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ORIGINAL RESEARCH ARTICLE

Study on Outcomes of Different Grades of Diabetic Foot Assessed According to Wagner's Classification

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ABSTRACT

Background: A large number of patients with diabetes mellitus are unaware of foot care and are at risk of developing foot ulcer and amputation. Diabetic foot adds to economic burden due to huge expenditure on treatment, loss of productivity, frequent recurrence of the problem, and high rate of amputation. **Aims :** This study is aimed to study the outcomes of different lesions of diabetic foot assessed according to Wagner classification and also to identify measures to decrease morbidity and mortality due to diabetic foot disease. **Materials and Methods:** This institutional based observations study was conducted in Burdwan Medical College and Hospital, West Bengal. Study was conducted from April 2020 to September 2021. During the period 60

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Patients with diabetic foot were included in the study as per inclusion criteria Thorough history taking and clinical examination was done. Template was generated in MS excel sheet and analysis was done on SPSS software. **Results:** The mean age in the present study was found to be 45.95 years suggesting predominant involvement of elderly population. maximum patients presented with GRADE 2 (35%) of Wagners Classification. 54 % patients needed debridement followed by disarticulation or amputation in 24%, dressing in 12%, incision and drainage in 3% and only antibiotic coverage in 7%. in the present study 76.66% of patients healed without amputation and 23.33% healed after amputation. **Conclusion:** Patient education, aggressive infection treatment, timely amputations to prevent the spread of infection and/or ischemia, footwear and pressure relief, and overall glycemic control are all critical to controlling the long-term prognosis for patients with chronic diabetes-related morbidity and mortality.

Keywords: Diabetic foot, grades, outcome, Wagner's classification

Introduction

Diabetic foot as defined by the World Health Organization is, The foot of a diabetic patient that has the potential risk of pathologic consequences, including infection, ulceration, and/or destruction of deep tissues associated with neurologicabnormalities, various degrees of peripheral vascular disease, and/or metabolic complications of diabetes in the lower limb.[1] Diabetic Foot (DF) is one of the most prevalent admittance complications, putting a significant medical and financial strain on our healthcare system. A diabetic's lifetime chance of developing a foot ulcer is as high as 25%,[2] and it is the most prevalent reason for diabetic patients' hospitalization (around 30%) and accounts for 20% of overall health-care costs, more than all other diabetic problems combined.[3] In India, 3percent of diabetics who visit a diabetic foot management centre (both indoor and outdoor setting) get foot ulcers. Foot ulcers affect 10.4% of diabetics in rural India whovisit hospitals as outpatients or inpatients. With around 66.8 million diabetics between the ages of 20 and 70, India ranks second (behind China). Diabetes affects 8.6% of Indians, and more than 1 million Indians die each year due to diabetes related causes, according to 2013 data.

Diabetic foot adds to economic burden due to huge expenditure on treatment, loss of productivity, frequent recurrence of the problem, and high rate of amputation. An estimated 40,000 legs are amputated each year in India, of which 75% are because of neuropathy and secondary infection and these are potentially preventable.[4] In terms of expenditure, patients

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without diabetic foot problem spent 9.3%, whereas patients with foot problem spent 32.3% of their total income on their treatment.[5] This underscores the importance of prevention of diabetic foot.

The present study is aimed to study the outcomes of different lesions of diabetic foot assessed according to Wagner classification and also to identify measures to decrease morbidity and mortality due to diabetic foot disease

Materials and Methods

This institutional based observations study was conducted in Burdwan Medical College and Hospital, West Bengal. Study was conducted from April 2020 to September 2021. 60 [sixty] cases of diabetic foot from the hospital records of the previous years, the number of patients attended S-OPD or ER-S for diabetic foot patients was 84. Considering 10% patients who did not give valid consent, another 10% were excluded after application of inclusion and exclusion criteria 60 patients were included over a period of one year.

Inclusion criteria were Adult male or female, 18 years of age or over having diagnosis of type 1 or 2 diabetes. Has a diagnosis of neuropathic foot ulcer with minimal, if any, ischemia present (Ankle-Brachial). Currently receiving treatment for diabetic foot ulcer or had an active ulcer healed within last 6 months. Exclusion criteria were patient has diagnosis of ulcer pertaining to other pathology such as Pressure ulcer, venous ulcer, arterial ulcer of has ulcers which are traumatic in origin such as burns, cold injury, radiation induced.

