DOI: https://doi.org/10.53350/pjmhs020231711667

**ORIGINAL ARTICLE**

# Prevalence and Severity of Visual Impairment in patients with Diabetic Foot Sepsis presenting in Surgical OPD of a Tertiary Care Hospital: An Observational Study

MUHAMMAD ZAFAR IQBAL[1], MALIK IRFAN AHMED[2], ABDUL QADIR KHURRUM[3], SAMRA RIAZ[4], ALI KAMRAN[5]
[1]*Associate Professor of Surgery, Rawalpindi Medical University, Rawalpindi*
[2]*Assistant Professor of Surgery, HBS Medical and Dental College, Islamabad*
[3]*Assistant Professor of Surgery, Rawalpindi Medical University, Rawalpindi*
[4]*Senior Registrar, Surgery, Rawalpindi Teaching Hospital, Rawalpindi*
[5]*Senior Registrar, Surgery, Rawalpindi Teaching Hospital, Rawalpindi*
*Correspondence to: Muhammad Zafar Iqbal, Email: mzafar1@gmail.com*

## ABSTRACT

**Background:** Amongst various complications of Diabetes mellitus, Diabetic septic foot and visual pathologies are most dreadful complications that lead to physical disability. Both of these conditions are due to Microvascular and Macrovascular pathology. Both of these conditions are well researched independently, but their specific co relationship between advance DSF and Ocular morbidity in Pakistani public remains under explored.

**Objective:** To determine the prevalence and severity of Diabetic Retinopathy and other visual pathologies in patients with Diabetic Septic Foot (DSF) disease, presenting daily Surgery Outpatients Department (OPD), in allied hospitals.

**Methods:** This prospective (cross sectional) study was conducted at Allied Hospitals of Rawalpindi Medical University from March 2019 to March 2023. A total of 315 patients were enrolled who had clinical DSF disease. The patients were examined by surgical specialist and findings noted on a Performa. These patients were then sent to Ophthalmology OPD with the same Performa. The ophthalmologist performed their relevant test which included visual acuity, slit-lamp examination, and fundoscopy through dilated pupils. The combine data both from general surgical and Ophthalmology specialists were analyzed using SPSS version 26.

**Results:** The study analyzed data from 315 patients with diabetic septic foot disease. The cohort had a mean age of 52.1 +- 8.4 years, with half of the patients (50.5%, n=159) belonging to the 40-50 years age group. This indicates a high disease burden in economically productive population. There was a significant male predominance (82.2% , n=259). A large proportion of patients were not well educated, with 51.7% ( n=163) educated bellow middle standard and 14.0% (n=44) being illiterate.

The mean duration of diabetes was 10.2 +- 4.8 years. Regarding foot pathology, a very large number (42.5%, n=134) of patients presented with gangrene, needing major or minor amputation of part involved. According to wageners classification, a significantly large number (n=234 ) of patients had advance DSF disease on presentation ( grade 3,4,and 5).

**Ophthalmologic findings:** The comprehensive examination of both eyes of patients revealed a staggering burden of ocular morbidity. The most significant finding was that 55 % of the patients (n=175 ) had some degree of diabetic retinopathy. The severity was distributed across the spectrum, with 17.8% (n=56) having mild non-proliferative DR (NPDR), 34.0 %(n=107) had moderate to severe NPDR, and 12.0 % ( n=12) had sight threatening proliferative DR(PDR). A vast majority of patients (84.1%, n=265) had correctable refractive errors. Cataract was present in 55.6% ( n=175) of cohort of patients.

A cross tabulation analysis revealed a statistically significant association ( p< 0.001) between the severity of DSF disease and stage of DR.

**Conclusion:** this study revealed an alarming high prevalence of Diabetic Retinopathy in patients of DSF presenting in surgical OPDs of Aliied Hospitals of Rawalpindi Medical University. The triad of low socioeconomic status, poor glycemic control and delayed presentation leads to concurrent, severe microvascular and macrovascular complications, which result in limb or foot disasters. These findings mandate an integrated , multidisciplinary care model in our settings for the management of Diabetic Septic foot. This will facilitate early detection and management of DSF. This is the only way to prevent catastrophy related to lower limbs of Diabetic patients.

