

A Cross Sectional Study to Assess the Outcomes of Diabetic Foot Ulcer in Government Chengalpattu Medical College and Hospital

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Abstract

Original Research Article

The diabetic foot syndrome is a set of disorders in which tissue breakdown caused by ischaemia, neuropathy, and infection can result in morbidity and even amputation. Diabetes is no longer just a condition of the developed world. It is a cross-sectional study that was carried out for a year at Chengalpattu Medical College to analyse the various conservative and surgical treatment options for various grades of diabetic foot ulcers and to evaluate the outcomes of diabetic foot ulcers based on the severity of diabetes mellitus. One hundred and twenty six diabetic patients with foot lesions were found overall in Govt. Chengalpattu Medical College & Hospital from January 2021 to February 2022, and they were all included in the study. Male patients made up 58% of the total (73), while female patients made up 42%. (53). The patients in this group ranged in age from 20 to 87. In the vast majority of cases, 55% of the patients were between the ages of 50 and 69. In our investigation, the average peak incidence of diabetic foot lesions was sixty years old. Close communication between surgeons, physicians, diabetologists, dieticians, podiatrists, vascular surgeons, and community health care providers is required for the multidisciplinary management of diabetic foot ulcers.

Keywords: Diabetes mellitus, ischaemia, Diabetic Foot Ulcer.

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INTRODUCTION

The diabetic foot syndrome are a group of syndromes in which ischaemia, neuropathy, and infection leads to tissue breakdown resulting in morbidity and possible amputation. Diabetes is no longer a disease of the affluent west. Global prevalence of diabetes in 2003 was estimated to be 194 million.

By 2030, this figure is predicted to rise to 366 million due to longer life expectancy and changing dietary habits. In fact the prevalence is soaring in southern India it may reach an astronomical figure of 13% to 18%. In such a scenario knowing about the disease is important. Foot complications in diabetics are on the rise and this is attributable to many reasons. India with the oncoming diabetic epidemic and the increased geriatric population is bound to have a good percentage of its population with foot ulcers.

Amputations and the ulcers that precede limb loss are largely preventable.

AIM OF THE STUDY

1. To Assess the outcomes of diabetic foot ulcer based on severity of diabetes mellitus
2. Analysis of different lines of conservative and surgical management for various grades of diabetic foot ulcers.

MATERIALS AND METHODOLOGY

Study Design: Cross Sectional Study

STUDY POPULATION: DIABETIC FOOT ULCER PATIENT ADMITTING IN CHENGALPATTU IMEDICAL COLLEGE

STUDY PLACE: GOVT.CHENGALPATTU
MEDICAL COLLEGE AND HOSPITAL,
CHENGALPATTU

STUDY DURATION: 1 YEAR

SAMPL SIZE: ARRIVED MINIMUM SAMPLE 126
PATIENTS

SAMPLING METHOD: CONVINIENT SAMPLING
Definition of a study subject: Patients admitted to
Department of Surgery, GOVT. CHENGALPATTU
MEDICAL COLLEGE FOR DIABETIC FOOT
ULCER.

The method of study consists of-

- Detailed history taking regarding duration of diabetes family history of diabetes, mode of treatment undertaken till date to control diabetes was taken. mode of onset and duration of the foot lesions were enquired.
- Detailed general examination and examination of the foot was done to asses the grade of the foot lesions.
- Investigations after taking written informed consent
- The line of management of these patients were observed and the various surgical interventions and conservative measures undertaken according to the grades of the foot lesion was studied.
- Study patients will be followed regularly up to 3 months after treated
- Note will made of any complications, time taken to return to work and patients satisfaction

INCLUSION CRITERIA:

- Patients with diabetic foot ulcer
- FBS (126 and above)
- PPBS (200 and above)
- Patients who are willing to participate in the study

EXCLUSION CRITERIA:

- Non diabetic foot ulcer
- Post traumatic foot ulcer
- FBS(125 and below)
- PPBS(99 and below)

DATA COLLECTION:

1. After obtaining ethical committee permission for the study
2. After taking written informed consent from the patients

INVESTIGATIONS:

Routine Investigations
Hb%, TC DC, Peripheral smear, ESR, Renal function tests, Liver function tests, Lipid profile,

FBS/PPBS, HIV, HB_s Ag, Urine for albumin, sugars, ketone bodies, microscopy, BT CT, wound site pus c/s

Other:

X-ray of the chest, local parts xray

Review of literature

Group 1 foot ulcers are divided in to four varieties:

THE ACUTE FOOT GROUP

The patient presents with sudden bleb swelling and fever in the foot and leg.

THE CORN FOOT GROUP

This is the commonest mode of presentation. Neuropathic patients have an increase in dynamic plantar foot pressures and thus they are at risk of developing plantar ulceration. The skin reacts by forming a thickened layer of keratin that continues to build up. These points of increased pressure built up more proteins called keratin. The keratin formed is also abnormal. Increased glucose in the diabetics leads to glycosylation of tissue proteins.

