A DISSERTATION ON

ASSESSMENT OF THE USEFULNESS OF DIAFORA TOOL IN THE MANAGEMENT OF DIABETIC FOOT ULCERS – A CLINICAL STUDY

Dissertation submitted in partial fulfillment of regulation for the award of

M.S. Degree in General Surgery

(Branch I)

The Tamilnadu

Dr. M.G.R. Medical University

Chennai MAY 2020

UNIVERSITY REGN NO: 221711314

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CERTIFICATE

Certified that this is the bonafide dissertation done by **DR.I.G.SAM VICTOR and** submitted in partial fulfillment of the requirements for the Degree of M.S., General Surgery, Branch I of The Tamilnadu Dr. M.G.R. Medical University, Chennai.

Date: Unit Chief

Date: Professor & HOD

Department of General Surgery

Date: **Dean**

Coimbatore Medical College

Coimbatore

DECLARATION

I certainly declare that this dissertation titled, **"ASSESSMENT OF THE USEFULNESS OF DIAFORA TOOL IN THE MANAGEMENT OF DIABETIC FOOT ULCERS,** represent a genuine work of mine. The contribution of any supervisors to the research are consistent with normal supervisory practice and are acknowledged.

I also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other university board, neither in India nor abroad. This is submitted to The Tamil Nadu Dr. MGR Medical University, Chennai in partial fulfillment of the rules and regulation for the award of Master of Surgery Degree Branch 1 (General Surgery).

Place:

Date:

Dr. I. G. SAM VICTOR
REGN NO: 221711314

INSTITUTIONAL HUMAN ETHICS COMMITTEE
COIMBATORE MEDICAL COLLEGE, COIMBATOR – 14

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CERTIFICATE OF APPROVAL

To
Dr.Sam Victor I G
Post Graduate,
Department of General Surgery,
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Coimbatore -18.

Dear **Dr.Sam Victor I G**

The Institutional Ethics Committee of Coimbatore Medical College, reviewed and discussed your application for approval of the proposal entitled **"Assessment of usefulness of Diafora tool in the management of Diabetic foot ulcers."**No.0114/2017.

The following members of Ethics Committee were present in the meeting held on 30.11.2017.conducted at MM - II Seminar Hall, Coimbatore Medical College Hospital Coimbatore-18

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15	Mr.V.A.Shahul Hameed, +2	Lay-Person

We approve the Proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

MEMBER SECRETARY
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I extend my heartfelt thanks to all the **patients** who co-operated for this study.

ABSTRACT

PURPOSE:

The Aim of the study was to assess the usefulness of the DIAFORA tool in predicting the occurrence of Lower Extremity Amputations (LEA's) in the patients with Diabetic Foot Ulcers (DFU).

DESIGN:

Around 110 patients who were admitted with DFUs in the in-patient department of CMCH were assessed and classified according to the DIAFORA tool and were prospectively followed up for a period of 1 year , for outcomes such as ulcer healing or LEAs or death , and were compared with the risk category of DIAFORA to assess its usefulness in the prediction of LEA occurrence in the CMCH in-patient set-up.

RESULTS:

Among the 23 patients in low-risk category, none (0%) needed amputation. Among the 35 patients in medium-risk category only 6 (17%) needed amputation. Among the 52 patients classified as high-risk category 48 (96%) needed amputation in the follow up period. These results were statistically significant and strong association were found between the individual ulcer and foot related variables and probability of LEA's.

CONCLUSION:

Hence this classification can be used in our set-up for assessing the predictability of occurrence of Lower Extremity Amputations (LEA's) in patients with Diabetic Foot Ulcers (DFU's). And the management protocols for the patients can be planned and the treatment can be appropriately changed according tot their risk criteria and this can be used in the prevention of occurrence of LEA's in the Diabetic Foot Ulcer patients.

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INTRODUCTION

Diabetes Mellitus (DM) is one of the most common non-communicable diseases (NCD) in the world. According to the International Diabetes Federation data, approximately 425 million people had DM in 2017 and the sum is expected to raise to 629 million people by 2045[1]. Diabetic foot ulcers (DFU), one of the most common preventable and disabling complication of DM has a high morbidity and mortality, if not adequately managed. DFU's are the most common foot injuries leading to early lower extremity amputation (LEA). In a developing nation like India, where bare foot walking is prevalent among rural population, adequate patient education, foot hygiene is necessary in the prevention. Seeking medical aid at the earliest along with early diagnosis and prompt treatment of DFU may drastically reduce the mortality, morbidity and financial burden in the community [2]. Foot ulcer is the predominant cause of non-traumatic diabetic foot amputations. DFU's are the most common ulcers in the outpatient department of most government hospitals in India, hence an accurate assessment of DFU's is essential in day to day practice to correctly identify the candidates for conservative management and LEA. Standardization and efficient approach to prevention of foot ulceration is always the crucial step in the management.[5] Currently there are 5 stratification systems for DFU

development and 15 for LEA's prediction. Variables such as diabetic peripheral neuropathy (DPN), peripheral arterial disease (PAD), Foot deformity (FD) and previous DFU or LEA were used among various classification systems [3,4].

A New classification system called DIABETIC FOOT RISK ASSESSMENT TOOL – DIAFORA has been developed by Monteiro-Soares et al, based upon the International working group on Diabetic foot (IWGDF) stratification system. Four foot related (DPN, Foot deformity, PAD, Previous DFU/LEA) and four DFU related variables (Multiple DFU, Infection, Gangrene, Bone involvement) were used in this classification system based upon a structured interview and foot examination by an experienced podiatrist.

In our study, we apply this tool and classify the patients according to their risk criteria for lower extremity amputation [3] and are followed up for one year and assessed for the usefulness of the scoring system in our hospital set up, since more than 2 out of 10 cases in our out patient set up is a DFU Patient and most of them requires LEA and which could almost save the life of the patient if done at the right time , because of the mortality associated with this disease is very high in our set-up .

AIM OF THE STUDY

1. To classify the patients with diabetic foot ulcers and manage them according to their risk category.

2. To assess the usefulness of the DIAFORA tool in the management of patients with diabetic foot ulcers.

OBJECTIVES

1. To apply the DIAFORA score to all diabetic foot ulcer patients.

2. To stratify them according to their risk criteria.

3. To follow up the patients for one year and assess the usefulness of DIAFORA score in predicting the occurrence of LEA.

REVIEW OF LITERATURE

Several studies and scoring systems have been used and devised in the past and many has been validated and used in routine clinical practice for the stratification of the DFUs. Appropriate stratification of patients by their risk of developing DFUs is crucial in resource allocation and complication prevention and serve as a guide for efficient management [4].

Five stratification systems were developed so far namely [4],

1. University of Texas (UT)
2. American Diabetes Association (ADA)
3. International Working Group on the Diabetic Foot (IWDGF)
4. Scottish Intercollegiate Grouping Network (SIGN) systems
5. Seattle risk score

- A Case- Control study by **Lavery LA et al**, on UTFRS system done among 225 age matched patients and controls, concluded that the certain clinical factors like Neuropathy, foot deformity, High Plantar pressures and History of previous amputation were significantly associated with DFUs [4].

- A systematic review done by **Boulton AJ et al**, on the ADA system all the patients with diabetes must have thorough foot examination at yearly intervals and also evaluated for the presence of risk factors such as neuropathy, vascular diseases and deformities [4].

- A clinical study by **Lavery LA et al,** on the IWGDF, evaluated 1,666 patients for 27.2± 4.2 months stated that the modified IWGDF system is more effective in predicting DFU complications. And proposed a new classification system called Texas Foot Risk Classification – that had a five-tiered classification. They also gave emphasis to the Pareto effect in economics, aka 80/20 effect, that states the effect of multiple variables on a single outcome [4,10].

- A Population based ,Prospective observational follow-up study **, by Leese GP et al**, that used the Scottish Intercollegiate Grouping Network ,conducted among the patients attending the routine diabetic care , based on eight easy to use and inexpensive variables, that employed around 3526 patients , followed up for a period of 1.7 years . This study had the highest sample size and had very high negative predictive value. and this was also concluded as one of the most useful clinical tools in the routine practice [4,5,11].

- A clinical Follow up observational study by **Bokro EJ et al,** mainly aimed at predicting the occurrence of DFUs based on the patients commonly available clinical information such as patient demographics, diabetes duration , HBA_{1C}, visual acuity, foot ulcer , foot shape and sensitivity etc., was conducted among the 1,285 diabetic veterans without foot ulcers and evaluated annually and through quarterly mailed questionnaires . The patients were followed up for a period of 3.38 years (longest available follow-up period). and the study was concluded that the readily available clinical has substantial predictive power in predicting DFU occurrence and also help in prevention [4,5,12].

- A systemic review done by, **Monteiro-Soares et al,** on the various available risk stratification systems, that took around 13 systems and compared their similarities, disparities, diagnostic accuracy etc. And confirmed that certain variables such as Diabetic neuropathy, Peripheral Vascular disease, Foot deformity, and previous ulcer or amputations were commonly associated with the high ulcer occurrence. The core variables in each system are almost similar and only the number of variables changes [5]. And also said that the foot ulcer risk stratifying systems are the most commonly needed tool in the patient evaluation [5].

- A retrospective cohort study conducted by **Martin-mendes et al,** carried out among the patients enrolled in diabetic clinics from 2002 to 2010. that involved 644 subjects with mean age of 65.1±11.2 years with a diabetes duration of 16.1±10.8 years. With incidence of DFU – 26.6%, LEA-5.8%, Death-14%. this study concluded that DFU serves as an independent risk factor with an absolute impact on LEA [6].

- A population based prospective study called as Eurodiale study by **Prompers et al ,** primarily aimed at avoiding the limitation being performed in a single center and confined to the particular group of population , which was carried out in 14 hospitals in 10 countries in Europe , that employed around 1,229 patients with new onset DFUs , and the variables used such as PAD and infection . It concluded that the comorbidity increases with DFU severity and also stated that the DFU severity is greater that it was reported previously [7].

- Hence based on the observations by the above said **Monteiro Soares et al ,** devised a scoring system for stratification of DFUs acronym name given as DIAFORA- Diabetic Foot risk Assessment tool, this is a prospective cohort study done among the patients attending Diabetic clinic from 2010 to 2013 , around 293 participants were enrolled and followed up for a period of 91 days till the final outcome like ulcer-healing or LEA or death. The variables used were 4 foot related and 4

ulcer related variables. And the tool on statistical analysis found to have high accuracy in predicting the LEA occurrence. Hence, they devised a new classification tool called as DIAFORA, that could be useful in a variety of settings such as primary, secondary and tertiary care.

Hence DIAFORA tool has been used in this study and has been assessed for the practicability in a government setting, convenience of usage and the credibility in determining the incidence of LEA's in the study population.

DIABETES MELLITUS:

Diabetes mellitus is a chronic, debilitating, eroding disease which is prevalent worldwide both in developing and developed countries. In 2015, 415 million people over the world were estimated to have diabetes, and this number is projected to rise to 642 million by the year 2040. Diabetes mellitus can be divided into 2 types – Type 1 – absence of insulin secretion due to autoimmune destruction of beta cells of pancreas, Type 2 – due to inadequate secretion of insulin / insulin insensitivity. Type 2 DM accounts for nearly 85-90% in developing countries and estimated to be higher in developed countries. As diabetes mellitus is a chronic disease which requires treatment lifelong with medications, poorly controlled and a long-standing DM may cause complications which are described below. The below mentioned complications are a cause of social and economic burden to the patient and the society. Hence any attempt in reducing the complication by prevention and intervening at the early stage and also predicting the course of the disease may be helpful in reducing the morbidity and mortality due to diabetes mellitus.

COMPLICATIONS OF DIABETES MELLITUS:

Macrovascular complications	Microvascular complications
• Cerebrovascular accidents	• Diabetic peripheral neuropathy
• Cardiovascular disease	• Diabetic retinopathy
• Peripheral vascular disease	• Diabetic Nephropathy

SECONDARY COMPLICATIONS:

- Immune dysfunction
- Diabetic foot ulcers
- Gangrene
- Cellulitis
- Necrotizing fasciitis
- Bacterial and fungal skin infections
- Vitiligo
- Necrobiosis lipoidica diabeticorum
- Diabetic systemic sclerosis

- **Macrovascular complications**

Cardiovascular disease

It is the most common cause of morbidity and mortality in patients with diabetes. Other risk factors such as hypertension, dyslipidemia, smoking, albuminuria, should be assessed once a year in patients with diabetes. Prevention and early intervention to prevent the complications due to cardiovascular events is the key to reduce the morbidity and mortality. Elimination of risk factors with lifestyle modifications, cessation of smoking and increased physical activity is an important part of treatment. Pharmacological agents are used to help prevent risk factors and also to treat the cardiovascular complications. In a 30-year study, Diabetes Control and Complications Trial (DCCT), the cumulative incidence of cardiovascular disease was 14% in the conventional therapy group and 9% in the intensive therapy group. In the follow-up of the same study, intensive treatment of blood glucose levels in patients with type 1 diabetes was shown to reduce the risk of long-term complications [8]

Cerebrovascular disease

Diabetes mellitus increases the risk of stroke by two to threefold,

and hyperglycemia at the time of admission for a stroke has been shown to be a predictor of worse neurological outcome. Women had a higher risk of stroke than men. Diabetes mellitus also increases the risk of dementia and cognitive decline. Cerebrovascular disease has been shown to be more common in patients with diabetic foot ulcer than patients without a foot ulcer.

Microvascular complications

Diabetic peripheral neuropathy

Diabetic peripheral neuropathies a serious complication and accounts for approximately 30–50% of patients with diabetes. Diabetic neuropathy is a major risk factor for developing DFU.

The sensory nerves are affected in diabetes mellitus and thus leading to the loss of touch/warmth/cold/pressure sensation which follows the reflex arc. Motor nerves are required in maintaining the locomotion and balance, loss of motor nerve function alters the biomechanics and foot anatomy, which leads to foot deformities and hence the pressure points differ with altered anatomy and this leads to pressure ulcers in the foot. Loss of the autonomic nervous control leads to dry skin and loss of control over vascular smooth muscles leads to impaired wound healing and chronic foot ulcers [7,8].

Diabetic retinopathy

Diabetic retinopathy is a specific vascular complication attributed to diabetes. The development of diabetic retinopathy is directly proportional to the duration of diabetes. It is the leading cause of new blindness in patients under 75 years. Due to microvascular angiopathy which causes a vascular compromised state which leads to neovascularization and macular edema progressing to blindness. Presence of retinopathy and loss of vision increases the risk of foot ulcers.[10]

Diabetic nephropathy

Diabetic nephropathy the leading cause of end-stage renal disease (ESRD), 20%- 40% patients of diabetes mellitus may require dialysis and/or renal transplantation. Nephropathy is a marker for worse outcome in diabetic foot ulcers. ESRD seems to have a stronger negative impact in patients who also have peripheral artery disease.

The diabetic foot

Diabetic foot is the infectious ulceration with or without destruction of deep soft tissues associated with neurological

abnormalities and various degrees of peripheral vascular disease. It is a full thickness wound which includes foot ulcers and amputations, and foot problems that needs inpatient care for a prolonged time period and is the major cause of morbidity and socioeconomic burden to the individual and the community [3,5].

The cause of diabetic foot is multifactorial. The prevalence is found to be between 4-10% and lifetime risk of up to 25% as stated by Eurodiale study [7,8]. Foot ulceration requires a long and focused treatment measures. It is associated with very significant effects in the quality of the patient's life and also of the caregivers. The most common cause of DFU is Diabetic peripheral neuropathy and diabetic peripheral vascular disease. [7,8]

Sensory loss, foot deformities, skin breakdown, visual impairment, callosities, previous foot ulceration or amputations are the important contributory etio-pathogenic causes in the development of foot ulcers. Peripheral vascular disease has been found in one half of the patients with diabetic foot ulcers and is an important predictor of outcome [7,8]

More often the ulcers get complicated by infections, and tissue loss which requires surgical management. 58% of ulcers are infected at the time of presentation at the DFU clinic increasing to 82% patients

hospitalized for diabetic foot ulcer. Patients with infected diabetic foot ulcers are at a 50-fold increased need for hospitalization and 150% [5,7,8] fold risk of lower extremity amputation. Approximately 5% of the patients will undergo major amputation and 20-30% will undergo minor amputation [7,8]. Unfortunately, systemic signs such as fever and leukocytosis are absent with a serious case of diabetic foot ulcer due to impaired immunity. The European study group on diabetes and lower extremity - EURODIALE [7,8] a large cohort of diabetic foot ulcer patients proved the value of IWGDF system for clinically relevant lower extremity amputations.

Classification of diabetic foot ulcers:

Appropriate classification is essential in the assessment and the management of foot ulcers. Classification systems should help in planning the management and also predict the expected outcomes. Several classification systems were proposed among them, most important are the

1. **Wagner's system** – based on the depth and the extent of tissue necrosis.

2. **University of Texas san Antonio classification** – UTSA; based on lesion depth, ischemia and infection.

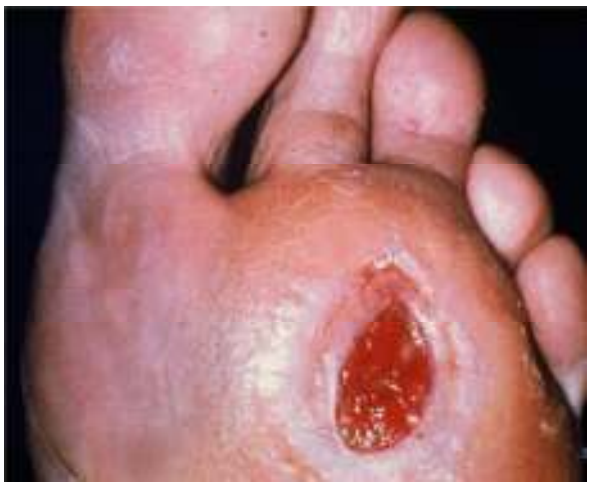
Both classification systems have been validated and increasingly used for assessment and classification of diabetic foot ulcers and also used in many clinical trials.

The Wagner classification system is most commonly used to classify the diabetic foot ulcers. It is graded according to the depth and extent of tissue damage.

