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Study of Severity of Diabetic Retinopathy with Duration of Type 2 Diabetes Mellitus

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ABSTRACT

Background: Chronic DM sequelae include microvascular complications like retinopathy, nephropathy, and neuropathy as well as macrovascular concerns including coronary artery disease, cerebrovascular disease, and peripheral vascular disease. The most frequent long-term microvascular consequence of diabetes mellitus and a major contributor to vision impairment and blindness is diabetic retinopathy, which is also potentially preventable. In this study, an effort has been made to measure and detail the relationship between severity of diabetic retinopathy and duration of type 2 diabetes mellitus.

Aim: The aim of the study was to correlate the severity of Diabetic Retinopathy with duration of Type 2 Diabetes Mellitus

Materials and Methods: 50 cases of type 2 DM were included in this study. Detailed history including age & sex of the patient, duration of diabetes, anterior segment and detailed fundus examination was carried out & grading of DR was done based on ETDRS (Early Treatment Diabetic Retinopathy Study).

Results: Out of all,35 patients were having some form of DR on presentation. The mean ages of mild, moderate, severe NPDR & PDR were 57.94±3.99, 59.82±5.28, 62.67±13.38, 68.33±3.33 years respectively. The mean duration for DM in the study for mild, moderate, severe NPDR and PDR were 7.17±1.98, 9.73±3.17, 13±3.06 & 21.33±9.33 years respectively.

Conclusions: Severity of diabetic retinopathy was strongly associated with duration of type 2 DM.

KEYWORDS: Diabetes mellitus, Diabetic retinopathy, Severity of diabetic retinopathy

ARTICLE DETAILS

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INTRODUCTION

Diabetes mellitus is one of the most common metabolic disease globally and hence one of the most challenging health concerns in modern era. Diabetic retinopathy is a very common, potentially preventable, long term, microvascular complication of diabetes mellitus and a leading cause of visual disability and blindness.[1] Almost all patients with type 1 diabetes mellitus (DM) and more than 60% of patients with type 2 DM will develop some degree of retinopathy after a 20-year history of diabetes.[2] Patients with diabetic retinopathy are 25 times more likely to become blind than non-diabetics (New York National Society to Prevent Blindness 1980). The severity of the issue is indicated by the vast number of individuals with DR. A 50.3% prevalence of diabetic retinopathy was discovered in the USA[3], 29.0% in Australia[4], 17.6% in India[5], and 33.6% in the UK.[6]

RISK FACTORS

- Level of glycemia
- Elevated serum lipids
- Blood pressure
- Duration of diabetes mellitus
- Pregnancy

- Renal disease
- Coronary artery disease
- Anemia

PATHOGENESIS OF DIABETIC RETINOPATHY [7,8,9]

Hyperglycemia is the primary cause of the structural alterations brought on by diabetic retinopathy. Hyperglycemia generates these alterations due to a combination of factors including biochemical, hemodynamic and paracrine factors producing structural changes in the arteries comprising (a) pericytes degeneration (b)basement membrane thickening and (c) endothelial cell proliferation.

Between 18 and 20 percent of people with diabetes, including Type I and Type II, acquire diabetic macular edoema.

CLASSIFICATION OF DIABETIC RETINOPATHY[10]

Modified Airlie House Classification

Abbreviated ETDRS Classification:

Staging
No Diabetic Retinopathy
Very Mild Non- proliferative diabetic retinopathy (NPDR) Microanurysm only
Mild Non-proliferative diabetic retinopathy (NPDR) Any or all of: Microaneurysms, retinal hemorrhages, exudates, cotton wool spots, up to the level of moderate NPDR. No IRMA or significant beading
Moderate Non-proliferative diabetic retinopathy (NPDR) - Severe retinal hemorrhages (more than ETDRS standard photograph 2A) Significant venous beading in no more than 1 quadrant Cotton wool spots commonly present
Severe Non-proliferative diabetic retinopathy (NPDR) 4:2:1 rule : one or more of : Severe hemorrhages in all 4 quadrants. Significant venous beading in 2 or more quadrants. Moderate IRMA in 1 or more quadrants.
Very Severe Non -proliferative diabetic retinopathy (NPDR) - 2 or more of the criteria for severe
Mild – Moderate Proliferative diabetic retinopathy (PDR) - New vessels on disc (NVD) or new vessels elsewhere (NVE),but extent insufficient to meet high risk criteria
High risk, Severe proliferative diabetic retinopathy (PDR) New vessels on disc (NVD) greater than ETDRS standard photograph 10A(about 1/3 disc area).Any NVD with vitreous or preretinal hemorrhage NVE greater than ½ disc area with vitreous or preretinal hemorrhage (or hemorrhage with presumed obscured NVD/E)
Advanced diabetic eye disease Tractional retinal detachment, significant persistent vitreous hemorrhage and neovascular glaucoma.

