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Original Research Article

Comparison of ocular manifestations in diabetic vs. non-diabetic patients in southern Rajasthan

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ABSTRACT

Background: Effects of DM are gradual, progressive and due to chronic exposure to high blood sugar levels. DM also affect the eyes which can lead to ocular morbidity as DR can cause blindness. In that view, it becomes increasingly important to diagnose them at theearliest for proper management and prevention of complications.
Methods: A total of 182 patients examined, out of which 91 were diabetic and 91 were non diabetic. Complete ocular examination was done that included visual acuity, anterior segment and fundus. Diabetic retinopathy was graded according to ETDRS classification. Diabetic patients were divided into 3 groups on the basis of HbA1c level (%): group-A (6-8), group-B (8-10) and group-C (>10). Patients were divided into 3 groups on the basis of duration (years): group1 (<5), group-2 (5-10) and group-3 (>10).
Results: Ocular manifestations were more prevalent in diabetics than non-diabetics along with that DR was found in diabetic patients and no retinopathy was found in non-diabetic patients. Out of 91 diabetic patients, DR was found in 30(33.3%) patients. Out of 30 DR, NPDR was found in 25(75%) and PDR was found in 5 (15%). DR in group A, B and C: 0, 17 (58%) and 13 (86%) respectively. DR in group1,2 and 3 was 3 (7.5%), 11 (35.4%) and 16 (80%) respectively.
Conclusions: Longer duration of diabetes and higher HbA1c level are associated with increased prevalence and severity of DR.

Keywords: Diabetes mellitus, Non proliferative diabetic retinopathy, Proliferative diabetic retinopathy, Glycemic index

INTRODUCTION

The prevalence of diabetes mellitus (DM) is rapidly increasing throughout theworld. Globally, the prevalence of diabetes mellitus (DM) has almost doubled from 4.7% (108 million) in 1980 to 8.5% (422 million) in 2014 in adult population.[1] The prevalence is predicted to further rise to 10.4% (642 million) by the end of 2040.[2] InIndia also, the prevalence of DM had increased from 5.5% (26.0 million) in 1990 to 7.7% (65.0 million) in 2016.[3] The number is expected to increase up to 80 million by 2030.[4] In addition to the increasing prevalence of DM, longevity of these patients is also increasing due to better treatment. These factors combine together resulting in increased complications of multiple organ systems of the body. DM can also affect the eyes which can lead to ocular morbidity including visual impairment. Visual impairment can be reversible and sometimes even irreversible or only partially reversible. Effects of DM are gradual, progressive and due to chronic exposure to high blood levels of glucose (i.e., hyperglycemia) caused by impairments in insulin metabolism and biological

macromolecules such as carbohydrates, lipids, proteins and nucleic acids.[5] The most common cause of visual impairment in DM is diabetic retinopathy (DR). While diabetic retinopathy is widely studied, there is paucity of information on prevalence of other ocular manifestations. In the eye, manifestations due to diabetes are found in almost every part i.e., orbit, lids and the anterior and posterior segments.[6] DR can cause blindness due to diabetic maculopathy, and complications of proliferative diabetic retinopathy (PDR) such as vitreous hemorrhage, tractional retinal detachment, and neovascular glaucoma.[7-9] Looking at the wide range of ocular morbidities and severity of visual impairment caused by DM, it becomes increasingly important to diagnose them at the earliest for proper management and prevention of complications. Although DR has been extensively studied, there are very few comprehensive studies on entire spectrum of ocular manifestations in DM. Moreover, no comprehensive study on comparative study on ocular manifestations in diabetics vs non diabetics has been conducted in this region. Therefore, I have decided to conduct this study to gain further insight.

METHODS

The cross-sectional, observational study was conducted from November 2020 to January 2022 in department of ophthalmology, Geetanjali medical college and hospital (GMCH), Udaipur, India.

Inclusion criteria

All the consenting patients of >18 years of age attending eye and medicine OPD and diagnosed with type-2 diabetes were examined and compared with age and sex matched controls.

