ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 06 | June - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ASSOCIATION OF SEVERITY OF DIABETIC RETINOPATHY IN PATIENTS WITH DIABETIC FOOT ULCER

Ophthalmology

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ABSTRACT

Objective: To establish association of diabetic retinopathy prevalence in diabetic foot ulcer patients based on severity and grade of disease. **Methods:** A cross sectional study done on patients presenting with diabetic foot ulcer at a tertiary care center, who underwent ophthalmic examination within study period of 10 months. A total of 108 patients who fulfilled the inclusion criteria were included in the study, diabetic foot ulcers were graded based on Wagner's grade and diabetic retinopathy was graded according to ETDRS classification to assess the severity and association between the two conditions. **Results:** Out of 108 patients, most grade 3 diabetic foot patients were seen in no DR group =12(66.7%) while, least grade 3 diabetic foot number was noted in PDR group =3(33.3%). Grade 1 diabetic foot was most noted in mild NPDR =3(10%) and least in CSME =0(0%). With a p value of 0.644%, this study reports no significant correlation between severity and grade of diabetic foot ulcer However, there is a significant correlation between the levels of HbA1C and the severity of diabetic retinopathy.

KEYWORDS

Diabetic foot ulcers, Diabetic retinopathy, Ophthalmic screening , Wagner classification.

INTRODUCTION

Diabetes Mellitus is a heterogeneous group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin resistance, or both. Diabetes is gaining the status of a potential epidemic in India with more than 62 million individuals currently diagnosed with the disease [1].

Diabetic foot ulcer is one of the most serious and disabling complications of DM, resulting in significantly elevated morbidity and mortality. Vascular insufficiency and associated neuropathy are important predisposing factors for diabetic foot ulcer, and diabetic foot ulcer is the most common cause of non-traumatic foot amputation worldwide. Up to 70% of all lower leg amputations are performed on patients with DM, and up to 85% of all amputations are preceded by a diabetic foot ulcer [2,3].

In patients who have diabetes, peripheral arterial occlusive disease is another important contributory factor that leads to both ulcer formation and delayed wound healing. It has to be remembered that, in those who are diabetic, are prone to develop diabetic microangiopathy at an earlier age and once there is onset of microangiopathy it tends to have a rapid progression, along with increased severity and it most commonly involves the segment between the ankle and knee to a greater extent. [6]

Diabetic retinopathy (DR) is a chronic complication associated with long DM duration and poor glycemic control, the overall incidence of diabetic retinopathy and of vision-threatening forms of diabetic retinopathy (VTDR) being higher in T1DM than in T2DM [5].

The incidence of retinopathy over six years was 41% in the 1,216 patients with newly diagnosed type 2 diabetes who had no retinopathy at baseline in the United Kingdom Prospective Diabetes Study (UKPDS), a multicentre randomised clinical trial examining the effects of targeted levels of glycaemia on complications of diabetes. 30% of individuals who had baseline retinopathy progressed on the ETDRS scale by two or more levels over the course of the six years.[7]

Duration of diabetes is one of the most consistent risk factors for the development and progression of diabetic retinopathy [4]. Since the duration of development in type 2 diabetes is difficult to determine, retinopathy may also present as an early sign.

Due to the high correlation between the HbA1c and diabetic problems, it is considered as one of the finest care evaluation measurements. In order to anticipate diabetic retinopathy and carry out early intervention, this study also attempted to establish a correlation between diabetic status of patient, diabetic foot ulcer and general factors influencing the prevalence and severity of diabetic retinopathy. Though no direct association between the severity of diabetic retinopathy and grade of diabetic foot ulcer has been reported till date. Considering that the etiopathology being shared between diabetic retinopathy and diabetic foot ulcer are the same, we believe that there is a relationship in incidence between the two diseases.

Therefore, the aim of this study was to investigate the prevalence of severity of diabetic retinopathy in patients with a diabetic foot ulcer and to evaluate the association between diabetic foot ulcer and diabetic retinopathy

METHODS:

A hospital based prospective cross-sectional study, conducted at A. J. Institute of Medical Science and research Centre, Mangalore, for a period of August 2022 to May 2023 (10 months). Purposive sampling technique was adopted.

All patients diagnosed with Type -2 diabetes mellitus with diabetic foot were including after getting an informed consent.

They underwent a thorough ophthalmic examination and were subsequently divided according to the ETDRS criteria into the several study groups. After that, in addition to their usual blood tests were done.

Diabetic foot ulcers were graded based on Wagner s grade and diabetic retinopathy graded as above, to assess the relationship between the severity and association between the two conditions in type 2 diabetic mellitus patients.

Patients suffering from a condition that interfered with wound healing e.g., carcinoma, vasculitis, connective tissue disease, an immune system disorder, treatment with corticosteroids, immunosuppressive agents, radiation therapy, chemotherapy and patient not giving consent were excluded.

