DIABETIC RETINOPATHY-RISK FACTORS, STAGING & MANAGEMENT

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ABSTRACT

INTRODUCTION

The objective of Diabetic retinopathy is to determine the risk factors associated with it, stage of retinopathy diagnosed at presentation, management of it and final visual outcome. The prevention is by strict glycemic control, prompt use of anti-diabetic drugs and regular exercises. The role of Laser Photocoagulation in Proliferative Retinopathy is high. With effective management strategies, visual loss due to the disease can be controlled and further dissemination of the disease could be prevented.

KEYWORDS

Retinopathy, PDR, NPDR, Hyperlipidemia.

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INTRODUCTION: Diabetes mellitus is a potentially life threatening metabolic disorder, characterized by hyperglycemia due to absolute or relative insulin deficiency, causes profound alterations in both micro and macrovasculature, affecting nearly every organ in the body namely brain, kidney, nervous system and retina.

Diabetic retinopathy, amicrovascular complication of diabetes has now emerged as one of the leading cause of ocular morbidity and blindness engulfing not just the developed countries but also the developing countries at an alarming rate.

The reasons for loss of vision are diabetic maculopathy and complications of Proliferative Diabetic Retinopathy (PDR) such as vitreous hemorrhage, tractional retinal detachment, and neovascular glaucoma. By 2030 developing countries will face an increase by 69% and industrialized countries by 20% of the number of patients with diabetes compared to 2010.[1]

AIMS AND OBJECTIVES OF THE STUDY: To evaluate the risk factors associated with Diabetic Retinopathy, clinical staging and management of the cases with a particular emphasis on the preventive measures at different levels.

The present study was conducted in the Department of Ophthalmology, Government General Hospital, Kakinada. The aim of the study is to determine the risk factors associated with Diabetic Retinopathy, identifying the stage of retinopathy at which it is presented and management of the cases.

In this study an attempt has been made to determine the extent of the association of the risk factors, staging the retinopathy following the international criteria of diabetic retinopathy and management of the cases and visual outcome.

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MATERIALS AND METHODS OF STUDY: The present study is a prospective hospital based study of 48 patients who have attended the out-patient department, Government General Hospital, Kakinada, during the years August 2007-Sept 2009.

The methodology followed is by taking the following criteria:

CRITERIA FOR SELECTION:

Inclusion Criteria:

1. Age: Between 30 years and 60 years.
2. Gender: Both sexes were included.
3. Patients already diagnosed as DM (Type I or Type II) attending for routine ophthalmic check-up and in-patients admitted with various complications.
4. Diabetic with H/o Hypertension.
5. Diabetic with H/o Smoking.
6. Diabetic with Renal disease.
7. Diabetic with Obesity, BMI >30.
8. Pregnant woman.

Exclusion Criteria:

1. All cases above 60 years.
2. Patients with acute complications of Diabetes like Hyperosmolar non-ketotic coma, ketoacidosis or acute infections.
3. The RCTs (Randomized Controlled Trials) published in major medical journals do not always clearly report exclusion criteria. Women, children, the elderly, and those with common medical conditions are frequently excluded from RCTs. Such exclusions may impair the generalizability of RCT results. These findings highlight a need for careful consideration and transparent reporting and justification of exclusion criteria in clinical trials.[2]

OBSERVATION AND ANALYSIS:

I. RISK FACTORS TO DIABETIC RETINOPATHY:

1. DURATION OF DIABETES:

Duration of Diabetes in Yrs	Mild NPDR	Moderate NPDR	Severe NPDR	Non high Risk PDR	High risk PDR
<5	-	2	-	-	-
5-10	6	4	5	1	1
10-20	12	8	20	16	9
NEW	-	2	-	-	-

Table 1: Duration of diabetes

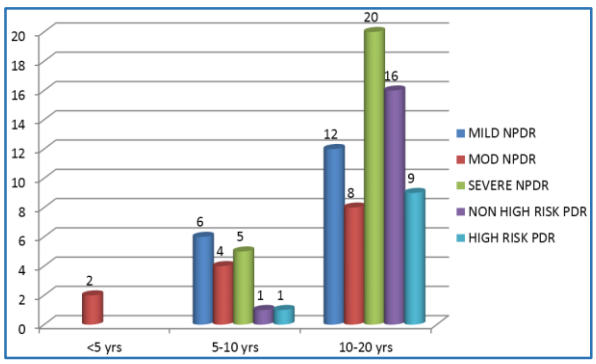

Fig. 1: Stages of d.r in relation to duration of diabetes

OBSERVATION: The prevalence of NPDR 15 to 20 years after the onset of NIDDM was high. After 20 or more years, the cases of severe NPDR increased. Eleven or more years after the onset, 3% of the patients had PDR.

