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Original Article

Evaluation of Foot Problems Among Diabetics in Rural Population: A Prospective Study at a Tertiary Center

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ABSTRACT

Background: Diabetic foot, being a crippling and life-threatening condition, awareness about its pathophysiology, symptoms, deformities, and preventive measures would lessen its frequency and severity. This study aimed to obtain representative data about the foot problems of diabetes mellitus in the rural population and to propose a Podiatric Health Education Program within the hospital complex.

Methods: A prospective study was conducted on all diabetic patients with foot problems from rural backgrounds at a tertiary center from January 2009 to April 2010. Data regarding demographic details, clinical features, investigation findings, management, and follow-up were collected. Diabetic foot ulcers in admitted patients were classified according to Wagner's grading and clinical staging systems. "Footcare and Footwear Questionnaire" was used to assess patients' awareness. The collected data were analyzed.

Results: A total of 400 diabetics with foot problems were assessed; 50 (12.5%) had diabetic foot ulcers. The most affected age was 41 to 60 years; the mean duration of diabetes was 5.02 years. Numbness (45%) and pain (40%) in the foot were the common symptoms, while callosities (55%), great toe deformity (28%), and claw/hammer toe (18%) were the common deformities. Most ulcers (60%) were of Wagner Grade 2 and 3 types. Extensor muscle involvement (36%), medial longitudinal arch abnormalities (42%), and posterior tibial artery involvement were frequent. Neuropathic feet (76%) outnumbered neuroischemic feet (24%). Patients had poor awareness about foot care and footwear.

Conclusions: Diabetic foot frequently complicates diabetes; presentation may vary, but severe handicap due to limb loss may result if not cared for. Footwear and footcare awareness promote preventive health and help in rehabilitation.

Key words: Diabetes, diabetic foot, foot deformities, rural, ulcers

INTRODUCTION

Over half a billion people are estimated to be affected by diabetes mellitus worldwide. [1] It being a systemic disease, affects all the systems of the body. The manifestations of diabetes are diverse, as are its complications. The metabolic dysregulations

associated with it cause secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system. In surgical patients, diabetes may be an unfortunate comorbidity worsened by and worsening the surgical stress.

The overall risk of developing a wound in diabetics has been estimated to be approximately 2% per year; this increases to 7.5% in patients with neuropathy, which further increases to 40% in people with a history of ulceration. [2] The risk tends to increase to 60% at 3 years and 75% at 5 years. [2]

The number of diabetics with foot ulcers has been approximated to be around 18.6 million worldwide in a recent review article by Armstrong et al. [3] These ulcers are the leading cause of lower limb amputations and are often associated with mortality in diabetics. [3] These vast numbers reveal the magnitude of the problem.

What constitutes a diabetic foot? It is not just the visually apparent ulcers, deformities, infection, or gangrene; rather, it comprises all the foot lesions in a diabetic that gradually evolve from a normally appearing foot with neuropathic or vasculopathic symptoms to a high-risk deformed foot, an ulcerated foot, an infected foot, a necrotic foot, and lastly an unsalvageable foot. Why is the foot of a diabetic at so much risk? It is due to the interplay of several pathogenic factors like neuropathy (sensory, motor, or autonomic), abnormal foot biomechanics, peripheral arterial disease, poor wound healing, and susceptibility to infections. Due to a lack of awareness and ignorance about foot problems in diabetes, foot problems are one of the leading causes of hospitalization in diabetics, and a significant number of amputations are the result of an uncared-for foot. These foot problems in the rural population are common due to illiteracy and unawareness about the problem, predominantly being engaged in outdoor work (farming and labor), poor notions about foot care and footwear, and a lack of modern diabetic foot care facilities in the villages. In a developing country like India, the differences are obvious enough to cause the rural–urban divide associated with this problem. To have an assessment of the common foot problems in diabetics with a rural background, a prospective study was conducted to develop a Podiatric Health Education Program within the hospital complex.

MATERIALS AND METHODS

Study Design, Setting, and Population

A prospective study was conducted on all patients with diabetes and foot problems who presented to the outpatient clinic or emergency department at a tertiary care center from January 2009 to April 2010. They were chosen from the vast number of diabetics who attended these clinics with any related or unrelated symptom.