**Keywords:** diabetic septic foot, Diabetic Retinopathy, diabetic complications, multi-disciplinary, multi-disciplinary care.

## INTRODUCTION

Diabetes mellitus is so common as if it is an epidemic globally. Pakistan is among the top ten countries in the world as far as its prevalence is concerned.[1] Patients suffering from diabetes mellitus have chronically elevated hyperglycemia, which results in a cascade of microvascular and macrovascular complications that significantly contribute to morbidity and mortality.[2] This can lead to poor quality of life and may also cost patients their limbs or even their lives.[3] Among all other complications of diabetes mellitus, diabetic septic foot (DSF) and diabetic retinopathy (DR) are the most devastating. DSF is a leading cause of lower limb amputations worldwide, other than trauma.[4] It is characterized by infection leading to ulceration of the skin and destruction of deep tissues of the foot. If not recognized early, it can result in partial or complete limb loss. The pathogenesis of this condition is a triad of neuropathy, peripheral arterial disease, and immunopathy.[5]

Received on 11-09-2023
Accepted on 06-11-2023

Similarly, diabetic retinopathy (DR) is the most common cause of preventable blindness in the working-age adult population.[6] It progresses from non-proliferative abnormalities to sight-threatening proliferative DR and diabetic macular edema.

The shared underlying pathophysiology chronic hyperglycemia-induced endothelial dysfunction, oxidative stress, and accumulation of advanced glycation end-products suggests that these complications are not isolated events but parallel manifestations of systemic diabetic damage.[7] A patient with severe foot disease is likely to suffer from significant microvascular damage in other vascular beds, particularly the retina and kidneys.[8]

Despite this pathophysiological link, these complications are often not managed by a coordinated team of surgeons, physicians, and ophthalmologists. This situation worsens in resource-constrained countries like Pakistan. A patient presenting with a foot ulcer in surgical OPD may not receive an ophthalmological referral, leading to undiagnosed and progressing retinopathy.[9] The situation is further aggravated by low health literacy, poor. Socioeconomic conditions, and inadequate access to specialized care, resulting in

advanced and often irreversible disease due to late presentations.[10]

While international literature has established a correlation between diabetic foot ulcer and retinopathy, local data are scarce, particularly in the Pakistani population.[11] Understanding this relationship is crucial for developing effective, integrated public health and clinical strategies.

This study aims to bridge this gap by investigating the prevalence and spectrum of diabetic retinopathy and other visual abnormalities in a large cohort of patients (n = 315) presenting with DSF disease to the surgical units of Allied Hospitals, Rawalpindi Medical University. The findings will help the public sector develop a coordinated, multidisciplinary diabetic care model in Pakistan's healthcare system.

## MATERIAL AND METHODS

**Study Design and Setting:** A prospective cross-sectional study was conducted at the surgical outpatient departments, diabetic clinics, and ophthalmology OPDs of the Allied Hospitals of Rawalpindi Medical University. The study was carried out from March 2019 to March 2023. Ethical approval was obtained from the Institutional Review Board of Rawalpindi Medical University (Ref: RMU/IRB/2019/45).

**Study Participants:** A total of 315 patients with a clinical diagnosis of DSF disease were enrolled using a consecutive, non-probability sampling technique.

**Inclusion Criteria**

- Patients aged 18 years and above of either sex
- Diagnosed with type 2 diabetes mellitus
- Presenting with a diabetic foot complication as defined by the International Working Group on the Diabetic Foot (IWGDF):[12]
- Active ulcer (Wagner grade 1–5)
- Infection
- Gangrene

**Exclusion Criteria**

- Patients with non-diabetic foot pathologies (e.g., traumatic wounds, venous ulcers)
- Patients with pre-existing blindness from non-diabetic causes (e.g., glaucoma, trauma)
- Patients who were critically ill or unwilling to give informed consent

**Data Collection and Variables:** Data were collected using a pre-designed, structured proforma with the following sections:

**Demographic and socioeconomic data:** Age, gender, educational status (illiterate, below middle standard, middle and above), occupation.