INFERENCE: The duration of Diabetes remained the strongest predictor of any Diabetic retinopathy and its severity.

Increased duration influencing the occurrence of diabetic retinopathy and severity was probably related to the magnitude or prolonged exposure to hyperglycemia.

The pattern of frequency of retinopathy in relation to duration of diabetes is largely determined by age at diagnosis of diabetes, and the younger the patient at diagnosis of diabetes, longer the duration of diabetes before retinopathy becomes common.[3]

2. SMOKING:

Type of DR	No. of Cases
Severe NPDR	4
Non High Risk PDR	3
High Risk PDR	8
DM	3
CSME	2

Table 2: Smoking

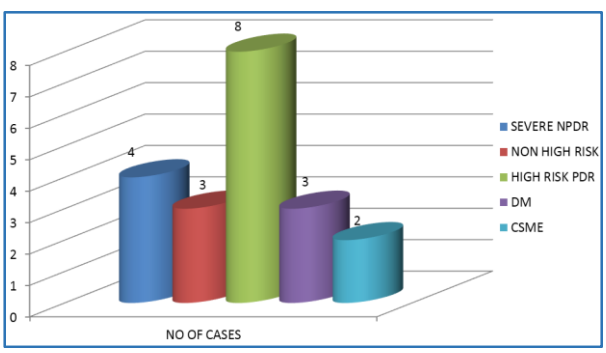

Fig. 2: Relation of smoking to type of diabetic retinopathy

OBSERVATION: In this study, out of 48 patients, 20 patients have a known H/o of smoking, of which 15 patients smoke 20 cigars per day, who started smoking at the age of 30 years and 5 patients smoke 5 cigarettes per day, who started at the age of 25 years.

INFERENCE: Smoking increases blood carbon monoxide levels and platelet aggregation causes vasoconstriction, which might be expected to accelerate diabetic retinopathy. Cigars smoking people are more prone for Diabetic Retinopathy.

In addition to increased insulin resistance, smoking also showed dyslipidemia prone to atherosclerosis. Smokers had higher fasting triglycerides and lower high density lipoprotein cholesterol levels, and an increased proportion of small dense low density lipoprotein particles. Fibrinogen levels and plasminogen activator inhibitor 1 activity were also elevated in smokers.[4]

The past and current smokers had a significantly increased risk for type 2 diabetes and the risk increased with the number of cigarettes smoked.[4]

3. HYPERLIPIDEMIA:

Type of DR	No. of Cases
Non High Risk PDR	2
High Risk PDR	4
Diffuse Maculopathy	6
Focal Maculopathy	3

Table 3: Hyperlipidemia

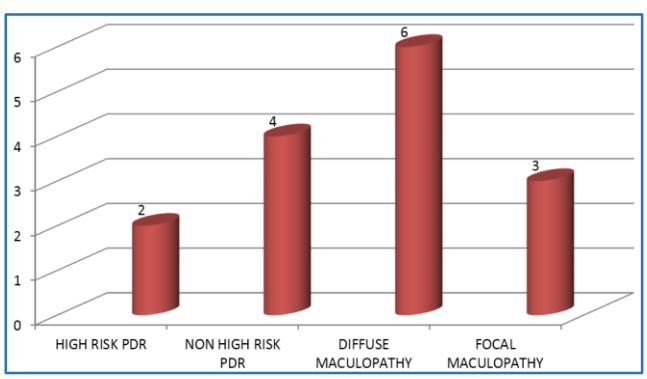

Fig. 3: Hyperlipidemia in relation to D.R.

OBSERVATION: In this study out of 48 patients, 15 patients have elevated S. triglycerides and S. cholesterol, 6 patients manifest with diffuse maculopathy.

INFERENCE: Patients with elevated total cholesterol and low-density lipoprotein cholesterol are likely to have diffuse hard exudates over macula and this correlates with visual loss.