Inclusion Criteria

- All diabetic patients presenting with foot problems who gave consent to be included in the study.
- The subset of patients with foot ulcers was admitted and further classified according to Wagner's and clinical classification.

Exclusion Criteria

- Patients having foot ulcers/deformities/pathologies/symptoms due to reasons other than diabetes.
- Patients who did not give consent to be included in the study.

Sample Size Calculation and Sampling Techniques

For the sample size calculation, the prevalence of foot ulcers in diabetics was taken from previous studies. A 9% prevalence of foot ulcers was taken from a study by Jayaprakash et al. [4] Taking the absolute precision rate of 10% and the prevalence rate of 9%, a sample size of 32 was calculated using the online "n calculator" sample size calculator. Adding a 10% loss to this data, it was decided to include 35 diabetic foot ulcer patients. For this, hospital-based convenience sampling was done from all the patients with diabetes complaining of foot symptoms, not necessarily foot ulcers. At the end of the study period, a total of 400 such patients were enrolled, with 50 patients having diabetic foot ulcers. These patients constituted the study group.

Data Collection Methods

All these diabetic patients with foot problems were examined and managed after taking a detailed history regarding demographic details, duration of diabetes, presenting complaints, past medical and surgical history, addictions, socioeconomic status, behavior, family history, allergies, and past treatment history. **Table 4** gives the details of the questionnaire regarding foot and footwear care to assess their awareness. This questionnaire was developed following an extensive review of relevant literature and inputs from experts. Content validity was assessed by the experts, while face validity was assessed by pilot testing the questions on a few patients initially enrolled in the study. A few minor corrections were made to ensure clarity in the questions. Appropriate factor structure using exploratory factor analysis ensured construct validity. Internal consistency, reliability, and test–retest reliability ensured the reliability of the questionnaire.

General examination and detailed local examination were done in each case, along with examination of their footwear. The condition of the skin in both lower limbs, any hair loss, any ulcers, deformity, corns/calluses, status of the nails, oedema, status of the joints, any area of necrosis or gangrene, peripheral pulses, local variation in temperature, crepitus, and any site of tenderness were specifically looked for. Measurement of the foot length, width, and circumference was done at different levels. The Ankle-Brachial Pressure Index (ABPI) was assessed using a sphygmomanometer cuff. In patients who had an indication of ischemic disease and who could not afford a Doppler ultrasound of the limb, ABPI was assessed using this method. Pain, temperature, and vibration sensations were tested to assess sensory neuropathy; muscles of the foot were assessed for their bulk and strength; Joint movements were also assessed. A 128 Hz tuning fork was used to test the vibration sensation, while a 10 g Semmes-Weinstein monofilament was used to assess pain sensations; sometimes cotton wisps were used as well to assess sensory functions. The presence of a high longitudinal medial arch and other deformities was taken as a clue for motor neuropathies. Autonomic neuropathy was assessed by the presence or

absence of dry skin with fissuring, sweating, the presence of distended veins over the dorsum of the foot, and coexisting systemic features of autonomic disturbance. Foot lesions were classified according to Wagner's classification (**Figure 1**) and clinical classification (**Figure 1**).

Investigations done included complete hemogram, routine urine, blood urea and serum creatinine, blood sugar (fasting and postprandial), culture and sensitivity of swab taken from foot ulcers, if any; X-ray of the foot and the involved joint to see bony involvement, joint deformities, gas in soft tissues, and any foreign bodies.

Doppler ultrasound sonography (USG) of the lower limb was done in neuro-ischemic patients who could afford it. Specific investigations were also conducted for other systemic involvements as needed for each patient. For example, fundoscopy was performed on patients with visual problems. The 400 patients with diabetes who enrolled for assessment of foot-related symptoms or signs were divided into three subgroups for subgroup analysis. These subgroups included (1) three groups for duration of diabetes (<5 years, 5–10 years, and >5 years duration), (2) two groups for type of diabetes (type I and type II diabetes), and (3) two groups for the nature of the work, whether indoor or outdoor. All the data regarding history, symptoms, signs, and deformities were analyzed with reference to these subgroups.

In addition, the subset of patients having foot ulcers was categorized as per Wagner's classification and clinical classification, as mentioned earlier. This was again sub-categorized depending upon the type of diabetes and its duration. Again, subgroup analysis was done.