**Diabetes-related history:** Duration of diabetes mellitus, treatment modalities.

**Foot assessment:** Wagner's classification was used.[13] The presence of gangrene was specifically noted.

**Ophthalmological assessment:** Conducted in the ophthalmology OPD by at least senior registrar-level doctors and included:

- Visual acuity
- Refraction
- Slit-lamp examination
- Fundoscopy

**Operational Definitions**

**Correctable visual pathology:** Visual impairment that improved by more than two lines on the Snellen chart with pinhole or refraction.

**Diabetic septic foot:** Any foot lesion in diabetic patients involving infection, ulceration, or gangrene.

**Data Analysis:** Data were analyzed using SPSS version 26.0. Descriptive statistics were computed for all variables. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. The chi-square test was used to assess associations between categorical variables (e.g., retinopathy severity and Wagner's grade). A p-value of <0.05 was considered statistically significant.

**Ethical Considerations:** Written informed consent was obtained from all participants after explaining the study purpose and procedures. Confidentiality was maintained, and patients diagnosed with sight-threatening conditions were provided with immediate consultation and management plans.

## RESULTS

A total of 315 patients with diabetic septic foot were included in the final analysis. The mean age of the patients was 52.1 ± 8.4 years, and about half of the cohort (50.5%) belonged to the 40–50-year age group. There was a clear male predominance, with males accounting for 82.2% (n = 259) of the study population.

The mean duration of diabetes mellitus was 10.2 ± 4.8 years. Based on duration, 18.4% of patients had diabetes for less than 5 years, 45.1% for 5–10 years, and 36.5% for more than 10 years.

With respect to foot disease severity, the majority of patients presented with advanced disease. Wagner grade 3, 4, or 5 lesions were observed in 74.3% of patients. Gangrene was present in 42.5% of cases, many of whom required partial or complete amputation.

Ophthalmological assessment revealed that more than half of the patients (55.6%) had diabetic retinopathy. Mild non-proliferative diabetic retinopathy (NPDR) was identified in 17.8% of patients, moderate to severe NPDR in 34.0%, and proliferative diabetic retinopathy in 3.8%. In contrast, 44.4% of patients had no evidence of diabetic retinopathy. Other ocular findings were also common; correctable refractive errors were detected in 84.1% of patients, while cataract was present in 55.6%.

Analysis of the relationship between diabetic retinopathy and foot disease severity showed a clear distribution across Wagner grades. In early foot disease (Wagner grades 1 and 2), most patients had either no diabetic retinopathy or only mild NPDR. As foot disease severity increased, more advanced forms of diabetic retinopathy became common. Moderate to severe NPDR was predominantly observed in Wagner grades 4 and 5, while all cases of proliferative diabetic retinopathy occurred in patients with Wagner grade 4 disease.

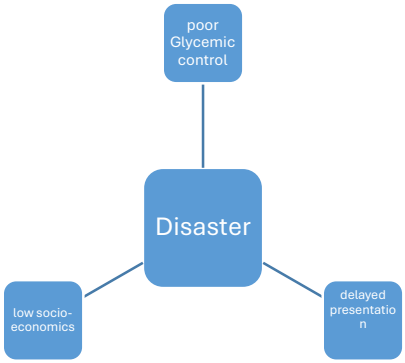
Table and Charts:

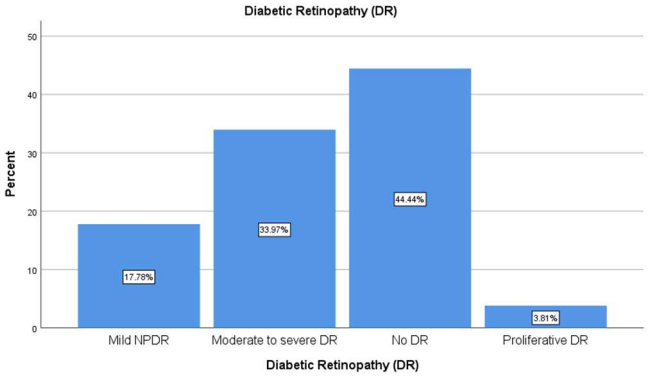
| Educational Level | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Below middle | 163 | 51.7 | 51.7 | 51.7 |
| | Illeterate | 44 | 14.0 | 14.0 | 65.7 |
| | Middle and above | 108 | 34.3 | 34.3 | 100.0 |
| | Total | 315 | 100.0 | 100.0 | |

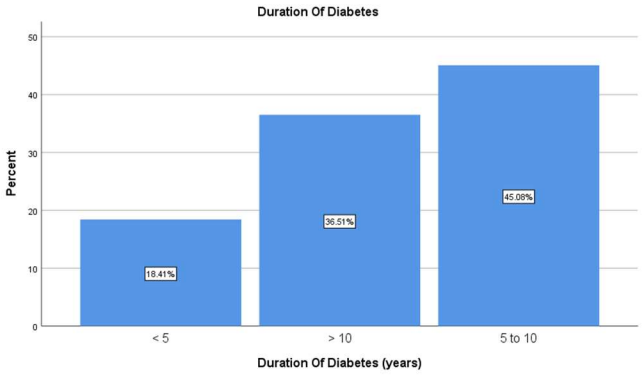
| Wagner Grade | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Grade 1 | 45 | 14.3 | 14.3 | 14.3 |
| | Grade 2 | 36 | 11.4 | 11.4 | 25.7 |
| | Grade 3 | 100 | 31.7 | 31.7 | 57.5 |
| | Grade 4 | 104 | 33.0 | 33.0 | 90.5 |
| | Grade 5 | 30 | 9.5 | 9.5 | 100.0 |
| | Total | 315 | 100.0 | 100.0 | |

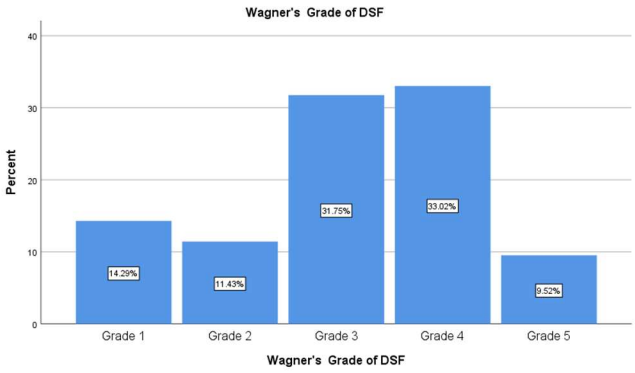
| Diabetic Retinopathy (DR) | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Mild NPDR | 56 | 17.8 | 17.8 | 17.8 |
| | Moderate to severe DR | 107 | 34.0 | 34.0 | 51.7 |
| | No DR | 140 | 44.4 | 44.4 | 96.2 |
| | Proliferative DR | 12 | 3.8 | 3.8 | 100.0 |
| | Total | 315 | 100.0 | 100.0 | |