High serum lipid levels have also been proposed as a risk factor for DR. High lipid levels are known to cause endothelial dysfunction due to a reduced bioavailability of nitric oxide and this endothelial dysfunction was suggested to play a role in retinal exudate formation in DR.[5]

4. HYPERTENSION:

No. of Patients	Hypertensive	Normotensive
48	34	14

Hypertensive	Mod-Severe NPDR	PDR
34	15	19

Table 4: Hypertension

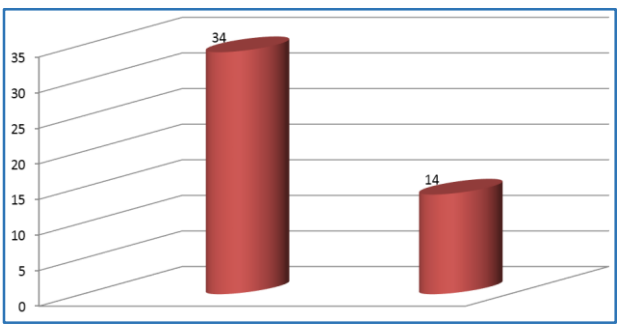

Fig. 4: Relation of hypertension to incidence of diabetic retinopathy

OBSERVATION: In this study out of 48 patients, 34 patients have systemic hypertension, out of which uncontrolled cases usually have proliferative retinopathy.

INFERENCE: When diastolic blood pressure is routinely elevated, diabetic retinopathy is stimulated to develop and progress.

Diabetes and hypertension are among the commonest diseases in developed countries, and the frequency of both diseases rises with age. In type 1 diabetes the development of diabetic nephropathy may play a major role in the subsequent development of hypertension since microalbuminuria is present in about 80% of type 1 diabetic subjects before the onset of hypertension. The pathogenesis of hypertension in type 2 diabetes is not so clear with a lesser significance for nephropathy with microalbuminuria predating hypertension in approximately 25% of type 2 diabetic subjects with hypertension.[6]

5. EFFECT OF CONTROL OF BLOOD SUGAR LEVELS: Elevated levels of glycosylated haemoglobin (HbA1C) in all the patients indicates the state of chronic uncontrolled hyperglycemia which leads to the progression of background retinopathy to a state of proliferative retinopathy; 20 patients under study have a value of HbA1C >7.2% and 28 patients have a value of HbA1C <5.2%.

INFERENCE: The progression of Diabetic retinopathy more common in patients with highHbA1C, at the same time low value of HbA1C will not prevent Diabetic Retinopathy.

The association of HbA1C with cardiovascular diseases and other diabetic micro- vascular complications was linear without evidence of a distinct threshold, several studies suggested a threshold value for A1C in Diabetic Retinopathy (DR). In studies about the optimal cut off value for A1C in DR, the A1C values range from 5.2% to 7.8%.[7]

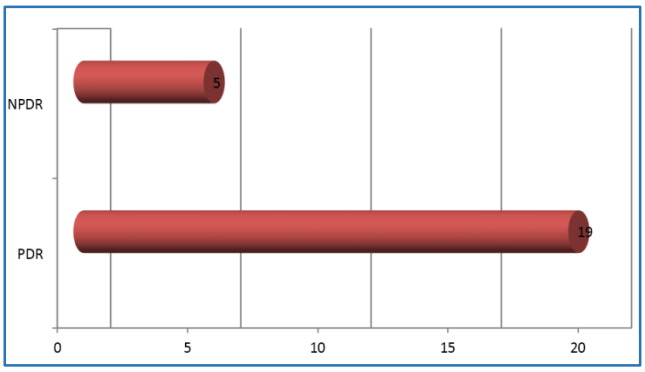

Fig. 5: Glycosylated Hb (HbA1C) in Relation to D.R

6. RENAL DISEASE:

Type of DR	No. of Eyes
Severe NPDR	3
Non-high risk PDR	6
High risk PDR	1

Table 5: Renal Disease

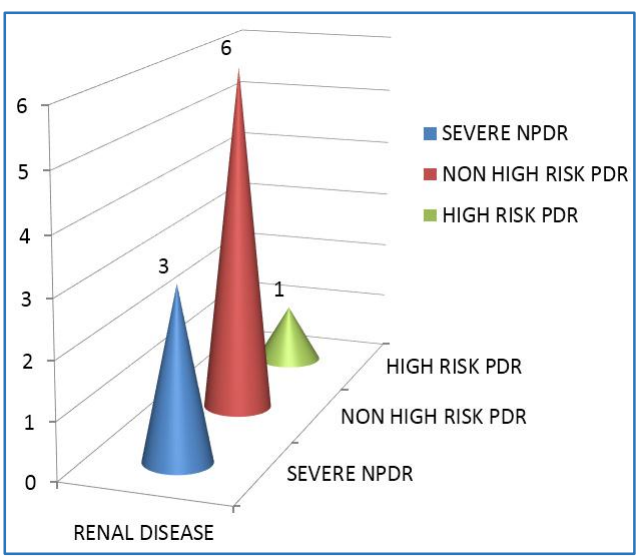

Fig. 6: Renal disease–Diabetic retinopathy

OBSERVATION: In this study, proteinuria was found in 5 patients, out of the 10 eyes, most of them are in the state of non-high risk PDR.

