



DIABETIC RETINOPATHY AND CLINICALLY SIGNIFICANT MACULAR EDEMA IN TYPE- 1 DIABETES MELLITUS: A CLINICAL STUDY

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ABSTRACT Type-1 diabetes mellitus is a metabolic disease resulting from autoimmune disorder involving the pancreas which causes selective destruction of beta cells responsible for insulin production. Multiple genetic and environmental factors contribute to the pathogenesis of type-1 diabetes mellitus. Management involves insulin administration and strict glycemic control. In this study 100 patients of type-1 diabetes were studied for retinopathy changes during a period of 2 years from December 2019 to December 2021. The age of onset of disease was noted and fundus examination was done with indirect ophthalmoscope or by using 90D lens. Laboratory workup including fasting and post-prandial blood sugars and HbA1C levels. The incidence and severity of diabetic retinopathy and clinically significant macular edema (CSME) was noted and found to be associated with increased duration of diabetes and poor glycemic control.

KEYWORDS : Type-1 diabetes mellitus, diabetic retinopathy, clinically significant macular edema, microangiopathy

INTRODUCTION

India has the largest percentage of diabetics worldwide which is the most common metabolic disorder causing significant rate of morbidity and mortality.¹ Type 1 diabetes is defined by the body's inability to manufacture insulin as a result of the autoimmune death of the pancreatic beta cell, causing chronic illness. The condition can develop in adults even if its onset is typically in infancy.² The most frequent symptoms are polyuria, polydipsia, polyphagia and unexplained weight loss. The high blood sugar levels cause blood vessels to undergo pathological alterations, which result in the chronic complications of diabetes mellitus. The condition may affect both larger and smaller blood vessels, causing macroangiopathy and microangiopathy.³ Microvascular dysfunction is primarily responsible for diabetic retinopathy and diabetic nephropathy. Patients with diabetes mellitus are at a significant risk of losing their vision due to a variety of ocular complications.⁴

One of the key factors in visual impairment in people with diabetes is macular edema, which develops in part because of the compromise of blood retinal barrier.⁵

MATERIALS AND METHODS:

The study was conducted in Regional eye hospital, Kurnool. Total 100 cases of Type 1 diabetes mellitus were studied over a period of 2 years from December 2019 to December 2021.

INCLUSION CRITERIA: Patients with type 1 diabetes mellitus with age of onset < 30 years

EXCLUSION CRITERIA:

1. Age at onset > 30 years
2. Ocular disease due to any other cause.
3. Any history of ocular surgery/trauma.
4. Other systemic diseases that can affect retina or vision.

Detailed medical history was taken including the age of onset of diabetes and the management with insulin and oral hypoglycemic agents being used. Laboratory tests included serum glucose, and plasma glycosylated hemoglobin (HbA1c). Urine tests were performed for urine sugars and to determine the presence of gross proteinuria at each of the examinations and for microalbuminuria for nephropathy. ocular evaluation included recording of visual acuity, slit lamp examination and fundus examination using indirect ophthalmoscope or 90D lens. OCT was done in necessary cases.

RESULTS:

Of the total 100 screened patients, 42 were female and 58 were male.

Age at the onset of diabetes was noted. In the present study it was seen that most of the patients had the age of onset at 16 – 20 years.

Table 1: Age at onset in type 1 diabetes mellitus

Age group at onset of type 1 diabetes mellitus	No. Of patients
11-15 years	14
16-20 years	56
21-25 years	22
26-30 years	8
Total	100

The duration of diabetes is the most important factor contributing to the incidence and severity of diabetic retinopathy. The duration of diabetes in the screened patients was noted at the time of screening.

Table 2: Duration of diabetes in years in the screened patients.

Duration of diabetes in years	No. Of patients
<5 years	14
6-10 years	32
11-15 years	27
16-20 years	21
21-25 years	6
Total	100

Of the total 100 patients screened, 52 patients were found to have diabetic retinopathy. Among them 8 had CSME on examination. 48 people had no retinopathy changes. No cases of isolated CSME were seen.