Statistical Analysis

The details about the diagnosis and treatment given, along with follow-up data, were also collected. Detailed data thus collected were tabulated and analyzed using SPSS-19 statistical tools. Nominal data were presented as frequencies and percentages. Continuous data were presented in the form of mean and standard deviation. Chi-square test and Fisher's exact tests were used for comparing nominal data where appropriate. A *P*-value of less than or equal to 0.05 was considered significant.

Ethical Considerations

The study was conducted with the approval of the institutional ethics committee (letter no. 20/Surgery/DMCH; date: January 27, 2009). The study was done in accordance with the Declaration of Helsinki. Consent was taken from the patients for including their clinical data in the study.

RESULTS

Demographic Data of Diabetic Patients With Foot Symptoms (Among 400 Patients)

A total of 400 cases of diabetes were observed and examined in the outpatient department. These patients came with different sets of complaints, not necessarily diabetic ulcers. Out of these 400 patients, 50 patients (12.5%) had diabetic foot. The latter needed admission and were assessed in detail.

The most common age group with diabetic foot was 41 to 60 years (60%), followed by 60 to 80 years (20%), 2 to 40 years (18%), and <20 years (2%). Among these patients, males (72%) outnumbered females (28%). Of the 50 cases of diabetic foot, 74% cases had type II diabetes, while 26% cases had type I diabetes.

The mean duration of diabetes in patients with diabetic foot in this study was 5.02 years. Five patients did not know that they had diabetes in the past, and knew that they were diabetic only by virtue of the investigations done when they had foot lesions. Forty percent of patients had a history of diabetes for <5 years; 36% for a duration of 5 to 10 years, while 24% cases had >10 years of diabetes mellitus. Seventy percent of patients did outdoor work, while 30% worked at home.

Data (Results) Regarding Foot Symptoms Experienced by Diabetics (Among 400 Patients)

Among the 400 patients, there was a previous history of foot ulcer in 16% of cases and amputation in 3.75% of cases. Among the common symptoms in this cohort, numbness

Wagner's classification of Diabetic Foot

Grade	Description
Grade 0	High Risk Foot, No ulcer
Grade 1	Superficial ulcer, not clinically infected
Grade 2	Deeper ulcer with cellulitis and infection
Grade 3	Deep ulcer with bony involvement
Grade 4	Localized gangrene
Grade 5	Gangrene of the whole foot

Clinical Staging of the Diabetic Foot

Stage	Description
Stage 1	Normal Foot
Stage 2	High Risk Foot
Stage 3	Ulcerated Foot
Stage 4	Infected Foot
Stage 5	Necrotic Foot
Stage 6	Unsalvageable Foot

Figure 1: Wagner's grading system and clinical classification system of diabetic foot.

and abnormal sensation in the foot were the most common (present in approximately 45% of all diabetics presenting to the OPD). This symptom was more common in long-duration diabetes (>10 years), type II diabetes, and outdoor workers.

On subgroup analysis, the common symptoms like pain in the foot (61.4%), numbness in the foot (77.8%), and pedal oedema (38.6%) were more common in long-duration diabetes, type II diabetes, and outdoor workers. These and other symptom-related findings are shown in **Table 1**. Claudication and smoking were not related to the duration of diabetes (*P* value > 0.05); claudication was not associated with the type of diabetes, as was foot ulceration, amputation, and smoking (*P* value > 0.05); claudication and pedal oedema were not related to the nature of occupation (*P* value > 0.05).

Data (Results) Regarding the Signs/Deformities Seen in Patients With Foot Symptoms (Among 400 Patients)

Table 2 summarizes the signs and deformities data in the 400 patients, while also presenting the subgroup analysis in these patients. Common foot lesions found were callosities (55%), clawing or hammer toe (18%), great toe deformities (28%), pes cavus (12%), and Charcot's deformity (3.8%).

Callosities were the most common lesion in both types of diabetes. The next common deformity was that of the great toe. All signs/deformities were significantly associated with the duration of diabetes, except pes cavus. Pes cavus, Charcot's deformity, and diabetic foot were not associated with the type of diabetes (*P*-value > 0.05). The rest of the deformities had a significant association with the type of diabetes. All deformities except Charcot's deformity were related to the nature of the occupation of the patients. Except for pes cavus, other deformities were more frequently seen in outdoor workers.

