



STUDY ON EVALUATION OF ANTERIOR SEGMENT IN SUBJECTS WITH TYPE 2 DIABETES

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ABSTRACT

Introduction: Diabetes mellitus type 2 formerly non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. It is characterized by hyperglycemia and associated with micro vascular macro vascular, and neuropathic complications. Diabetes mellitus affects almost all the structures in anterior segment of the eyeball. **Aim And Objective Of The Study:** The objective of the study is to evaluate the anterior segment manifestations in patients of type 2 diabetes mellitus. **Materials And Methods:** In all the subjects we measured best corrected visual acuity using illuminated snellens chart, Haag streit slit lamp biomicroscope was used to perform Slit-lamp examination of the anterior segment, Direct ophthalmoscope was used to perform distant direct ophthalmoscopy, Schirmer test without corneal anesthesia was performed to assess total secretion of tears. Tear Film stability was assessed using fluorescein TBUT, Indirect Gonioscopy was done, Goldmann applanation tonometer was used to measure the intraocular pressure, Keratometry was performed using baush and lomb keratometer in our OPD Pupillary dilatation was effected using one drop of tropicamide 1%, which was instilled into each eye and repeated after 5–10 minutes. Cranial nerves associated with sensory or motor supply of the eyeball and lid i.e. 3rd, 4th, 6th and 7th cranial nerves were assessed. **Results:** In our study, most of the patients were having visual acuity of right eye between 6/6 to 6/18 (78.0%) and in left eye between (74.5%) which was significantly higher. Lid examination was done and the findings were warts in 31 (15.5%) patients, chalazion in 14 (6%) patients, sty in 19 (9.5%) patients, dermatochalasis in 26 (13%). In our study, the conjunctival examination under slit lamp showed the following significant findings - 23.0% of the patients had tortuosity of vessels, 16.5% of the patients had Pterygium and 16.5% of the patients had Pinguecula. In our study 23.5% and 20.5% of the patients under our study had abnormal schirmer test value in right and left eye respectively while 36% and 33% of the patients had an abnormal TBUT value in right and left eye respectively. In our study 12.5% of the patients had keratoepitheliopathy which comprised of findings such as recurrent corneal erosions, superficial punctate keratitis, filamentary keratitis. In our study, we found that 107 patients (53.5%) had cataract in right and 103 patients (51.5%) had cataract in left eye. In our study, 4.5% patients had 7th cranial nerve palsy, 3% patients had 3rd cranial nerve palsy, 1% had 4th cranial nerve palsy while no patient had 6th cranial nerve palsy. **Discussion And Conclusion:** Diabetes mellitus is a global problem with the greatest frequency in developing countries. It has been postulated that there is a need for global surveillance programs for primary, secondary, and tertiary prevention of diabetes and its complications. Also, it has been shown that blinding complications such as diabetic retinopathy can be significantly reduced by early intervention with laser treatment. Effective treatment therefore has to be initiated at an early stage before the patient is aware of any symptoms. This can be achieved only by systematic screening. This study stresses the fact that medical practitioners must be aware of the anterior segment findings in diabetes mellitus and of their role in referring these patients promptly before sight-threatening complications such as diabetic retinopathy occur. In addition, an effective partnership between the person with diabetes, the primary care physician, and the eye care professional is essential in order to ensure appropriate eye care. The need for an age-matched case-control study cannot be overemphasized.

KEYWORDS : Anterior Segment, Cornea, Conjunctiva, Iris, Cranial Nerve Palsy, Intra Ocular Pressure.**INTRODUCTION**

Diabetes mellitus type 2 formerly non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. It is characterized by hyperglycemia and associated with micro vascular (i.e., retinal, renal, possibly neuropathic), macro vascular (i.e., coronary, peripheral vascular), and neuropathic (i.e., autonomic, peripheral) complications.¹

