



An Analytical Study of Ocular Complications of Diabetes Mellitus

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Abstract

Introduction: Diabetes mellitus is the most common medical problem in the world. Diabetes causes an array of long-term systemic complications, which have a considerable impact on both the patients and the society because it typically affects individuals in their most productive years. Ocular complications of diabetes mellitus are preventable with early detection and treatment. Common ocular complications of diabetes are Retinopathy, cataract, primary open angle glaucoma and extra ocular muscle palsy.

Aim: The objective of the study was to find out the incidence of different ocular complications of diabetes and to determine the ocular complications relating to the duration of diabetes and age of the diabetic patients.

Materials and Methods: 200 diabetic patients were attending ophthalmology outpatient department from the period of September 2015 to August 2017 in Karuna medical college Hospital, Kerala, India was included in this study.

Results: In this study we found that Retinopathy was the most common (60.5%) ocular complication in diabetes followed by cataract (20%), primary open angle glaucoma (4.5%) and extra ocular muscle palsy (3.5%). The most notable complication seen with increased duration of diabetes were Non Proliferative Diabetic Retinopathy (NPDR) (42.5%) and Clinically Significant Macular Edema (CSME) (6%). A non significant association was noted between the age of the diabetic patients and associated ocular complications.

Conclusions: Diabetic Retinopathy was the commonest ocular complication of diabetes, followed by cataract and primary open angle glaucoma and extra ocular muscle palsy. The prevalence of diabetic ocular complications were higher in patients with longer duration of diabetes. There was no significant correlation between age of the diabetic patients and associated ocular complications.

Keywords: Diabetic mellitus, Diabetic Retinopathy, Cataract.

Introduction

Diabetes mellitus was recognized as 'madhu meha' or 'honey urine' and the symptoms of thirst; foul breath and languor by sushruta in 5th

century AD.⁽¹⁾ Aretaeus; a follower of Hippocrates of Alexandria in 2nd century A.D. gave the name Diabetes (a pauser through; siphon like) to the disease.⁽¹⁾

Incidence of diabetes mellitus according to WHO in the world is estimated 347 million people had diabetes in 2008.⁽²⁾ As per the 2015 data india has approximately 69.2 million people had diabetes and tops the list of countries with diabetics.⁽²⁾ Diabetes mellitus is a group of metabolic disorder that share the phenotype of hyperglycaemia. The etiology lies in complex interaction of genetic and environmental factors. Diabetes can be type 1 (insulin dependent diabetes mellitus) or type 2 (non insulin dependent diabetes mellitus)^(3,4). Type 1 diabetes mellitus results from auto immune mediated destruction of beta cells resulting in absolute or near total insulin deficiency. Auto immune process is triggered by infections or environmental stimuli. Type 2 diabetes is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion and increased glucose production.

Chronic hyperglycaemia is responsible for diabetes specific micro vascular complications affecting eye (diabetic retinopathy), kidney (diabetic nephropathy), and feet (diabetic neuropathy)^(3,4). Other common ocular complications of diabetes were cataract, corneal abnormalities, glaucoma, recurrent stye or chalazion, optic atrophy, orbital cellulitis and extra ocular muscle palsy.^(3,5)

Aims

1. To determine the common ocular complications of diabetes
2. To determine ocular complications related to the duration of diabetes.
3. To determine ocular complications related to the age of the diabetic patient.

Materials and Methods

200 diabetic patients were attending ophthalmology outpatient department from September 2015 to August 2017 in Karuna medical college Hospital, Palakkad, Kerala, India was taken for this study. Patient details like demographic details, diabetic disease details like duration of

diabetes, type of diabetes, whether patient was taking regular treatment or not, and patient was taking whether oral hypoglycaemic agents or insulin were mentioned. The clinical findings were recorded and ocular examination likes visual acuity recorded by snellens chart. Other materials used were Direct ophthalmoscope, Indirect ophthalmoscope, Slit lamp with +90D lens examinations for fundus examination and Schiotz and Goldmann applanation tonometer for intra ocular pressure measurement and Goldmann 3 mirror gonioscopy used for anterior chamber angle structures visualisation. Extra ocular movements were checked to rule out extra ocular muscle palsy.