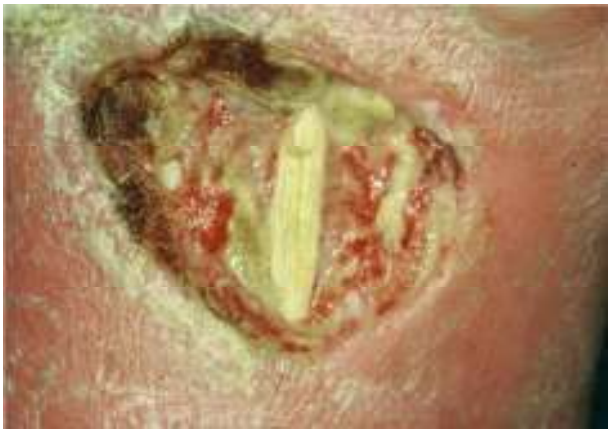
GRADE	PRESENTATION
Grade 0	No ulcer
Grade 1	Superficial ulcer up to but not through dermis.
Grade 2	Ulcer extension involving ligament, tendon and joint, capsule or fascia (no abscess or osteomyelitis)
Grade 3	Osteomyelitis with ulceration or abscess
Grade 4	Gangrenous patches affecting toe or part of the foot
Grade 5	Gangrene of entire foot

Grades 0–2: Graded according to physical depth of the lesion, Grade 3: Involves both physical depth and infection

Grade 4–5: Graded according to the extent of gangrene in the foot.



Wagner Grade 1



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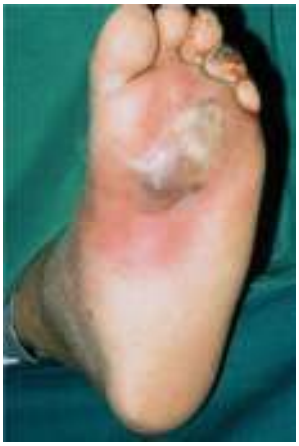

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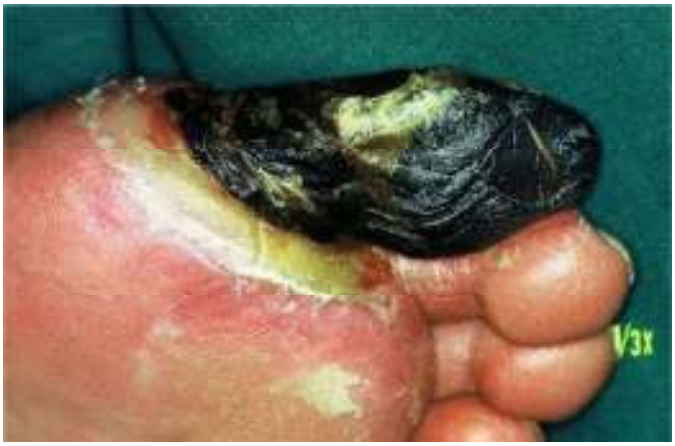
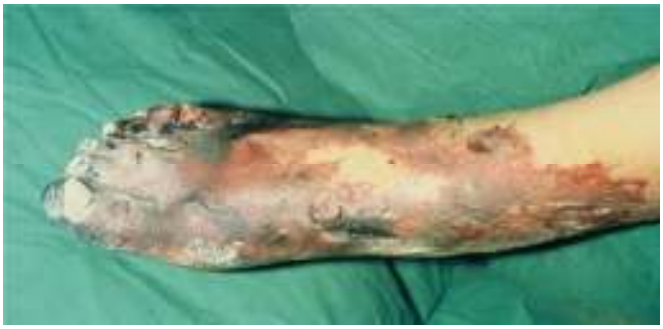


Wagner Grade 4



Wagner Grade 5

Figure: 1 Wagners classification system of DFU'S

THE TEXAS DIABETIC WOUND CLASSIFICATION SYSTEM

STAGE	0	1	2	3
A	Pre/post ulcerative lesion completely epithelialized	Superficial wound no involvement of tendon/capsule/bone	Penetrating wound to tendon or capsule	Penetrating wound to bone/joint
B	Infection (+)	Infection (+)	Infection (+)	Infection (+)
C	Ischemia (+)	Ischemia (+)	Ischemia (+)	Ischemia (+)
D	Presence of Infection and ischemia	Presence of Infection and ischemia	Presence of Infection and ischemia	Presence of Infection and ischemia

Hence in addition to the depth of the wound, the UTSA classification system has been subcategorized as A, B, C and D based on the absence and presence of infection, ischemia and both respectively. Hence higher he grades; more is the risk of lower extremity amputation.

RISK FACTORS OF ULCERATION:

Around 5% of patients with diabetic foot ulcers are subjected to lower extremity amputation. Diabetic foot related complications mainly, diabetic foot ulcers, lower extremity amputations are very prevalent worldwide [4]. Foot ulcer has been recognized as the important antecedent of lower extremity amputation in multiple studies. Several observational studies have been conducted worldwide and several important risk factors has been identified by them [6]. The most important risk factors

1. Peripheral neuropathy
2. Foot deformity
3. Peripheral arterial disease
4. Infections of DFU'S
5. Gangrene
6. Bone involvement
7. Multiple DFU'S
8. Visual impairment
9. Abnormal foot pressure points.

Diabetic Peripheral neuropathy (DPN):

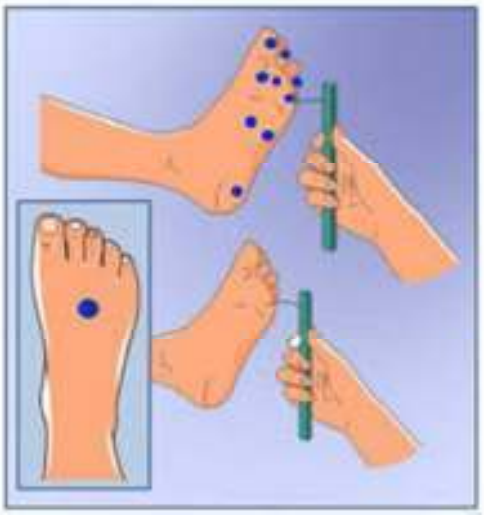
Peripheral sensory neuropathy leading to the unrecognized trauma is the primary risk factor for DFU'S. According to a prospective multi-center study.

Sensory neuropathy being most frequent in the casual sequence to ulceration in diabetic patients. The basic pathology behind peripheral neuropathy being the thickening of the basement membrane of the Vasa Nervorum [19]. this leads to conduction deficits, abnormal signaling and eventual loss of conduction. Other forms of neuropathy such as motor neuropathy leading to muscle atrophy and muscle weakness can lead to foot deformities. Autonomic neuropathy leads to decreased sensations and reduced secretions over the skin cracking a portal for free entry of bacteria [3,19]. It often results in cracking and fissuring of skin but also contributes to easy bacterial entry. The resultant foot deformities due to motor neuropathy produces abnormal pressure points with consequent development of hammer toes, fat pad displacement etc. [19].

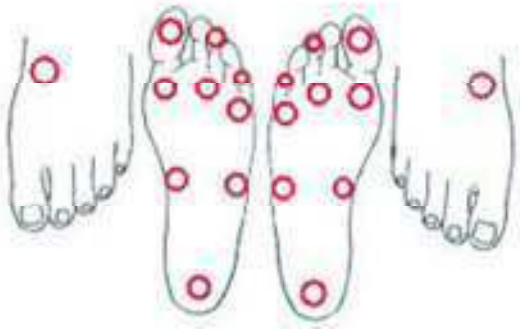
Hence ulcers develop at the point of maximum friction leading to further consequences. Limited joint mobility that occurs due to glycosylation of collagen as a result of long-term diabetes mellitus leads to stiffening of intracapsular and extracapsular structures in the joints (cheiro-arthropathy) [3,4]. The resultant reduction in ankle, subtalar and

first metatarsophalangeal joint mobility results in varied pressure points and increases the risk of ulceration [4]. The alteration of arrangement of collagen in the Achilles tendon and its glycosylation in the development of ulcer has been observed in many studies. Other risk factors include diabetic nephropathy, uncontrolled blood sugars, long duration of diabetes mellitus and advanced age [4,10]

The performance of a 10gm Semmes -Weinstein monofilament test and 10 ipsilateral foot sites by an experienced physician is an extremely sensitive test for peripheral neuropathy.



Monofilament test
(semmes – weinstien 10gm)



10 pressure points
(9 plantar,1 dorsal)

Figure 2 : Test for Diabetic Peripheral Neuropathy

FOOT DEFORMITY

This is the most important contributory factor predominantly caused by associated motor neuropathy. Motor neuropathy upsets the delicate balance between flexors and extensors leading to the atrophy of the joints of the foot leading to hammer toes, claw toes, equinus deformities, prominent metatarsal heads and pes cavus. In due course, callosities develop at the high-pressure points that leads to hemorrhage underneath and eventually ulceration [3,4]. This is confirmed by the fact that ulcers usually develop at the site of maximum pressure [4,10]. Significant relationship has been described between factors such as deformities of the foot, patterns of plantar pressure distribution, callous formation and ulceration [4]. It is commonly accepted that specific foot deformities in diabetes as a result of muscle weakness contributes mainly to the ulceration.

PERIPHERAL ARTERIAL DISEASE:

It is defined as a clinical disorder where there is stenosis or occlusion of lower limb arteries. Atherosclerosis is the main cause of PAD in people over 40 years of age. Diabetes is associated with 2 to 4-fold increase in PAD compared to normal population [14]. It is present approximately in one half of patients with foot ulcers. It is considered as one of the predictors of outcome of DFU's. Peripheral arterial disease

rarely leads to foot ulcerations directly instead it leads to prolonged time of healing and imparting an increased risk for amputation. Peripheral arterial disease is often assessed by clinical examination by manual palpation of pulses or handheld doppler mainly in the femoral, popliteal, posterior tibial and dorsalis pedis locations. Factors such as ankle brachial pressure index clinically and radiologically by doppler study are also included. Ankle brachial index is obtained by dividing ankle systolic pressure by the brachial systolic pressure. A value of >0.95 is considered normal. Unfortunately, the calcification of lower limb arteries in diabetic patients leads to false positive results. In such cases toe pressure and pulse volume recordings augment the investigation. Transcutaneous oximetry ($TcPO_2$) has been advocated by many practitioners. A screening test as well as a determinant for healing potential. Dr. fife et al has given a consensus statement in a workshop – transcutaneous oximetry: art and science practice.

*$TcPO_2$ <40mmHg = tissue hypoxia

*$TcPO_2$<30mmHg = Critical limb ischemia

* $TcPO_2$<40mmHg is associated with less likelihood of wound healing

*$TcPO_2$>40mmHg is associated with healing.

Peripheral arterial disease is concluded as most important risk factors in developing DFU's in type 2 diabetes mellitus patients and hence early

treatment of the vascular disease along with control of diabetes mellitus has been stressed as an important factor in the development of the disease.[14]

INFECTIONS OF DFU'S

It is defined as soft tissue or bony infections below the malleoli. It is the most common complication of diabetes mellitus leading to hospitalization and most frequent cause of nontraumatic lower extremity amputation. Infections are diagnosed clinically by the presence of clinical findings of inflammation or purulence. Most infections being polymicrobial caused by aerobic gram-positive cocci and gram-negative bacilli – anaerobic organisms. Osteomyelitis is the dreaded complication of diabetic foot infections that necessitates surgical intervention. Major predisposing factors being peripheral neuropathy, peripheral arterial disease and impaired immunity [16]. The infections of the plantar aspect of the foot ae particularly problematic [19]. Mild infections can be treated with antibiotics and by a conservative management. Moderate and severe infections need intravenous antibiotics and further evaluation for necessary surgical intervention. The infectious diseases society of America and IWGDF, classified the diabetic foot infections based on a prospective longitudinal study of 1666 patients, as uninfected and infected with mid moderate and severe grades of infections.

Clinical manifestation of infection	IWGDF/IDSA
No systemic or local signs of infections	1 – Uninfected
€local infection involving only skin and subcutaneous tissue (without signs of systemic inflammatory response) and any erythema present extends >0.5 to <2cms around the wound.	2 – mild infection
€Local infection with erythema >2cms around the wound or involving deeper structures and no signs of systemic inflammatory syndrome.	3 – moderate infection
€Local infections with signs of systemic inflammatory syndrome	4- severe infection

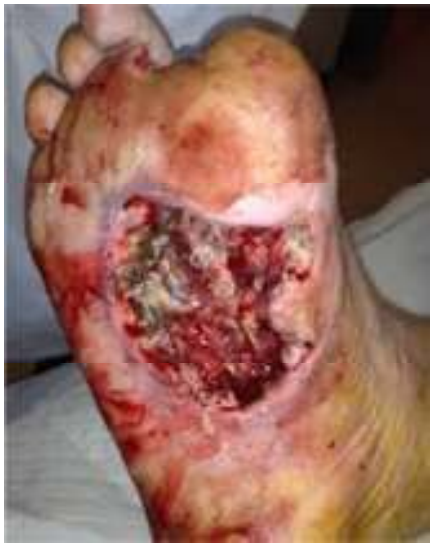
€Local infection is defined as the presence of at least 2 of the following

1. Swelling or induration,
2. Erythema >0.5cms in any direction around the ulcer
3. Local tenderness or pain
4. Warmth
5. Purulent discharge

GANGRENE:

It implies macroscopic death of tissue with putrefaction [17]. Diabetic gangrene is usually rapid in onset and painless with large areas of necrosis. High chances for deep seated infections are usually present. It is often misguided by the presence of ankle pulsations which is a striking feature [19]. There are 2 types of gangrene depending upon the etiology:

Dry gangrene



Wet gangrene

Figure 3 : Types of Gangrene

DRY GANGRENE:

It occurs due to aseptic ulceration due to minimal infection. The gangrenous areas are dried and mummified. Clear line of demarcation between the normal and the gangrenous tissue is present [17].

WET GANGRENE:

It occurs due to septic ulceration. Associated with purulent discharge. Often the line of demarcation is vague. There may be skip lesions proximally. There is no clear line of demarcation between the normal and gangrenous tissues [17].

PATHOGENESIS OF GANGRENE:

High blood glucose level in the tissues along with microangiopathy due to diabetes associated with neuropathy and atherosclerosis leads to blockade of circulation and loss of sensations. This leads to increased propensity to infections which leads to gangrenous changes of the toe and soft tissue structures [18].

Gangrene of toes:

Most common type of lesion to start with following an unnoticed injury. Usually wet gangrenous type treated by minor LEA's.

Gangrenous patches:

They more commonly occur in the pressure areas of the foo mainly over the heal, first and fifth metatarsal heads and over the lateral plantar aspect. this develops due to pressure necrosis and is associated with skip lesions and has more tendency to ascend proximally. They are also seen in the interdigital clefts that are usually missed in the examination by untrained personnel.

BONY INVOLVEMENT:

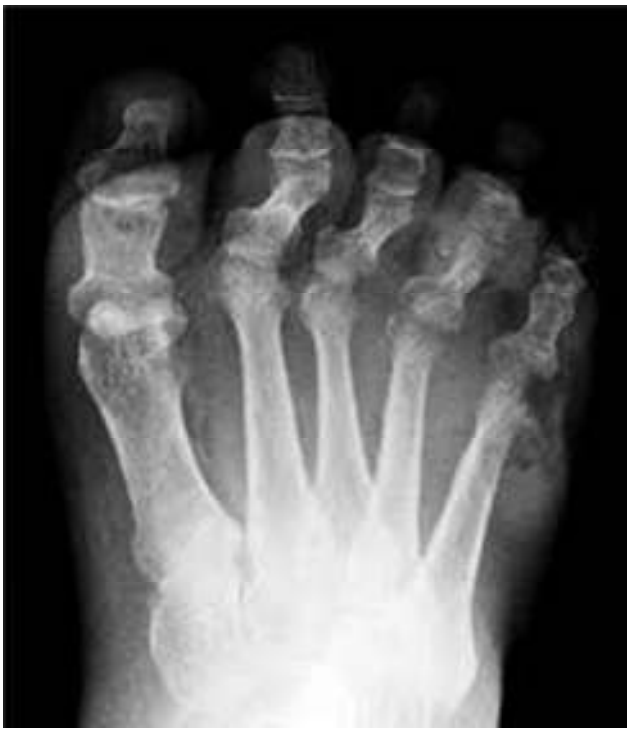


Figure 4 : X-ray Showing Bony Involvement

It is the most predominant factor associated with LEA'S. The presence of bony involvement is assessed by a sterile probe examination. The next step to confirm bony involvement is plain X ray imaging of the foot with classical findings such as demineralization, periosteal reaction and bony distortion. MRI and triple phase bone scanning unusually becomes positive within 48 hrs. after infection. Both these investigations have high negative predictive value and sensitivity. Once bony involvement has been found out amputation of the involved bone along with iv antibiotics for 6 weeks after debridement is necessary. Hence adequate debridement in the early periods with the complete removal of the infected soft tissues plays a vital role in the bony involvement and further amputations [21,22].