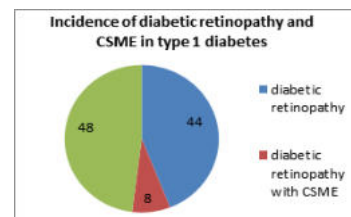


Figure 1: Pie-chart showing incidence of diabetic retinopathy and CSME in Type-1 diabetes mellitus

Table 3: table showing incidence of diabetic retinopathy and CSME in Type1 diabetes mellitus according to the duration of illness

The various grades of diabetic retinopathy among the screened patients was noted. The severity of retinopathy depended largely on the duration of diabetes mellitus and the control of blood sugars which can be effectively monitored with HbA1C levels.

Table 4: Table showing the frequency of various grades of retinopathy

Type of diabetic retinopathy	Frequency in screened patients
Mild	20
Moderate	14
Severe	8
Very severe	5
Early PDR	3
High risk PDR	2
Total	52

DISCUSSION :

Type-1 diabetes mellitus is a chronic metabolic disease caused by insufficient insulin production resulting from the autoimmune destruction of the pancreatic beta cells.¹ Hyperglycemia and diabetes is usually diagnosed after 80-90% of the beta cells are destroyed. Though it is seen to arise frequently in juvenile age group, type-1 diabetes mellitus can occur at any age. The etiology for autoimmunity involves both genetic component and environmental component. Multiple genes are associated with type-1 diabetes mellitus and there is high incidence in association with positive family history and in siblings and twins.⁵ The main component in the management is regular administration on insulin. Patients land in diabetic ketoacidosis with insufficient insulin intake.⁷

This metabolic disease causes micro and macro vasculopathy resulting in end organ damage in patients with time. Ischemic changes occur in retina, kidney, brain and peripheral nerves. Diabetic retinopathy, nephropathy, sensory and autonomic neuropathy and cranial nerve palsies are well known among patients with disease of longer duration. All these complications of diabetes can be prevented with intensive management of diabetes mellitus and control of blood sugars.⁸

Chronic rise in blood glucose levels leads to activation of alternate pathways of glucose metabolism leading to accumulation of advanced glycation end products and activation of protein kinase C, cytokines and growth factors. This leads to vascular endothelial damage and increased vascular permeability causing microvascular occlusion. The microvascular occlusion causes retinal ischemia which ultimately leads to neovascularisation and proliferative diabetic retinopathy. Accumulation of advanced glycation end products can lead to disruption of blood retinal barrier which causes leakage and accumulation of fluid in the subretinal space. Diabetic macular edema presents with blurred vision and metamorphopsia.⁹

According to the Early Treatment Diabetic Retinopathy Study classification protocol, CSME is the presence of retinal thickening at or within 500 μm of the macula's centre or hard exudates at or within 500 μm of the macula's centre if associated with thickening of the adjacent retina and/or zones of retinal thickening that are at least partially within 1 disc diameter of the centre.¹⁰

Other ocular manifestations of diabetes include recurrent sty and chalazion, blepharitis, transient changes in refraction, cataract, primary open angle glaucoma, neovascular glaucoma, orbital cellulitis, extraocular muscle palsy, corneal ulcer and anterior ischemic optic neuropathy.⁴

In this study, a significant association is found between the duration of diabetes and the incidence of diabetic retinopathy and CSME. Incidence of retinopathy was observed to be lower in patients taking insulin regularly and having good glycemic control when compared to patients not taking regular treatment. Also the severity of retinopathy was severe in those with long duration of disease and uncontrolled blood sugars.

Younger age of onset is associated with increased life years with diabetes and thus increased incidence of complications. Regular monitoring of fasting and post-prandial blood sugars along with HbA1C levels is essential to check for glycemic control and modify therapy. Frequent retinal fundus examinations are essential to monitor the retinopathy changes and early identification of proliferative diabetic retinopathy requiring management. Diabetic retinopathy and

CSME correlate with the incidence of nephropathy and risk of ischemic heart disease in older age groups. Strict and intensive control of blood glucose levels decreases the rate of progression of diabetic retinopathy and other organ damage associated with diabetes.⁹

SUMMARY AND CONCLUSION :

In this study a total of 100 patients with type-1 diabetes mellitus were studied and diabetic retinopathy in various grades of severity was found in 52 patients among which CSME was found in 8 patients. The severity of retinopathy was related to duration of diabetes and glycemic control. Strict control of blood sugars and regular monitoring of blood sugar levels are essential for prevention of progression of retinopathy changes. Regular screening has to be done in patients with diabetes to identify retinopathy in early stages.

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