All patients with type 1 and type 2 diabetes were included in this study. Gestational diabetes, drug induced diabetes and history of hypertension were excluded from this study. Statistical package for social science (SPSS) software was used to analyse the data in this study.

Results

In this analytical study 53% patients were males and 47% patients were females.^(table 1) Majority of the patients (46%) participated in the age group of 51-70 years in this study.^(chart 1) Minimum patient's age was 10 years and maximum was 90 years for this study. In this study majority of the patients (43.5%) were having diabetes for 10 years and 13 patients were having more than 30 years of diabetes.^{(chart 2)(table 2)} 11.5% patients were having type 1 diabetes and 88.5% patients were having type 2 diabetes.^(table 3) In this study we found that retinopathy was the most common (60.5%) ocular complication in diabetes. The prevalence of cataract was 20% followed by Primary open angle glaucoma (4.5%) and extra ocular muscle palsy (3.5%).^(chart 3) Xanthalesma, Recurrent Stye/ chalazion, Blepharitis, transient change in refraction, corneal ulcer, branch retinal vein occlusion, optic atrophy, orbital cellulitis, recurrent lacrimal abscess and extra ocular muscle palsy were all grouped under the subheading OTHERS for ease of computing statistical

analysis.^(table 4) Most of the diabetic ocular complications (46%) occurs in the age group between 51-70years followed by 31-50yrs (21.5%).^{(chart 4)(table 5)} Non Proliferative Diabetic Retinopathy (NPDR) was the most common (42.5%) ocular complication in this study. Incidence of Clinically Significant Macular Edema (CSME) was slightly higher in males (3.5%) than females (2.5%) in this study.^(table6)

Incidence of mild NPDR was more in case with duration of diabetes 1-10 years but severity of retinopathy was increasing with duration of diabetes in this study.^(table 7) Incidence of Proliferative Diabetic Retinopathy (PDR) was high (5.5%) when compared to other ocular complications in Type1 diabetic patients.^{(chart 5)(table 8)}

Table: 1 Distribution of Patients by sex and age group

AGE	MALE	FEMALE	TOTAL
10-30	14 (7%)	5 (2.5%)	19 (9.5%)
31-50	24 (12%)	35 (17.5%)	59 (29.5%)
51-70	40 (20%)	52 (26%)	92 (46%)
71-90	16 (8%)	14 (7%)	30 (15%)
TOTAL	94 (47%)	106 (53%)	200 (100%)

Table: 2 Distribution of Patients by duration of diabetes

YEARS	NUMBER OF PATIENTS
1-10	89 (43.5%)
11-20	73 (36.5%)
21-30	27 (13.5%)
>30	13 (6.5%)

Table 3 Distribution of Patients by type of Diabetes

TYPE-I DM	23 (11.5%)
TYPE-II DM	177 (88.5%)

Table: 4 Distribution of Paatients with Associated Ocular Complications of Diabetes

OCULAR COMPLICATIONS	NUMBER OF PATIENTS
XANTHELASMA	1 (0.5%)
RECURRENT STYE/CHALAZION	4 (2%)
BLEPHARITIS	2 (1%)
PRIMARY OPEN ANGLE GLAUCOMA	9 (4.5%)
CATARACT	40 (20%)
TRANSIENT CHANGE IN REFRACTION	2 (1%)
CORNEAL ULCER	2 (1%)
RETINOPATHY	121 (60.5%)
BRANCH RETINAL VEIN OCCLUSION	4 (2%)
OPTIC ATROPY	2 (1%)
ORBITAL CELLULITIS	3 (1.5%)
RECURRENT LACRIMAL ABCESS	3 (1.5%)
EXTRA OCULAR MUSCLE PALSY	7 (3.5%)