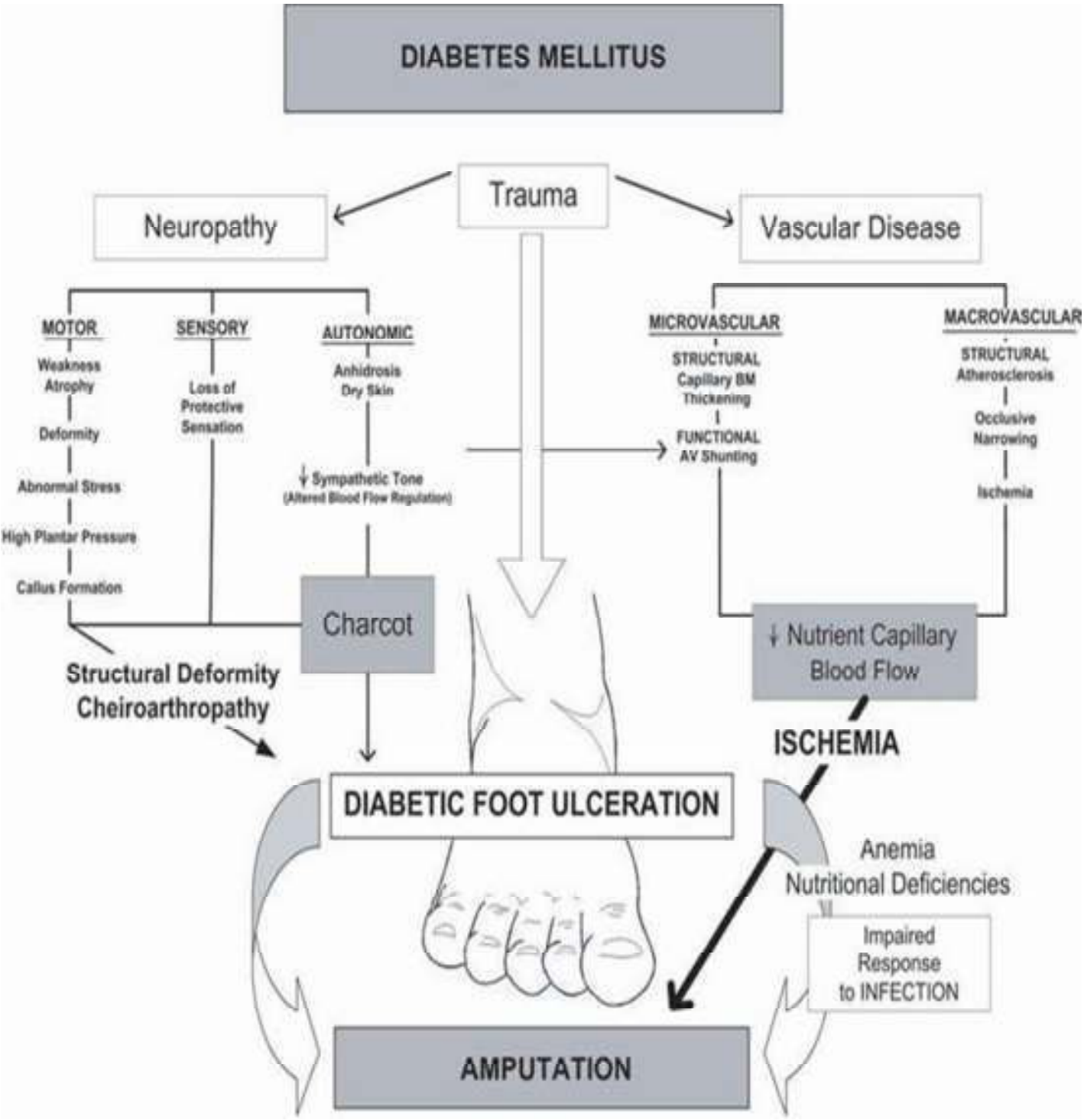


FIGURE 5: Pathophysiology of Diabetic Ulcer Foot

FOOT EVALUATION:

- **Evaluation of neuropathy:**

1. Vibration sensitivity – Biothesiometer/ Tuning fork test
2. Temperature discrimination – Tip thermometer
3. SWM – Semmes – Weinstein monofilament test

- **Evaluation of peripheral vasculature:**

1. Manual palpation of pulses
2. Duplex doppler ultrasound
3. Transcutaneous oximetry - $TcPO_2$
4. Digital subtraction angiography
5. Magnetic resonance angiography

- **Evaluation of bony involvement:**

1. Sterile probe test
2. Plain radiographs
3. Triple phase bone scanning
4. CT imaging with tagged WBC's scanning

5. MRI

6. Tc 99 synctigraphy

MANAGEMENT OF DIABETIC FOOT LESIONS

In 1999, the American Diabetes Association (ADA) has put forth basic principles of diabetic wound healing.

1. Pressure relief devices

2. Debridement

3. Use of appropriate dressings

4. Medical and surgical treatment of infection

5.Vascular reconstruction and / or amputation or reconstructive foot surgery when necessary.

1. Pressure relief devices or Offloading:

Due to the biomechanical changes that are a frequent consequence of neuropathy in diabetes, there is an altered pressure load on the sole. Hence a constant pressure relief is the essential key for the prevention and also the healing of foot ulcers [23].

Total contact casting (TLC): The most effective method of off - loading. It is a special cast that has been designed as a way to redistribute

the patient's weight off the ulcer site and hence allowing ambulation during healing [24]

Off-Loading Techniques [23]:

1	Accommodative dressings	Patellar tendon – bearing braces
2	Assistive devices	Removable walking braces
3	Callous removal	Scotch cast boot
4	Foot casts	Shoe cut outs
5	Half, wedge or surgical shoes	Surgical correction of deformity
6	Orthoses	Therapeutic shoes
7	Padded hosiery	Total contact casting

Debridement:

Ulcer debridement is the corner stone of the management of DFU'S. It is defined as the thorough removal of the devitalized tissue. The main aim of debridement is to remove fibrin which is white, yellow or green tissue which forms the bed of an ulcer) and necrotic tissue (black tissue) thus producing a clean and well vascularized wound bed.

Types of debridement:

Surgical: The gold standard technique of debridement. It removes both necrotic tissue and also the micro-organisms. Majority of diabetics have neuropathy and hence they have a markedly reduced pain sensation and therefore extensive surgical debridement can be performed under local or regional block anesthesia [26].

Mechanical: It includes wet -to-dry dressings, hydrotherapy, saline wound irrigation and dextranomers.

Enzymatic: Using chemical enzymes such as collagenase, papain or trypsin - cream or ointment base). Long standing ulcers are enzymatically debrided especially in elderly patients where regular, surgical debridement is not possible, e.g. if the necrotic zone is thin, in ulcers with sinuses. It can also be used as an additional procedure to sharp debridement.

Autolytic debridement: It uses in-vivo enzymes which are capable of auto digestion of devitalized tissue such as hydrocolloids, hydrogels, and transparent films. It uses the body's own enzymes, moisture to re-hydrate. The ulcers soften and finally liquefy the eschar and slough. It is a highly selective process, which liquifies only the necrotic tissue and is painless to the patient. It is usually done in non - infected ulcers with mild to moderate exudates.

Biomechanical wound Treatment: (Biosurgery)

1.Treatment with sterile maggots (Larval therapy) – Larvae of Lucillia serricata (Greenbottle fly) Larva feeds on the necrotic tissue and the presence of growth factors in the larval secretion contributes to healing and granulation [27].

2. Leeches (Hirudo medicinalis) - Due to the presence of hirudin, anti-inflammatory and antithrombotic factor, it is used in the treatment of ulcers with critically impaired circulation.

SURGICAL MANAGEMENT OF DIABETIC FOOT

- Surgical Decompression of foot and leg
- Role of Amputation
- Role of Vascular Management [28]

SURGICAL DECOMPRESSION –

1. FOREFOOT DECOMPRESSION

Indications: i) Webspace infection,

ii)central plantar space infections.

Incision - Deep into plantar space cutting plantar aponeurosis.

PLANTAR SPACE DECOMPRESSION

Indications: Plantar space infection.

Characteristic of ulcer: Disappearance of longitudinal arch

Disappearance of skin crease.

Bulging of longitudinal arch area and sole becomes edematous.

Incision: Little toe to the heel over the medial aspect.

FOOT AND LEG DECOMPRESSION (Fasciotomy):

Indications: i) Cellulitis

ii) Compartment syndrome

Incision: Vertical release incision over the leg

Horizontal incisions for foot

AVERAGE HEALING TIME:

1.Forefoot decompression	11 - 38 days
2.Plantar decompression	12 - 40 days
3.Foot and leg decompression	12 - 60 days

ROLE OF AMPUTATION [21,22]

Risk factors:

1. Diabetic Nephropathy
2. Peripheral vascular disease
3. Diabetic peripheral neuropathy
4. Gangrene
5. Bony involvement

6. Uncontrolled Diabetic Keto-acidosis

7. Uncontrolled Septicemia

Toe amputation [22]

Indicated in gangrene of digits alone, patients with adequate circulation, with no rest pain or a perforating ulcer in the IP joint of great toe.

Great toe amputation [22]

Incision is made over the base of the toe and is extended 2 - 3 cms along medial border of the foot proximally. Tendons and tissues are divided, and toe disarticulated through MTP Joint (Metatarsophalangeal joint).

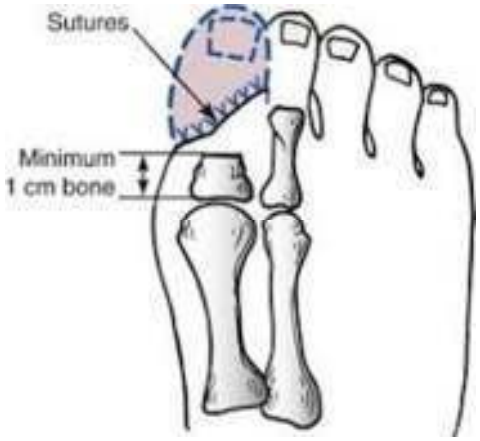


Figure 6 : Great Toe Amputation

Other toes amputation [22]

Incision is made at the junction of living and dead tissue. The soft tissues from bone are carefully stripped and the bone is divided through base of proximal phalanx or disarticulate at MTP joint.

Ray Amputation [22]

The entire toe and the distal half of the shaft of metatarsal bone is removed. Adequate drainage of deep parts of foot is done. The prominent metatarsal head beneath the ulcer is removed. It is indicated for infection that involves single MTP joint that arises from trophic ulcer and deep flexor tendon sheath.

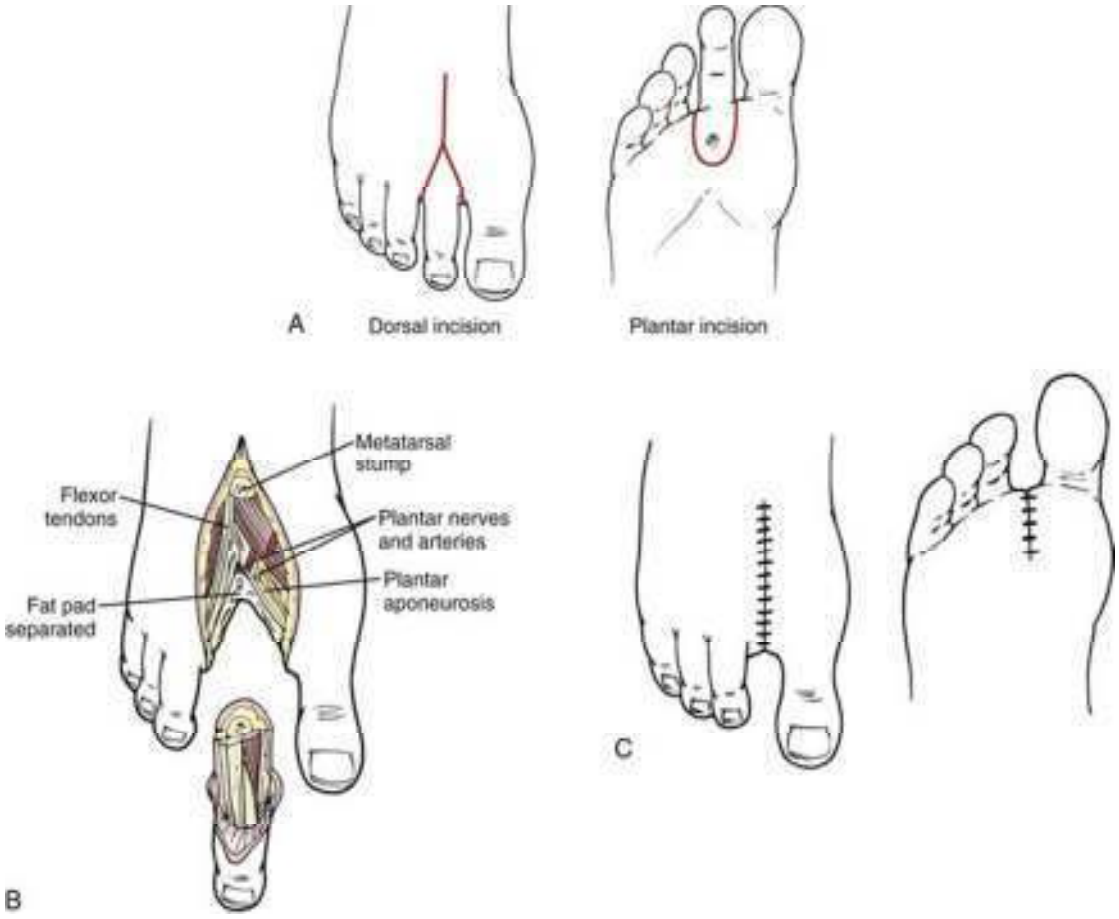


Figure 7 : Ray Amputation

Incision circles around the base of toe and also extends proximally into the sole. The toe disarticulated at MTP joint. `The distal part of plantar incision extended down. The soft tissue is shaved off from the metatarsal attachment. Bone is dividing in the middle of metatarsal bone and this gives good drainage.

Trans Metatarsal amputation [22]:

Indication: Gangrene involving >1 toe, persistent or recurrent plantar ulcer.

Incision: Across the dorsum of foot and at the level of middle of the metatarsal bone. The plantar incision is made at the base of toes. Both incisions are joined along medial and lateral borders.

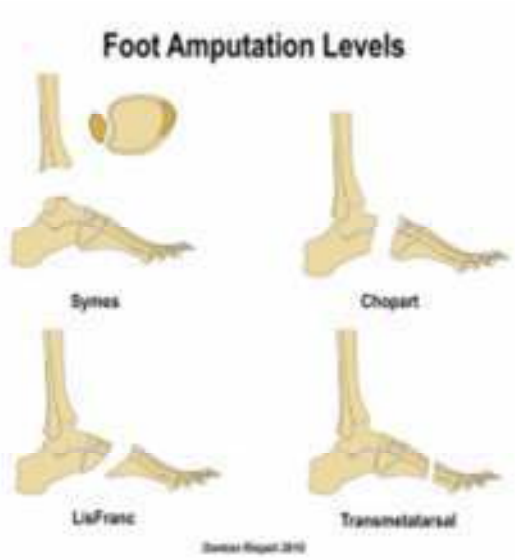


Figure 8 : Foot Amputation Levels

Below knee amputation:

Indication: Gangrene, Uncontrolled sepsis. Posterior flap should be long. The bone is divided in the middle of the leg approximately at the junction of upper and middle third of the leg. Anterior surface of tibia is beveled, and the fibula is divided 3 or 4 cms higher than that of tibia.

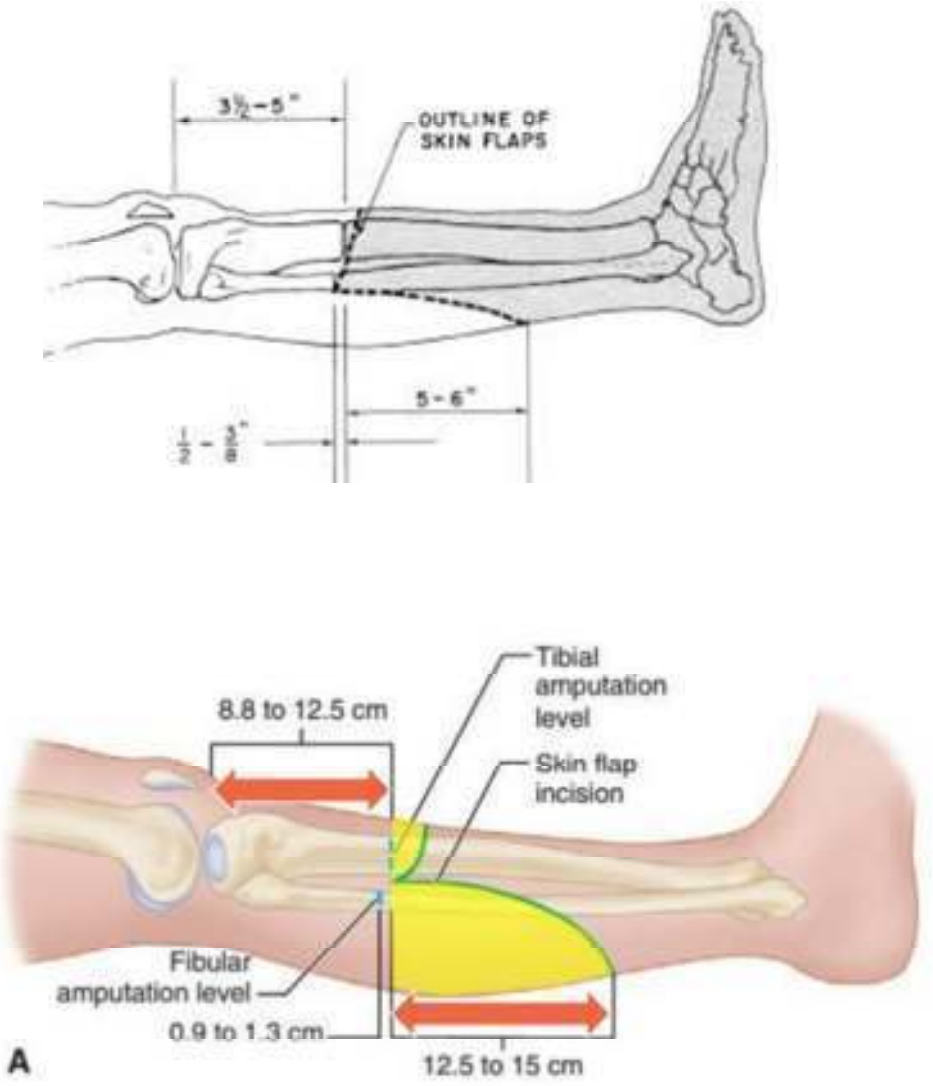


Figure 9 : **Below knee amputation**

HIGHER LEVEL AMPUTATIONS

1. Knee disarticulation

2. Above knee amputation.

These are done in the cases of uncontrolled sepsis with ascending infection and also in cases of extensive vascular involvement. These are mostly moribund procedures that requires high levels of postoperative care and rehabilitation along with patient and family education.

