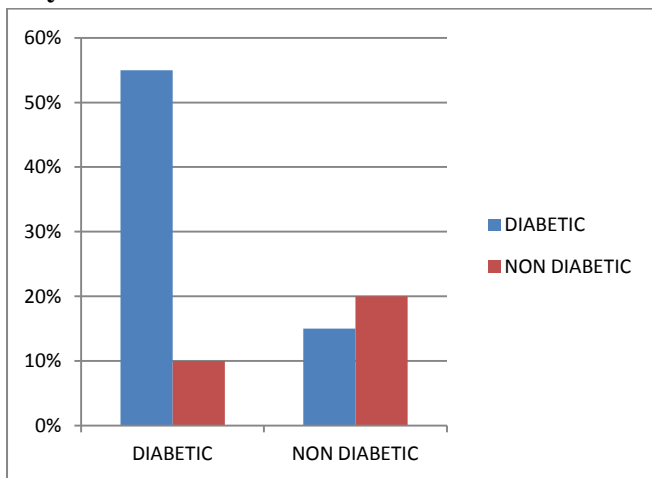


Table 6: Polymicrobial Versus Monomicrobial

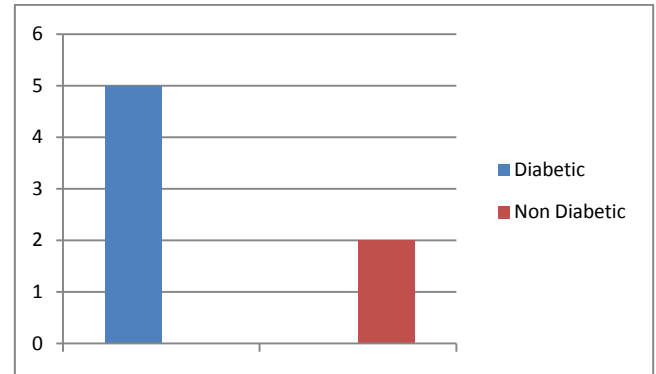
Infections	Diabetic	Non Diabetic
Polymicrobial	55%	15%
Monomicrobial	10%	20%
Total	65%	35%

Polymicrobial versus monomicrobial



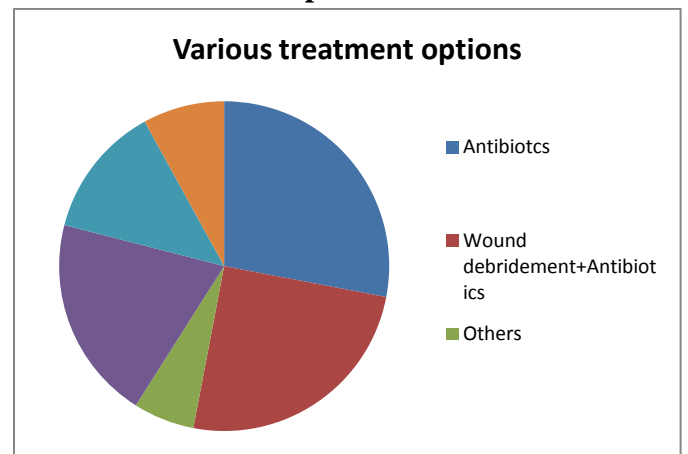
Polymicrobial infections in diabetics were common predominant organisms are staphylococcus aureus, Pseudomonas, Klebsiella, Streptococcus, Proteus.

Amputation



In the case of gangrene amputation rates (17.5%) were more in diabetics (12.5%) when compared to Non-diabetics (5%)

Various Treatment Options



Results

A total of 40 patients with foot infections among those 70% had diabetic, 30% are non-diabetic. Among which 42.5% had ulcer which is the most common complication. Males (72.5%) were commonly affected when compared to females (27.5%). Morbidity, mortality, poly-microbial infections and complications were more in diabetics. Diabetes is the one of the commonest cause for non traumatic lower limb amputations in the world. In my study amputation rates (17.5%) also higher in diabetics (12.5%) when compared to non diabetics (5%).

Conclusion

The finding that the foot infections, incidence, prevalence, morbidity, complications were more in diabetics is similar to that of other studies carried out in India and other parts of the world. In my study also it constitutes 70%. This study emphasizes that early screening for diabetes, patient's education about diabetes and its complications, foot care practices will reduce morbidity and mortality of diabetes.

Review of Literature

- R. Vidhya Rani and J. Nithyalakshmi
Department of microbiology, Government Mohan kumaramangalam medical college, Salem. A 1 year study shows that I diabetic patients 81% of the total specimens shows significant poly-microbial growth and more number of MRSA and ESBL when compared to non diabetics.
- Carter MJS, supported by health research institute, Diabetes research centre, Ahvan Jundishapur University of medical sciences. In this study foot ulcer in diabetic were common and frequently leads to lower limb amputation unless a rational multidisciplinary approach to therapy taken.
- Frykberg, RG J Foot ankle surgeon, 2006 September to October. In this study incidence, prevalence, morbidity, mortality was more in diabetics 79.5% and most of the foot infections were result in gangrene and lower limb amputation compared to non diabetics.
- Shodhaganga@INFLIBNET, reservoir of Indian these centre, Jawaharlal Nehru university. A cross sectional study was conducted in Iran