INFERENCE: The prevalence of Retinopathy can be predicted by proteinuria which correlates with the duration of Diabetes.

According to Diabetes Control and Complications Trial (DCCT), the outcomes related to retinopathy included a progression of at least three steps in the grade of retinopathy from the level on enrolment in the DCCT, the presence of severe, non-proliferative diabetic retinopathy or worse and the development of proliferative retinopathy.[8]

The presence and severity of DR is an indicator of the risk of gross proteinuria and conversely, proteinuria predicts presence of PDR. A few studies have reported a beneficial effect of dialysis and renal transplant on DR with improved stabilization and response of retinopathy to laser treatment.[9]

II. STATISTICAL ANALYSIS OF RISK FACTORS: Multiple logistic regression analysis of dependent variables obtained by Chi square test and Yate's formula.

Variables	OR (95%CI)	P value
HbA1C	1.44(1.18-1.75)	<0.001
Smoking	5.80(2.23-15.07)	<0.001
Hypertension	2.56(1.21-5.38)	0.01
Nephropathy	11.46(2.5651.35)	<0.001
HDL Cholesterol	0.96(0.64-1.45)	0.03

Table 6

III. CLINICAL STAGING OF DIABETIC RETINOPATHY:

Clinical stage of Diabetic Retinopathy	No. of Eyes
Mild NPDR	19
Moderate NPDR	19
Severe NPDR	27
Non high risk PDR	18
High risk PDR	13
Total	**96**

Table 7

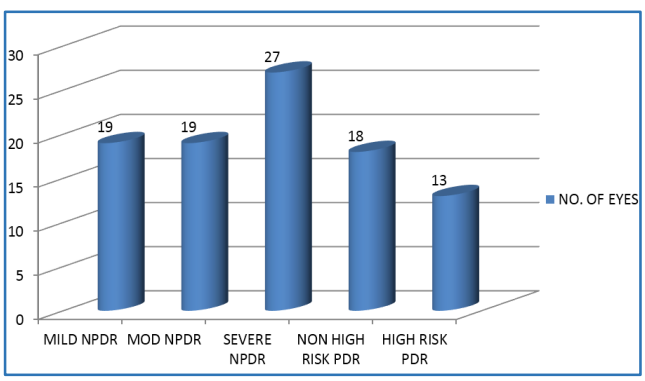

Fig. 7: Clinical staging of diabetic retinopathy

IV. Diabetic Maculopathy:

Focal maculopathy	4
Diffuse maculopathy	8
CSME	5

Table 8

OBSERVATION: In the present study of 48 patients, out of 96 eyes most of the eyes are in the stage of severe NPDR followed by mild-to-moderate NPDR, least of the eyes fall in stage of high risk PDR.

Diabetic maculopathy found in 17 eyes, of which most of them are in stage of Diffuse Maculopathy.

MANAGEMENT OF DIABETIC RETINOPATHY:

A. Managed on Conservative method by:

1. Strict Glycemic control by oral hypoglycaemic drugs and insulin.
2. Strict dietary habits and regular exercises.
3. Control of Hypertension.
4. Tab. Calcium Dobesilate.
5. Tab. Aspirin.
6. Hypolipidemic drugs (Statins).

B. Managed on surgical methods following FFA by:

1. Pars plana vitrectomy in complications like Vitreous haemorrhage and Tractional RD or in combination with Rhegmatogenous RD.
2. Intravitreal Injection of Triamcinolone and Avastin in PDR.
3. Pan-Retinal Photocoagulation for diabetic macular edema and PDR.
4. Grid Photocoagulation.

RESULT ANALYSIS: All the results are tabulated after 1 year study.

Total number of patients: 48 (96 Eyes).

Nature of DR	Total no. of Eyes	Improved	Status QUO	Worse
PDR	28	12	8	8
NPDR	68	35	31	2
Total	**96**	**47**	**39**	**10**