THE BLACK TOE GROUP

When the blood flow to the foot is reduced the tissues show features of ischemia. The tips of toes, being more distal suffer maximum ischemia. The great toe and the second are commonly affected. When the blood flow is very low the situation is called CLI (Critical limb ischemia).When the arterial tree is extensively diseased these patients may proceed on a stage when a major amputation is necessary.

THE BANDAGER GROUP

Patients often have deep infections in the foot with non-healing ulcers and sinuses. The infection keeps grumbling and smoldering inside the foot. The infection may involve the bones. The foot is deformed, distorted and foot arches are collapsed.

These patientsrarely progress on to major amputation but have the morbidity of non-healing ulcers for years. Conservative management like repeated slough excision and bandages help in controlling sepsis and avoiding major amputation.

Group 2: The patients presenting without ulcers are divided in to nine varieties.

THE PARAESTHESIA GROUP

A wide variety of sensory disturbances occur in the foot. They may have tingling and numbness in the foot. Some may have shooting neurological pain or weakness or paralysis of the limb muscles. When the hands and the feet are alone involved the disease is termed "glove and stocking type".

CLAWED FOOT GROUP

Foot deformities frequently lead to ulceration. Patients with diabetes are particularly prone to the development of cocked up toes. This can result in pressure at the top of the tip of the toes, referred as the “tip- top-toe syndrome.” This deformity frequently is associated with a thinning or shifting of the fatpad.

THE CHARCOT JOINT GROUP

Charcot foot is characterized by foot deformity as a result of fractures and bone collapse. The foot takes on a clubfoot appearance and a rocker bottom configuration.

Treatment requires special molded shoes. If the patient is to walk on an unprotected feet then the fourth stage with development of a plantar ulceration in the area of the arch occurs. The ulceration may get infected, progressing to gangrene and leads to amputation.

DIABETIC SKIN GROUP

A myriad of dermatologic lesions can affect the lower extremity and foot of the diabetic patient. Periungual telangiectasia occurs most frequently in the fingernails of the diabetic patient but can also occur in the toes. Necrobiosis lipoidica diabetorum usually affects the anterior tibial areas of the lower extremity

and occurs in 0.3% to 1.2% of diabetic persons. It is more common in women.

Diabetic dermopathy is a relatively common lesion and is characterized by atrophic circumscribed brown patches on the front and sides of the lower portion of the legs in diabetic subjects. The sudden appearance of one or more tense blisters, diabetic bullae, generally on the acroportions of the body, is a clinically significant diabetic marker.

THE NAIL INFECTION GROUP

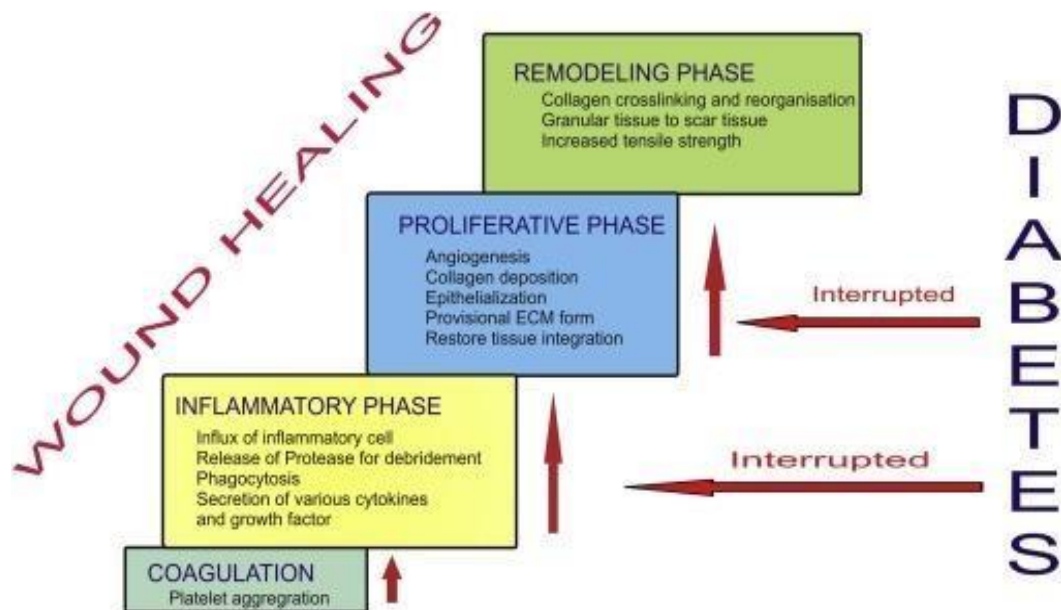
Recurrent and chronic paronychia of the great toe is a marker of NIDDM.

**THE CLAUDICATOR GROUP
FOOT ULCER HEALING IN DIABETES**

It is a common clinical observation that wound healing is defective in diabetes mellitus. Diabetic foot wounds.

There are distinctive phases in wound healing:

- The injury phase
- The inflammatory phase
- The proliferative, phase
- Phase of complete epithelialization.