Table : 5 Distribution of Patients according to age group and associated ocular complications

OCULAR COMPLICATIONS	AGE GROUP				
	10-30 yrs	31-50 yrs	51-70 yrs	71-90 yrs	TOTAL
NPDR	0	23 (11.5%)	53 (26.5%)	9 (4.5%)	85 (42.5%)
PDR	8 (4%)	7 (3.5%)	5 (2.5%)	4 (2%)	24 (12%)
CATARACT	0	14 (7%)	19 (9.5%)	7 (3.5%)	40 (20%)
POAG	0	3 (1.5%)	4 (2%)	2 (1%)	9 (4.5%)
CSME	0	2 (1%)	7 (3.5%)	3 (1.5%)	12 (6%)
OTHERS	11 (5.5%)	10 (5%)	4 (2%)	5 (2.5%)	30 (15%)
TOTAL	19 (9.5%)	59 (29.5%)	92 (46%)	30 (15%)	200 (100%)

Table: 6 Distribution of patients according to sex and associated ocular complications

DIAGNOSIS	MALE	FEMALE	TOTAL
NPDR	38 (19%)	47 (23.5%)	85 (42.5%)
PDR	10 (5%)	14 (7%)	24 (12%)
CATARACT	16 (8%)	24 (12%)	40 (20%)
POAG	3 (1.5%)	6 (3%)	9 (4.5%)
CSMG	7 (3.5%)	5 (2.5%)	12 (6%)
OTHERS	20 (10%)	10 (5%)	30 (15%)
TOTAL	94 (47%)	106 (53%)	200 (100%)

Table: 7 Correlation between duration of diabetes and associated ocular complications

DIAGNOSIS	1-10 yrs	11-20yrs	21-30yrs	>30yrs	TOTAL
NPDR	61 (30.5%)	20 (10%)	3 (1.5%)	1 (0.5%)	85 (42.5%)
PDR	7 (3.5%)	14 (7%)	2 (1%)	1 (0.5%)	24 (12%)
CATARACT	6 (3%)	27 (13.5%)	5 (2.5%)	2 (1%)	40 (20%)
POAG	2 (1%)	2 (1%)	3 (1.5%)	2 (1%)	9 (4.5%)
CSMG	4 (2%)	2 (1%)	3 (1.5%)	3 (1.5%)	12 (6%)
OTHERS	7 (3.5%)	8 (4%)	11 (5.5%)	4 (2%)	30 (15%)
TOTAL	87 (43.5%)	73 (36.5%)	27 (13.5%)	13 (6.5%)	200 (100%)

Table: 8 Distribution of patients according to type of diabetes and associated ocular complications

DIAGNOSIS	TYPE-I DM	TYPE-II DM	TOTAL
NPDR	2 (1%)	83 (41.5%)	85 (42.5%)
PDR	11 (5.5%)	13 (6.5%)	24 (12%)
CATARACT	6 (3%)	34 (17%)	40 (20%)
POAG	0	9 (4.5%)	9 (4.5%)
CSME	0	12 (6%)	12 (6%)
OTHERS	4 (2%)	26 (13%)	30 (15%)
TOTAL	23 (11.5%)	177 (88.5%)	200 (100%)

Table: 5 Distribution of patients according to age group and associated ocular complications

OCULAR COMPLICATIONS	AGE GROUP				TOTAL
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NPDR	0	23 (11.5%)	53 (26.5%)	9 (4.5%)	85 (42.5%)
PDR	8 (4%)	7 (3.5%)	5 (2.5%)	4 (2%)	24 (12%)
CATARACT	0	14 (7%)	19 (9.5%)	7 (3.5%)	40 (20%)
POAG	0	3 (1.5%)	4 (2%)	2 (1%)	9 (4.5%)
CSME	0	2 (1%)	7 (3.5%)	3 (1.5%)	12 (6%)
OTHERS	11 (5.5%)	10 (5%)	4 (2%)	5 (2.5%)	30 (15%)
TOTAL	19 (9.5%)	59 (29.5%)	92 (46%)	30 (15%)	200 (100%)