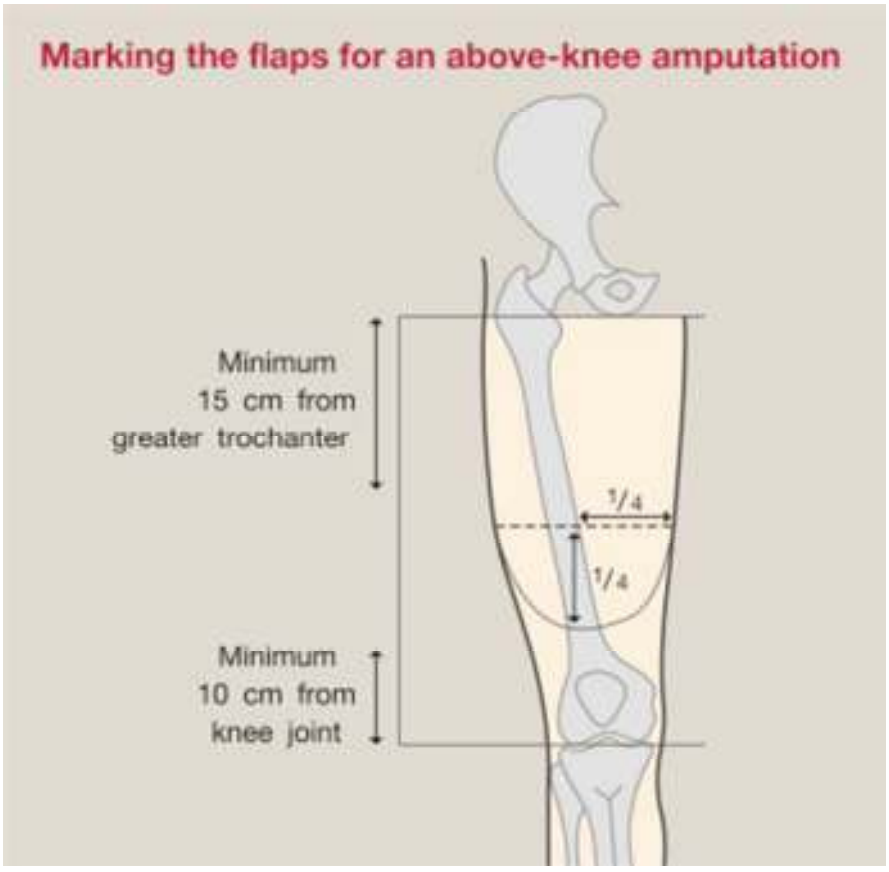


Figure 10: Above knee amputation

METHODOLOGY

METHODOLOGY

Study design:

Descriptive study

Study population:

Patients with diabetic foot ulcers admitted as inpatient in the department of surgery

Place of study:

Department of General surgery, CMCH

Sample size:

n=100 (Mean of last three years in patients with DFU)

Inclusion criteria:

1. Known patients of Diabetes mellitus with non-healing ulcer of more than 2-month duration admitted in the inpatient department of department of surgery.
2. Patients of any age group without other medical co morbidities.

Exclusion criteria

1. Ulcers due to varicose veins, decubitus ulcers
2. Co morbidities like CVA, renal disease, liver disease, Peripheral vascular disease.
3. DFU patients who are treated in outpatient department.

METHODOLOGY

- Identifying patients according to the inclusion and exclusion criteria.
- Applying the clinical variables of DIAFORA tool to the individual patients and stratifying the risk criteria
- Classifying the patients according to the score as low/moderate/high risk.
- Treating the patients according to the individual risk category as either conservative/ LEA.
- Follow up the patients for one year for outcomes like healing/ amputation or death of patient.

DEFINITIONS FOR VARIABLES

FOOT RELATED

1. **DIABETIC PERIPHERAL NEUROPATHY (DPN) [3]**

   Inability to feel monofilament stimulation (SWM – Semmes-Weinstein monofilament) at ≥ 1of 4 points (Hallux pulp, first, third and fifth metatarsal heads)

2. **FOOT DEFORMITY [3]:**

   Any anatomical alteration in the foot which increases pressure in ≥ 1 site of the foot.

3. **PERIPHERAL ARTERIAL DISEASE (PAD) [3]:**

   ≤1 Palpable pedal pulse (Posterior tibial artery and dorsalis pedis artery).

4. **PREVIOUS DFU/LEA [3]:**

   Any previous history of diabetic foot ulcers or lower extremity amputations in the ipsilateral or contralateral limbs.

ULCER RELATED:

1. **MULTIPLE DIABETIC FOOT ULCERS:**

   Presence of ≥ 1 DFU

2. **INFECTION:**

   Presence of purulent discharge with 2 local signs of inflammation (Warmth, Erythema, Lymphangitis, lymphadenopathy, Edema or Pain)

3. **GANGRENE:**

   Presence of necrosis (Dry/ wet) in the ulcer and its surrounding areas documented clinically.

4. **BONY INVOLVEMENT:**

   Bony exposure identified through visual inspection, palpation with sterile probe/ bony affection in X ray.

RISK SCORING FOR EACH VARIABLE

FOOT RELATED	SCORE	ULCER RELATED	SCORE
DPN	4	MULTIPLE DFU	4
FOOT DEFORMITY	1	INFECTION	4
PAD	7	GANGRENE	10
PREVIOUS DFU/LEA	3	BONE INVOLVEMENT	7

RISK CATEGORY FOR LEA

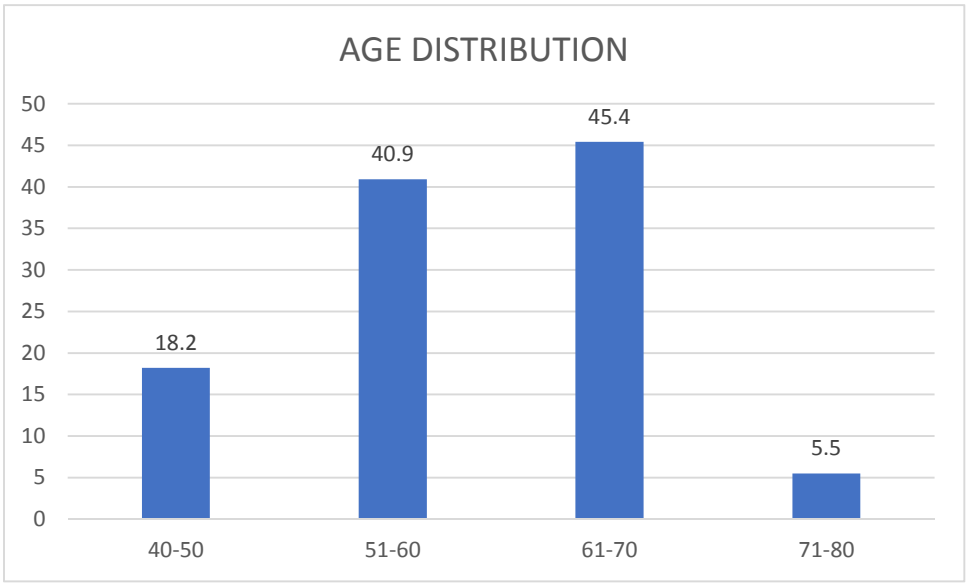
- <15 – LOW RISK
- 15-25 MODERATE RISK
- >25 HIGH RISK

RESULTS OF THE STUDY

DISTRIBUTION OF STUDY POPULATION ACCORDING TO AGE GROUP OF THE PATIENT

Age group	Frequency	Percentage
40-50	20	18.2
51-60	45	40.9
61-70	39	45.4
71-80	6	5.5
Total	**110**	**100**

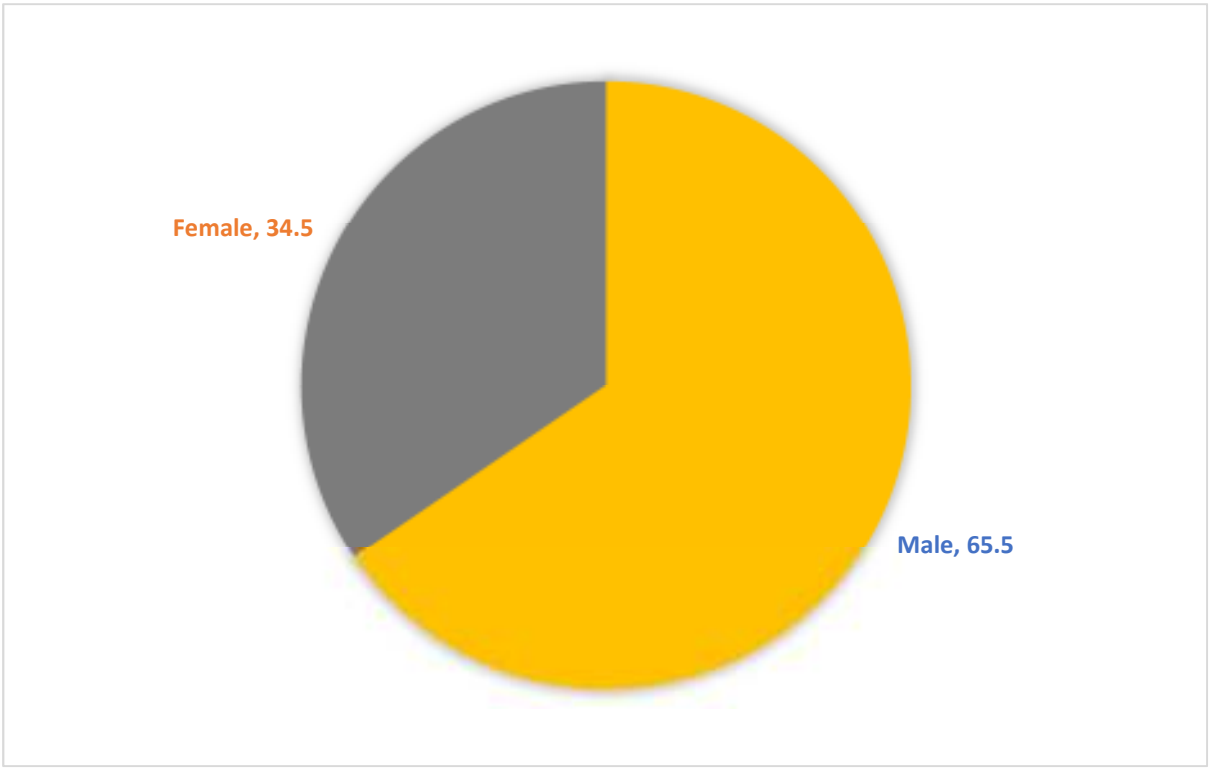
Majority of the study population were between the age group of 51 to 70 years



DISTRIBUTION OF STUDY POPULATION ACCORDING TO SEX OF THE PATIENT

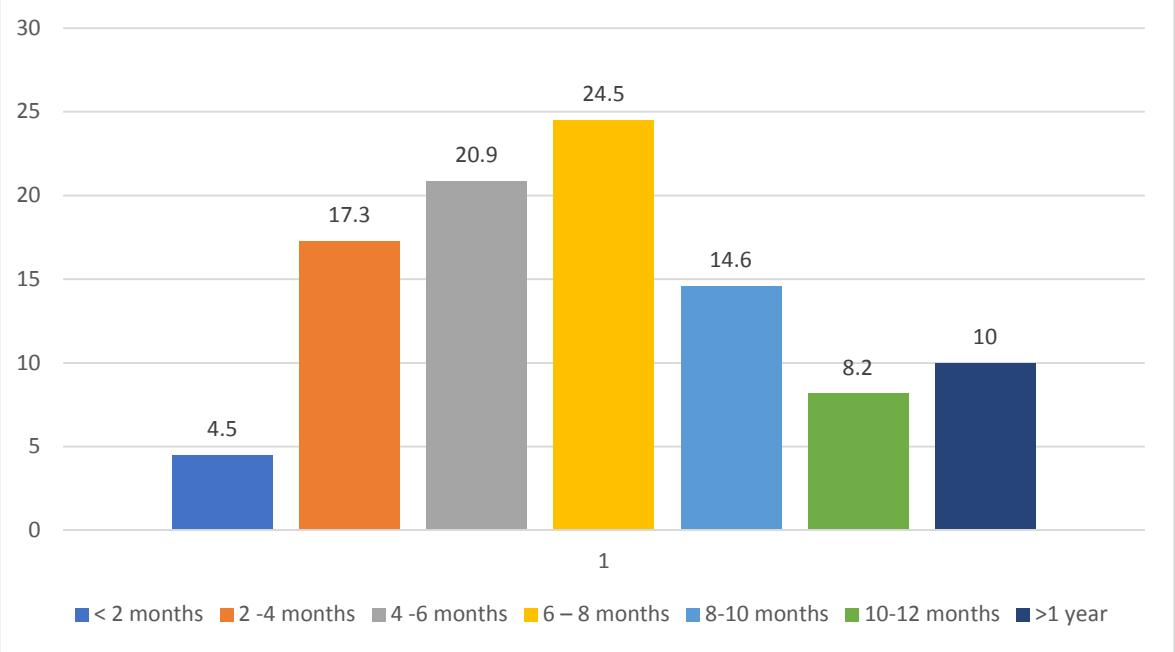
Age group	Frequency	Percentage
Male	72	65.5
Female	38	34.5
Total	**110**	**100**

Around 65.5% of study population were males.



DISTRIBUTION OF STUDY POPULATION ACCORDING TO DURATION OF ULCER

Duration of ulcer	Frequency	Percentage
< 2 months	5	4.5
2 -4 months	19	17.3
4 -6 months	23	20.9
6 – 8 months	27	24.5
8-10 months	16	14.6
10-12 months	9	8.2
>1 year	11	10
Total	**110**	**100**

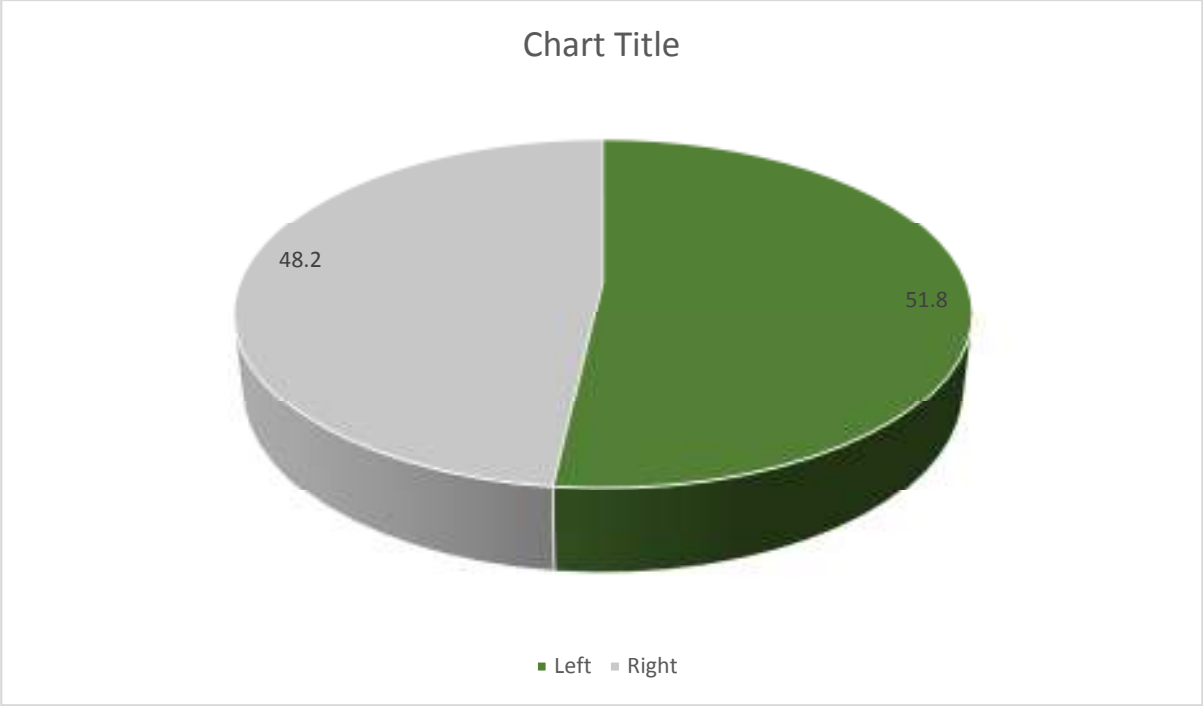


Around 60% of study population had ulcer for around 4 to 10 months

DISTRIBUTION OF STUDY POPULATION ACCORDING TO THE SIDE OF LEG INVOLVEMENT

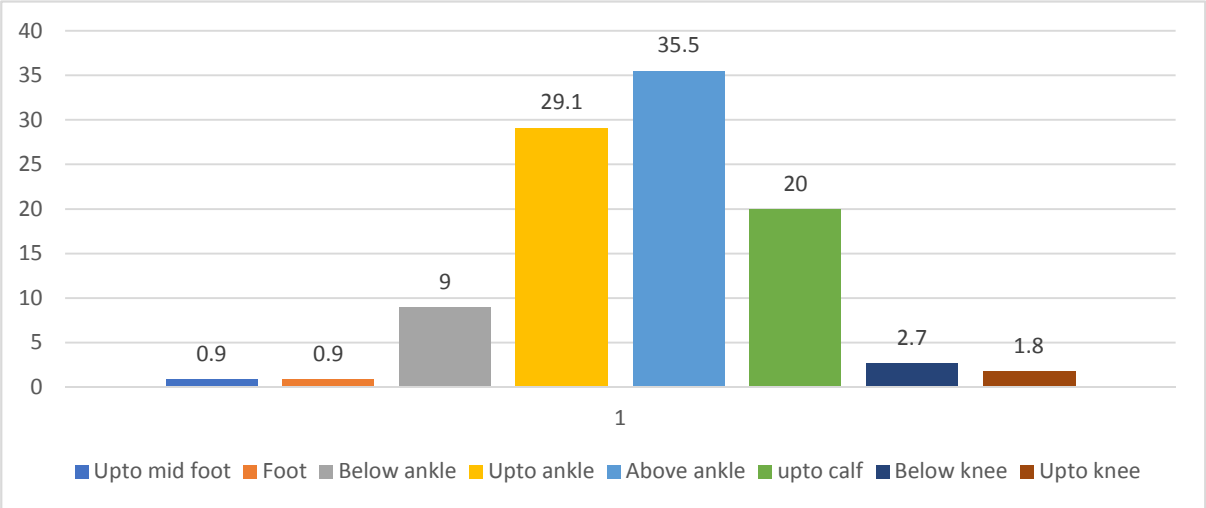
Leg affected in ulcer	Frequency	Percentage
Left	57	51.8
Right	53	48.2
Total	**110**	**100**

There is no difference in which leg had ulcer (52% vs 48%)



DISTRIBUTION OF STUDY POPULATION ACCORDING TO EXTENT OF INFLAMMATION

Duration of ulcer	Frequency	Percentage
Up to mid foot	1	0.9
Foot	1	0.9
Below ankle	10	9
up to ankle	32	29.1
Above ankle	39	35.5
up to calf	22	20
Below knee	3	2.7
Upton knee	2	1.8
Total	**110**	**100**