Data was collected by detailed history, clinical examination, wound or ulcer and wase recorded in the predesigned profoma. Age, sex, socioeconomic status, duration and type of diabetes, wagner's classification, examination findings, blood investigations, renal function test, swab of the wound. X-ray and treatment provided was collected. Treatment was carried out in both medical and surgical means.

Classification of diabetic ulcers

Wagner system foot lesions are divided into six grades based on the depth of the wound and extent of tissue necrosis.[6]

The Wagner diabetic foot ulcer classification system assesses ulcer depth and the presence of osteomyelitis or gangrene by using the following grades:

Grade 0 – intact Skin

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Grade 1 – superficial ulcer of skin or subcutaneous tissue

Grade 2 – ulcers extend into tendon, bone, or capsule

Grade 3 – deep ulcer with osteomyelitis, or abscess

Grade 4 – partial foot gangrene

Grade 5 – whole foot gangrene

Statistical Analysis: Statistical analysis using statistical package for social sciences (SPSS) was done, and categorical data was expressed as rates, ratios and percentages and comparison was done using Fisher's exact test. A 'p' value of less than or equal to 0.05 at 95% confidence interval was considered as statistically significant. The relative risk of amputation in different grades of diabetic foot ulcer based on Wagner classification was determined.

Results

This institutional based observations study was conducted in Burdwan Medical College and Hospital, West Bengal. Study was conducted from April 2020 to September 2021. During the period 60 Patients with diabetic foot were included in the study as per inclusion criteria.

Table 1 : Gender wise distribution of the patients.

Gender	Number	Percentage (%)
Male	42	70.0
Female	18	30.0

Table 1 shows that In the present study male preponderance was noted as majority of the patients were males (70%) with higher male to female ratio (2.3:1).

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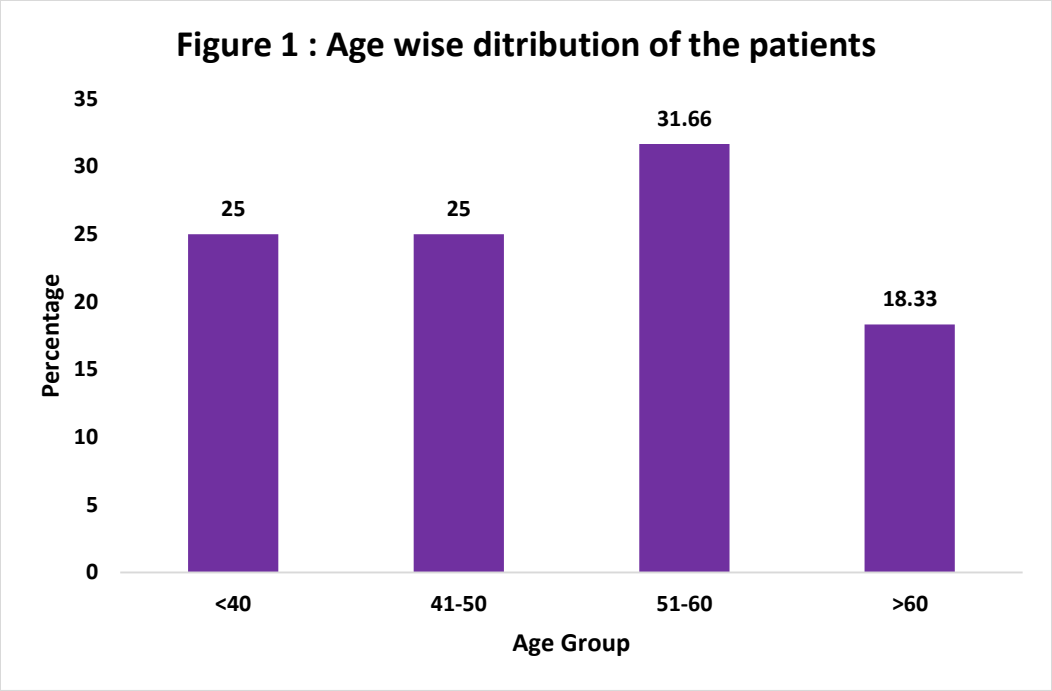

The mean age in the present study was found to be 45.95 years suggesting predominant involvement of elderly population. (Figure 1)