According to WHO diabetes criteria the cut off value of plasma glucose to detect diabetes mellitus is as follows: 2 hr post prandial plasma glucose ≥ 11.1 mmol/l (≥ 200 mg/dl) and fasting plasma glucose ≥ 7.0 mmol/l (≥ 126 mg/dl). The WHO Consultation concluded that HbA1c can be used as a diagnostic test for diabetes. An HbA1c of 6.5% is recommended as the cut-off point for diagnosing diabetes.^{2,3}

Diabetes mellitus affects almost all the structures in anterior segment of the eyeball.⁴ It has been reported that xanthelasma is more common in diabetic patients.⁵ Being generally more susceptible to infection, diabetic patients are more at risk of developing blepharitis and orbital cellulitis.^{6,7} It has been suggested that recurrent hordeolum and blepharitis may be an early sign of diabetes in naive patients.⁸ It has also been seen that tear film abnormalities are common in diabetic patients who also experience an increased incidence of dry eye. Tear break-up time, an indicator of tear film stability has been reported to be diminished in diabetic patients. Diabetic patients have been reported to exhibit diminished wetting by Schirmer's test, used to assess tear function.^{9,10,11,12}

Keratopathy is a well-described ocular complication of diabetes. Specifically, patients are at higher risk of developing several corneal

complications including superficial punctate keratitis, recurrent corneal erosions and persistent epithelial defects.¹³ The most serious consequence of diabetes in the iris is neovascularization. This is most commonly observed around the pupil margin but, if advanced, can involve the entire iris surface and angle of ac.¹⁴

Diabetic patients may also have a weaker reaction to mydriatic drops (1% tropicamide) and this is believed to be a manifestation of diabetic neuropathy resulting in reduced functional innervation of the dilator muscle.^{15,16}

Cataracts are a well-known cause of visual impairment in diabetic patients. Many studies, including the large population-based Blue Mountains Eye Study and Beaver Dam Eye Study, have reported an increased prevalence and incidence of posterior subcapsular cataracts in diabetic patients.¹⁷⁻¹⁹

Cranial nerve mononeuropathies are a well-documented diabetic complication, specifically those affecting the third, fourth, sixth and seventh cranial nerves.²⁰

In view of previous studies this study aims to detect the prevalence of the anterior segment manifestations in type two diabetes mellitus patients attending the Ophthalmology OPD at Prasad Institute of Medical Sciences, Lucknow.

AIM AND OBJECTIVES OF THE STUDY:

The objective of the study is to evaluate the anterior segment manifestations in patients of type 2 diabetes mellitus.

MATERIALS AND METHODS

Source Of Data: This is a hospital based cross-sectional study,

conducted at Dept. of Ophthalmology, Prasad Institute of Medical Sciences, Lucknow, UP

Study Population: We included a total of 200 subjects in the age group of >40 years and <80 years both males and females.

Inclusion Criteria: Patients with type 2 diabetes mellitus fulfilling the WHO diabetes criteria of 2006

Exclusion Criteria: Subjects refusing informed consent, type 1 diabetes mellitus or DM secondary to any disease or drug usage and any diagnosed systemic or ocular disease involving anterior segment of the eyeball were excluded from the study.

Techniques And Data Collection: Detailed information of their age, gender, family history, medical history, personal history, history of any other illness and history of any ocular interventions was taken.

- Best corrected visual acuity was obtained using illuminated snellens chart.
- Haag streit slit lamp biomicroscope was used to perform Slit-lamp examination of the anterior segment.
- Direct ophthalmoscope was used to perform distant direct ophthalmoscopy.
- Schirmer test without corneal anesthesia was performed to assess total secretion of tears. Tear Film stability was assessed using fluorescein TBUT.
- Indirect Gonioscopy was done in all the patients.
- Goldmann applanation tonometer was used to measure the intraocular pressure.
- Keratometry was performed using baush and lomb keratometer in our OPD.
- Pupillary dilatation was effected using one drop of tropicamide 1%, which was instilled into each eye and repeated after 5–10 minutes. . cranial nerves associated with sensory or motor supply of the eyeball and lid i.e. 3rd, 4th, 6th and 7th cranial nerves were assessed.
- All data was recorded in case record form and presented after statistical analysis.