Chronic wounds with lack of progression to heal occurs due to arrested phase in the sequence of normal healing. The wound fails to close. The diabetic foot ulcer is a chronic wound. Hyperglycaemia may be toxic to fibroblasts and neutrophils, resulting in greater susceptibility to infection. Cytokines and growth factors play a very important role in the process of acute wound healing. It is an area of future research with great potential to identify novel molecular level therapies. The typical diabetic wound is a sequel of tissue necrosis

due to sepsis. The foot ulcer is usually due to neuro-or neuroischaemic changes in the foot which are fore runner of sepsis. In acute conditions drainage of pus or fasciotomy may be required. The infected wound needs extensive, repetitive debridement.

Good limb elevations and rest will heal majority of the wounds. In some chronic leg ulcer occurs. Many treatment modalities are described. The famous saying that ‘The foot ulcers in diabetics are not

non healing ulcers but they are maltreated ulcers' is true. Local applications must be safe for the wound. Most of the antiseptic solutions are dangerous to the wound. Wound management is divided in to four types:

- Protective dressing
- Trophic ulcer with sepsis
- Acute septic wound
- Indolent non healing wound
- Novel therapies

MANAGEMENT BASED ON GRADING GRADE 0 FEET:

By definition, a grade 0 feet has no open lesions but represent the previously described 'at risk'. Any foot with heavy callus formation under weight bearing areas should have the callus trimmed to ensure that it is not making an active ulcer.



GRADE I LESIONS:

The grade 1 lesion consists of a superficial ulcer, although there is full thickness skin loss.

Although most patients can be managed on an outpatient basis, admission occasionally may be required if there is either extensive infection or additional ischemic problems.

GRADE 2 LESIONS:

The grade 2 ulcer is deep and often penetrates the subcutaneous fact down to tendon or ligaments and, although infection usually is present, there is no bony involvement.

General Management consists of rest with elevation of the foot (in the absence of ischemia), with strict control of the blood glucose. The ulcer should be debrided and then irrigated with saline or a weak solution of hydrogen peroxide. In the presence of infection, antibiotic therapy should be started after swabs have been taken.

GRADE 3 LESIONS:

Surgical intervention usually is required in the management of grade 3 lesions, which are characterized by deep infection with abscess formation.



The neuropathic foot has excellent healing potential however, and local procedures, such as a ray excision of diseased bone, often are successful. Initial treatment with bed rest, elevation of the nonischemic foot, antibiotics according to culture and sensitivities.

GRADE 4 LESIONS:

Gangrene of part of the foot is present in grade 4 cases and may be localized. Grade 4 ulcers and angioplasty also may be successful if a suitably short stenosis is demonstrated on arteriography. A painless, black toe with 'dry gangrene' occasionally may be left to demarcate and amputate spontaneously.

GRADE 5 LESIONS:

The patient with extensive gangrene of the foot requires urgent hospital admission, control of diabetes and infection and a major amputation.

OBSERVATIONS AND RESULTS

The total number of diabetic patients with foot lesions observed in Govt. Chengalpattu Medical College & Hospital, during Jan 2021 to Feb 2022 was one hundred and twenty six and they were taken up for study. 58% of the patients were male (73) and 42% female (53). The age of these patients varied from 20 to 87 years. Maximum number of cases 55% belonged to the age group of 50 to 69 years. The average peak

incidence of diabetic foot lesions in our study was sixty years.

Table 1: Age Group

Age group	Frequency	Percent
<30 Years	3	2.4
31-40 Years	13	10.3
41-50 Years	25	19.8
51-60 Years	38	30.2
61-70 Years	34	27.0
Above 70 Years	13	10.3
Total	126	100.0

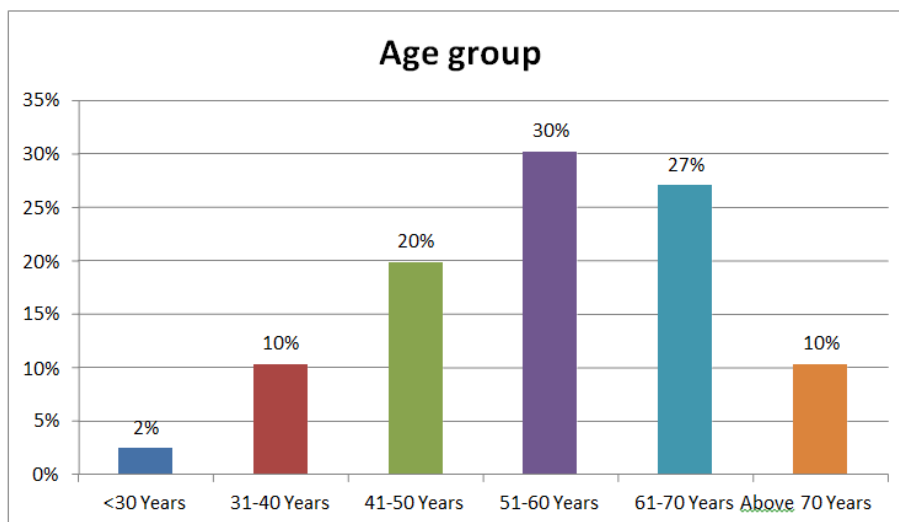


Table 2

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
RBS_ON_ADMISSION	126	127.00	403.00	266.6508	72.07455
AGE	126	27.00	88.00	56.6667	12.70087