Exclusion criteria

Exclusion criteria for current study were; patients refusing informed consent, patients diagnosed with hypertension and patients with history of metabolic disorders other than diabetes, ocular and systemic malignancies, ocular trauma and collagen vascular disorders.

Detailed history

Detailed systemic history was taken from both diabetic and non diabetic group which includes duration of diabetes and HbA1C levels. Complete ocular examination was done which included visual acuity, anterior segment and fundus.

Sample size

Sample size has been calculated using Cochrane's formulae;

$$n = Z2\alpha P(1 - P)/d2$$

Where, P is prevalence of ocular morbidities in diabetes=62%, E is Absolute Error=10%, Zα at95% confidence level=1.96 .Thus sample size (n)=91, total sample size (diabetics+non-diabetic patients)=182.

Data analysis

Data were described in terms of range; mean ±standard deviation (±SD), frequencies (number of cases) and relative frequencies (percentage) as appropriate. Comparison of quantitative variables between the study groups was done using ANOVA. For comparing categorical data, Chi square (χ^2) test was performed and Exact test was used when the expected frequency was less than 5, $p<0.05$ was considered statistically significant. All the statistical calculations were done using SPSS 21version.

RESULTS

Total number of 91 patients with diabetes and 91 non-diabetic patients wereexamined in our study.

Table 1: Gender wise distribution of diabetic and non-diabetic patients.

Gender	Diabetic	Non-diabetic	P value
Male	52	51	0.881
Female	39	40	0.881
Total	91	91	-

Table 2: Distribution of diabetic patients according to duration of diabetes.

Duration of diabetes (years)	N	%
<5	40	44
5-10	31	34
>10	20	22
Total	91	100

Table 3: Distribution of diabetic patients according to HbA1c levels.

HbA1c level (%)	N	%
<8	47	52
8-10	29	32
>10	15	16
Total	91	100

Out of 91 diabetic patients 52 were males and 39 were females. Out of 91 non-diabetic patients 51 were males and 40 were females. In our study, most of the patients had history of diabetes for less than 5 years i.e., 40 patients and 20 patients had history of more than 10 years. 47 patients had their HbA1C level between less than 8% and 15 patients had HbA1C level more than 10%. In diabetic patients, most common ocular finding was cataract (51.6%) followed by diabetic retinopathy (33%) and dry eye (22%). In non-diabetic patients, most

common ocular finding was cataract (28.6%) followed by dry eye (7.7%). Eyelid lesions were found to be more prevalent in diabetic patients (26.4%) as compared to non-diabetic patients (12%) (p<0.05).

Table 4: List of ocular findings in diabetic patients.

Variables	Ocular findings	Diabetic	%
Eyelid	Stye	4	4.4
	Chalazion	3	3.2
	MGD	14	15.4
	Anterior blepharitis	3	3.2
Conjunctiva	Pterygium	15	16.4
Cornea	SPKs	6	6.5
Tear film	Dry eye	20	22
Lens	Cataract	47	51.6
Fundus	Diabetic retinopathy	30	33
	ARMD	3	3.2
	Asteroid hyalosis	2	2.2

Table 5: List of ocular findings in non-diabetic patients.

Variables	Ocular findings	Non-Diabetic	%
Eyelid	Stye	2	2.2
	Chalazion	2	2.2
	MGD	5	5.4
	Anterior blepharitis	2	2.2
Conjunctiva	Pterygium	7	7.7
	Pinguicula	1	1.1
Tear film	Dry eye	7	7.7
Lens	Cataract	26	28.6

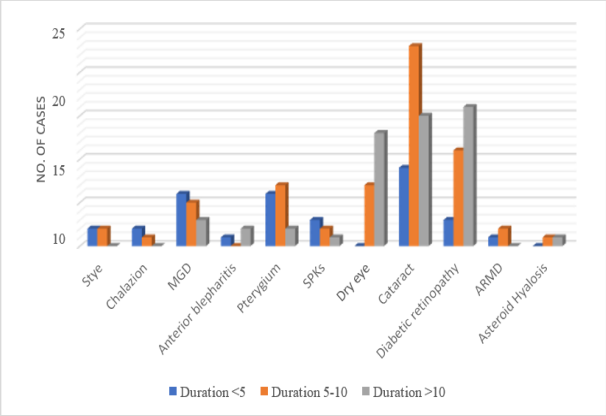

Figure 1: Association of ocular findings and duration of diabetes (years) in diabetic patients.