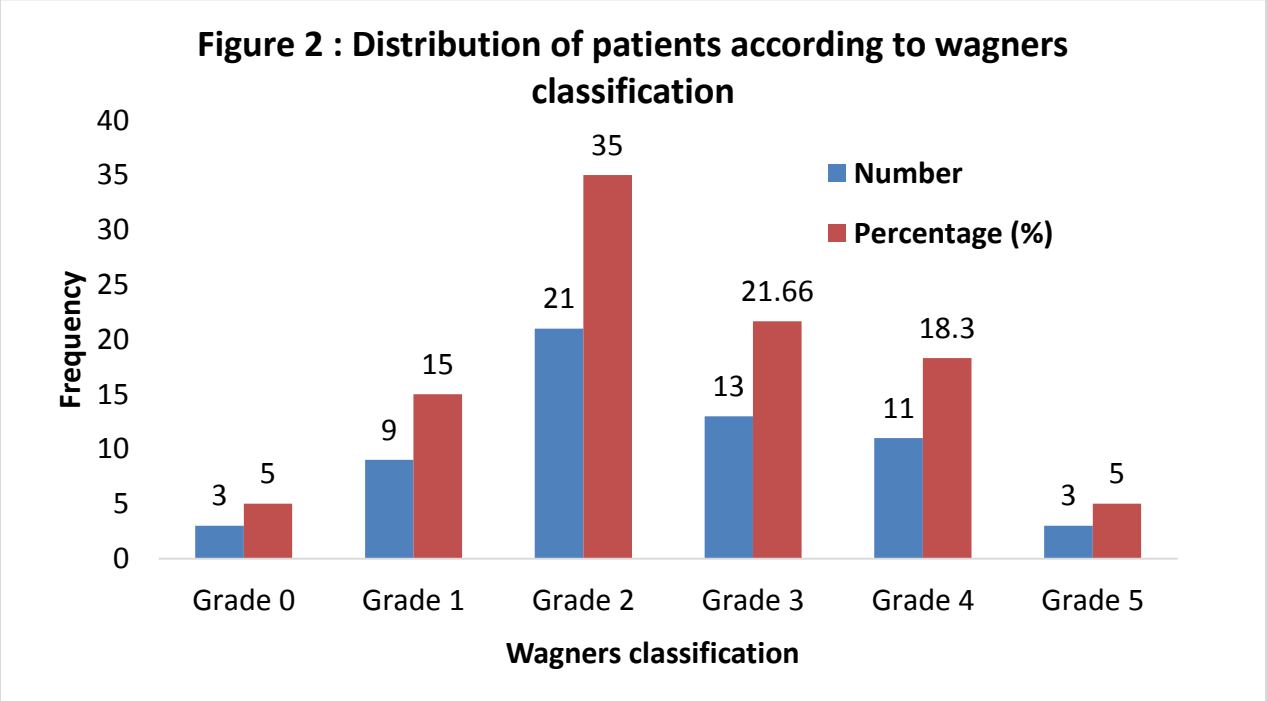

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Figure 2 shows that the maximum patients presented with GRADE 2 (35%) of Wagners Classification.

Table 2: Distribution of patients according to treatment provided.

Treatment	Number	Percentage (%)
Antibiotics alone	4	6.66
Dressing	7	11.66
Incision and drainage	2	3.33
Debridement	32	53.33
Amputation	14	23.33

Table 2 shows that 54 % patients needed debridement followed by disarticulation or amputation in 24%, dressing in 12%, incision and drainage in 3% and only antibiotic coverage in 7%.