Table: 6 Distribution of patients according to sex and associated ocular complications

DIAGNOSIS	MALE	FEMALE	TOTAL
NPDR	38 (19%)	47 (23.5%)	85 (42.5%)
PDR	10 (5%)	14 (7%)	24 (12%)
CATARACT	16 (8%)	24 (12%)	40 (20%)
POAG	3 (1.5%)	6 (3%)	9 (4.5%)
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OTHERS	20 (10%)	10 (5%)	30 (15%)
TOTAL	94 (47%)	106 (53%)	200 (100%)

Table: 7 Correlation between duration of diabetes and associated ocular complications

DIAGNOSIS	1-10 yrs	11-20yrs	21-30yrs	>30yrs	TOTAL
NPDR	61 (30.5%)	20 (10%)	3 (1.5%)	1 (0.5%)	85 (42.5%)
PDR	7 (3.5%)	14 (7%)	2 (1%)	1 (0.5%)	24 (12%)
CATARACT	6 (3%)	27 (13.5%)	5 (2.5%)	2 (1%)	40 (20%)
POAG	2 (1%)	2 (1%)	3 (1.5%)	2 (1%)	9 (4.5%)
CSMG	4 (2%)	2 (1%)	3 (1.5%)	3 (1.5%)	12 (6%)
OTHERS	7 (3.5%)	8 (4%)	11 (5.5%)	4 (2%)	30 (15%)
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TOTAL	23 (11.5%)	177 (88.5%)	200 (100%)

