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A Study of Outcome of Pattern of Diabetic Foot Ulcers Based on The Pedis Classification Scoring System

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A B S T R A C T

Background: Diabetic foot ulcers (DFUs) are a significant complication of diabetes mellitus and a major cause of non-traumatic lower limb amputations.
The PEDIS classification (Perfusion, Extent, Depth, Infection, Sensation) provides a structured scoring system for evaluating DFUs.
This study aims to evaluate the outcomes of DFUs using the PEDIS scoring system.
Methods: This prospective observational study was conducted at the Department of General Surgery, Travancore Medical College, over 18 months.
A total of 110 patients with clinically diagnosed DFUs were enrolled. Each patient was assessed using the PEDIS score at presentation and followed up for six months to assess outcomes (healed, non-healed, amputated, or dead).
Results: Of the 110 patients, 61 had low PEDIS scores (0–7), and 49 had high scores (8–12).
Patients with high PEDIS scores had a statistically significant longer duration of diabetes ($p<0.001$), greater prevalence of hypertension ($p=0.042$),
diabetic neuropathy ($p<0.001$), peripheral occlusive vascular disease ($p<0.001$), and critical limb ischemia ($p<0.001$).
Surgical interventions, including debridement and amputation, were more common in the high PEDIS group ($p<0.001$).
Healing time was significantly longer (3.71 ± 1.81 months vs. 2.16 ± 1.15 months, $p<0.001$), and the rate of healing was lower in the high PEDIS group (28.57% vs. 96.72%, $p<0.001$).
Conclusion: The PEDIS scoring system is an effective tool for predicting outcomes in DFU patients.
A high PEDIS score correlates with poorer outcomes, increased need for surgical intervention, and prolonged healing duration.

Keywords: Diabetic Foot Ulcer, PEDIS Classification, Amputation, Healing Outcome, Risk Stratification

INTRODUCTION

One of diabetes mellitus's few major side effects is diabetic foot ulcers (DFU). The main causes of DFU are peripheral arterial disease and peripheral neuropathy. An estimated 25% of those who have diabetes mellitus are susceptible to developing foot ulcers. An injury to the foot that is full-thickness, directly beneath the malleolus, is the hallmark of a diabetic foot ulcer. The most frequently impacted areas are pressure points, including the heel, metatarsal heads, and plantar side of the toes. Infection, dry and wet gangrene, nonhealing ulcers, and eventually amputation of the affected areas are all common outcomes of these foot ulcers.

Diabetic foot ulcers (DFUs) affect approximately 25% of diabetic patients in their lifetime and are a leading cause of lower limb amputation.

The International Working Group on Diabetic Foot (IWGDF) developed the PEDIS classification system in 2004 to standardize the assessment of DFUs. PEDIS stands for Perfusion, Extent, Depth, Infection, and Sensation. With a score

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ranging from 0 to 12. Patients with diabetic foot are evaluated using this scoring system, which then assigns a score that divides them into high-risk and low risk groups. This rating aids in the care plan for DFU and has a high degree of accuracy in grading them.

The present study assesses the utility of this scoring system in predicting clinical outcomes of DFUs.

Typical appearance of a DFU with tissue breakdown at weight-bearing areas.

Materials and Methods
Study Design and Setting: A prospective observational study conducted at the OPD and IPD of the Department of General Surgery, Travancore Medical College, Kollam.

Study population and participants: Patients attending surgical OPD and/or admitted in Travancore Medical College with diabetic foot ulcer, who provided informed consent and "met the inclusion criteria were considered study participants". The study was conducted for 18 months after obtaining Ethics Committee Clearance.

Sample Size: 110 patients, calculated based on Chuan et al.'s study.
Inclusion Criteria: All patients diagnosed with DFUs in "Department of General Surgery at Travancore Medical College, Kollam"

Exclusion Criteria: Ulcers due to trauma or non-diabetic vascular diseases of limb leg. Syphilis, venous ulcer, systemic vasculitis, etc. patients not consenting.

Data Collection: PEDIS scoring was applied at presentation. Patients were followed for six months.

Methodology
Patients with diabetic foot ulcers who presented to Travancore Medical College's General Surgery OPD/IP in Kollam were assigned to the trial. After getting the patient's informed consent at the time of presentation, the diabetic ulcer was scored using PEDIS. Patients are checked in at six months, and the results are recorded. Information was gathered for every diabetic foot ulcer patient using a proforma. Along with PEDIS grading, the proforma includes demographic data involving age, sex, diabetes type, duration, co-morbid conditions, complications from diabetes, and treatment outcome. Following a physical examination and non-invasive vascular tests such as transcutaneous oxygen saturation monitoring and color Doppler for the limb's arterial system, perfusion was ascertained.