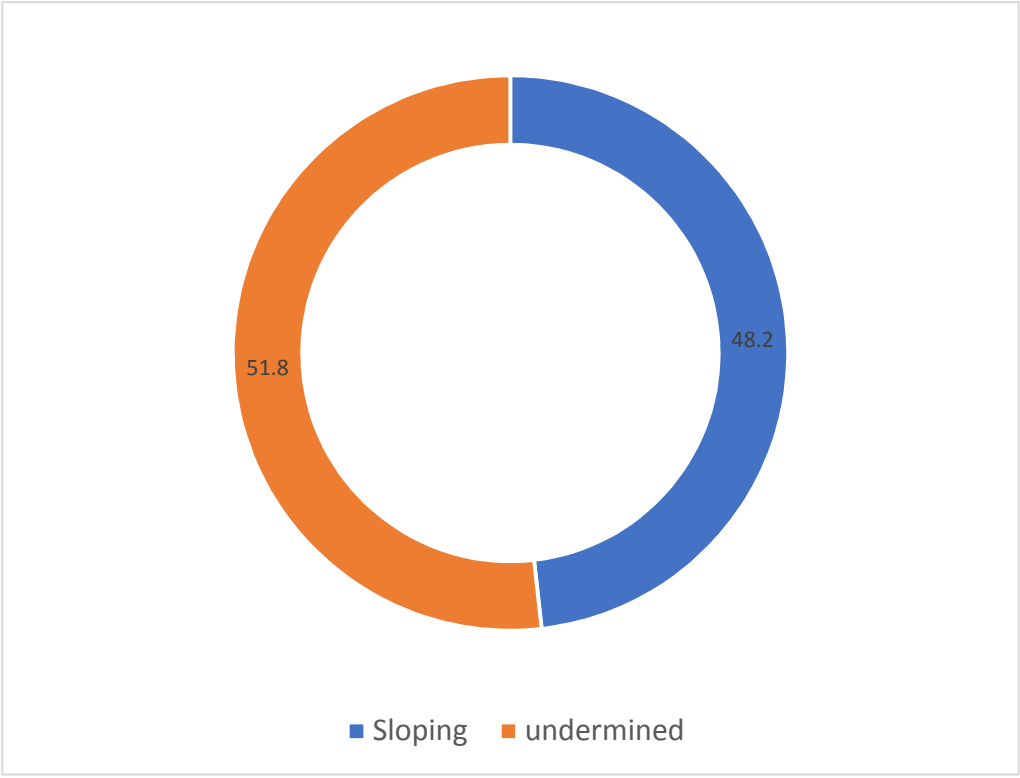


Majority of the study population (around 65%) had inflammation up to the ankle

DISTRIBUTION OF STUDY POPULATION ACCORDING TO EDGE OF THE ULCER

Edge of the ulcer	Frequency	Percentage
Sloping	53	48.2
Undermined	57	51.8
Total	**110**	**100**

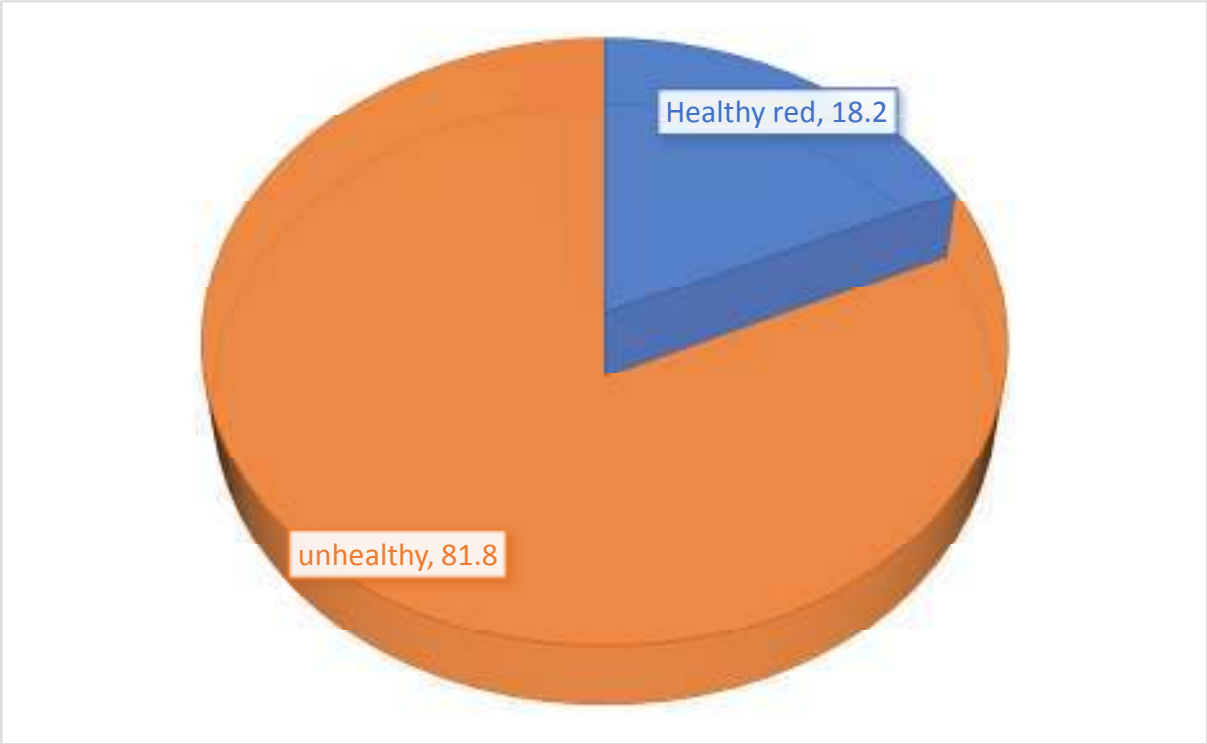
Around 50% had sloping edge while other fifty percent had undermined edge



DISTRIBUTION OF STUDY POPULATION ACCORDING TO THE APPEARANCE OF GRANULATION TISSUE

Granulation tissue	Frequency	Percentage
Healthy red	20	18.2
Unhealthy	90	81.8
Total	**110**	**100**

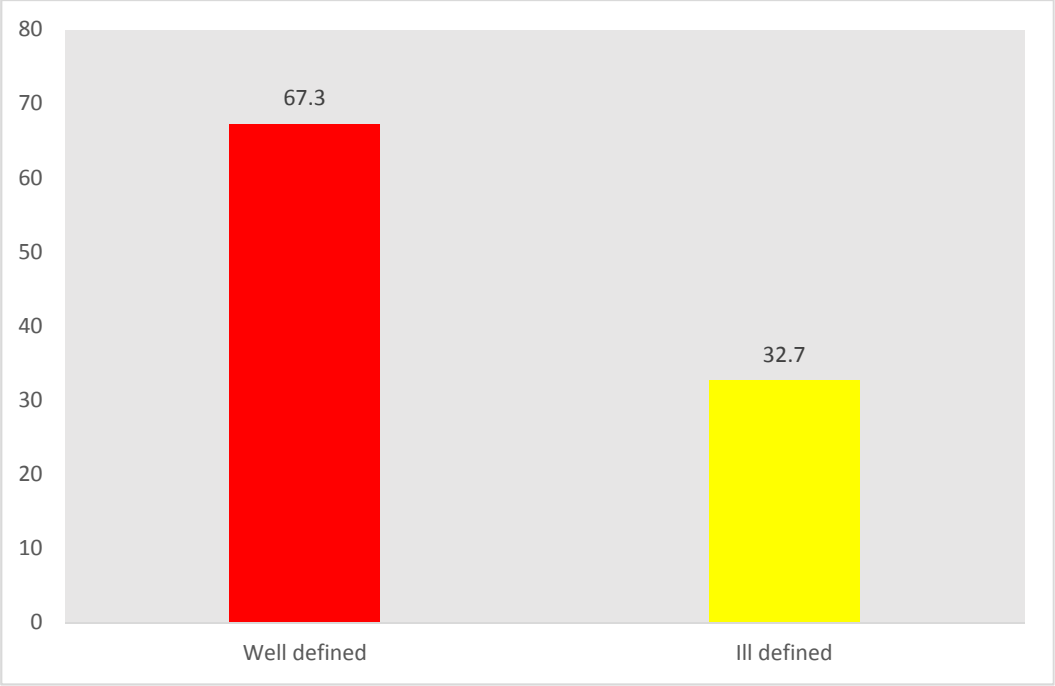
Around 82% of the study population had unhealthy granulation tissue



DISTRIBUTION OF STUDY POPULATION ACCORDING TO THE MARGINS OF THE ULCER

Margin of the ulcer	Frequency	Percentage
Well defined	74	67.3
Ill defined	36	32.7
Total	**110**	**100**

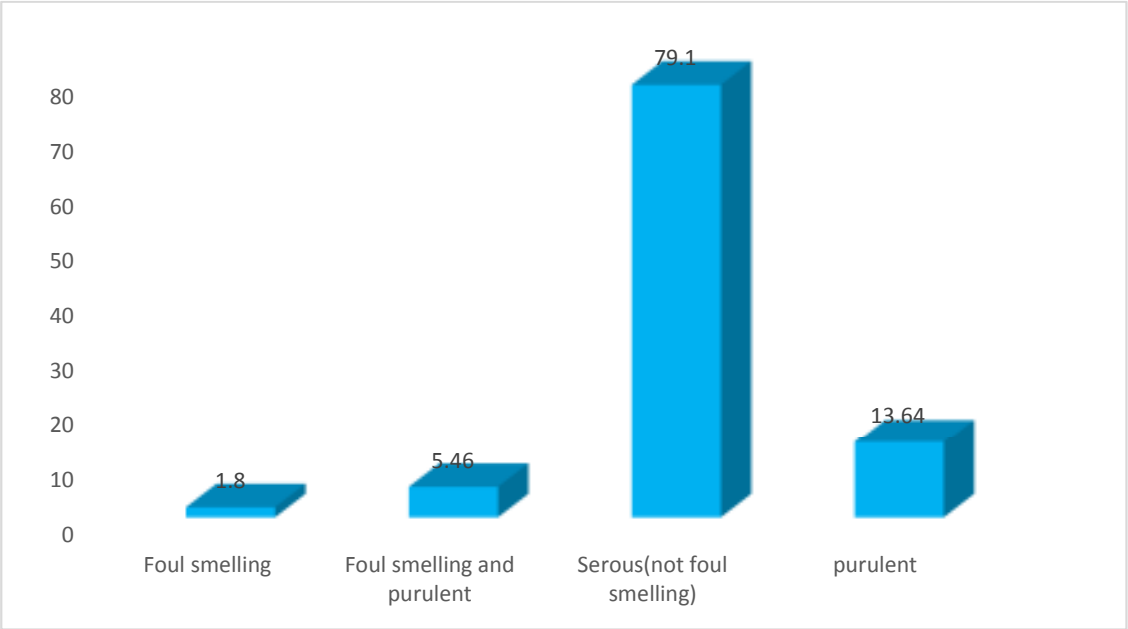
Around 67 % of study population had well defined ulcer margin



DISTRIBUTION OF STUDY POPULATION ACCORDING TO TYPE OF DISCHARGE

Type of discharge	Frequency	Percentage
Foul smelling	2	1.8
Foul smelling and purulent	6	5.46
Serous (not foul smelling)	87	79.1
purulent	15	13.64
Total	**110**	**100**

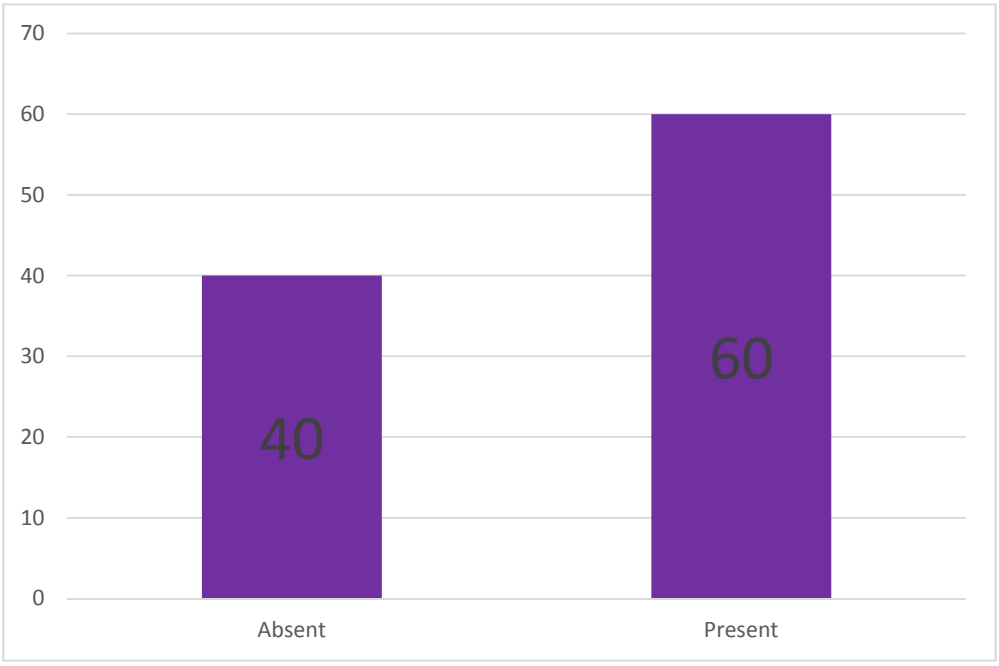
Around 79 % of the infection had a non-foul-smelling serous discharge



Distribution of study population according to presence of Diabetic Peripheral Neuropathy

DPN score	Frequency	Percentage
Absent	44	40
Present	66	60
Total	**110**	**100**

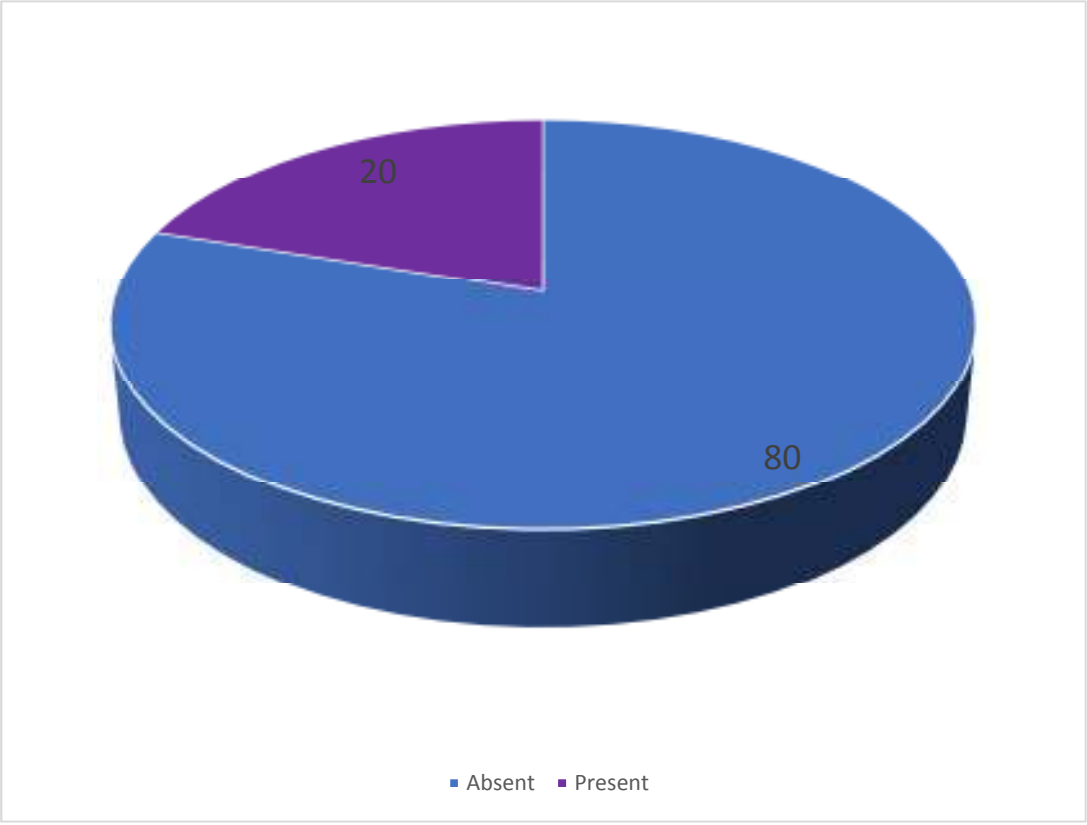
Around 66 % of the study population had diabetic peripheral neuropathy



DISTRIBUTION OF STUDY POPULATION ACCORDING TO FOOT DEFORMITY

Foot deformity	Frequency	Percentage
Absent	88	80
Present	22	20
Total	**110**	**100**

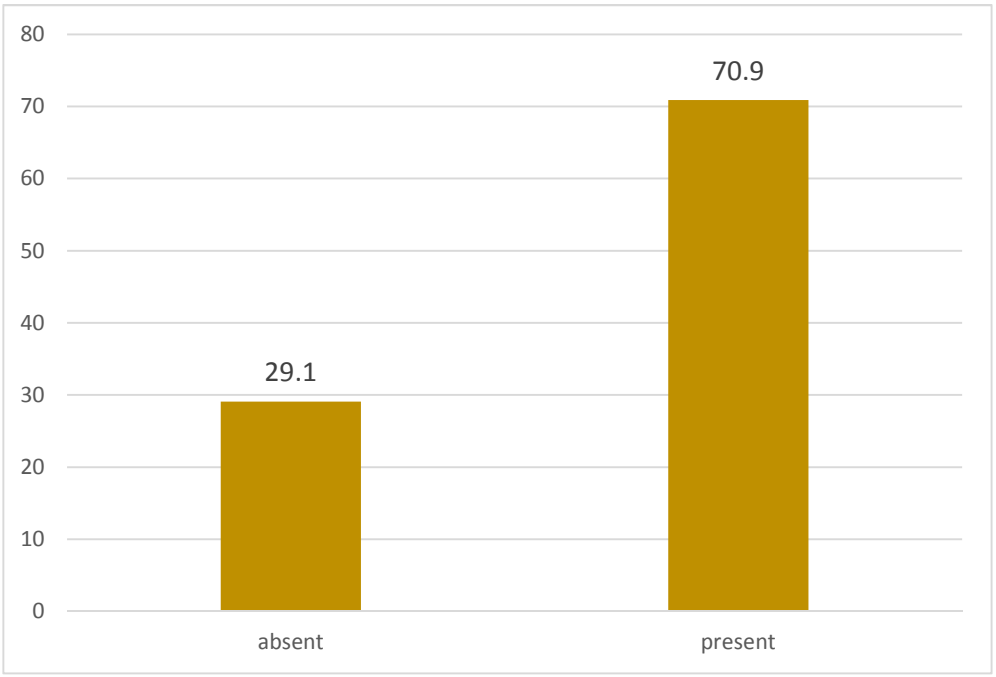
Only, 20 % of the study population had foot deformities