Table 3

SEX	Frequency	Percent
Male	77	61.1
Female	49	38.9
Total	126	100.0

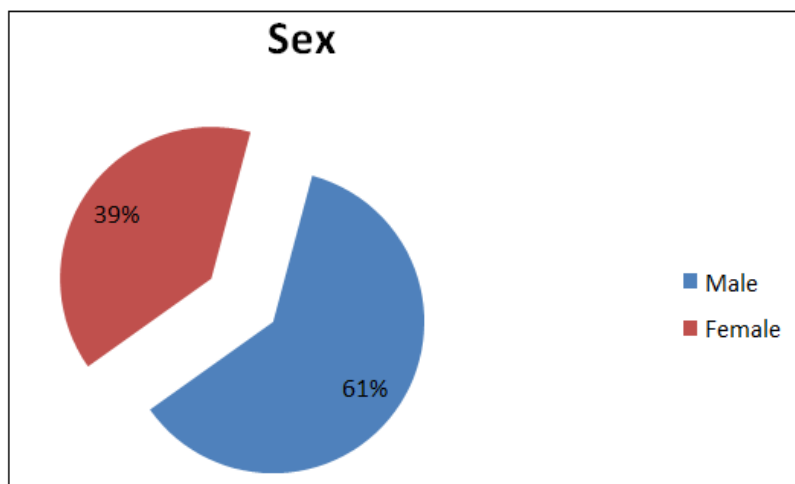


Table 4

RBS Group	Frequency	Percent
<180	15	11.9
180-300	56	44.4
>300	55	43.7
Total	126	100.0

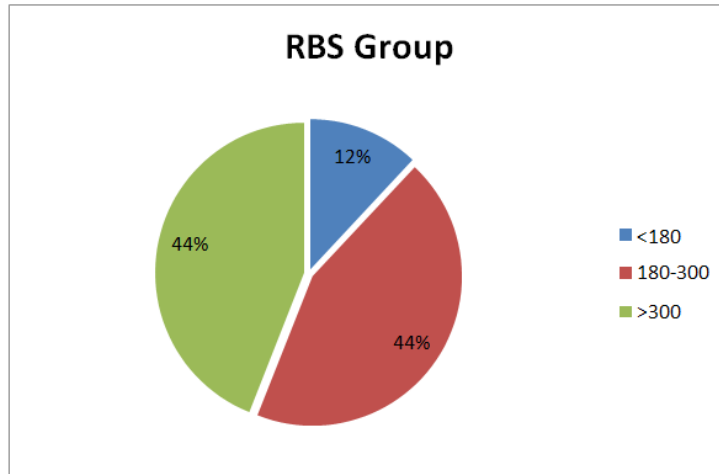


Table 5

WOUND HEALING	Frequency	Percent
SHAVING CORN	6	4.8
WD	52	41.3
WD+SSG	12	9.5
WD+FLAPCOVER	2	1.6
WD+TOE AMPUTATION	36	28.6
WD+TOE AMPUTATION+SSG	2	1.6
TRANSMETATARSAL AMPUTATION	1	.8
BELOW KNEE	14	11.1
ABOVE KNEE	1	.8
Total	126	100.0

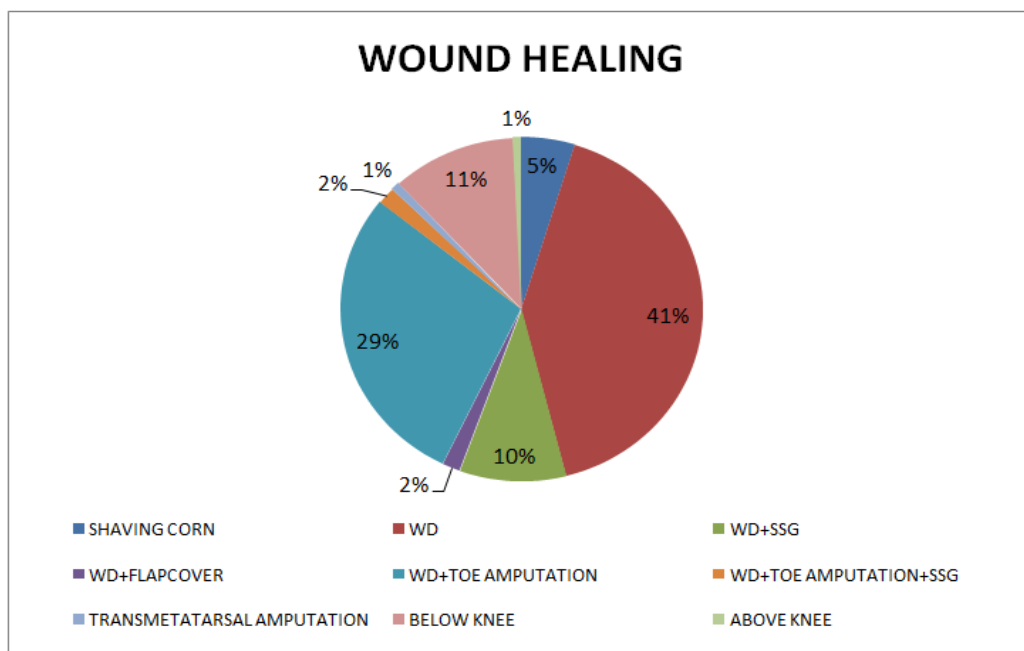


Table 6

WAGNERS GRADE	Frequency	Percent
0	6	4.8
1	25	19.8
2	26	20.6
3	33	26.2
4	27	21.4
5	9	7.1
Total	126	100.0