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The ulcer's estimated size, measured in cm2, was divided into three groups. • A sterile blunt probe was used to measure the ulcer's depth. The presence or absence of pus was used to determine the infection's diagnosis, laboratory findings for sensitivity and culture, and imaging tests such as MRI and x-ray pictures.

10g monofilament have been employed to measure sensation. For each patient, ten locations on the plantar and dorsal surfaces were chosen for monofilament, and the outcomes were noted. Every patient's PEDIS score was noted. A patient's Pedis score can be anywhere between 1 and 12. Every patient is monitored for six months, whichever comes first. The results were classified as dead, amputated, healed, or unhealed. The study continued until a sufficient sample size was obtained.

Outcome measures included healing, non-healing, amputation, and death. Investigations included lab parameters (HbA1c, FBS, PPBS), Doppler studies, and monofilament testing.
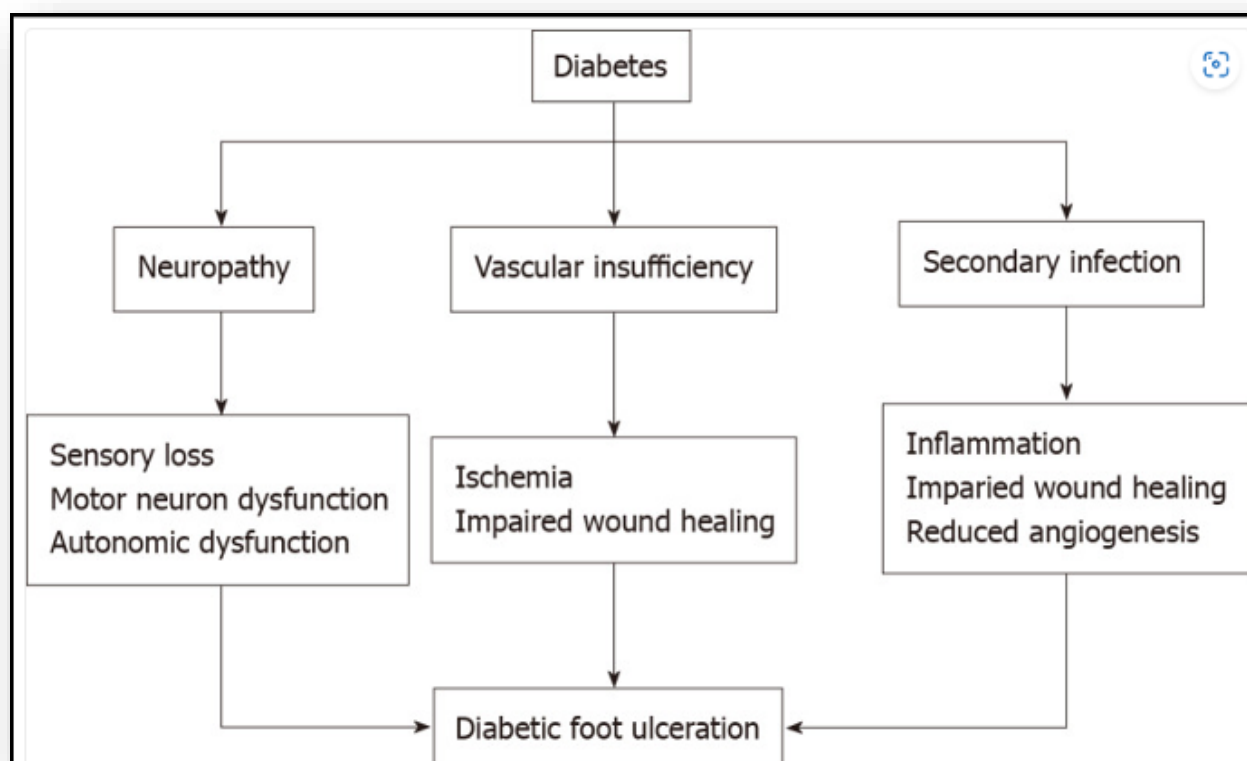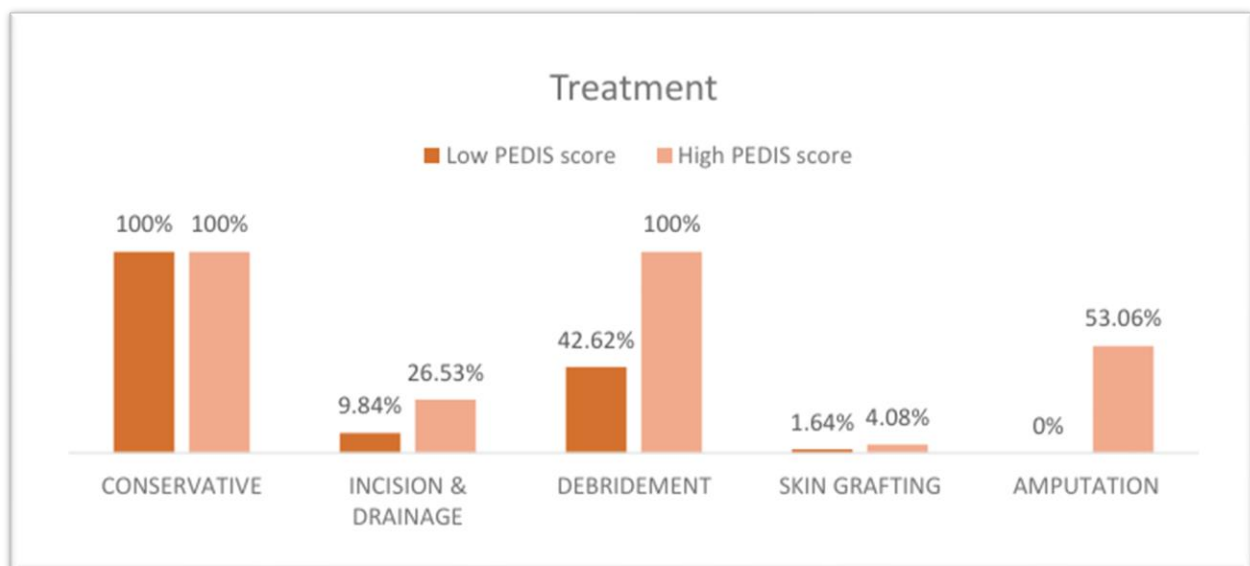