Statistical Analysis:

Data was entered into Microsoft excel spread sheet and analysed using of Epi Info (TM) 3.5.3, the prevalence of the anterior segment abnormalities was calculated. Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations. Test of proportion was used to find the Standard Normal Deviate (Z) to compare the difference proportions and chi-square test was performed to find the associations. t-test was used to compare the means. p<0.05 was taken to be statistically significant.

RESULTS

We included a total of 200 subjects with senile cataract based on inclusion and exclusion criteria in the age group of 40-80 years.

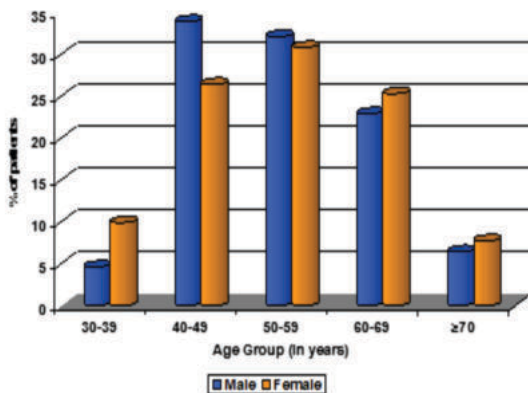


Figure 1: Shows Age wise Distribution Of Study Subjects

The mean age (mean ± SD.) of males was 53.69±9.87 years with range 32 - 80 years and the median age was 53.0 years. The mean age (mean ± SD) of females was 54.14±11.17 years with range 32 - 88 years and the median age was 52.00 years. Student t-test showed that there was no significant difference between the mean age of males and females (t₁₉₈=0.29; p=0.76). Thus, the male and female were more or less equally distributed over ages.

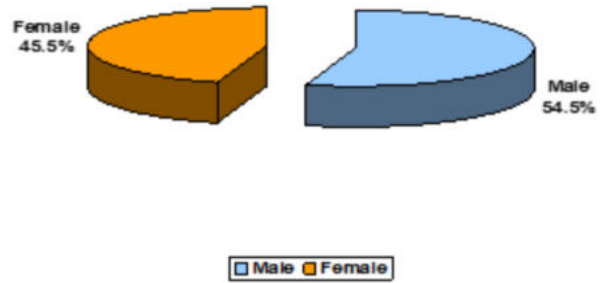


Figure 2: Shows Gender Wise Distribution Of Study Subjects

It is evident that the proportion of males (109, 54.5%) was higher than that of females (91, 45.5%) but was not significant (Z=1.41; p=0.15). The ratio of male and female was 1.2:1.0.

Table 1: Shows Visual Acuity In Both Right And Left Eye

Visual acuity	Right Eye		Left eye	
	Number	%	Number	%
6/6 - 6/18	156	78.0%	149	74.50%
6/24 - 6/60	25	12.5%	30	15.00%
5/60 - 3/60	12	6.0%	17	8.50%
3/60 - PL	7	3.5%	4	2.00%
Total	200	100.0%	200	100.0%

Most of the patients were having right visual acuity between 6/6 to 6/18 (78.0%) which was significantly higher (Z=9.22; p<0.0001). Most of the patients were having visual acuity of left eye between 6/6 to 6/18 (74.5%) which was significantly higher (Z=8.52; p<0.0001).

Table 2: Shows Distribution Of Eye Lid Findings In Study Subjects

Eye lid stye	Number	%
Yes	19	9.5%
No	181	90.5%
Total	200	100.0%
Eye lid wart		
Yes	31	15.5%
No	169	84.5%
Total	200	100.0%
Eye lid dermatochalosis		
Yes	26	13.0%
No	174	87.0%
Total	200	100.0%
Eye lid Chalazion		
Yes	12	6.0%
No	188	94.0%
Total	200	100.0%

It is evident from the above table that 9.5% had eye lid stye, 15.5% had eye lid wart, 13% had eye lid dermatochalosis and 6% had chalazion.