Table 9: Severe NPDR & PDR cases

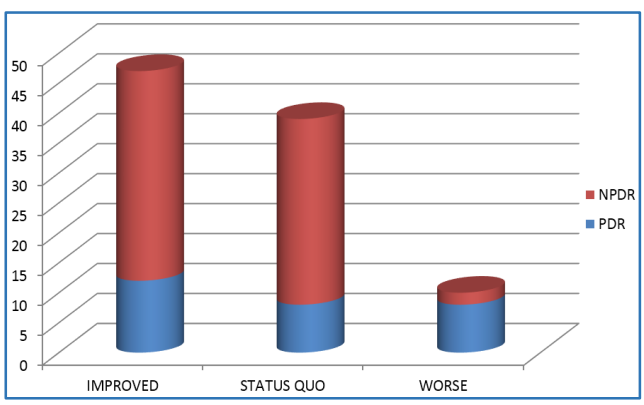

Fig. 8: Severe NPDR & PDR cases

Total no. of Eyes	Improved	Status QUO
22	15	7

Table 10: Mild-Moderate NPDR cases

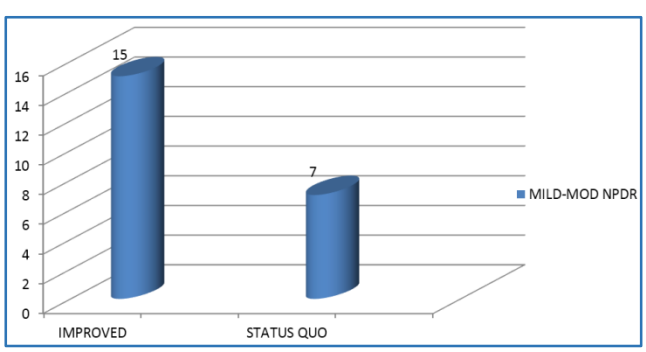

Fig. 9

CONCLUSION: From the above data the following conclusions are drawn:

- ✓ Improvement of vision is 42.85%in PDR eyes.
- ✓ Improvement of vision is 51.47% in NPDR cases.
- ✓ Vision is maintained at baseline in 28.57% PDR cases.
- ✓ Vision is maintained at baseline in 45.58% in NPDR cases.
- ✓ Visual condition is deteriorated in 28.57% PDR cases.

- ✓ Visual condition is deteriorated in 2.94% NPDR eyes.
- ✓ Improvement is seen in 48.95% of patients, vision is maintained at baseline in 40.62% and 10.41% showing deterioration irrespective of the stage of diabetic retinopathy.
- ✓ Altogether 89.57% benefited with stable vision as against 10.41% worsening.
- ✓ 97.05% attained stable vision in NPDR group as against 71.42% in PDR group.
- ✓ 2.94% worsening in NPDR group as against 28.57% in PDR group.
- ✓ Female patients (60%) are more effected with Diabetic Retinopathy than males (40%).

DISCUSSION: Although Diabetes Mellitus is the leading cause of blindness in adults most diabetic visual loss can be prevented by an effective screening strategy, Fundus photographs evaluated by specially trained Technicians and detailed, regular examinations performed by Physicians.

In the present study, attainment of better vision is observed in 48.95% cases postoperatively following PRP or Pars plana vitrectomy or by Intravitreal injection of Triamcinolone and Avastin or by combination procedures depending upon the stage of DR at the time of diagnosis.

The results of the present study suggest that the intravitreal injection of triamcinolone may be beneficial as a treatment for diffuse diabetic macular edema. For patients who show an initial improvement in visual acuity after an intravitreal injection of triamcinolone and who eventually experience a second decline in visual acuity sometime after the injection, an intravitreal reinjection of triamcinolone may be considered.[10]

In our study severe NPDR cases benefited better than PDR cases. Visual improvement in 52% NPDR is as against 41% in PDR. DRS reported visual loss is reduced by 50% with Photocoagulation, ETDRS also reported the same.

Regarding the management, early detected cases of Mild to Moderate NPDR showed improvement of vision by conservative measures like maintenance of glycemic levels by Anti-diabetic medication, good dietary habits, control of Systemic hypertension and regular exercise. In our study of 22 eyes, 15 eyes showed improvement and 7 maintained vision at baseline.

In cases of severe NPDR and PDR Laser Photocoagulation benefited much. In our study improvement of vision is seen in 42.85% and 51.47% of PDR and NPDR respectively. Vision is maintained at the baseline in 28.57% and 45.58% in NPDR and PDR cases respectively. Worsening of the vision is seen in 28.57% and 2.94% of PDR and NPDR respectively.

Continuing medical education for diabetic care physicians, training ophthalmologists in photocoagulation and health education amongst diabetic patients should be established. It should be kept in mind that diabetic patients in certain populations may have visual impairment or blindness due to other causes, such as refractive error or cataract.[11]

Early detection, regular treatment, Diabetologist counselling, avoidance of the risk factors like smoking, Hyperlipidemia and renal disease will make the Diabetic individual to live with good health and have a fruitful vision in their life time.

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