Figure 3: Pathophysiology of Diabetic Foot Ulceration. Illustrates the interplay of neuropathy, ischemia, and infection in DFU development.

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PEDIS classification system.

Grade	Perfussion	Extent	Depth	Infection	Sensation	Score
1	No PAD	Skin Intact	Skin intact	None	No Loss	0
2	PAD, No CLI	<1cm^2	Superficial	Surface	Loss	1
3	CLI	1-3cm^2	Fascia, muscle, tendon	Abscess, Fascitis, Septic athritis		2
4		>3cm^2	Bone or joint	SIRS		3

Treatment given

Preventive care	Non-invasive modalities	Invasive modalities
Self screening Health care screening Insoles Podiatric care	Wound dressing Human skin equivalent Total-contact casting Hyperbaric oxygen Topical growth factos Shock wave therapy Stem cell therapy Antiobiotics Negative pressure wound care Maggot therapy	Debridement Revascularization Skin grafting Amputation

Figure 4: Overview of management of diabetic foot ulceration.

Figure 6 : Total Contact Casting

Figure 8 : Negative pressure wound therapy

Results

Statistical Analysis: SPSS software was used. Chi-square test and independent sample t-test were applied. p<0.05 was considered statistically significant.
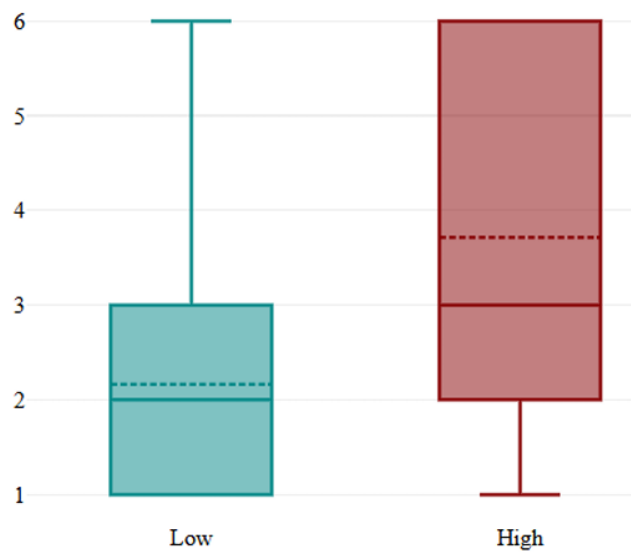
in our study, 96.72% in low PEDIS score group and 28.57% in high PEDIS score group had completely healed ulcer at final follow-up. There was statistically significantly a greater number of patients with healed ulcer, among low PEDIS score group in our study. (p>0.001).