| Diabetic Retinopathy (DR) * Wagner Grade * Duration of Diabetes Crosstabulation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Count | | | | | | | | |
| Duration of Diabetes | | | Wagner Grade | | | | | Total |
| | | | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Grade 5 | |
| < 5 | Diabetic Retinopathy (DR) | Mild NPDR | 3 | 0 | | | | 3 |
| | | No DR | 42 | 13 | | | | 55 |
| | Total | | 45 | 13 | | | | 58 |
| > 10 | Diabetic Retinopathy (DR) | Moderate to severe DR | | | | 73 | 30 | 103 |
| | | Proliferative DR | | | | 12 | 0 | 12 |
| | Total | | | | | 85 | 30 | 115 |
| 5 to 10 | Diabetic Retinopathy (DR) | Mild NPDR | | 23 | 30 | 0 | | 53 |
| | | Moderate to severe DR | | 0 | 4 | 0 | | 4 |
| | | No DR | | 0 | 66 | 19 | | 85 |
| | Total | | | 23 | 100 | 19 | | 142 |
| Total | Diabetic Retinopathy (DR) | Mild NPDR | 3 | 23 | 30 | 0 | 0 | 56 |
| | | Moderate to severe DR | 0 | 0 | 4 | 73 | 30 | 107 |
| | | No DR | 42 | 13 | 66 | 19 | 0 | 140 |
| | | Proliferative DR | 0 | 0 | 0 | 12 | 0 | 12 |
| | Total | | 45 | 36 | 100 | 104 | 30 | 315 |




When stratified by duration of diabetes, patients with a duration of less than 5 years largely showed no diabetic retinopathy, with only a few cases of mild NPDR. Patients with diabetes duration of 5–10 years exhibited mainly mild to moderate retinopathy, whereas proliferative diabetic retinopathy was observed exclusively in patients with diabetes duration exceeding 10 years.

Overall, statistical analysis confirmed a strong association between the severity of diabetic retinopathy and the Wagner grade of diabetic foot disease ($\chi^2 = 299.97$, df = 12, $p < 0.001$).

## DISCUSSION

This prospective study of 315 patients provides strong evidence of a link between DSF and DR in our population. The finding that over half of the patients had some degree of DR is alarming and exceeds the reported prevalence of DR in the general diabetic population, which ranges from 30% to 40%.[14,15] Therefore, patients presenting with advanced foot complications represent a distinct subgroup with severe and widespread microvascular damage.

Our results are consistent with, yet more pronounced than, findings from international studies. Kumar et al. in India reported a DR prevalence of 72% among diabetic foot ulcer patients.[16] A meta-analysis by Zhang et al. concluded that the presence of a diabetic foot ulcer significantly increased the odds of having DR (OR 2.89).[11] The high prevalence observed in our study may be attributed to late presentation, prolonged duration of diabetes, and poor glycemic control. This “triad of failure”—failure of preventive care, failure of glycemic control, and failure of early detection—leads to severe complications such as DSF and DR.

The significant male predominance (82.2%) reflects higher occupational exposure to foot trauma.[17] The large proportion of patients with education below middle standard (65.7%) highlights a key social determinant influencing healthcare-seeking behavior

and adherence to treatment. Poor health literacy contributes to inadequate foot care, poor glycemic control, lack of regular ophthalmologic screening, and delayed surgical intervention.[18]

A patient with gangrenous diabetic foot sepsis is highly likely to develop sight-threatening proliferative DR, underscoring the need for routine ophthalmological referral. The high prevalence of correctable refractive errors and cataract further contributes to disability. Impaired vision affects a patient's ability to perform foot self-examination, recognize early signs of ulceration, and maintain foot hygiene, thereby perpetuating a vicious cycle of diabetic complications.[19]

**Strengths and Limitations:** A key strength of this study is its large sample size in a real clinical setting. The use of standardized classification systems for foot and eye pathology enhances reliability. However, being a single-center study, findings may not be fully representative of the entire Pakistani population. The cross-sectional design establishes association but not causality. Other microvascular complications, such as nephropathy, were not included, which would have provided a more comprehensive assessment of systemic involvement.

**Clinical Importance:** This study indicates that the current practice of diabetic care in the public sector healthcare system is not aligned with international standards. This places patients at high risk for devastating complications such as DSF, DR, and nephropathy. It is recommended that multidisciplinary diabetic foot clinics be established within public sector hospitals, offering medical, surgical, and ophthalmological care under one roof. Patients should be evaluated by trained general surgeons, diabetologists, dietary experts, and pharmacists, with access to psychological support for those undergoing major amputations.