Chart : 1-DISTRIBUTION OF PATIENTS BY SEX AND AGE GROUP

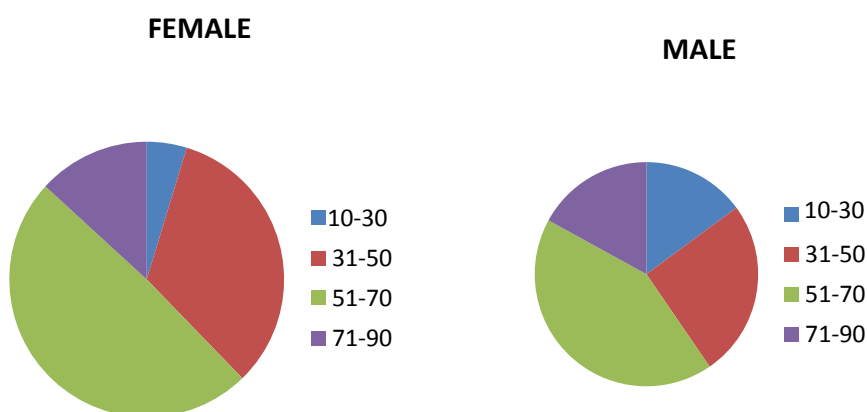


Chart : 2- DISTRIBUTION OF PATIENTS BY DURATION OF DIABETES

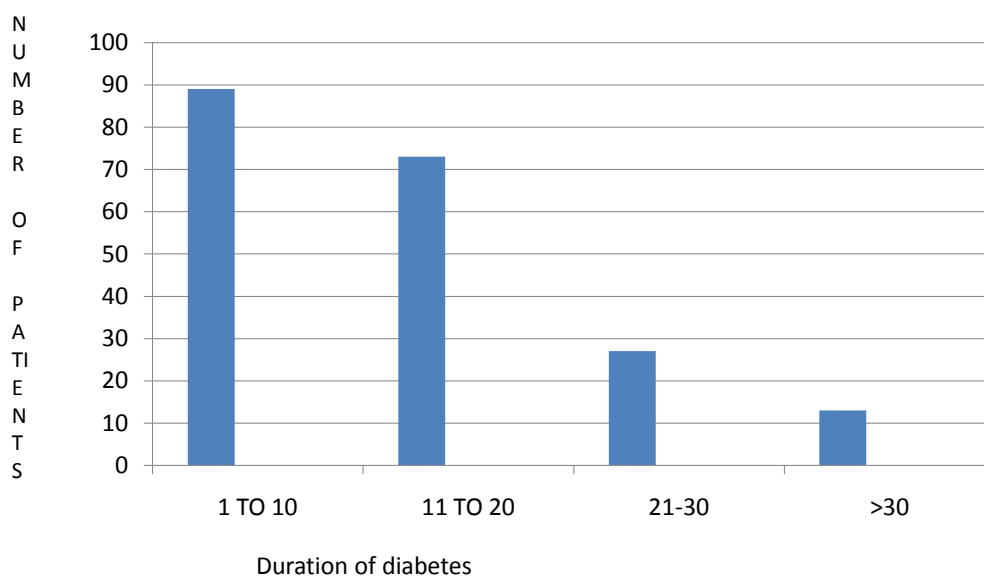


Chart :3-DISTRIBUTION OF PAIENTS WITH ASSOCIATED OCULAR COMPLICATIONS OF DIABETES

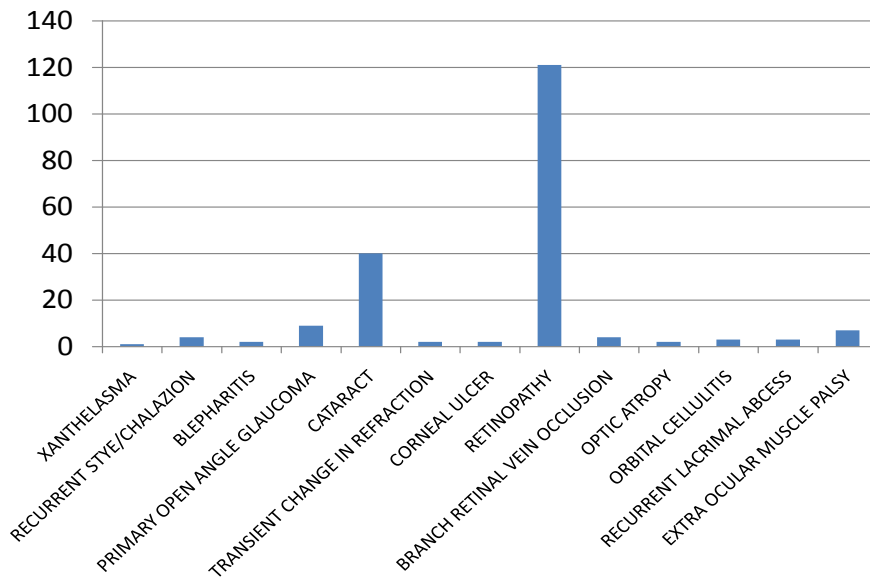


Chart :4-DISTRIBUTION OF PATIENTS WITH ASSOCIATED OCULAR COMPLICATIONS ACCORDING TO AGE GROUP

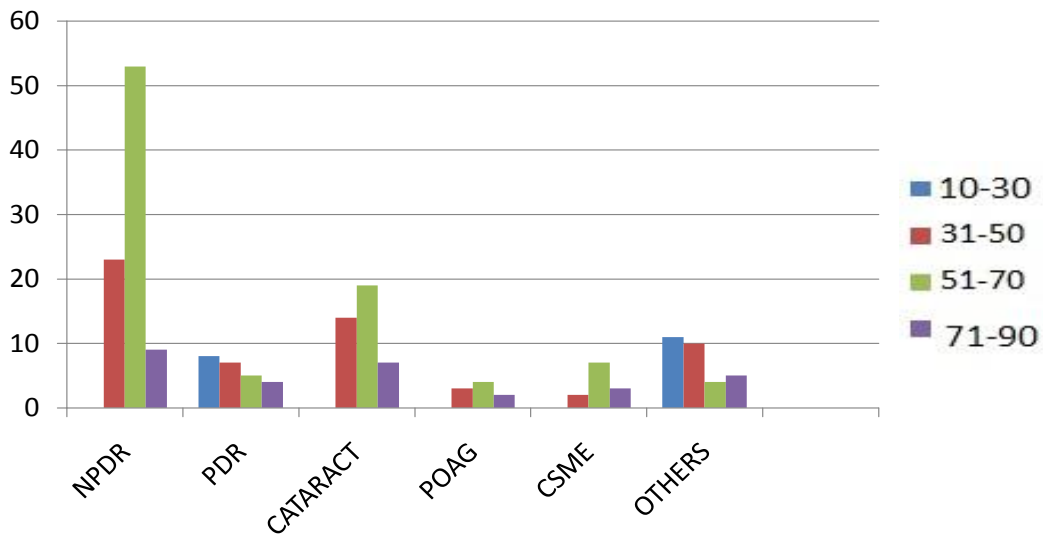
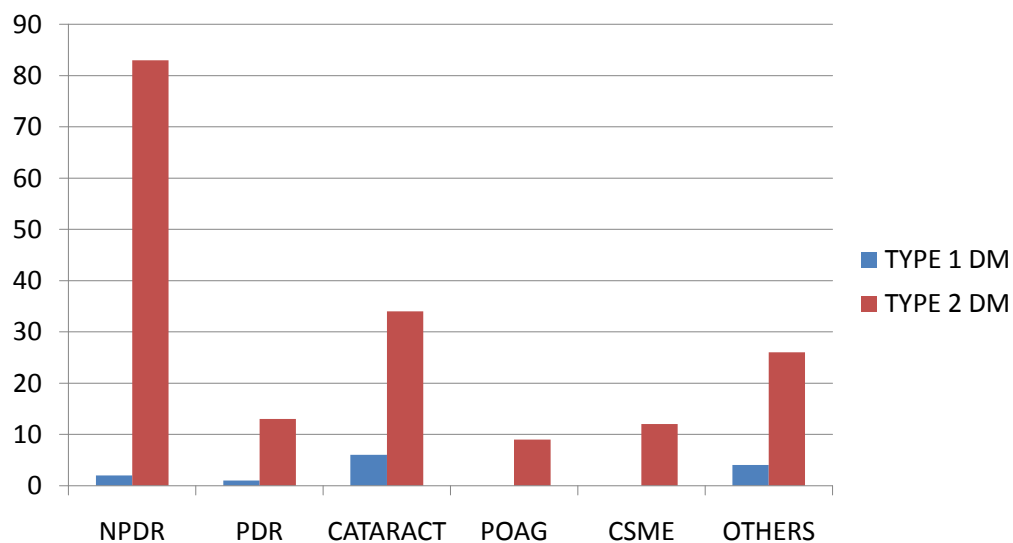


Chart :5-DISTRIBUTION OF PATIENTS ACCORDING TO TYPE OF DIABETES AND ASSOCIATED OCULAR COMPLICATIONS



Discussion

In this study 106 patients were females and 94 patients were males. Prevalence of Diabetic Retinopathy was high in female patients which was similar to Wisconsin Epidemiological study of Diabetic Retinopathy (WEDR) study.^(6,7) Most of the patients were found to be in the age group of 51-70years (46%) in this study. There was no significant correlation between age group and ocular complications of diabetes which was similar to a study conducted by Raheja.⁽⁸⁾ In this study 43.5% patients were having diabetes for 10years duration and 6.5% of patients were having diabetes more than 30years. Diabetic retinopathy (60.5%) was the most common ocular complications of diabetes. The prevalence of cataract was 20% followed by Primary Open Angle Glaucoma (4.5%) and extraocular muscle palsy (3.5%) in this study.