44.9% had Amputation, 20.41% had non-healing ulcer and 6.12% patients expired in high PEDIS score group in our study.

OUTCOME by PEDIS SCORE
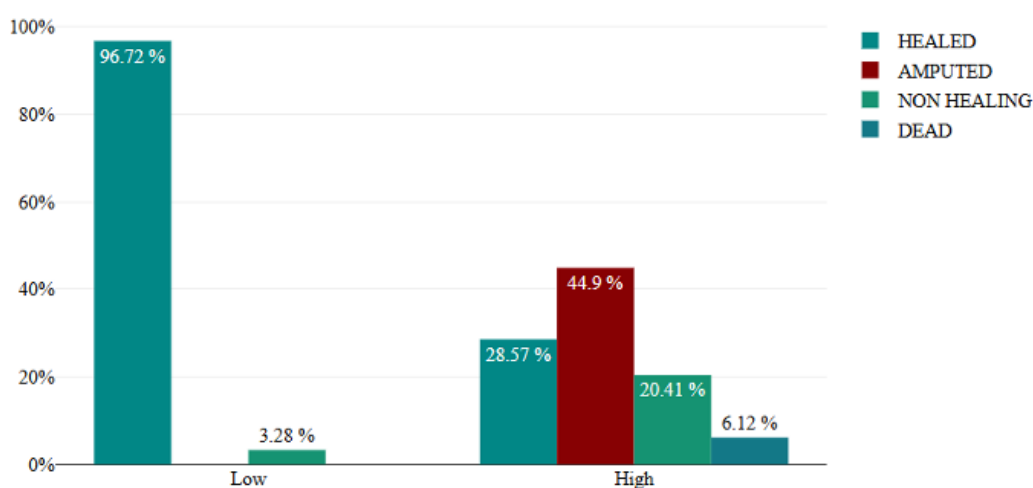
Duration to heal (months) by PEDIS SCORE

The mean duration to heal was 2.16 ± 1.15 months in low PEDIS score group and 3.71 ± 1.81 months in high PEDIS score group. There was statistically significantly longer duration for healing among high PEDIS score group in our study. (p <0.001)

Table 1: PEDIS Score and Outcome Distribution

Outcome	Low PEDIS (n=61)	High PEDIS (n=49)	p-value
Healed	59 (96.72%)	14 (28.57%)	<0.001
Amputated	0 (0%)	22 (44.9%)	<0.001
Non-healing	2 (3.28%)	10 (20.41%)	<0.001
Death	0 (0%)	3 (6.12%)	0.045

Table 2: Mean Duration of Healing

Group	Mean Duration (months)	SD	p-value
Low PEDIS	2.16	1.15	
High PEDIS	3.71	1.81	<0.001

Discussion

In our study, 100% patients in both the groups received conservative treatment with antibiotics. I&D was done in 9.84% in low PEDIS score group and 26.53% in high PEDIS score group. This was statistically significant. (p =0.021) Debridement was done in 42.62% in low PEDIS score group and 100% in high PEDIS score group There was statistical significance in this. (p<0.001)

Skin grafting was performed in 4.08% in the group with a high PEDIS score and 1.64% of the group with a low PEDIS score. Statistical significance was not achieved. (p = 0.434)

In our study, 53.06% in the group having a low PEDIS score and all of the group with a high PEDIS score underwent an amputation. This was statistically significant. (p<0.001). BK amputation was most common level of amputation in our study, followed by Ray amputation of foot.

The mean duration to heal was 2.16 ± 1.15 months in low PEDIS score group and 3.71 ± 1.81 months in high PEDIS score group. There was statistically significantly longer duration for healing among high PEDIS score group in our study.

Conclusion

The PEDIS scoring system is a reliable tool for predicting DFU outcomes. Early identification of high-risk patients can guide timely interventions and reduce morbidity.

Conflicts of Interest: None
Funding: None

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Ethical Approval: Obtained from Institutional Ethics Committee

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