Among muscles, the extensors were more commonly involved than the flexors in deformed diabetic feet. Extensors showed reduced bulk on measurement. They were found in 19.5% of all 400 diabetic patients, but when seen in patients with diabetic foot, extensors were reduced in 36% of the 50 cases.

Among all the toes involved, the great toe was most often involved (seen in 28% cases). Among the arches of the foot, the medial longitudinal arch was more often involved and was found to be affected in as many as 42% of the 50 admitted patients.

Among admitted patients, neuropathic feet (76%) outnumbered neuroischemic feet (24%). The number of deformed neuropathic feet was much more than those having ischemic features like absent peripheral pulse, gangrene.

Table 1: Symptoms and history data.

Findings	Duration of diabetes (years)			*P* value	Type of diabetes		*P* value	Occupation		*P* value
	<5 years	5–10 years	>10 years		Type I	Type II		Indoor	Outdoor	
Total patient out of 400	256 (64%)	100 (25%)	44 (11%)		120 (30%)	280 (70%)		210 (52.5%)	190 (47.5%)	
H/O Numbness N = 180	80 (31.25%)	65 (65%)	45 (77.8%)	**<0.05**	18 (15%)	162 (57.9%)	**<0.05%**	80 (38.1%)	100 (52.6%)	**<0.05**
H/O pain in the foot N = 160	77 (30.1%)	56 (56%)	27 (61.4%)	**<0.05**	30 (25%)	130 (46.4%)	**<0.05**	74 (32.2%)	86 (45.3%)	**<0.05**
H/O pedal oedema N = 67	38 (14.8%)	12 (12%)	17 (38.6%)	**<0.05**	28 (23.3%)	39 (13.9%)	**<0.05**	30 (14.3%)	37 (19.5%)	**<0.05**
H/O Claudication N = 20	5 (1.9%)	11 (11%)	4 (9.1%)	>0.05	5 (4.2%)	15 (5.4%)	>0.05	10 (4.8%)	10 (5.3%)	>0.05
H/O foot ulcer N = 64	25 (9.8%)	22 (22%)	17 (38.6%)	**<0.05**	16 (13.3%)	48 (17.1%)	>0.05	25 (11.9%)	39 (20.5%)	**<0.05**
H/O smoking N = 72	44 (17.2%)	19 (19%)	9 (20.4%)	>0.05	24 (20%)	48 (17.1%)	>0.05	NA	NA	
H/O amputation N = 15	5 (1.9%)	3 (3%)	7 (15.9%)	**<0.05**	3 (2.5)	12 (4.2%)	>0.05	5 (2.4%)	10 (5.3%)	**<0.05**

Figures in brackets represent percentages.

Table 2: Deformity and signs data.

Findings on foot examination	Duration of diabetes (years)			*P* value	Type of diabetes		*P* value	Occupation		*P* value
	<5 years	5–10 years	>10 years		Type I	Type II		Indoor	Outdoor	
Total patient out of 400	256 (64%)	100 (25%)	44 (11%)		120 (30%)	280 (70%)		210 (52.5%)	190 (47.5%)	
Clawing/Hammer toe N = 72 (18%)	16 (6.2%)	36 (36%)	20 (45.4%)	**<0.05**	7 (5.8%)	65 (23.2%)	**<0.05**	31 (14.8%)	41 (21.6%)	**<0.05**
Great toe deformities (Hallux valgus/varus/etc.) N = 112 (28%)	42 (16.4%)	40 (40%)	30 (68.2%)	**<0.05**	10 (8.3%)	102 (36.4%)	**<0.05**	50 (23.8%)	62 (32.6%)	**<0.05**
Pes cavus N =48 (12%)	31 (64.6%)	9 (9%)	8 (18.1%)	>0.05	16 (13.3%)	32 (11.4%)	>0.05	30 (14.3%)	18 (9.5%)	<0.05
Charcot's deformity N = 15 (3.8%)	1 (0.4%)	9 (9%)	5 (11.4%)	**<0.05**	3 (2.5%)	12 (4.3)	>0.05	6 (2.9%)	9 (4.7%)	>0.05
Callosities N = 220 (55%)	115 (44.9%)	70 (70%)	35 (79.5%)	**<0.05**	42 (35%)	178 (63.6%)	**<0.05**	80 (38.1%)	140 (73.7%)	**<0.05**
Reduced bulk of extensor muscles of the foot N = 78 (19.5%)	34 (13.3%)	21 (21%)	23 (52.3%)	**<0.05**	30 (25%)	48 (17.1%)	**<0.05**	34 (16.2%)	44 (23.2%)	**<0.05**
Diabetic foot N = 50 (12.5%)	20 (7.8%)	18 (18%)	12 (27.3%)	**<0.05**	13 (10.8%)	37 (13.2%)	>0.05	15 (7.1%)	35 (18.4%)	**<0.05**

Figures in brackets represent percentages.