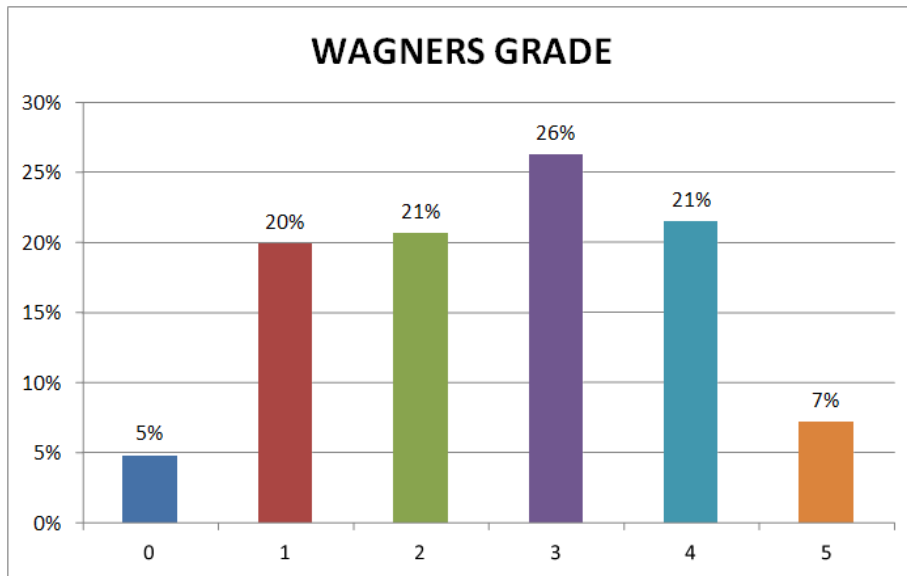


Table 7

DEATH	Frequency	Percent
RECOVERED	123	97.6
DEATH	3	2.4
Total	126	100.0

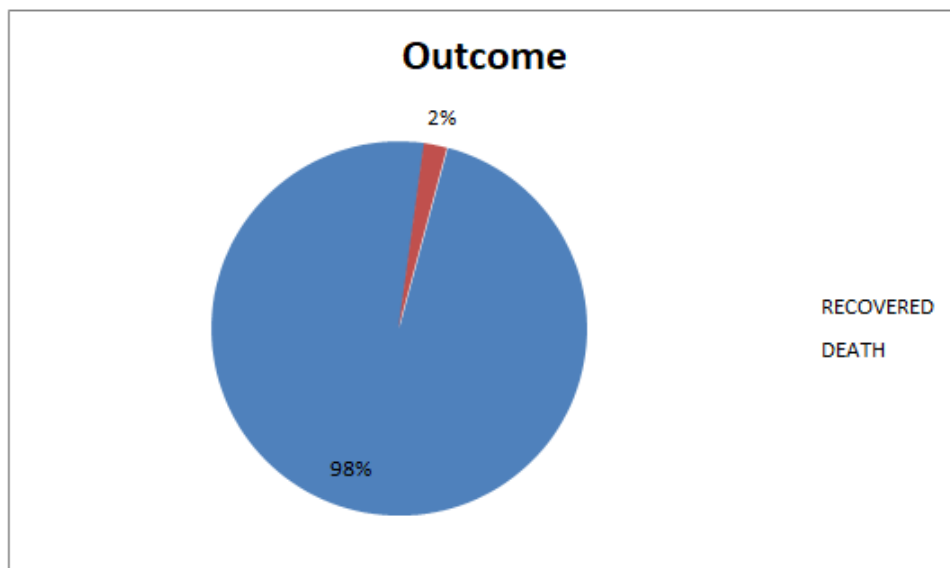


Table 8

Crosstab			WAGNERS GRADE						Total
			0	1	2	3	4	5	
Age group	<30 Years	Count	0	1	0	0	2	0	3
		%	0.0%	4.0%	0.0%	0.0%	7.4%	0.0%	2.4%
	31-40 Years	Count	0	2	6	2	1	2	13
		%	0.0%	8.0%	23.1%	6.1%	3.7%	22.2%	10.3%
	41-50 Years	Count	0	7	2	7	5	4	25
		%	0.0%	28.0%	7.7%	21.2%	18.5%	44.4%	19.8%
	51-60 Years	Count	3	5	9	10	10	1	38
		%	50.0%	20.0%	34.6%	30.3%	37.0%	11.1%	30.2%
	61-70 Years	Count	3	6	7	12	5	1	34
		%	50.0%	24.0%	26.9%	36.4%	18.5%	11.1%	27.0%
	Above 70 Years	Count	0	4	2	2	4	1	13
		%	0.0%	16.0%	7.7%	6.1%	14.8%	11.1%	10.3%
Total		Count	6	25	26	33	27	9	126
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=29.378 P=0.248