DISTRIBUTION OF STUDY POPULATION ACCORDING TO PERIPHERAL ARTERIAL DISEASE

Peripheral arterial Disease	Frequency	Percentage
Absent	32	29.1
Present	78	70.9
Total	**110**	**100**

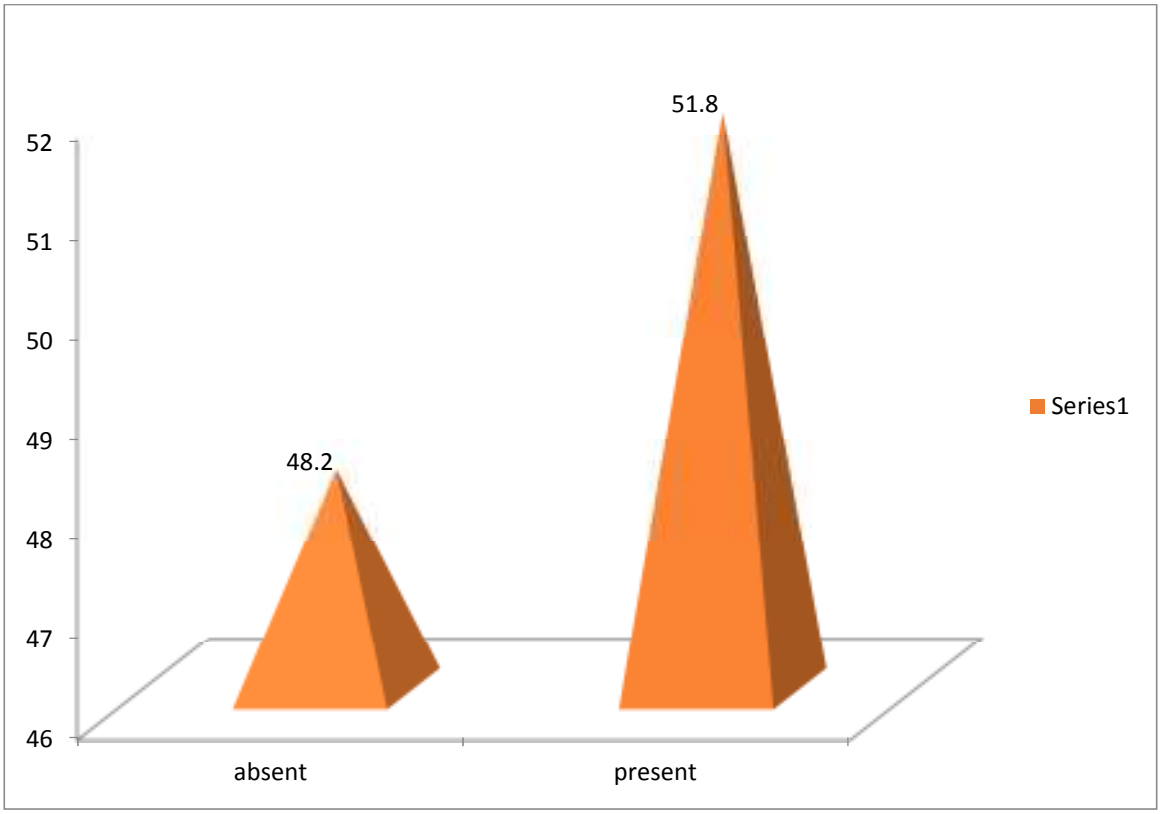
Peripheral arterial disease (PAD) was present in 70.9% of the study population



DISTRIBUTION OF STUDY POPULATION ACCORDING TO PREVIOUS HISTORY OF DIABETIC FOOT ULCER OR LOWER EXTREMITY AMPUTATION.

Previous DFU or LEA	Frequency	Percentage
Absent	53	48.2
Present	57	51.8
Total	**110**	**100**

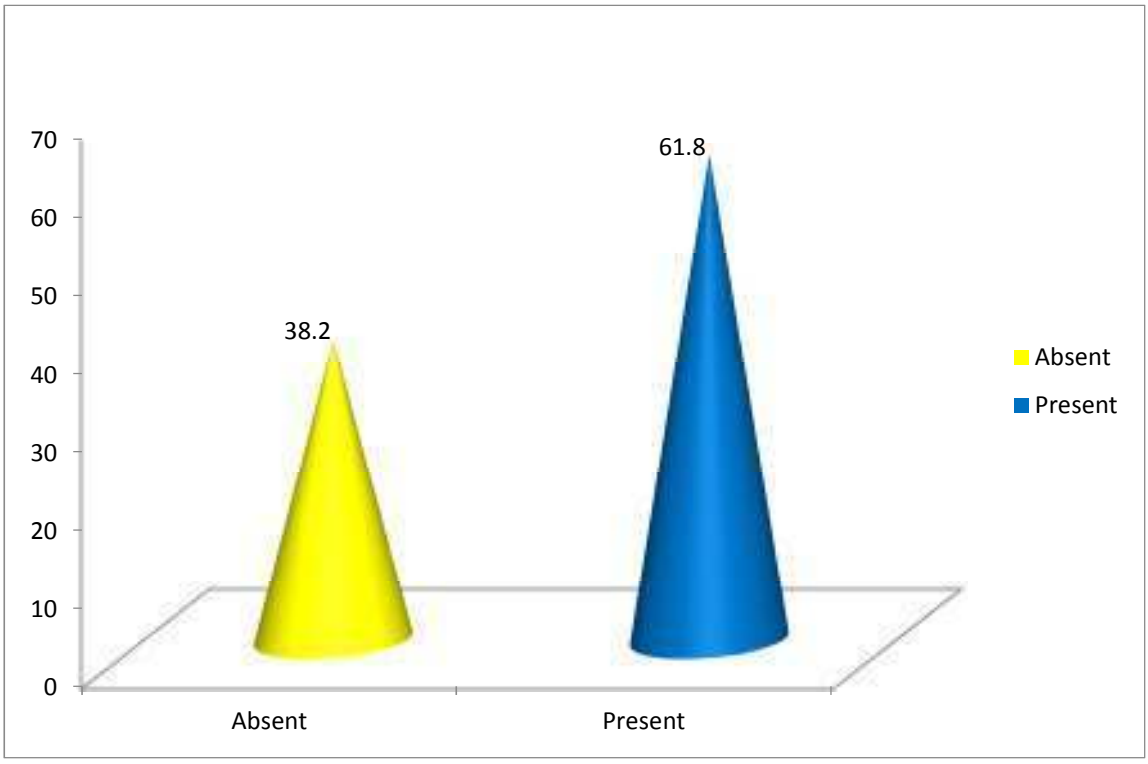
Around 51 % of the study population had significant past history of previous lower extremity amputation.



DISTRIBUTION OF STUDY POPULATION ACCORDING TO MULTIPLE DIABETIC FOOT ULCER

Multiple DFU	Frequency	Percentage
Absent	42	38.2
Present	68	61.8
Total	**110**	**100**

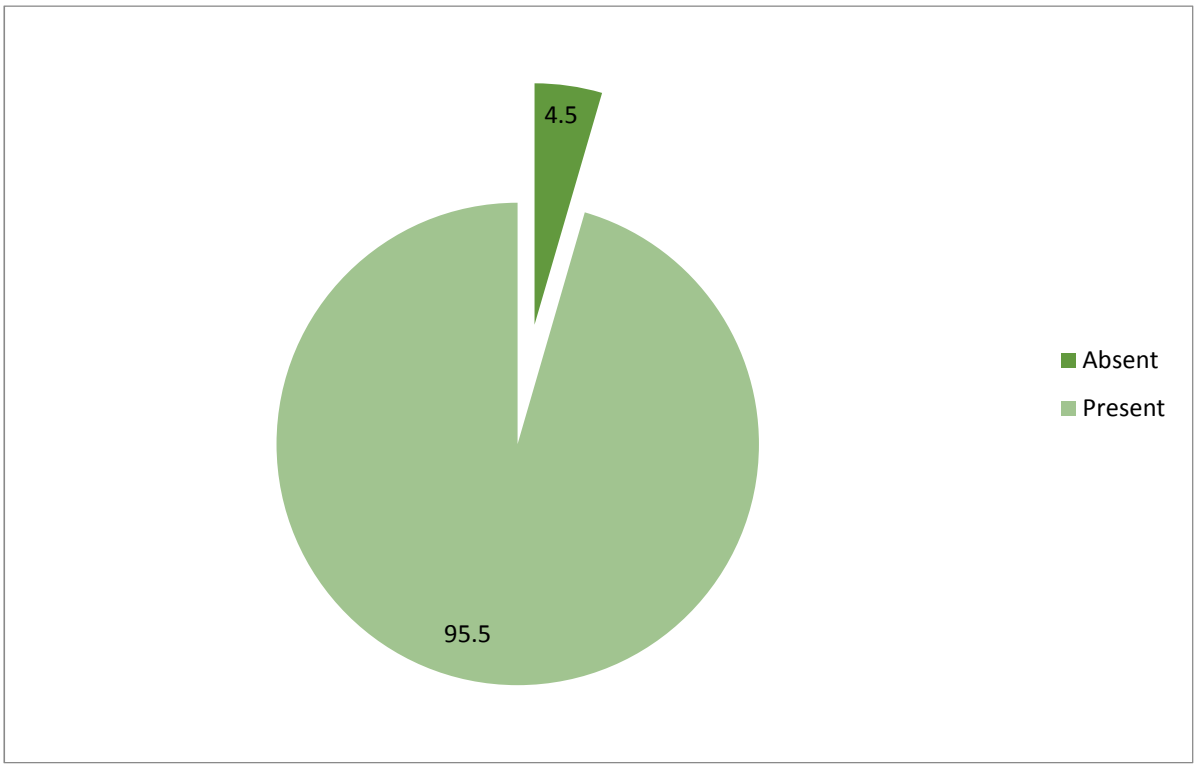
Multiple DFUs were present among 61.8% of the study population



DISTRIBUTION OF STUDY POPULATION ACCORDING TO INFECTION

Infection	Frequency	Percentage
Absent	5	4.5
Present	105	95.5
Total	**110**	**100**

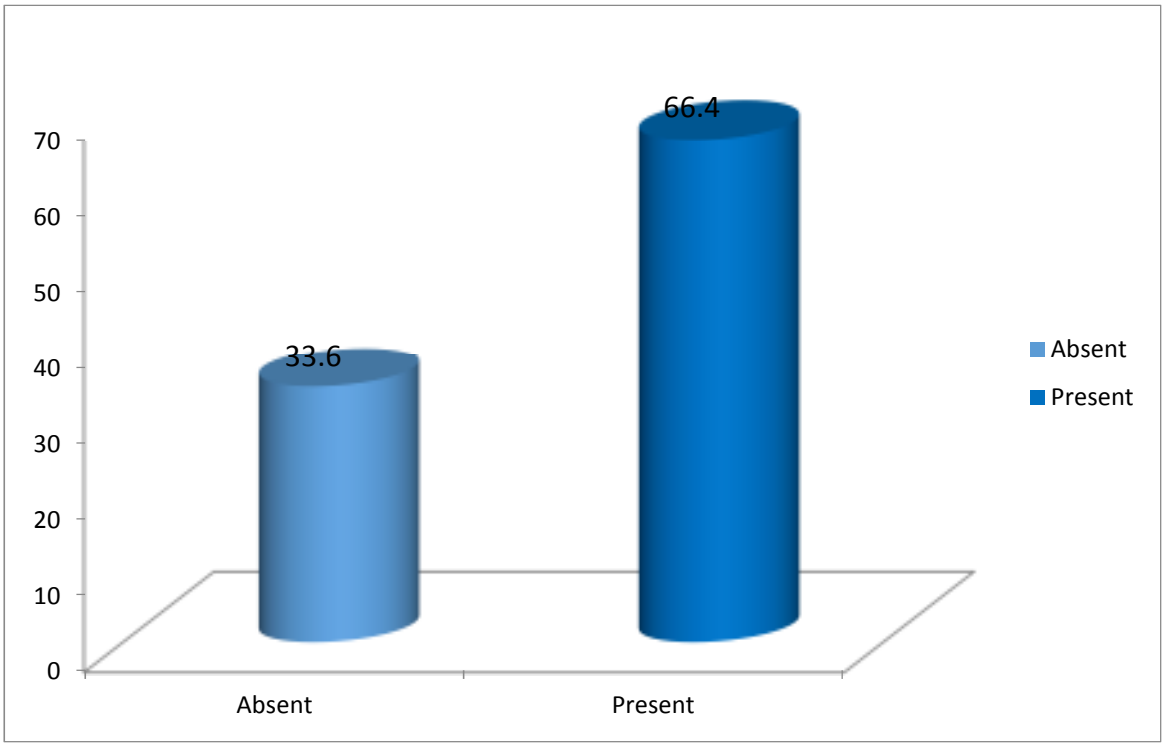
More than 95% of the study population had associated infection of the DFUs



DISTRIBUTION OF STUDY POPULATION ACCORDING TO GANGRENE

Gangrene	Frequency	Percentage
Absent	37	33.6
Present	73	66.4
Total	**110**	**100**

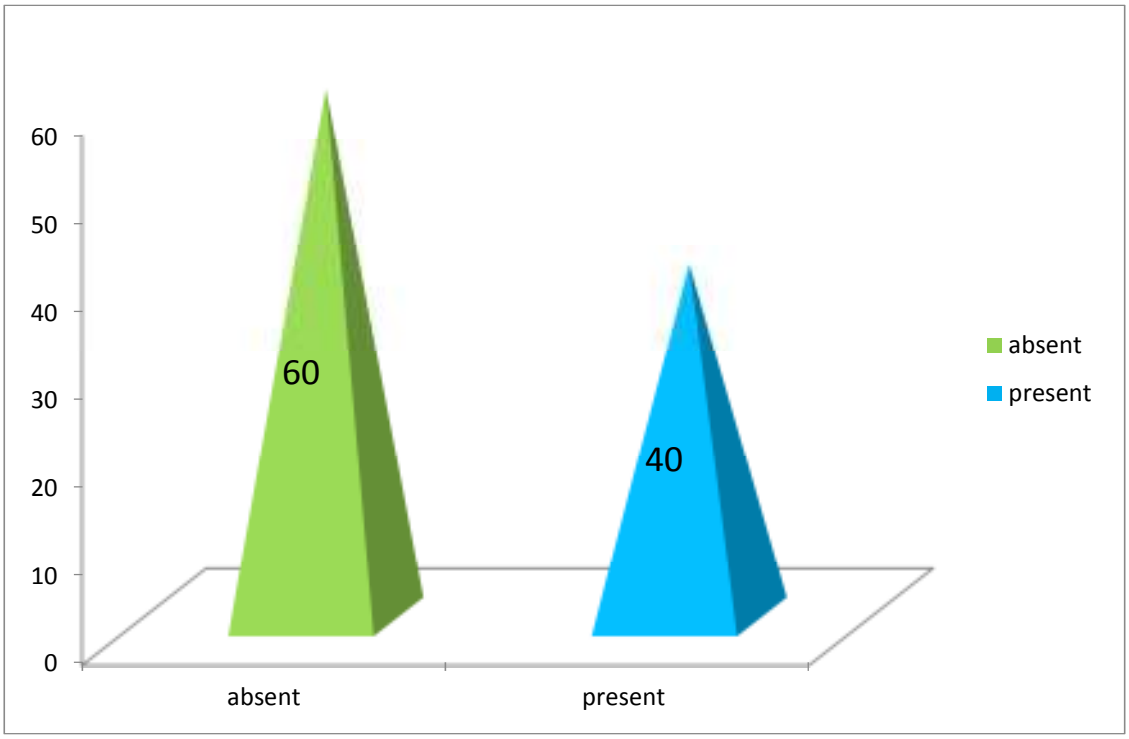
Around 66.4 % of study population had gangrene



DISTRIBUTION OF STUDY POPULATION ACCORDING TO BONE INVOLVEMENT

Bone involvement	Frequency	Percentage
Absent	66	60
Present	44	40
Total	**110**	**100**

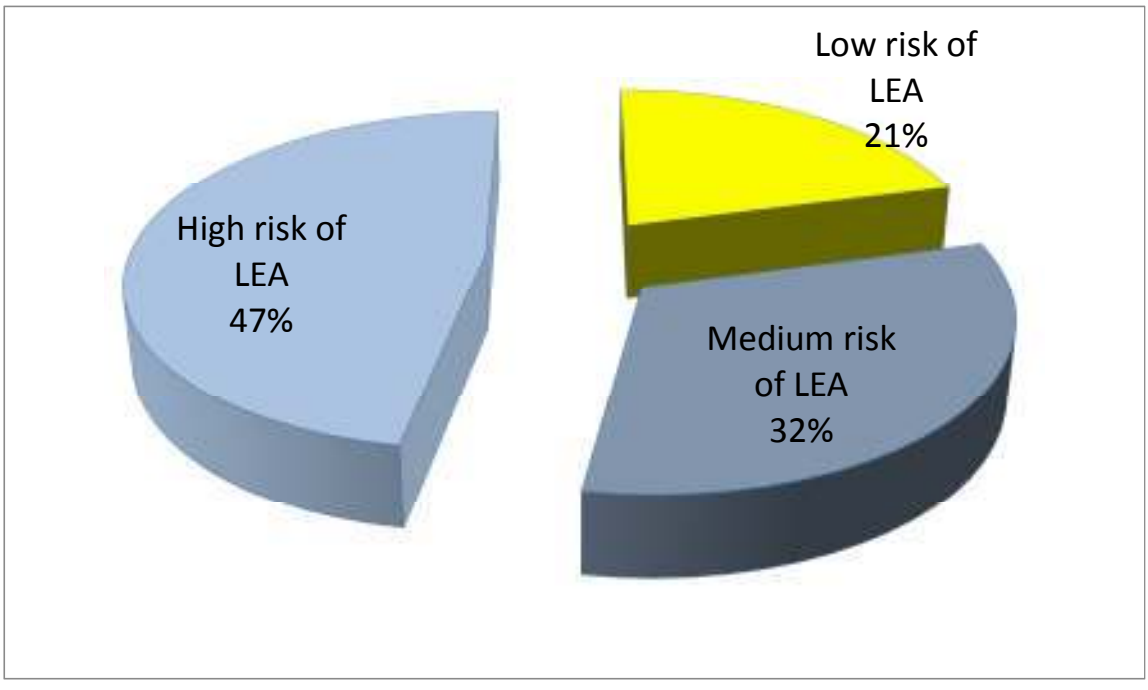
Around 40% of the study population had bone involvement