Table 3: Wagner's classification, Diabetes type, duration & Diabetic foot

Wagner's grade	Diabetes Duration			*P* value	Type of Diabetes		*P* value
S. No	<5yrs.	5-10yrs.	>10yrs.		Type I	Type II	
	20	18	12		13	37	
1. N = 7	3 (15%)	2 (11.1%)	2 (16.7%)	**<0.05**	1 (7.7%)	6 (16.2%)	**<0.05**
2. N = 18	6 (30%)	7 (38.9%)	5 (41.7%)	**<0.05**	5 (38.5%)	13 (35.1%)	**<0.05**
3. N = 12	6 (30%)	4 (22.2%)	2 (16.7%)	**<0.05**	5 **(38.5%)**	7 (18.9%)	**<0.05**
4. N = 10	4 (20%)	3 (16.7%)	3 (25%)	**<0.05**	3 (23.1%)	7 (18.9%)	**<0.05**
5. N = 3	1 (5%)	1 (5.6%)	1 (8.3%)	**<0.05**	0 (0%)	3 (8.1%)	**<0.05**

Note: Figure in brackets represents percentage.

Data (Results) Related to the Type of Foot Ulcers (Among 50 Patients)

When classifying the foot ulcers among the 50 admitted patients as per Wagner's classification, Grade 2 Wagner's lesions (36%) were the most common. On subgroup analysis, Grades 2, 4, and 5 were more common in long-duration diabetes (>10 years). While Grades 2, 3, and 4 were more common in type 1 diabetes, Grades 1 and 5 were more common in type II diabetes. **Table 3** presents these results.

As per the clinical classification, the infected ulcer group was the most common (stage 4).

Results of the Responses of the Patients to the Footwear and Footcare Questionnaire (Among 400 Patients)

Table 4 gives a summary of the responses of the 400 patients in this study to the Footwear and Footcare Questionnaire. Surprisingly, 93.75% of the diabetics did not inspect their feet for cracks, callosities, trauma, or fissures. A sizeable group (41.25%) walked barefoot on some or the other occasion. Seventy-five percent of patients did not wash their feet daily, and 65% did not dry their feet completely after washing. Wrong practices like scrubbing their feet (47.5%), wearing shoes without socks (75.75%), and infrequent washing of socks (81%) were prevalent. Almost 70% patients did not care for their shoes.

Additional Results in Diabetic Foot (Among 50 Admitted Patients)

The pus swab cultures sent from the involved foot in the 50 patients revealed *Staphylococcus aureus* in 38% cases, and it was the most common infecting microorganism.

Bone Involvement and Amputation

Twenty-two percent of the admitted patients had bone involvement on X-ray. Twenty-four percent of patients had evidence of gangrene. Of the 50 admitted patients, 32% needed amputation of some part of their foot or leg. Most of the amputations were of the great toe (16%).

Doppler USG Evaluation

Due to cost constraints, Doppler USG could be done in only 10 of the 50 patients. Out of them, eight showed involvement of the posterior tibial artery, two showed involvement of the popliteal artery, and one showed involvement of both the femoral artery and popliteal artery both. Two patients had affections of the dorsalis pedis artery. So, in our study, the posterior tibial arteries were the most involved in diabetic neuro-ischemic foot.

Mortality and Morbidity

Of the 50 admitted patients, five died in the follow-up period (two due to sepsis and three due to cardiovascular events). Eight patients had eye-related symptoms and were managed by the ophthalmology team. Ten patients showed an increased level of blood urea, serum creatinine, and microscopic proteinuria.

Treatment Details

The various treatment modalities adopted included offloading the affected foot, debridement and dressings, antibiotics, grafting where needed, diabetes control (using insulin, antibiotics, diet, and exercise), amputation where necessary, and making the patients aware of footwear and foot care.