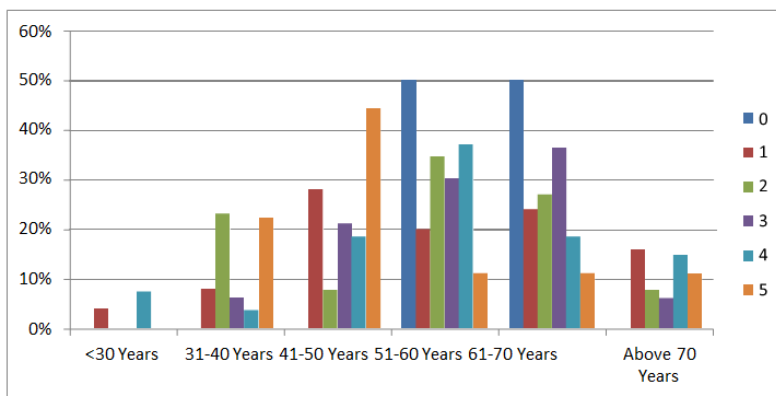


Table 9

Crosstab			WAGNERS GRADE						Total
			0	1	2	3	4	5	
SEX	Male	Count	5	21	13	18	15	5	77
		%	83.3%	84.0%	50.0%	54.5%	55.6%	55.6%	61.1%
	Female	Count	1	4	13	15	12	4	49
		%	16.7%	16.0%	50.0%	45.5%	44.4%	44.4%	38.9%
Total		Count	6	25	26	33	27	9	126
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=9.175 P=0.102

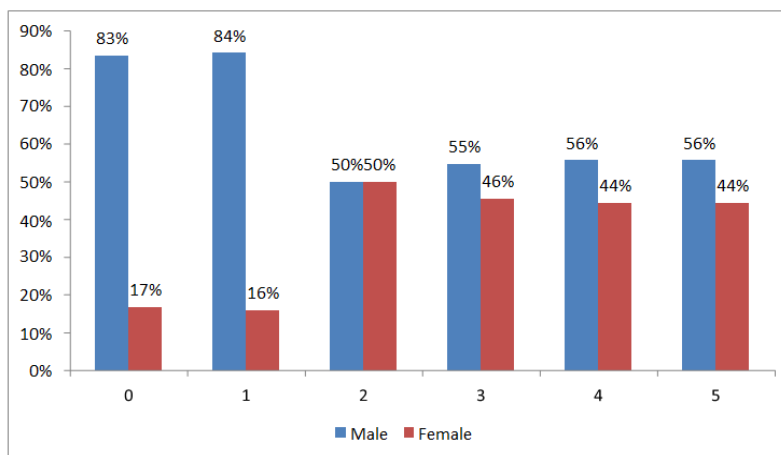


Table 10

Crosstab			WAGNERS GRADE						Total
			0	1	2	3	4	5	
RBS Group	<180	Count	4	4	3	3	1	0	15
		%	66.7%	16.0%	11.5%	9.1%	3.7%	0.0%	11.9%
	180-300	Count	2	9	16	17	12	0	56
		%	33.3%	36.0%	61.5%	51.5%	44.4%	0.0%	44.4%
	>300	Count	0	12	7	13	14	9	55
		%	0.0%	48.0%	26.9%	39.4%	51.9%	100.0%	43.7%
Total		Count	6	25	26	33	27	9	126
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=36.428** P<0.001