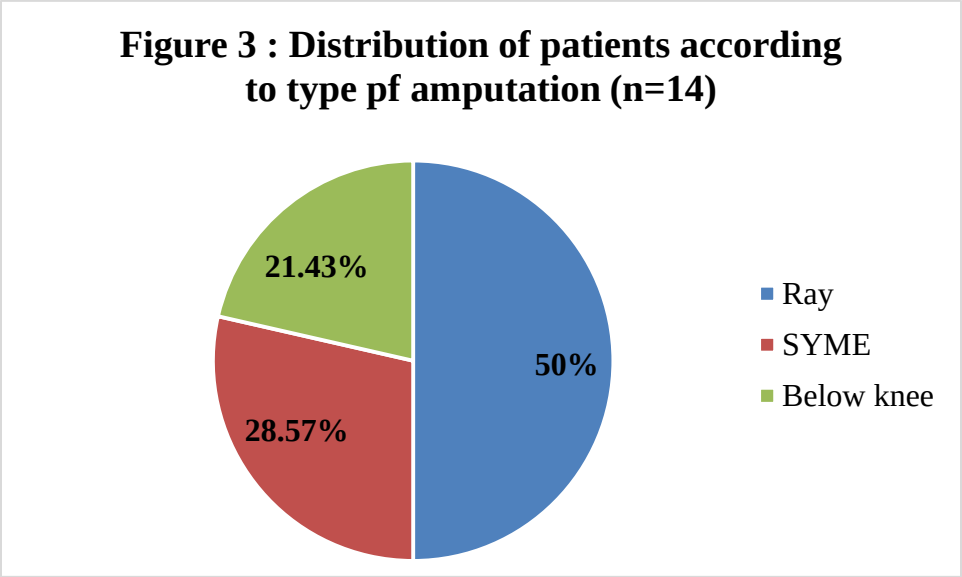

Figure 3 shows that out of 14 amputations 50% amputation were done using ray followed by SYME 28.57% and below knee 21.42%.

Table 3: Outcome according to ulcer grading based on Wagners Classification (n=14).

Wagners Grade	Healing without amputation		Healing with amputation	
	Number	Percentage (%)	Number	Percentage (%)
GRADE 0	3	5.0	0	0
GRADE 1	9	15.0	0	0

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GRADE 2	21	35	0	0
GRADE 3	13	22.66	0	0
GRADE 4	0	0	11	18.3
GRADE 5	0	0	3	5.0

Table 3 shows that in the present study 76.66% of patients healed without amputation and 23.33% healed after amputation. The patient group not requiring amputation comprised of patients belonging to grade 0,1,2 and 3 of Wagners Classification while patients with grade 4 and 5 of Wagners Classification constituted patients who had to undergo amputation. Thus an increased trend in amputation with increasing Wagners classification Grade. Patients belonging to Grade 4 and 5 have 90.8 times higher risk of amputation compared to grade 0,1,2 and 3. (significant p value < 0.05, Relative risk 90.8,95 % CI 5.75 to 1433.78).

DISCUSSION

Diabetic foot is a common and dreaded complication of Diabetes. This has both social and economic implications for the patient and his/her family. To add to the insult is the ever lingering risk for amputation or even death in the worst case scenario. Considering that a large part of Indian population comprises of Diabetics the burden on healthcare system is tremendous. As observed in our study, it is more common in males. More commonly afflicted age group are those in between 40-60 in our study. The hallmark of diabetic foot is its gross infection and major contributing factors are negligence, social stigma, poorly managed Diabetes, bare foot walking, self treatment.

Peripheral neuropathy and infection are common risk factors diabetic foot. In our study mixred infection, includes aerobes, anaerobes, is common. The standard treatment for diabetic foot according to Wagner's classification is

1. Grade 0 - Prevention
2. Grade 1 - Antibiotics and good glycemic control
3. Grade 2 – hospitalisation as they need surgical management along with antibiotics and glycemic control
4. Grade 3 – debridement
5. Grade 4 – wide debridement along with amputation
6. Grade 5 – preferred treatment is below knee amputation

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There have been several classification systems proposed for diabetic foot ulcers. Certain characteristics, such as precision, flexibility, specificity, and simplicity, must be met by these classification systems. They must also be applicable for education and communication among all types of care providers, including nurses, general practitioners, and specialists. They can be extremely useful in evaluating treatment plans. The most common classifications are based on factors such as infection, neuropathy, vasculopathy, and the extent (surface and depth) of the ulcer.

The best known and widely available classifications are Meggit/Wagner, Gibbon's, Frykberg's and Coleman's, Forrest's, Knighton's, the Texas Diabetic Wound Classification, and the Ten-Level Seattle Wound Classification System.5 Each of these classifications were developed to accomplish a particular objective, utilizes different criteria, and categorizes lesions according to different rationales. Only a few of these classifications were evaluated for the assessment of the prognosis on salvage of the ulcerated diabetic limb. Wagner's classification is the most widely accepted Grading system for Lesions of Diabetic foot. This study assessed the role of Wagner wound classification in predicting the outcome of diabetic foot ulcer.