DISCUSSION

This study, conducted on diabetic patients from rural backgrounds, revealed that the foot-related symptoms in diabetics are not restricted to diabetic ulcers, but several other related symptoms and deformities occur in their natural course, all of which increase the morbidity of the patients. These pathologies are compounded and worsened by the lack of awareness about feet being at risk in diabetics and about the overall care of the feet, including the casual notion about care for the footwear. In a developing country like India, the rural population is still devoid of tertiary health care facilities, which contributes to the rural–urban divide. All these factors account for a higher incidence of diabetic feet in villages that are left uncared for, leading to an increase in the number of limbs lost to diabetes.

The incidence and severity of foot affections in diabetes can be lessened if awareness and proper care are instituted at an early stage. Indeed, the noted Diabetologist Elliott P. Joslin meant this when he said, "diabetic gangrene is not heaven-sent, but earthborn." [5] Many lesions in the spectrum of diabetic foot can be prevented, and limb salvage can be done at an early stage of the disease, if proper foot care is instituted following early consultation by an aware patient. Tight glucose

Table 4: Responses of the patients to the Footwear and Footcare Questionnaire.

Questions	Responses	
	Yes	No
1. Do you inspect your feet daily?	25 (6.25%)	375 (93.75)
2. Do you walk barefoot inside or outside your house?	165 (41.25%)	235 (58.75%)
3. Do you wash your feet daily?	100 (25%)	300 (75%)
4. Do you dry your feet completely after washing?	140 (35%)	260 (65%)
5. Are you aware that diabetics need special footcare?	80 (20%)	320 (80%)
6. Are you aware that diabetes can cause foot problems?	50 (12.5)	350 (87.5%)
7. Do you inspect your shoes daily before wearing them?	120 (30%)	280 (70%)
8. Do you scrub your feet?	190 (47.5%)	210 (52.5%)
9. Do you wear shoes with socks?	303 (75.75%)	95 (24.25%)
10. Do you wash your socks daily?	76 (19%)	324 (81%)

Figures in brackets represent percentages.

control can reduce microvascular complications and prevent ulceration. So, patient education is important for risk factor modification and early recognition of foot complications.

In this study, 12.5% of diabetic cases had diabetic foot ulcers. This has been variously reported. [6–9] There could be several reasons for finding a higher prevalence of diabetic foot ulcers in our study. The study was conducted at a tertiary referral center in a place with a predominantly rural population, where the at-risk foot is not looked after properly, and because the data were based on a hospital-based population, these could be the possible reasons for a higher prevalence of diabetic foot ulcers in this study.

Males outnumbering females and the number of outdoor workers getting affected more than the number of indoor workers can be correlated with the greater number of males getting engaged in outdoor activities, making their feet more vulnerable, as seen in this study.

In our study, the mean duration of diabetes was found to be 5.02 ± 4 years. This was significantly less than the time reported for the development of diabetic foot in diabetics by other researchers. [10–12] This can again be explained by the predominance of patients with uncared-for and ignored feet in our study. As with most other studies, the most common age group affected was 41 to 60 years, and type II diabetics were more numerous.

Numbness (45%) and pain (40%) were the most common symptoms in this study, as also reported by Harris et al. and Helfand et al. [13,14]. Callosities were seen in 55% cases, while great toe deformities were seen in 28% cases. Helfand et al. reported callosities in 46.3% and great toe deformities in 44.7% in their series. [13] In our series, pedal oedema was found in 16.75% cases, which was far less than that reported by Harris et al. (34.1%). [14] Also, the number of patients with a previous history of foot ulcers (16%) and amputation (3.75%) was fewer than that reported by Lavery et al. (34%) and Harris et al. (18.4%) but more than that reported by Rith-Najarian et al. (12.5%). [12,14,15]

The metabolic and biochemical changes that occur in a patient suffering from diabetes mellitus lead to distal sensorimotor peripheral neuropathy, autonomic neuropathy, peripheral vascular diseases, microvascular complications, and susceptibility to trauma and infection. [5,16] The interplay of these factors leads to the devastating spectrum of diabetic foot. [5] An understanding of these factors is essential to be able to intervene to lessen the incidence of diabetic foot ulcers and amputations. The Wagner classification and the clinical staging classification describe an increasing or worsening order of the spectrum of diabetic foot (**Figure 1**). Identifying and classifying a case like this helps in instituting individualized treatment to improve outcomes and decrease morbidity. In both the classification systems, the infected ulcer group was the most common (Grade 2 lesions: Wagner; Stage 4 lesions: Clinical staging).