TREATMENT OF DIABETIC RETINOPATHY[11,12]

The most important step is controlling diabetes. This is crucial for halting the growth of microvascular problems. The principal methods of treating diabetes mellitus include:

1.Insulin Therapy

This is the cornerstone in cases of juvenile and adult-onset diabetes if oral hypoglycemic medications have failed to keep blood sugar levels in check. Available insulin formulations include:

Rapidly acting medications with a peak activity time of 2-4 hours for intravenous, intramuscular, and subcutaneous usage.

• Intermediate acting medicines, such as NPH (isophane) and Lente (zinc), which have peaks in activity between 6 and 12 hours.

• Long-acting medications with a 14–24-hour duration of peak effect, such as ultra lente and protamine zinc insulin (PZI).

• Human Insulin: Animal insulins have been essentially eliminated by synthetic insulin, which has a structure identical to that of human hormone. It can be made via recombinant DNA techniques or chemical synthesis. Less antigenicity appears.

2.Diet

Diabetes patients of normal weight typically need 35 kcal per kg of body weight per day and 0.8 to 1 g of protein per kg of body weight per day. A typical recommendation is for saturated fat to be in the range of 7–10% and for fat content to be 30% or less of total calories.

3.Exercise

4.Oral Hypoglycemic Agents

- Sulphonyl Ureas –Glipizide, Glimepride, Glyburide
- Biguanides – Metformin
- Meglitinides – Nateglinide, Repaglinide
- Thiazolidinediones – Pioglitazone, Rosiglitazone
- Glucosidase Inhibitors – Acarbose, Miglitol
- DPP-IV Inhibitors – Sitagliptin

Specific Treatment for Diabetic Retinopathy

• Laser Photocoagulation

• Surgical:– Vitrectomy, Intravitreal Injections

MATERIALS AND METHODS

This study was conducted over a period of one year (september 2020 to august 2021) and 50 diagnosed cases of type 2 diabetes mellitus attending Ophthalmology OPD at Sri Siddhartha Medical College Hospital & Research Centre, Tumkur, were selected at random and enrolled in the study. The cases were non selective with regards to age, gender, ethnic origin and occupation.

All patients underwent detailed history and ocular examination which included duration of diabetes, visual acuity using Snellen's chart along with slit lamp examination to visualize the anterior segment of both the eyes. IOP was measured using GAT & documented of both eyes. Fundus examination of both eyes was done and any changes attributable to diabetes were documented. (ETDRS)

Inclusion Criteria

- All patients presenting with Type 2 diabetes mellitus with no contraindication to dilatation of pupil presenting to Ophthalmology OPD at Sri Siddhartha Medical College Hospital & Research Centre.

Exclusion criteria

- Patients with Type 1 diabetes mellitus
- Patients with angle closure glaucoma
- Patients with hazy media impairing visualization of fundus.
- Severely ill and debilitated patients.
- Pregnancy & lactation.

Data Entry and Analysis

The data was entered in Excel spread sheet. Descriptive statistical analysis was done by mean and standard deviation for quantitative variables and frequency/percentage for categorical variables. The association between categorical variables was analyzed by using Chi-square test. The data was analyzed by using SPSS software (version 20) and $P<0.05$ was considered as level of significance

RESULTS

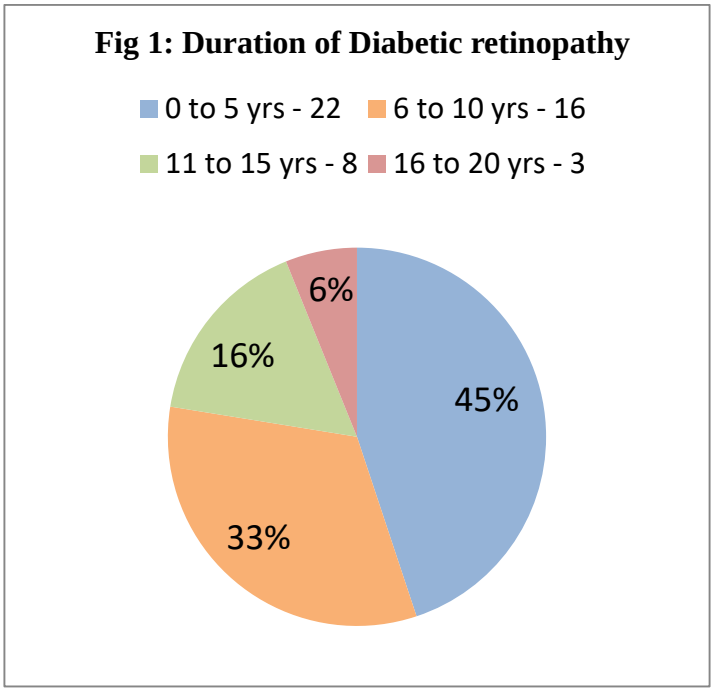

Table 1: General characteristics of participants

S.NO	CHARACTERISTIC	VALUE
1.	Mean age (SD)	58.52 ± 2.32 years
2.	Gender: Male Female	 64% (32) 36% (18)