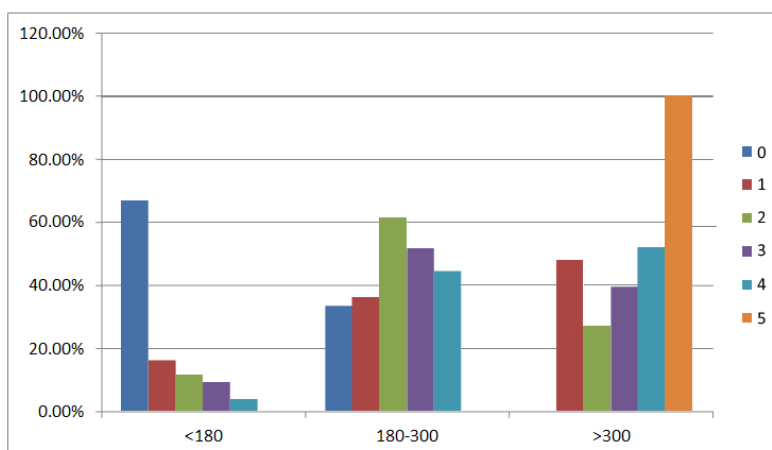


Table 11

Crosstab			WAGNERS GRADE						Total
			0	1	2	3	4	5	
WOUND HEALING	Shaving Corn	Count	6	0	0	0	0	0	6
		%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%
	WD	Count	0	19	18	15	0	0	52
		%	0.0%	76.0%	69.2%	45.5%	0.0%	0.0%	41.3%
	WD+SSG	Count	0	6	6	0	0	0	12
		%	0.0%	24.0%	23.1%	0.0%	0.0%	0.0%	9.5%
	WD+FLAPCOVER	Count	0	0	2	0	0	0	2
		%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	1.6%
	WD+TOE AMPUTATION	Count	0	0	0	18	18	0	36
		%	0.0%	0.0%	0.0%	54.5%	66.7%	0.0%	28.6%
	WD+TOE AMPUTATION+SSG	Count	0	0	0	0	2	0	2
		%	0.0%	0.0%	0.0%	0.0%	7.4%	0.0%	1.6%
	TRANSMETATARS AL AMPUTATION	Count	0	0	0	0	1	0	1
		%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	0.8%
	BELOW KNEE	Count	0	0	0	0	6	8	14
		%	0.0%	0.0%	0.0%	0.0%	22.2%	88.9%	11.1%
ABOVE KNEE	Count	0	0	0	0	0	1	1	
	%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%	0.8%	
Total		Count	6	25	26	33	27	9	126
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=301.420** P<0.001

DEATH * WAGNERS GRADE Crosstabulation									
			WAGNERS GRADE						Total
			0	1	2	3	4	5	
DEATH	RECOVERED	Count	6	25	26	33	26	7	123
		%	100.0%	100.0%	100.0%	100.0%	96.3%	77.8%	97.6%
DEATH	DEATH	Count	0	0	0	0	1	2	3
		%	0.0%	0.0%	0.0%	0.0%	3.7%	22.2%	2.4%
Total		Count	6	25	26	33	27	9	126
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=17.642** P=0.003

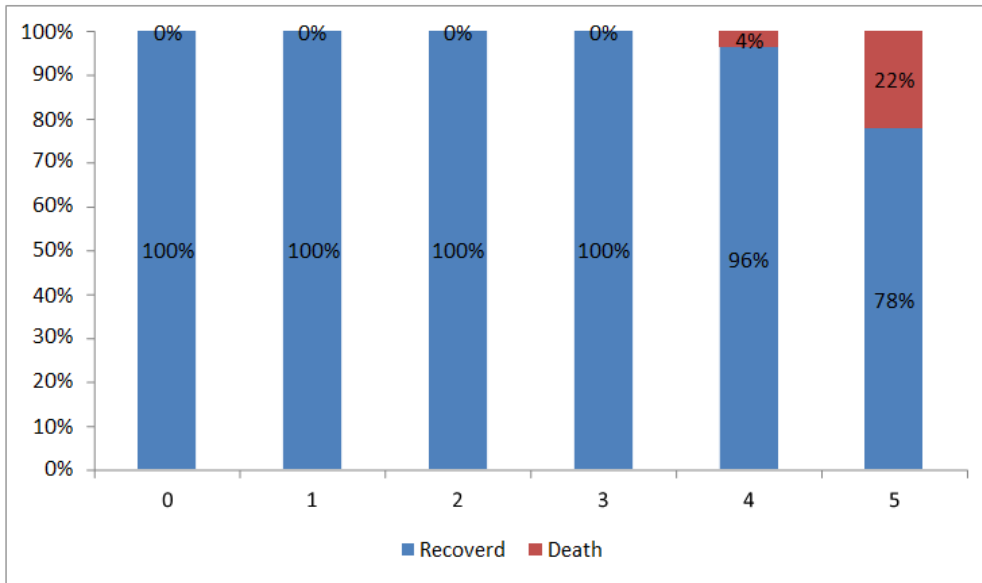
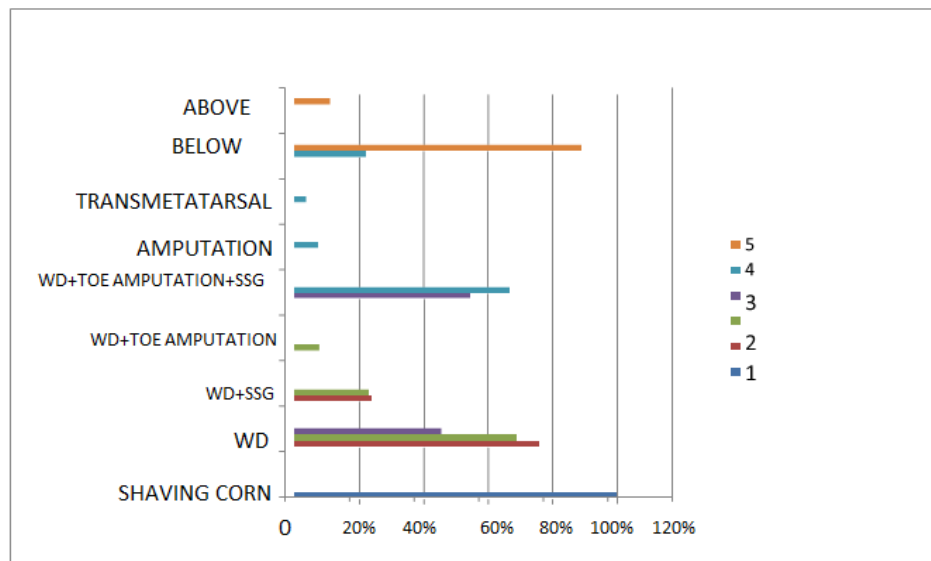