Conjunctival lesions were found to be more prevalent in diabetic patients (16.4%) as compared to non-diabetic patients (8.8%) (p<0.05). SPKs (p<0.05) were found only in diabetic patients. Dry eye was found to be more prevalent in diabetic patients as compared to nondiabetic patients (p<0.05). Cataract was found to be more prevalent in diabetic patients as compared to nondiabetic patients (p<0.05). DR was found in diabetic patients and no retinopathy was found in non-diabetic patients (p<0.05).

Table 6: List of ocular findings in diabetic vs. non-diabetic patients.

Variables	Ocular findings	Diabetic	Non-Diabetic	P value
Eyelid	Stye	4	2	0.682
	Chalazion	3	2	0.65
	MGD	14	5	0.029
	Anterior blepharitis	3	2	0.65
Conjunctiva	Pterygium	15	7	0.069
	Pinguicula	0	1	0.316
Cornea	SPKs	6	0	0.029
Tear film	Dry eye	20	7	0.011
Lens	Cataract	47	26	0.002
Fundus	Diabetic retinopathy	30	0	0.001
	ARMD	3	0	0.226
	Asteroid hyalosis	2	0	0.322

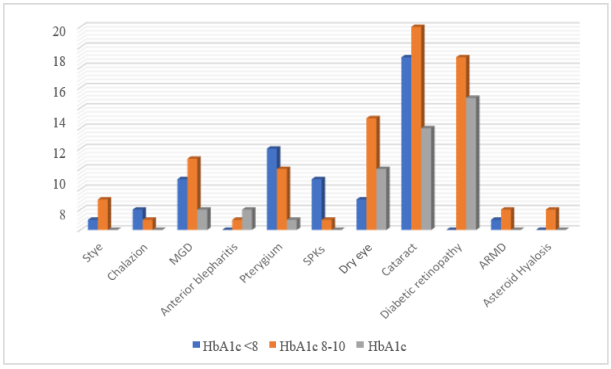

Figure 2: Association of ocular findings and HbA1c level (%) in diabetic patients.

There was significant association found between duration of diabetes and dry eye, cataract and DR (p<0.05). There was significant association found between HbA1c level and dry eye, cataract and DR (p<0.05). In diabetic patients, there was significant association between duration of diabetes and severity of DR (p<0.05). Maximum number of patients with PDR i.e.,4 had duration of diabetes more than 10 years. In diabetic patients, there was significant association between HbA1c level and severity of DR (p<0.05). Patients with PDR had HbA1c level more than 10%.

DISCUSSION

In our study, total 91 diabetic patients were examined. Various ocular disorders were present such as stye (4.4%), chalazion (3.2%), MGD (15.38%), anterior

blepharitis (3.28%), pterygium (16.48%), SPKs (6.5%), dry eye (22%), cataract (51.6%), DR (33%), asteroid hyalosis (2.2%) and ARMD (3.2%) (Table 4) Our findings were consistent to those of Kathiara et al Prabhakar et al and Kumar et al.[10-12] 91 non-diabetic patients were examined and ocular disorders such as stye (2.2%), chalazion (2.2%), MGD (5.49%), anterior blepharitis (2.2%), pterygium (7.69%), pinguecula (1.1%), dry eye (7.7%) and cataract (28.6%) were present (Table 5). In our study, we observed that eyelid lesions were more common in diabetics (26.4%) than non-diabetics (12%) (Table 6). In our study we also observed that stye was more in diabetic than non-diabetics (4.4 % vs. 2.2%) but this difference was statistically insignificant. Prevalence of stye in diabetics in our study was consistent with other studies.[10-12]

Table 7: Association of duration of diabetes and severity of diabetic retinopathy (ETDRS classification).