3.	**HbA1c:** **Normal (< 6.5)** **Abnormal (>6.5)**	 **22% (11)** **78% (39)**
4.	**Mean Duration of DM**	**8.2 ± 1.6 yrs**

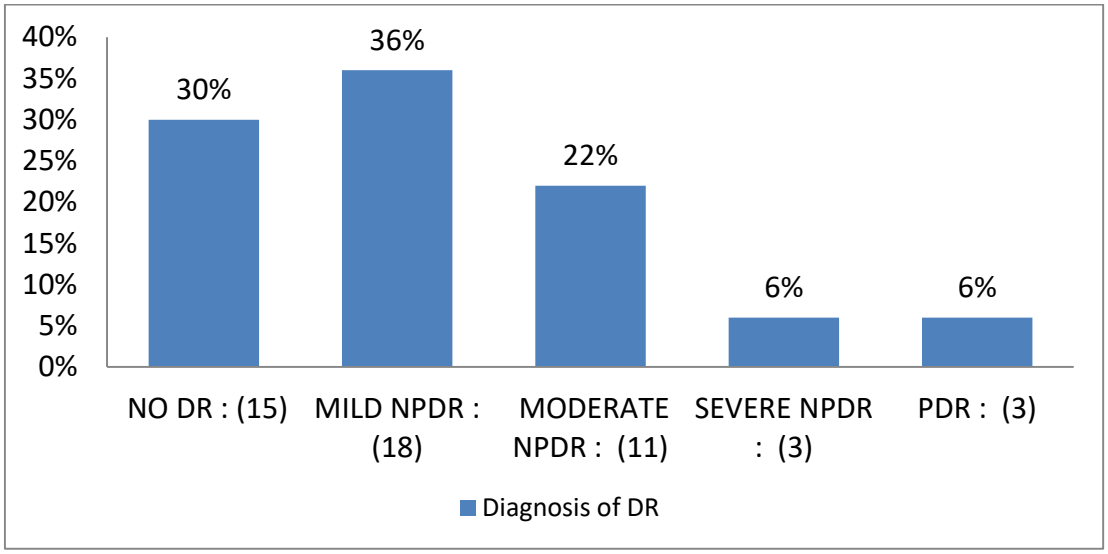

Fig 2. Grades of Diabetic retinopathy

Table 2. Association of grades of diabetic retinopathy with duration of DM

Duration of DM	No DR	MILD NPDR	MOD NPDR	SEVERE NPDR	PDR
0 to 5 yrs	11	8	3	0	0
6 to 10 yrs	4	8	3	1	0
11 to 15 yrs	0	1	4	2	1
16 to 20 yrs	0	1	1	0	1
> 21 yrs	0	0	0	0	1
TOTAL	15	18	11	3	3

P value: <0.001 (significant)

Table 3: Association of grades of diabetic retinopathy with HbA1c

HbA1c	No DR	MILD NPDR	MOD NPDR	SEVERE NPDR	PDR
<6.5 (good)	13	5	1	0	0
6.5 – 8.5(fair)	4	7	3	0	0
>8.5 (poor)	1	3	7	3	3
TOTAL	18	15	11	3	3

DISCUSSION

A total of 50 patients were enrolled in this study. The mean age of study participants was 58.52 ± 2.32 years ranging 40-80 years of age. There were 64% male i.e 32 participants and 36% female i.e.18 participants. This was correlating with the study done by Niveditha H et al and Gadkari SS et al. [13,14]

In our study we found that 38%of participants had normal HbA1C level(<6.5) and 62% of participants had abnormal HbA1C(>6.5). We also observed that participants having a good glycemic contol (HbA1C<6.5) had lower prevalence of DR (31.5%) as compared to those having fair control (HbA1C 6.5-8.5) 71.4% and poor control (HbA1C >8.5) 94.1%. Similar to our study Deepasha S et al and Manaviat et al also found a significant association between HbA1C level and diabetic retinapathy. [15,16] Whereas , in a study conducted by Nagashree D et al, it showed no significant association between HbA1c level and Diabetic retinopathy. [17]

Mean duration of diabetes mellitus was found to be 8.2 ± 1.6 yrs. Based on Chi Square test, this study shows that there is significant association between duration of diabetes and the severity of diabetic retinopathy ($p<0.001$). The result is consistent with the study done by Abhishek et al. and Fath et al. which showed a significant relationship between duration of diabetes and the severity of diabetic retinopathy. [18,19] However, this result is different from the study done by Intan Lamy et al. which showed there is no association between diabetes duration with the severity of diabetic retinopathy. [20]

CONCLUSION

The result of this study statistically indicates that there is association between duration of diabetes with the severity of diabetic retinopathy.

This result also concludes that, as the HbA1C level increases diabetic retinopathy also increases both in terms of frequency and severity. Hence , it is advisable to include HbA1C as a screening tool in the evaluation of DM and as a predictor for the development of diabetic retinopathy.

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None

CONFLICT OF INTEREST

None

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