Statistical Analysis:

- Data collected will be entered in Microsoft Excel. Data will be compiled and presented as tables and diagrams. Descriptive statistics will be used to describe the results.
- Baseline data will be represented by percentages.
- Continuous variables will be expressed as Mean and Standard deviation.
- Z-test will be used to test the significant differences in Glycosylated Hemoglobin (HbA1C) among Diabetic patients with and without Retinopathy.
- Chi-square test will be used to test the significant differences amongst the parameters accordingly

RESULTS

In our study, most of the patients were male, 61(56.5%) and females 47(43.5%).

In most grades males were a majority except in mild NPDR and in no diabetic retinopathy, wherein females were a majority. The mean age in the study was 59.74+ 12.433 years.

The mean duration of diabetes is 10.88+ 7.163 (Median duration is 10 years). Minimum years since diagnosis of diabetes was made in the patients, was 1 year and maximum was 30 years.

Table 1- Prevalence of Grade of Diabetic Retinopathy (N=108) Diabetic Duration

Diabetic Retinopathy	Frequency	Percent
No Diabetic Retinopathy	18	16.7
Mild NPDR	29	26.9
Moderate NPDR	32	29.6
Severe NPDR	12	11.1
PDR	9	8.3
CSME	8	7.4
Total	108	100.0

In our study a significant association was seen between years since diagnosed with diabetes and grade of Diabetic Retinopathy (X^2 23.115, P= 0.001*).

Table 2: Association of Years since diagnosed with diabetes and grade of Diabetic Retinopathy

	N	Median	IQR	Minimum	Maximum	Mean Rank	X2	P value
NO DR	18	5.50	7	1	14	33.14	23.155	<0.001
MILD NPDR	29	6	12	1	22	44.67		
MODERATE NPDR	32	10.00	10	1	25	58.86		
SEVERE NPDR	12	14.50	12	6	26	77.25		
PDR	9	15.00	12	5	30	76.56		
CSME	8	14.00	12	2	22	61.81		

* P value of <0.05 is considered as significant

On evaluation by linear regression analysis, it was found that HbA1c had 27% contribution in the pathogenesis of diabetic retinopathy than diabetic duration which had 25% contribution, proving that glycemic control (HbA1C) had more effect in the pathogenesis and progression of diabetic retinopathy as compared to diabetic duration.

Considered together both HbA1c & diabetic duration contributed 20 % to severity of diabetic retinopathy (R-square =0.204)

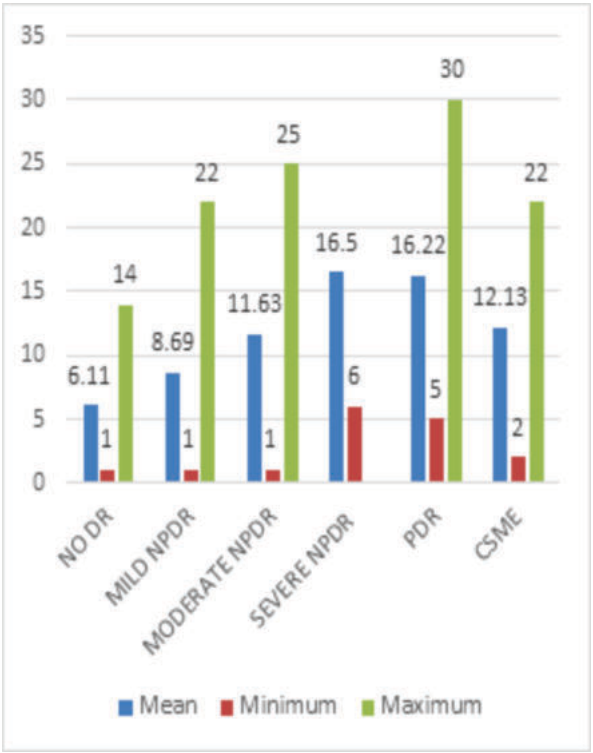

Figure 1: Distribution of subjects according to Diabetes Duration

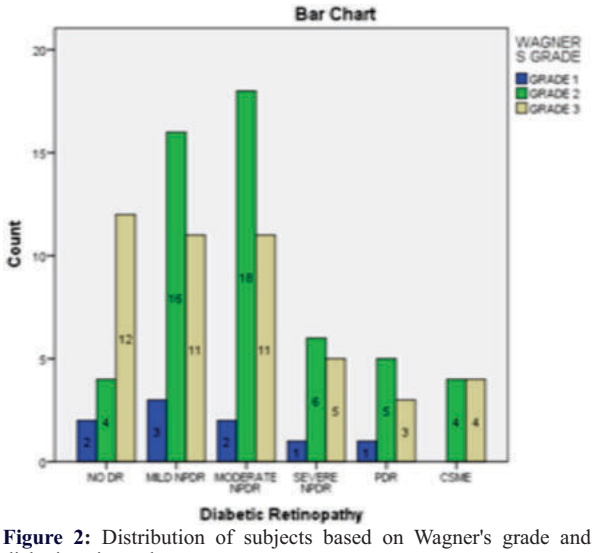

Figure 2: Distribution of subjects based on Wagner's grade and diabetic retinopathy status