DISTRIBUTION OF STUDY POPULATION ACCORDING TO DIAFORA PREDICTION RULE

	Frequency	Percentage
Low risk of LEA	23	20.9
Medium risk of LEA	35	31.8
High risk of LEA	52	47.3
Total	**110**	**100**

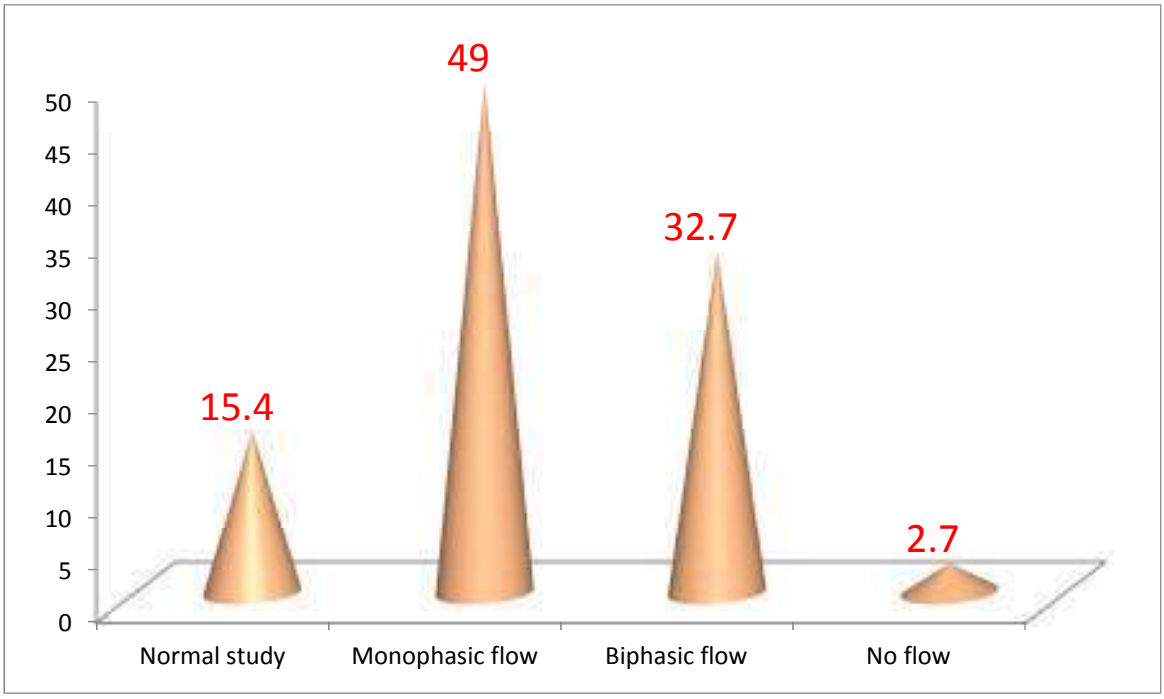
Around 47% of study population had high risk of LEA, while another 32% had medium risk, just 20% of them were at Low risk for LEA



DISTRIBUTION OF STUDY POPULATION ACCORDING TO DOPPLER FLOW

	Frequency	Percentage
Normal study	17	15.4
Monophasic flow	54	49
Biphasic flow	36	32.7
No flow	3	2.7
Total	**110**	**100**

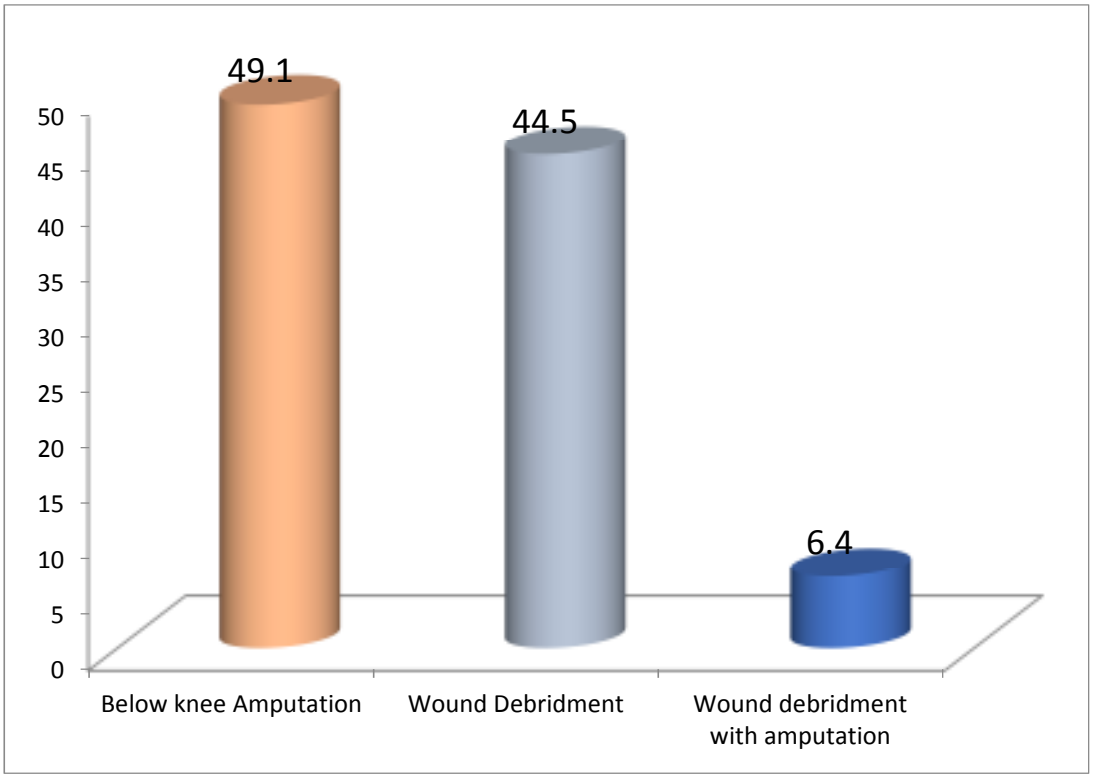
Around 51% of the study population had abnormal Doppler study



DISTRIBUTION OF STUDY POPULATION ACCORDING TO TREATMENT DONE

Treatment done	Frequency	Percentage
Below knee Amputation	54	49.1
Wound Debridement	49	44.5
Wound debridement with amputation	7	6.4
Total	**110**	**100**

Around 49 % of study population had amputation.



DATA ANALYSIS

ASSOCIATION BETWEEN DIAFORA PREDICTION AND OUTCOME

	Wound debridement	**Wound debridement with SSG**	**Amputation**	**Chi-square**	**Significance**
Low risk of LEA	19	4	0	77.76	0.000
Medium risk of LEA	27	2	6		
High risk of LEA	3	1	48		

Out of the 23 who have been classified as having low risk of amputation none needed amputation,

Of those who were classified as having medium risk of amputation (35), only 17% needed amputation.

Of the 52 who were classified as having high risk of amputation, 92% needed amputation.

The results are also statistically significant. Hence this classification can be used for planning the prognosis of the diabetic ulcer.

ASSOCIATION BETWEEN DPN AND OUTCOME OF DIABETIC ULCER

DPN	Debridement/SSG	Amputation	Chi square value	P Value
Absent	26(59.1)	18(40.9)	1.964	0.178
Present	30(45.5)	36(54.5)		

There is ***no association*** between DPN and outcome

ASSOCIATION BETWEEN FOOT DEFORMITY AND OUTCOME OF DIABETIC ULCER

Foot deformity	Debridement/SSG	Amputation	Chi square value	P Value
Absent	51(58)	37(42)	8.739	0.002
Present	5(22.7)	17(77.3)		

Percentage of amputation done (77.3%) ***is more in*** those who have ***foot deformity*** compared to those who did not have diabetic ulcer and the results are ***statistically significant***

ASSOCIATION BETWEEN PERIPHERAL ARTERIAL DISEASE AND OUTCOME OF DIABETIC ULCER

Peripheral arterial Disease	Debridement/SSG	Amputation	Chi square value	P Value
Absent	27(48.21)	5(10.2)	20.224	0.000
Present	29(51.79)	49(89.8)		

About 90% of those who underwent amputation had peripheral artery disease and the results are ***statistically significant***

ASSOCIATION BETWEEN PREVIOUS DFU AND OUTCOME OF DIABETIC ULCER

Previous DFU	Debridement/SSG	Amputation	Chi square value	P Value
Absent	25(47.2)	28(52.8)	0.572	0.567
Present	31(54.4)	26(45.6)		

There is ***no association*** between previous DFU and the outcome of diabetic ulcer

ASSOCIATION BETWEEN MULTIPLE DFU AND OUTCOME OF DIABETIC ULCER

Multiple DFU	Debridement/SSG	Amputation	Chi square value	P Value
Absent	21(50)	21(50)	0.022	1
Present	35(51.5)	33(48.5)		

There is ***no association*** between multiple DFU and the outcome of diabetic ulcer

ASSOCIATION BETWEEN INFECTION AND OUTCOME OF DIABETIC ULCER

Infection	Debridement/SSG	Amputation	Fischer exact value	P Value
Absent	5(100)	0	6.981	0.057
Present	51(48.6)	54(51.4)		

There is ***no association*** between prevalence of infection and the outcome of diabetic ulcer.

ASSOCIATION BETWEEN GANGRENE AND OUTCOME OF DIABETIC ULCER

Gangrene	Debridement/SSG	Amputation	Chi square value	P Value
Absent	30(53.57)	7(14.89)	20.309	0.000
Present	26(46.43)	47(85.11)		

85.11% of the study population who underwent amputation had gangrene compared to 46% in the non-amputation group

ASSOCIATION BETWEEN BONE INVOLVEMENT AND OUTCOME OF DIABETIC ULCER

Bone involvement	Debridement/SSG	Amputation	Chi square value	P Value
Absent	53(94.64)	13(24.07)	57.043	0.000
Present	3(5.36)	41(75.93)		

75.93% of the study population who underwent amputation had bone involvement compared to 46% in the non-amputation group.

DISCUSSION

A total of 110 patients with diabetic foot ulcer were included in the study. These patients were assessed as inpatients and was evaluated for the age of patient, nature of the ulcer, site of ulcer, duration of ulcer, extent of the ulcer, individual ulcer characteristics like margin, edge, discharge, presence or absence of inflammation, infection, diabetic neuropathy, peripheral vascular disease, foot deformity, previous history of DFU/LEA, bony involvement, multiple foot ulcers and gangrene. These patients were then categorized according to the DIAFORA – Diabetic foot risk assessment tool as low risk (<15), medium risk (15-25), high risk (>25) out of a total score of 40.

These patients were followed up for a period of one year and assessed for the outcomes like wound healing, Lower extremity amputation and death.

Among the study population, most of the patients fell between age group 51yrs -70yrs (86.3%). Male: female ratio of 1.5:1. Around 60%of patients had ulcer for a period of 4-10months. Both the legs were equally affected in the study population. Majority of the ulcers had signs of inflammation, extending up to the ankle – 65%. Around 82%of study population had unhealthy granulation tissue with non-foul-smelling serous discharge.

Among the foot related variables, 60%of population had peripheral neuropathy and only 20% had deformities in the foot. Around 71% of study population had demonstrable peripheral arterial disease. 52% had previous history of diabetic foot ulcers/ LEAs. Among the ulcer related variables, 62% presented with multiple DFU's. 96% had active infection in the ulcer. 67% had gangrene that required wound debridement and only 40% had bony involvement.

According to the DIAFORA tool, patients were classified as

*20.9% patients' low risk for LEA.

*31.8% as moderate risk for LEA'S.

*47.3% as high risk for LEA's

Among them, 41.9% of population underwent LEA's. and remaining patients were treated conservatively.

Out of the 23 patients in low risk category, none needed amputation in the study period. 35 patients of medium risk category, only 6 needed LEAS'. Among the 52 patients in the high-risk category, 48 patients needed amputation (92%).

The results as compared statistically were also significant.

Hence the variables like foot deformity, peripheral arterial disease, gangrene and bony involvement were predominantly present in the amputated group than in the non-amputated group.

CONCLUSION

CONCLUSION

Thus, according to the study conducted among the diabetic foot ulcer patients in the evaluation of DIAFORA score as a tool for predicting the occurrence of lower extremity amputation, this DAFORA tool was found to be much helpful and reliable in predicting the occurrence for lower extremity amputation. By assessing the four foot related and four ulcer related variables and scoring the patients according to the DIAFORA risk criteria in the inpatient set up of our institution, this tool was found to be more valuable, easily applicable, less expensive and more appropriate in the classification of DFU's and planning the management protocols and foreseeing the progress of the disease and managing complications and also the prediction of occurrence of LEAs. The most important and notable advantage is that this tool can be used in the patients in the out-patient department also.

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ANNEXURES

PATIENT CONSENT FORM

STUDY TITLE: –ASSESSMENT OF THE USEFULNESS OF DIAFORA TOOL IN THE MANAGEMENT OF PATIENTS WITH DIABETIC FOOT ULCERS.

STUDY CENTRE:

Coimbatore Medical College Hospital, Coimbatore.

PARTICIPANT NAME: AGE/SEX:

I.P. NO:

I confirm that I have understood the purpose of treatment and procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during the interventional procedure. I understand that my participation in the study i s voluntary and that I am free to withdraw at any time without giving any reason.

I understand that the investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I hereby consent to participate in this study of, **The Assessment of the Usefulness of DIAFORA tool in the management of patients with Diabetic Foot Ulcers**.,

Date: Signature of the patient & Name

Place: Signature of the investigator & Name

CASE PROFORMA

NAME	AGE	SEX
CASE NO	IP.NO	ADDRESS
DOA	DOS	DOD
OCCUPATION		

I. Chief complaints (with duration)

A. Ulcer

B. Discharge

C. Other complaints

PAST HISTORY:

HISTORY OF PREVIOUS SURGERY–

DURATION OF DIABETES –

OTHER COMPLICATIONS OF DIABETES PERSONAL HISTORY:

EXAMINATION: INVESTIGATION:

DIAFORA SCORE:

RISK SCORING FOR EACH VARIABLE

FOOT RELATED	**SCORE**	**ULCER RELATED**	**SCORE**
DPN	4	MULTIPLE DFU	4
FOOT DEFORMITY	1	INFECTION	4
PAD	7	GANGRENE	10
PREVIOUS DFU/LEA	3	BONE INVOLVEMENT	7

RISK CATEGORY:

MANAGEMENT:

POST OPERATIVE COURSE:

FOLLOW UP:

ABBREVIATIONS

DM	:	Diabetes Mellitus
DFU	:	Diabetic Foot Ulcers
LEA	:	Lower Extremity Amputation
DIAFORA	:	Diabetic Foot Risk Assessment tool
DPN	:	Diabetic Peripheral Neuropathy
PAD	:	Peripheral Arterial Disease
SWM	:	Semmes-Weinstein Monofilament
MTP joint	:	Meta-tarso Phalangeal joint
IP Joint	:	Inter-phalangeal joint
ADA	:	American Diabetes Association
$TcPO_2$	:	Trans-cutaneous Oximetry
UTSA	:	University of Texas San-Antonio
IWGDF	:	International Working Group on Diabetic Foot
EURODIALE	:	European study Group on Diabetes and Lower extremity
DCCT	:	Diabetes Control and Complications Trial
ESRD	:	End Stage Renal Disease
SIGN	:	Scottish Intercollegiate Grouping Network