Jaeger first described the existence of specific retinal changes in the fundus of diabetics.⁽⁹⁾ The prevalence of diabetic retinopathy varied from 28.8% in persons who had diabetes for less than 5 years to 77.8% in persons who had diabetes for 15 or more years in a study conducted by Klein et

al.⁽⁶⁾ Diabetic cataract was first described by Berndt in 1834. In 1778 John Rollo first noticed that the sufferers from diabetes mellitus are particularly prone to development of cataract⁽¹⁰⁾. The highest incidence of cataract was found in the 51-70 years age groups (9.5%) and cataract was more common in females in this study (12%). This was similar to another study conducted by Harding J J et al & Raman.⁽¹¹⁾ Overall risk for cataract formation in diabetic patient is 2-4 times higher compared to non diabetic patients.⁽¹²⁾ Incidence of glaucoma was higher in females (3%) than males (1.5%) in this study. This was similar to study conducted by Dobson & Girard.⁽¹³⁾ Among 200 diabetic patients, 7 patients were having extra ocular muscle-nerve palsy in which 5 patients had third nerve palsy & 2 patients had sixth nerve palsy in our study. Rucker found that 6% of the 335 isolated third nerve lesions and 4% of 409 isolated sixth nerve lesions were in diabetes in 1958⁽¹⁴⁾. Diabetes is the underlying cause in 25-30% of patients aged 45 years & older who develop acute extra ocular muscle palsy.⁽¹⁵⁾ In a study by Watanabe K 1% of patients with diabetes were found to have cranial

palsies, compared with only 0.13% of control objects⁽¹⁶⁾. We found a prevalence of 2% Branch Retinal Vein Occlusion (BRVO) amongst diabetics in our study while BRVO was detected in 0.79% in a study conducted by Kawasaki R.⁽¹⁷⁾ In this study we found a significant correlation between duration of diabetes & associated ocular complications. Increased incidence of mild Non-Proliferative Diabetic Retinopathy (NPDR) (30.5%) was noted 1-10 years duration of diabetes but severity of retinopathy was increasing with duration of diabetes in this study. Increased incidence of retinopathy with increase in duration of diabetes was noted in studies conducted by Klein et al⁽¹⁸⁾ and Yanko et al.⁽¹⁹⁾ Increased incidence of Clinically Significant Macular Edema (CSME) was noted as the duration of diabetes increased in this study. When the duration of diabetes was less than 10 years 2% of patients had CSME and duration of diabetes was more than 10 years 4 % of patients had CSME. Similar increased incidence of CSME with increased duration of diabetes was noted in a study by Varma et al.⁽²⁰⁾ A non significant association was noted between the type of diabetes & associated ocular complications in this study. In this study 11.5% patients were Type – I diabetes & 88.5% were Type-II diabetes. 41.5% Type-II diabetic patients had NPDR & 1% Type-I diabetic patients had NPDR. The prevalence of NPDR was higher in Type-II diabetic patients. The prevalence of PDR was 5.5% in Type-I diabetic patients & 6.5% in Type II diabetic patients which was similar to a study done by Muawyah.⁽²¹⁾ We found that 6% of Type II diabetic patients had CSME but none of the Type I diabetic patients had CSME which was similar to a study conducted by Zander et al.⁽²²⁾

Conclusion

Diabetic Retinopathy was the commonest ocular complication of diabetes followed by cataract and primary open angle glaucoma in this study. Non Proliferative Diabetic Retinopathy (NPDR) was the most common type of retinopathy, which was

more common in type 2 diabetic patients than type 1 diabetic patients. Prevalence of Clinically Significant Macular Edema (CSME) was higher in patients with longer duration and in type 2 diabetic patients. Extra ocular muscle palsy also common in diabetes. Majority of the patients had III nerve and VI nerve palsy in this study. Prevalence of Primary Open Angle Glaucoma (POAG) was slightly higher in female diabetic patients. Incidence of cataract formation was 2-4 times higher in diabetic patients than non diabetic patients. Diabetic ocular complications were increased with duration of diabetes in this study. But there was no significant correlation between the patient's age and associated ocular complications. Ocular complications of diabetes mellitus are preventable with early detection and treatment.

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