Table 3: Diabetic Retinopathy and Wagner's grade cross tabulation

			Wagner S Grade			Total
			Grade 1	Grade 2	Grade 3	
Diabetic Retinopathy	NO DR	Count	2	4	12	18
		% within Diabetic Retinopathy	11.1%	22.2%	66.7%	100.0%
		% Within Wagner S Grade	22.2%	7.5%	26.1%	16.7%
	MILD NPDR	Count	3	16	11	30
		% within Diabetic Retinopathy	10.0%	53.3%	36.7%	100.0%
		% Within Wagner S Grade	33.3%	30.2%	23.9%	27.8%
	MODERATE NPDR	Count	2	18	11	31
		% within Diabetic Retinopathy	6.5%	58.1%	35.5%	100.0%
		% Within Wagner S Grade	22.2%	34.0%	23.9%	28.7%
	SEVERE NPDR	Count	1	6	5	12
		% within Diabetic Retinopathy	8.3%	50.0%	41.7%	100.0%
		% Within Wagner S Grade	11.1%	11.3%	10.9%	11.1%
	PDR	Count	1	5	3	9
		% within Diabetic Retinopathy	11.1%	55.6%	33.3%	100.0%
		% Within Wagner S Grade	11.1%	9.4%	6.5%	8.3%
	CSME	Count	0	4	4	8
		% within Diabetic Retinopathy	0.0%	50.0%	50.0%	100.0%
		% within Wagner S Grade	0.0%	7.5%	8.7%	7.4%
Total		Count	9	53	46	108
		% within Diabetic Retinopathy	8.3%	49.1%	42.6%	100.0%
		% Within Wagner S Grade	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	P value (<0.05 is significant)
Pearson Chi-Square	7.846	10	.644

Most of the grade 3 diabetic foot patients were seen to have No DR =12(66.7%) least grade 3 diabetic foot number was noted in PDR group=3(33.3%). Grade 1 diabetic foot was most noted in mild NPDR =3 (10%) and least in CSME =0 (0%).

DISCUSSION:

The prevalence of NPDR was highest in this study of the 108 diabetic patients, at 84.3%, whereas the prevalence of PDR was lowest, at 8.3%. In our study, 61 (56.5%) of the participants were men, and 47 (43.5%) were women. Males predominated in the majority in most grades, with the exception of those with mild NPDR and those without diabetic retinopathy. The mean age and diabetes duration in the study were 59.74 + 12.433 years and 10.88 + 7.163 years, respectively.

The age group of 61-70 years was shown to have the highest prevalence of diabetic retinopathy (37%). While moderate, severe, and PDR were more prevalent in the 61-70 age range, mild NPDR was most frequently observed in the 51-60 age group.

According to a similar study done by Hwang et al. [9] out of 100 DFU patients, 90 patients (90%) had DR and 55 (55%) had proliferative DR (PDR). There was no significant association between DR and DFU severities

The HbA1C readings and the grade of diabetic retinopathy appeared to differ in our study. All grades had median HbA1C values that were greater than the threshold of 6.5. The p value of 0.001 revealed that the correlation is very significant, and the HbA1C levels were significantly greater in those with higher grades of retinopathy. This underlines once more the link between long-term glycemic control (lasting more than three months), of which elevated HbA1C levels are a sign, and a more rapid progression of diabetic retinopathy.

According to the Kruskal-Wallis test, a significant correlation between the duration of time from a diabetes diagnosis and the grade of diabetic retinopathy was found in our study.

According to a linear regression analysis, glycemic control (HbA1C) had a greater impact on the pathogenesis and progression of diabetic retinopathy than did diabetic duration, which had a 25% contribution. This finding shows that glycemic control (HbA1C) had a greater impact than diabetic duration on the development of diabetic retinopathy.

Together, both HbA1c and the duration of diabetes were associated with a 20% increase in the severity of diabetic retinopathy (Rsquare = 0.204).

Most of the grade 3 diabetic foot patients were seen to have No DR =12(66.7%) while, least grade 3 diabetic foot number was noted in PDR group=3(33.3%). Grade 1 diabetic foot was most noted in mild NPDR =3(10%) and least in CSME =0(0%).

With a p value of 0.644%, this study reports no significant correlation between severity and grade of diabetic foot ulcer despite having the same pathogenesis of the disease.

However, multi centric studies with a larger population and variable socio demographic characteristics must be undertaken to further correlate and substantiate the results of this study.

CONCLUSION

Based on the results of this study, no significant correlation between severity and grade of diabetic foot ulcer

However, there is a significant correlation between the levels of HbA1C and the severity of diabetic retinopathy, with individuals who have higher levels of HbA1C exhibiting more severe grades of diabetic retinopathy.

Conflict Of Interest: NONE

Acknowledgement

We thank the participants who willingly participated in the study, without their cooperation this study would not be possible. We are thankful to the management and staff of A.J institute of medical sciences and research for their technical support and resourceful feedback.

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