In our series, some unique observations were made regarding alteration in the anatomy of the deformed foot. Among muscles, the extensors of the foot were more commonly involved, and changes could be appreciated in 36% of the 50 admitted children. Great toe deformities were common (28% of all 400 cases). Among arches, the medial longitudinal arch was more deformed, leading to changes in weight balance and abnormal pressure distribution, further resulting in ulcerations and other deformities. Neuropathic feet (76%) were more common compared to neuroischemic feet (24%). Of the 10 patients who could be evaluated using Doppler USG, the posterior tibial artery was found to be the most blocked.

In his review, Jeffcoate et al. reported weak evidence about foot care education reducing the risk of first ulceration. [17] However, recent advances in the understanding of pathogenesis and awareness about the factors playing a role can help in lessening the contributing factors leading to strong preventive efforts. [5] A rapid but comprehensive foot examination and risk assessment can be performed using minimal equipment, as advocated by the American Diabetes Association. [18,19] The American Diabetes Association – Diabetic Foot Risk classification – risk stratifies the patients with diabetic foot into different categories with priority for intervention, referral, and follow-up guidelines. [18] These examinations and guidelines tools can be used for better evaluation and effective management.

Three important factors in limb salvage are the degree of tissue loss (wound severity), severity of ischemia, and severity of foot infection. [20] The Society for Vascular Surgery (SVS) Threatened Limb Classification System uses a grading system (0–3) for each of these three factors and uses the acronym "WIfI score" (Wound, Ischemia, foot Infection). [20] The scoring systems also help in judging the severity of the foot lesion and guide appropriate management.

Shoes and the offloading methods have an important role in healing and rehabilitating a patient with diabetic foot. [17] Therefore, awareness about shoes and offloading methods is important. As evident from our "Footcare and Footwear Questionnaire" results (**Table 4**), patients in our study were virtually unaware of the importance of proper shoes and proper foot care. Based on the findings of this study, we now run a "Hospital-based Health Education/Awareness Program" which has instructions focused on "Podiatric Health Care in Diabetes" for the patients. Some important instructions are: (1) to stop smoking/lessen alcohol; (2) daily inspection of feet for any cracks, fissures, trauma, callosities; (3) daily washing and drying of feet; (4) stop bare foot walking; (5) regular inspection of shoes and their changing as per need and time; (6) shoes and footwear should not be hurting, no protruding nails should be there; they should be of proper size, shape and non-allergic material; insoles should cater to the needs of the patient's foot; (7) socks should be of soft cotton material with comfortable seams; (8) avoid scrubbing feet with rough stones; (9) best time to trim nails is after bath as they are softer then; (10) risky and in-turned nails should be managed by doctors in diabetics; (11) any abnormal lesion over the foot should be brought to the notice of the doctor; (12) diabetes should be kept under control by diet, exercise and drugs. Periodic examination of the eyes, cardiovascular system, nervous system, and urine must be done; (13) feet swell during the day, and so new shoes should be bought preferably in the evening hours; (14) once a diabetic foot patient, there is always a risk to the foot in the future. One should be aware and safe.

Strengths and Limitations of the Study

The study presents valuable, context-specific data giving insights into the burden and risk factors of foot symptoms and diabetic foot disease among diabetics in a rural population. However, these findings may have limited generalizability beyond the study area confined to the rural regions surrounding the tertiary center in this study. Also, partial reliance on self-reported data may introduce bias. The follow-up period was small in this short-term study. A long-term study with data from similar settings in different regions would strengthen the evidence and understanding about the foot problems in diabetics.

CONCLUSIONS

Diabetic foot frequently results from gross ignorance and negligence among diabetics with a rural background. If not cared for, it leads to disability and amputation, besides being a risk factor for mortality. Proper education about foot care, footwear, diabetes, and diabetic foot can lessen the severity of the disease and help in better rehabilitation.

AUTHORS' CONTRIBUTION

Each author has made a substantial contribution to the present work in one or more areas, including conception, study design, conduct, data collection, analysis, and interpretation. All authors have given final approval of the version to be published, agreed on the journal to which the article has been submitted, and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

None.

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