Diabetic retinopathy ETDRS classification		Duration of diabetes (years)			Total	P value
		<5	5-10	>10		
NPDR	Mild	2	7	2	11	0.0001
	Moderate	0	3	7	10	
	Severe	1	0	3	4	
PDR	Mild	0	1	0	1	
	High risk	0	0	3	3	
	Advance	0	0	1	1	

Table 8: Association of HbA1c level and severity of diabetic retinopathy (ETDRS classification).

Diabetic retinopathy ETDRS classification		HbA1c level (%)			Total	P value
		<8	8-10	>10		
NPDR	Mild	0	10	1	11	0.0001
	Moderate	0	7	3	10	
	Severe	0	0	4	4	
PDR	Mild	0	0	1	1	
	High risk	0	0	3	3	
	Advance	0	0	1	1	

In our study, we found that chalazion was more in diabetics than non-diabetics (3.2% vs. 2.2%) (Table 6) but this difference was statistically insignificant. Prevalence of chalazion in diabetics was found to be similar to other studies (1.6%-3%).[10,11] In our study, we found that MGD was more in diabetics than non-diabetics (15.4% vs 5.4%) (Table 6) and this difference was statistically significant. This could be due to higher susceptibility of diabetics to infections. In our study, we found that pterygium was more in diabetics than non-diabetics (16.48% vs. 7.69%) (Table 6) but this difference was statistically insignificant.

In our study, SPKs were found only in diabetics while it was absent in non- diabetics. Our finding was similar to Inoue et al.[13] This could be due to non uniformity of tear lipid layer, decreased corneal sensitivity, and decreased tear breakup time in diabetics.[14,16] In our study, the prevalence of dry eye was found to be higher in diabetics than non-diabetics (22% vs. 7.7%) (Table 6) and this difference was statistically significant. Prevalence of dry eye was also found to be higher in other studies. [17,18] The most possible mechanism of dry eye in diabetes is hyperglycemia leading to corneal neuropathy which is responsible for tear film instability and lower tear break up time (TBUT).[19,20] Strong association was found between dry eye and duration of diabetes which was similar to study done by Manaviat et al.[21] Dry eye was associated with HbA1c level and it was consistent with study done by Waris et al.[22] In our study, we found that cataract was more common in diabetics than non-diabetics (51.6% vs. 28.6%) (Table 6) and this difference was statistically significant. Prevalence of cataract was also found to be higher in other studies.[11,23] The higher occurrence of cataract in diabetic patients is related to raised level of glycated protein in lenses as postulated in several studies.[24-26]

In our study longer duration of diabetes and high HbA1c level were found to be an important risk factors in patients diagnosed with cataract and the findings were similar to the study done by Raman et al and Kim et al although according to Skalka et al HbA1c wasnot a risk factor.[25-28] In our study, DR was found in 30 (33%) patients with diabetes which was consistent with other studies Mahar et al and Prabhakar et al (Table 7-8).[23,24,11] Studies conducted by Almutairi et al and Al-Maskari et al showed that durationof diabetes and HbA1c levels were the major risk factors for DR and our study also had similar findings.[30,31] In our study, we found that severity of DR increases with longer duration of diabetes and higher HbA1c levels (Figure 2) These finding were consistent to other studies.[32,33]

Limitations

The limitations of our study are single centre study, small sample size and short study duration.

CONCLUSION

Patients with diabetes have higher prevalence of ocular manifestations as compared to non-diabetics. Eyelid disorders, viz, stye, chalazion, MGD and anterior blepharitis were found to be significantly higher in diabetics compared to non-diabetics. Pterygium was more common in diabetics compared to non-diabetics but the difference was not statistically significant. In cornea, SPKs were seen only in diabetic patients. Prevalence of dry eye was found to be higher in diabetics than non-diabetics. Cataract was the most common ocular disorder. Its prevalence was higher in diabetics compared to non-diabetics and the difference was statistically significant. Longer the duration of diabetes, higher the prevalence of dry eye, cataract and DR, Higher the HbA1c level, more the prevalence of dry eye, cataract and DR. Diabetic patients tend to develop cataract earlier than non-diabetics. Patients with longer duration and uncontrolled diabetes had severe DR than patients with shorter duration and controlled diabetes.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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