s.no	age	sex	duration	side	extent	edge	granulation	margins	discharge	DPN	foot deformity	PAD	previous DFU or LEA	multiple DFU	Infection	gangrene	bone involvement	total score	doppler	treatment	outcome
1	52yrs	male	3months	right	upto calf	undermined	unhealthy	well defined	foul smell	4	1	7	3	0	4	10	7	36	biphasic flow	bk amputation	discharged with flap
2	63yrs	male	5 months	right	upto ankle	slopping	unhealthy	well defined	foul smelling-purulent	4	0	0	3	4	4	10	0	25	normal study	wound debridement	discharged
3	64 yrs	male	2 months	left	upto ankle	slopping	healthy- red	well defined	not foul smelling- serous	0	0	7	0	0	4	10	0	21	biphasic flow	wound debridement	discharged
4	48 yrs	female	7 months	right	upto calf	slopping	unhealthy	ill defined	foul smelling- purulent	4	1	7	0	4	4	10	7	37	monophasic	bk amputa- guillotine	patient died
5	65yrs	female	12months	right	upto calf	undermined	unhealthy	ill defined	foul smelling-purulent	4	0	7	3	4	4	10	7	39	monophasic	bk amputation	discharged
6	59yrs	male	8 months	left	upto calf	slopping	unhealthy	ill defined	foul smelling - prulent	4	1	0	3	4	4	0	7	23	normal study	wound debridemnet	discharged
7	45 yrs	male	7 months	left	upto knee	undermined	unhealthy	ill defined	foul smelling-purulent	0	0	7	3	4	4	0	0	18	monophasic flow	wound debridement	discharged
8	64 yrs	female	9 months	left	above ankle	undermined	unhealthy	well defined	foul smelling	4	0	0	0	4	4	10	7	29	normal study	bk amputation	discharged
9	70 yrs	female	15 months	right	above ankle	slopping	unhealthy	ill defined	foul smelling purulent	4	0	7	3	0	4	10	7	35	monophasic	bk amputation	discharged
10	53 yrs	female	4 months	right	upto ankle	slopping	healthy- red	well defined	serous	0	0	0	3	4	4	0	7	18	biphasic flow	wound debridement	discharged
11	40 yrs	male	6 months	left	upto calf	undermined	unhealthy	ill defined	purulent	4	1	7	0	0	4	10	7	33	monophasic	bk amputation	discharged
12	48 yrs	female	5 months	right	upto ankle	slopping	healthy- red	well defined	serous	4	0	0	3	4	0	0	0	11	normal study	skin cover with SS	discharged
13	55 yrs	male	4 months	right	upto ankle	slopping	unhealthy	ill defined	purulent	0	0	7	3	0	4	10	7	31	monophasic flow	bk amputation	discharged
14	63 yrs	male	8 months	right	above ankle	undermined	unhealthy	ill defined	purulent	4	1	7	0	0	4	10	7	33	monophasic flow	bk amputation	patient died
15	57 yrs	female	6 months	left	upto calf	slopping	unhealthy	well defined	purulent	0	0	7	0	0	4	10	0	21	biphasic flow	wound debridment and SSG	discharged
16	73 yrs	male	15 months	left	upto calf	undermined	unhealthy	ill defined	purulent	4	0	7	3	4	4	10	7	39	monophasic flow	bk amputation	patient died
17	63 yrs	male	11 months	right	upto ankle	slopping	unhealthy	ill defined	purulent	4	1	0	3	0	4	10	7	29	biphasic flow	bk amputation	discharged
18	47 yrs	male	2 months	right	upto ankle	slopping	unhealthy	well defined	purulent	0	0	0	0	4	4	10	0	18	biphasic flow	wound debridement	discharged
19	45 yrs	female	5 months	right	upto calf	slopping	unhealthy	ill defined	purulent	0	1	7	0	0	4	10	7	29	monophasic flow	bk amputation	discharged
20	56 yrs	male	7 months	left	upto ankle	slopping	healthy- red	well defined	serous	4	0	0	3	4	4	0	0	15	normal study	wound debidement with SSG	discharged
21	63 yrs	male	9 months	left	upto calf	undermined	unhealthy	well defined	purulent	0	0	7	0	4	4	10	7	32	monophasic flow	bk amputation discharged	
22	60 yrs	male	5 months	left	upto ankle	slopping	healthy- red	well defined	serous	0	0	0	3	4	4	10	0	21	normal study	wound debridement	discharged
23	43 yrs	female	13 months	right	upto mid foot	slopping	unhealthy	well defined	purulent	4	1	0	0	0	4	0	0	9	normal study	wound debridement	discharged
24	59 yrs	male	8 months	right	upto calf	undermined	unhealthy	well defined	purulent	0	0	7	0	4	4	10	0	25	biphasic flow	wound debridement	patient died
25	61 yrs	male	18 months	right	above ankle	undermined	unhealthy	ill defined	purulent	4	1	7	0	0	4	10	7	33	monophasic	bk amputation	discharged
26	66 yrs	female	14 months	right	above ankle	slopping	unhealthy	well defined	purulent	0	0	7	3	0	4	10	7	31	monophasic flow	bk amputation discharged	
27	43 yrs	male	4 months	left	upto ankle	slopping	unhealthy	well defined	purulent	4	0	7	0	0	4	10	0	25	monophasic flow	wound debridement with SSG	discharged
28	49 yrs	male	7 months	left	upto ankle	slopping	healthy- red	well defined	serous	0	1	7	3	0	4	0	0	15	monophasic flow	wound debridement	discharged
29	54 yrs	male	10 months	right	upto ankle	undermined	unhealthy	well defined	purulent	4	0	0	3	4	4	0	7	22	biphasic flow	bk amputation	discharged
30	58 yrs	female	11 months	left	upto knee	slopping	healthy- red	well defined	serous	4	0	0	3	4	0	0	0	11	biphasic flow	wound debridement	discharged
31	65 yrs	male	15 months	left	upto calf	undermined	unhealthy	ill defined	purulent	0	0	7	3	0	4	10	0	24	monophasic flow	bk amputation	discharged
32	67 yrs	male	20 months	right	upto calf	undermined	unhealthy	ill defined	purulent	4	1	7	3	0	4	10	7	36	no flow	bk amputation	patient died
33	77 yrs	male	3 months	left	upto ankle	slopping	unhealthy	well defined	purulent	4	0	0	3	4	4	0	0	15	biphasic flow	wound debridement with SSG	discharged
34	60 yrs	male	7 months	left	upto ankle	undermined	unhealthy	well defined	purulent	0	0	7	3	4	4	10	0	28	monophasic flow	bk amputation	discharged
35	62 yrs	male	8 months	right	upto calf	undermined	unhealthy	ill defined	purulent	4	1	0	3	4	4	10	0	26	biphasic flow	wound debridement with SSG cover	discharged
36	58 yrs	male	9 months	left	upto ankle	slopping	healthy- red	well defined	serous	0	0	0	3	4	4	0	0	11	biphasic flow	wound debridement	discharged

37	66 yrs	female	7 months	left	upto ankle	undermined	healthy- red	well defined	purulent	0	0	7	3	0	4	10	0	24	monophasic flow	wound debridement	discharged
38	70 yrs	male	11 months	left	above ankle	slopping	unhealthy	well defined	purulent	4	0	0	3	4	4	0	0	15	normal study	wound debridement	discharged
39	51 yrs	male	10 months	right	above ankle	undermined	unhealthy	well defined	purulent	0	1	7	0	4	4	10	7	33	monophasic flow	bk amputation	discharged with flap cover
40	53 yrs	female	4 months	right	upto ankle	slopping	healthy- red	well defined	purulent	0	0	0	3	0	4	10	0	17	normal study	wound debridement	discharged with ssg cover
41	59 yrs	male	8 months	right	upto calf	undermined	unhealthy	ill defined	purulent	4	0	7	0	4	4	10	0	29	monophasic flow	wound debriment	discharged with ssg cover
42	61 yrs	male	10 months	right	upto calf	slopping	unhealthy	ill defined	purulent	4	0	7	3	4	4	10	0	32	monophasic flow	bk amputation	discharged with flap cover
43	68 yrs	female	11 months	left	upto ankle	undermined	unhealthy	ill defined	purulent	0	0	7	3	4	4	10	7	35	monophasic flow	bk amputation	patient died
44	52 yrs	male	6 months	left	upto calf	undermined	unhealthy	ill defined	purulent	4	0	0	3	0	4	10	0	21	normal study	wound debridement	discharged with SSg cover
45	57 yrs	male	9 months	right	upto ankle	slopping	unhealthy	well defined	purulent	0	0	7	0	4	4	0	0	15	normal study	wound debridement	discharged with SSG cover
46	68 yrs	female	5 months	right	upto ankle	undermined	unhealthy	well defined	purulent	4	0	0	3	4	4	10	0	25	normal study	wound debridement	discharged with ssg cover
47	60 yrs	male	14 months	left	above ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	4	4	10	7	36	monophasic flow	bk amputation	discharged
48	51 yrs	male	4 months	right	above ankle	slopping	healthy- red	well defined	serous	4	0	0	3	4	0	0	0	11	norml study	wound debridement	discharged with SSg cover
49	70 yrs	male	15 months	left	upto ankle	undermined	unhealthy	ill defined	purulent	4	0	7	0	4	4	10	0	29	monophasic flow	bk amputation	discharged
50	65 yrs	male	11 monthd	left	upto calf	undermined	unhealthy	well defined	purulent	4	0	0	3	0	4	0	0	11	biphasic flow	wound debridement	discharged with SSG cover
51	52 yrs	female	5 months	right	upto ankle	slopping	unhealthy	well defined	purulent	0	0	7	0	0	4	0	0	11	biphasic flow	wound debridement	discharged with SSG cover
52	46 yrs	female	4 months	left	upto ankle	slopping	healthy- red	well defined	serous	4	0	0	0	4	0	0	0	8	normal study	wound debridement with SSG cover	discharged
53	56 yrs	male	7 months	left	foot	slopping	unhealthy	well defined	purulent	0	0	7	3	4	4	0	0	18	biphasic flow	wound debridement	discharged with SSG cover
54	63 yrs	male	6 months	left	upto ankle	undermined	unhealthy	well defined	purulent	0	0	7	3	0	4	0	7	21	monophsic flow	bk amputation	discharged
55	60 yrs	female	2 months	right	above ankle	slopping	healthy- red	well defined	purulent	0	0	7	3	0	4	0	0	14	biphasic flow	wound debridement	discharged with ssg cover
56	59 yrs	male	5 months	left	above ankle	undermined	unhealthy	well defined	purulent	4	0	0	3	4	4	0	7	22	biphasic flow	bk amputation	discharged
57	62 yrs	male	6 months	left	above ankle	undermined	unhealthy	ill defined	purulent	4	0	7	0	4	4	10	0	29	biphasic flow	bk amputation	discharged
58	65 yrs	male	8 months	right	above ankle	slopping	unhealthy	well defined	purulent	0	1	7	0	0	4	10	0	22	biphasic flow	bk amputation	discharged
59	49 yrs	male	6 months	left	upto ankle	slopping	unhealthy	well defined	purulent	4	0	7	0	4	4	0	7	26	biphasic flow	bk amputaion	discharged
60	57 yrs	female	7 months	left	upto ankle	undermined	unhealthy	well defined	purulent	0	0	7	3	4	4	10	0	28	monophasic flow	bk amputation	discharged
61	58 yrs	male	9 months	left	upto calf	undermined	unhealthy	well defined	purulent	4	0	7	0	4	4	10	7	36	monophasic flow	bk guillitone amputation	pt died
62	63 yrs	male	13 months	left	above ankle	undermined	unhealthy	ill defined	purulent	4	0	7	3	4	4	10	7	39	monophasic flow	bk ampuation	pt discharged
63	56 yrs	male	10 months	right	above ankle	slopping	unhealthy	well defined	purulent	0	0	7	3	0	4	10	0	24	monophasic flow	wound debridement	discharged with ssg cover
64	62 yrs	female	11 months	right	above ankle	slopping	unhealthy	well defined	purulent	0	0	7	0	4	4	0	0	15	monophasic flow	wound debridement	discharged
65	49 yrs	female	7 months	left	above ankle	undermined	unhealthy	well defined	purulent	4	0	0	3	4	4	0	7	22	biphasic flow	wound debridement	discharged
66	55 yrs	male	6 months	left	above ankle	undermined	unhealthy	well defined	purulent	0	0	7	0	4	4	10	0	25	monophasic flow	wound debridement	discharged
67	54 yrs	male	5 months	left	upto ankle	slopping	healthy- red	well defined	serous	0	0	7	0	0	4	10	0	21	monophasic flow	wound debridement	discharged
68	59 yrs	male	10 months	right	upto ankle	undermined	unhealthy	ill defined	purulent	0	0	7	3	4	4	10	7	35	monophasic flow	bk guillitone amputation	discharged with revision
69	71 yrs	female	9 months	right	upto ankle	slopping	unhealthy	well defined	purulent	0	0	7	0	4	4	10	7	32	monophasic flow	bk guillitone amputation	pt died
70	63 yrs	male	4 months	right	above ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	0	4	10	7	32	biphasic flow	bk guillitone amputation	discharged after revision
71	51 yrs	male	7 months	right	above ankle	undermined	unhealthy	well defined	purulent	0	1	7	3	4	4	0	7	26	monophasic flow	bk amputation	discharged
72	57 yrs	male	20 months	right	above ankle	undermined	unhealthy	ill defined	purulent	4	1	7	3	0	4	10	7	36	no flow	bk amputation	discharged
73	46 yrs	female	3 months	right	below ankle	slopping	unhealthy	ill defined	purulent	0	0	7	0	0	4	10	0	21	monophasic flow	wound debriement	discharged with SSG cover
74	72 yrs	male	9 months	left	below knee	undermined	unhealthy	ill defined	purulent	0	0	7	3	4	4	10	7	35	monophasic flow	bk guillitone amputation	pt died
75	49 yrs	male	5 months	left	below ankle	slopping	unhealthy	ill defined	purulent	4	0	7	0	4	4	10	0	29	monopasic flow	wound debridement	discharged with ssg cover
76	75 yrs	female	3 months	left	below ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	0	4	10	7	32	monophasic flow	bk amputation	discharged
77	51 hrs	female	6 months	right	below knee	undermined	unhealthy	ill defined	purulent	4	1	7	0	4	4	10	7	37	no flow	bk guillitone amputation	discharged

78	48 yrs	male	4 months	right	below ankle	slopping	healthy- red	well defined	purulent	0	0	0	3	4	4	10	0	21	monophasic flow	wound debridement	discharged with ssg cover
79	62 yrs	female	8 months	right	above ankle	undermined	unhealthy	ill defined	purulent	4	0	7	0	0	4	10	7	32	monophasic flow	bk amputation	discharged
80	66 yrs	female	7 months	right	above ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	0	4	10	0	25	monophasic flow	wound debridement	discharged with ssg cover
81	68 yrs	male	4 months	left	upto ankle	slopping	healthy- red	well defined	serous	4	1	0	3	4	0	0	0	12	biphasic flow	wound debridement	ssg cover
82	57 yrs	female	8 months	right	upto ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	4	4	10	0	29	biphasic flow	bk amputation	discharged
83	50 yrs	male	4 mnths	left	upto ankle	slopping	unhealthy	well defined	purulent	0	0	7	3	4	4	10	0	28	monophasic flow	wound debridement	ssg cover
84	58 yrs	male	7 months	right	above ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	0	4	0	7	22	monophasic flow	bk amputation	discharged
85	60 yrs	male	2 months	right	above ankle	slopping	unhealthy	well defined	purulent	0	0	7	3	0	4	0	0	14	biphasic flow	wound debriement	ssg cover
86	49 yrs	male	8 months	right	above ankle	slopping	unhealthy	well defined	purulent	4	0	7	0	4	4	10	0	29	biphasic flow	bk amputation	discharged
87	57 yrs	female	7 months	left	below ankle	slopping	healthy- red	well defined	serous	4	0	0	0	4	4	0	0	12	normal study	wound debridement	ssg cover
88	71 yrs	female	6 months	left	above ankle	undermined	unhealthy	well defined	purulent	4	1	7	0	4	4	10	0	30	monophasic flow	bk amputation	pt died
89	55 yrs	female	9 months	right	above ankle	undermined	unhealthy	ill defined	purulent	4	0	7	0	0	4	10	0	25	biphasic flow	wound debridement	ssg cover
90	56 yrs	male	12 months	right	upto calf	undermined	unhealthy	ill defined	purulent	4	0	7	0	4	4	10	0	29	monophasic flow	bk guillitone amputation	pt died
91	60 yrs	male	10 months	right	above ankle	undermined	unhealthy	well defined	purulent	0	0	7	0	0	4	10	0	21	biphasic flow	wound debridement	discharged
92	64 yrs	male	8 months	right	above ankle	slopping	healthy- red	well defined	serous	0	0	7	0	4	4	0	0	15	biphasic flow	wound debridement	ssg cover
93	62 yrs	male	3 months	left	above ankle	slopping	unhealthy	well defined	purulent	4	0	7	3	4	4	0	0	22	biphasic flow	wound debridement	ssg cover
94	51 yrs	male	6 months	left	below ankle	slopping	unhealthy	well defined	purulent	4	0	7	0	0	4	10	0	25	biphasic flow	wound debridement	discharged with ssg cover
95	68 yrs	female	8 months	left	above ankle	undermined	unhealthy	ill defined	purulent	4	1	7	3	0	4	10	7	36	monophasic flow	bk guillitone amputation	discharged with revision
96	49 yrs	female	2 months	left	below ankle	slopping	unhealthy	well defined	purulent	4	0	0	0	4	4	10	0	22	normal study	wound debridement	discharged ssg cover
97	57 yrs	male	9 months	right	above ankle	undermined	unhealthy	well defined	purulent	0	0	7	3	4	4	10	7	35	biphasic flow	bk amputation discharged	
98	48 yrs	male	3 months	left	below ankle	slopping	healthy- red	well defined	serous	0	0	0	3	4	4	0	0	11	normal study	wound debridement	ssg cover
99	58 yrs	male	6 months	right	above ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	4	4	0	7	26	biphasic flow	bk amputation	discharged
100	56 yrs	female	10 months	right	above ankle	undermined	unhealthy	ill defined	purulent	4	1	7	0	0	4	10	7	33	monophasic flow	bk amputation	discharged
101	61 yrs	male	4 months	left	below ankle	undermined	unhealthy	well defined	purulent	4	0	0	3	4	4	0	0	15	biphasic flow	wound debridement	sssg cover
102	57 yrs	female	8 months	left	above ankle	undermined	unhealthy	well defined	purulent	4	0	7	0	4	4	0	0	19	biphasic flow	wound debridement	ssg cover
103	49 yrs	male	7 months	left	upto calf	undermined	unhealthy	well defined	purulent	4	0	0	3	4	4	10	0	25	biphasic flow	wound debridement	ssg cover
104	57 yrs	male	6 months	right	above ankle	slopping	unhealthy	ill defined	purulent	0	0	0	3	4	4	10	7	28	monophasic flow	bk amputation	discharged
105	61 yrs	female	4 months	left	above ankle	slopping	unhealthy	well defined	purulent	4	0	7	0	0	4	0	0	15	monophasic flow	wound debridement	ssg cover
106	65 yrs	female	3 months	right	below ankle	slopping	healthy- red	well defined	purulent	4	0	7	0	0	4	0	0	15	monophasic flow	wound debridement	discharged
107	65 yrs	male	6 months	right	upto calf	undermined	unhealthy	well defined	purulent	4	1	7	0	0	4	10	7	33	monophasic flow	bk guillitone amputation	pt died
108	64 yrs	male	7 months	right	upto calf	undermined	unhealthy	ill defined	purulent	0	0	7	3	4	4	10	7	35	monophasic flow	bk guillitone amputation	discharged with revisison
109	67 yrs	female	11 months	right	below knee	undermined	unhealthy	ill defined	purulent	4	0	7	0	4	4	10	0	29	monophasic flow	bk guillitone amputation	disharged with revision
110	69 yrs	male	5 months	left	above ankle	slopping	unhealthy	well defined	purulent	4	0	7	3	4	4	10	0	32	monophasic flow	bk amputation	discharged