Table 13: Methods of Management of Various Grades of Diabetic Foot Ulcer

Grade	Method	No of cases
Grade 0	Shaving of corn	6
Grade 1	Wound debridement alone	19
	Wound debridement +SSG	6
	Wound debridement + Flap cover	2
Grade 2	Wound debridement alone	19
	Wound debridement +SSG	6
Grade 3	Wound debridement alone	14
	Wound debridement +Toe amputation	18
	Wound debridement +Flap cover	0
Grade 4	Wound debridement + Toe amputation	19
	Wound debridement +Toe amputation +SSG	2
	Trans metatarsal amputation alone	1
	Trans metatarsal amputation +SSG	0
	Below knee amputation	6
Grade 5	Below knee amputation	7
	Above knee amputation	1



DISCUSSION

In this study, a total number 126 patients with foot lesion observed in Government Chengalpattu Medical College & Hospital, Chengalpattu, during the period of 2021 Jan to Feb 2022.

Male preponderance 58% and Female is 42% and it is more inactive sedentary workers (68%). The reasons for this could be that the diabetics who are active are more prone for trauma and is the precipitating factor in already compromised neuro ischemic foot.

Nearly 44% presented with sugar value range of 180-300 mg/dl at the time of admission among them majority (52%) presented with grade 3 and 4, and 44% presented with sugar value range of >300 mg/dl at the time of admission, among them majority (42%) presented with grade 4 and 5.

Nearly 72% of patients are diabetes more than one year and nearly 62 % having positive family history of diabetes.

Only less than 14% of patients reported to hospital within one week of symptoms. Reasons attributed for delayed reporting for treatment are either the symptoms are less severe may be due to neuropathy, seeking native treatment, socio-economic problems etc. This shows majority of the patients lack the awareness of the seriousness of their illness.

In our study nearly 70% of the patients had diabetic polyneuropathy and 59% had microangiopathy and only 14% of patients had infection alone without neuropathy or angiopathy though 94% of the foot lesions were infected. This is in contrast to the common finding in Indian diabetics where non neuroischemic but purely infected foot is common.

In this study up to grade II lesions were treated with surgical debridement, systemic antibiotics, bed rest and with or without skin grafting or amputation. In addition, the needy patients must also be provided with different types of shoes or casts (like instant healing sandals for healing ulcers, 'Extra depth shoes' healed ulcers, 'Custom molded shoes' for deformed foot or plaster of paris cast). Total contact cast, boot cast, cam walker all help heal ulcers fast and also prevent ulcer formation.

The grade IV and V lesions were treated by amputation depending upon the severity of the lesion. In local amputation either disarticulation of toes or ray excision was performed and the wound allowed to heal by granulation. Wherever possible, it is better to avoid entry into joints as this may lead on to problems in future.

Comparison with our results:

1. Similar to this study more than 42% of the patient ended up in either minor or major amputations, another observational studies suggest that 6– 43% of patients with diabetes foot ulcer eventually progress to amputation (7–9)., Ramsey *et al.*, (34).
2. The majority of patients (51%) in the study research article - biomedical research (2018) Volume 29, Issue 9, had poorly controlled T2DM with advanced stage of DFUs that necessitated amputations, compared with our study 43% had high sugar values , with advanced stage of diabetic foot ulcer (35).

CONCLUSION

Diabetic foot lesions and its management was taken up for study with the view to evaluate how it is being done in our hospital setup. The study period included March 2018-february 2019. Total number of patients studied were 126.

The management predominantly consisted of Surgical intervention in various forms in all grade and types of Diabetic foot lesions in addition to medical management in controlling Hyperglycaemia, Infection etc. Surgical intervention ranged shaving of corn foot to major Amputations including Debridement, Drainage, Decompression, Dismemberment, SSG, Flap covers.

For obvious reasons revascularization surgeries could not be taken up. Had it been done more limbs could have been saved. Delay in reporting for treatment shows the lack of awareness among the patients about the seriousness of the problem.

Due to the short period of study and non compliance of patients for regular follow up the success (or) otherwise of the management and recurrence of the problems in the long term could not be completed.

Diabetes is on the increase globally, type 2 patients are often detected late, but this group can suffer similar foot pathology to long-term type 1 patients.

In this study only the lack of awareness above this disease leads to the final amputation to the patient and quality of the patients life is affected [1].

The Management of Diabetic foot ulcers is multidisciplinary and necessitates close Communication between the Surgeons, Physicians, Diabetologists, Dieticians, Podiatrist, Vascular Surgeons and Community Health care workers.

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