A structured protocol should be implemented whereby:

- Every patient with a diabetic foot problem receives mandatory same-day ophthalmological screening.
- Every patient diagnosed with sight-threatening retinopathy is counseled on the critical importance of foot care.
- Community-based awareness programs educate patients about the interconnected nature of diabetic complications.

Such an integrated approach can break the cycle of neglect, facilitate early detection, streamline management, and ultimately prevent blindness and amputations.

## CONCLUSION

This study unequivocally demonstrates that diabetic retinopathy is a near-universal companion of diabetic septic foot disease in our patient population. The coexistence of these severe complications, driven by poor glycemic control and delayed presentation, highlights critical systemic failures in the current diabetes care framework. Management must evolve from a fragmented, organ-specific approach to a holistic, patient-centered, and integrated model.

## REFERENCES


1. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: IDF; 2021.
2. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045. Diabetes Res Clin Pract. 2019;157:107843.
3. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. N Engl J Med. 2017;376(24):2367–2375.
4. Hingorani A, LaMuraglia GM, Henke P, et al. The management of diabetic foot: A clinical practice guideline by the Society for Vascular Surgery. J Vasc Surg. 2016;63(2 Suppl):3S–21S.
5. Yau JWY, Rogers SL, Kawasaki R, et al. Global prevalence and major risk factors of diabetic retinopathy. Diabetes Care. 2012;35(3):556–564.
6. Bourne RRA, Flaxman SR, Braithwaite T, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and vision impairment. Lancet Glob Health. 2017;5(9):e888–e897.
7. Brownlee M. The pathobiology of diabetic complications: A unifying mechanism. Diabetes. 2005;54(6):1615–1625.
8. Afkarian M, Zelnick LR, Hall YN, et al. Clinical manifestations of kidney disease among US adults with diabetes. JAMA. 2016;316(6):602–610.
9. Scanlon PH. The English National Screening Programme for diabetic retinopathy 2003–2016. Acta Diabetol. 2017;54(6):515–525.
10. Gillani AH, Sulaiman SA, Baig MR, et al. Barriers to diabetes care in Pakistan: A qualitative study. BMC Health Serv Res. 2018;18(1):423.
11. Zhang Y, Lazzarini PA, McPhail SM, et al. Global disability burdens of diabetes-related lower-extremity complications. Diabetes Care. 2020;43(5):964–974.
12. International Working Group on the Diabetic Foot (IWGDF). IWGDF Guidelines on the Prevention and Management of Diabetic Foot Disease. 2019.
13. Wagner FW Jr. The diabetic foot. Orthopedics. 1987;10(1):163–172.
14. Zheng Y, He M, Congdon N. The worldwide epidemic of diabetic retinopathy. Indian J Ophthalmol. 2012;60(5):428–431.
15. Fong DS, Aiello L, Gardner TW, et al. Retinopathy in diabetes. Diabetes Care. 2004;27(Suppl 1):S84–S87.
16. Kumar S, Pai S, Ravishankar R, et al. Prevalence of diabetic retinopathy in patients with diabetic foot ulcers. Indian J Endocrinol Metab. 2018;22(4):514–518.
17. Abbas ZG, Lutale JK, Bakker K, et al. The "Step by Step" Diabetic Foot Project in Tanzania. Int Wound J. 2011;8(2):169–176.
18. Ahmad J, Masood T, Ahmed I, et al. Diabetic foot ulcers: A growing global concern. J Pak Med Assoc. 2020;70(1):144–148.
19. Dorresteijn JAN, Kriegsman DMW, Assendelft WJJ, et al. Patient education for preventing diabetic foot ulceration. Cochrane Database Syst Rev. 2014;(12):CD001488.


**This article may be cited as:** Iqbal MZ, Ahmed MI, Khurrum AQ, Riaz S, Kamran A; Prevalence and Severity of Visual Impairment in Patients with Diabetic Foot Sepsis Presenting in Surgical OPD of a Tertiary Care Hospital: An Observational Study. Pak J Med Health Sci, 2023;17(11):667-670.