The present one year cross sectional study included a total of 60 patients with diabetic foot ulcer at the Department of General Surgery, Burdwan Medical College and Hospital. The diabetes foot ulcers were graded according to the Wagner's classification. The occurrence of DFUs mostly in males and middle-aged subjects has been reported by several researchers. In the present study male preponderance was noted as majority of the patients were males (70%) with higher male to female ratio (2.3:1). (Table 1) These findings were consistent with a study from Varanasi to determine risk factors for foot ulceration where 71.13% of the patients were males and 28.86% were females.[7] The mean age in the present study was found to be 45.95 years suggesting predominant involvement of elderly population. A study from Varanasi to determine risk factors for foot ulceration reported mean age of the patients with diabetic foot ulcers as 55.25 years. The mean age in the present study was found to be 45.95 years suggesting predominant involvement of elderly population. A study from Varanasi to determine risk factors for foot ulceration reported mean age of the patients with diabetic foot ulcers as 55.25 years.[7]

In the present study most of the patients (35%) had Grade 2 diabetic foot ulcers followed by Grade 3(21.66%), Grade 4 (18.3%), Grade I(15%) and Grade 0 and Grade 5 (3%) each based on Wagner's Classification (Table 2). Recently a study to evaluate diabetic foot ulcer according to

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Wagner's Classification at a rural hospital in Maharashtra, India found that the commonest presentation was Wagner's Grade 2 diabetic foot.[8]

In this study 53.3 % patients needed debridement followed by disarticulation or amputation in 23.33%, dressing in 11.66%, incision and drainage in 3.33 % and only antibiotic coverage in 6.66%. Of these majority of the patients (79%) had healing without amputation but a substantial number of patients (20.83%) needed amputation. However, of the 10 patients who had grade I diabetic foot ulcer all (100%) had healing without amputation. Further of the 31 patients with grade III ulcer, 51.61% had healing. In the present study 76.66% of patients healed without amputation and 23.33 % healed after amputation. The patient group not requiring amputation comprised of patients belonging to grade 0,1,2 and 3 of Wagners Classification while patients with grade 4 and 5 of Wagners Classification constituted patients who had to undergo amputation. Thus an increased trend in amputation with increasing Wagners classification Grade. Patients belonging to Grade 4 and 5 have 90.8 times higher risk of amputation compared to grade 0,1,2 and 3. (significant p value < 0.05, Relative risk 90.8,95 % CI 5.75 to 1433.78).

The current study's findings were consistent with those of Oyibo et al, who found that the Wagner grade significantly correlates with the risk of amputation.[9] According to Calhoun et al, an increase in Wagner grade was associated with a higher rate of treatment failure.[10] Wagner grades 4 and 5 ulcers indicate the presence of local or diffuse gangrene, which is typically caused by a combination of ischemia and infection. It is not surprising, then, that in our study, grade 4 and 5 ulcers were strongly associated with amputation. According to a study conducted in Pakistan, lower grade lesions responded well to conservative treatment with antibiotics and surgical debridement, whereas those with higher Grades 4 and 5 required amputation.[11] They also concluded that Grading diabetic foot lesions according to Wagner's classification helps in correlating appropriate treatment to Proper Grade of lesion with better outcome. Another study in Karachi to know the role of wound classification in predicting the

outcome of diabetic foot ulcer showed that grading diabetic foot ulcer affects and predicts the outcome and amputation rates increase with increase in the Wagner's grade.[12] Calhoun et al found that classification of foot lesion not only enabled them to institute proper treatment regimen, but additionally, when such protocols were followed, the treatment outcome were significantly more successful than when protocols were not followed.[10]

Overall, the current study found that grading diabetic foot ulcers using the Wagner classification

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affects and predicts the outcome, and that amputation rates increase as the grade increases.

CONCLUSION

In this study, we found that Grading of diabetic foot ulcer based on Wagner's classification affects and predicts the outcome and the risk of amputation increases with increasing grade. Most of the patients admitted for diabetic foot ulcers in our hospital belonged to Wagner's grade 2 (48%). Patient education, aggressive infection treatment, timely amputations to prevent the spread of infection and/or ischemia, footwear and pressure relief, and overall glycemic control are all critical to controlling the long-term prognosis for patients with chronic diabetes-related morbidity and mortality.

The best treatment is prevention. Wagner's classification of diabetic foot lesions aids in the selection of appropriate treatment for each grade. Incidence of Diabetic foot can be decreased with patient education and aggressive glycemic control. Early identification and hospitalization, as well as proper therapy, such as medicinal and surgical treatment tailored to the severity of the condition, can drastically reduce morbidity and mortality.

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