Table 3: Shows Distribution Of Conjunctival Findings In Study Subjects

Tortuosity of vessels	Number	%
Yes	46	23.0%
No	154	77.0%
Total	200	100.0%
Pterygium		
Yes	33	16.5%
No	167	83.5%
Total	200	100.0%
Pinguecula		
Yes	29	14.5%
No	171	85.5%
Total	200	100.0%

It is evident from the above table that 23% had Tortuosity of vessels, 16.5% had Pterygium, 14.5% Pinguecula.

Table 4: Shows Distribution Of Tear Film Findings In Study Subjects

Schirmer of left eye	Number	%
<5	4	2.0%
5-9	37	18.5%
≥10	159	79.5%

Total	200	100.0%
Schirmer of right eye	33	16.5%
<5	4	2.0%
5-9	43	21.5%
≥10	153	76.5%
Total	200	100.0%
TBUT of right eye		
<10	72	36.0%
≥10	128	64.0%
Total	200	100.0%
TBUT of left eye		
<10	66	33.0%
≥10	134	67.0%
Total	200	100.0%

The mean and SD value of Schirmer finding of the patients was 16.61±6.26 with range 4 - 31 and the median was 18. The mean and SD value of Schirmer finding of the patients was 17.29±6.36 with range 3-30 and the median was 18. The mean and SD of TBUT of the patients was 10.61±2.36 with range 5-17 and the median was 12. 36.0% of the patients had TBUT<10. The mean and SD of TBUT of the patients was 10.73±2.32 with range 3 - 16 and the median was 11.5. 33.0% of the patients had TBUT<10

Table 5: Shows Distribution Of Corneal Findings In Study Subjects

Keratopathy	Number	%
Yes	25	12.5%
No	175	87.5%
Total	200	100.0%
Corneal ulcer		
Yes	1	0.5%
No	199	99.5%
Total	200	100.0%
Cataract in right eye		
Yes	107	53.5%
No	93	46.5%
Total	200	100.0%
Cataract in left eye		
Yes	103	51.5%
No	97	48.5%
Total	200	100.0%

It is evident from the above table that 12.5% of the patients had Keratoepitheliopathy. Only 1(0.5%) patient had corneal ulcer 53.5% of the patients had cataract in right eye. 51.5% of the patients had cataract in left eye.

Table 6: Shows Distribution Of IOP, Iris, Angle Of AC Findings And 3rd, 4th And 6th Cranial Nerve Palsy In Study Subjects

IOP of right eye	Number	%
11-21	184	92.0%
>21	16	8.0%
Total	200	100.0%
IOP of left eye		
11-21	187	93.5%
>21	13	6.5%
Total	200	100.0%
Neovascularization of iris		
Yes	6	3.0%
No	194	97.0%
Total	200	100.0%
Iris atrophy		
Yes	25	12.5%
No	175	87.5%
Total	200	100.0%
Neovascularization of angle of AC		
Yes	3	1.5%
No	197	98.5%
Total	200	100.0%
Angle of anterior chamber according to gonioscopy		
Closed	7	3.5%
Open	193	96.5%

Total	200	100.0%
3 rd nerve palsy		
Yes	6	3.0%
No	194	97.0%
Total	200	100.0%
4 th nerve palsy		
Yes	2	1.0%
No	198	99.0%
Total	200	100.0%
6 th nerve palsy		
Yes	0	0.0%
No	200	100.0%
Total	200	100.0%
7 th nerve palsy		
Yes	9	4.5%
No	191	95.5%
Total	200	100.0%

The mean and SD of IOP of the patients was 16.37±4.26 mmHg with range 11–38 mmHg and the median was 16.0 mmHg. 8.0% of the patients had IOP>21 mmHg. The mean and SD of IOP of the patients was 15.59±3.30 mmHg with range 11 – 34 mmHg and the median was 14.0 mmHg. 6.5% of the patients had IOP>21 mmHg. 3.0% of the patients had neovascularisation of iris. iris atrophy was found in 12.5% of the patients. 1.5% of the patients had neovascularisation in the angle of anterior chamber 3.5% had closed angle of anterior chamber on gonioscopy. 3.0% had 3rd nerve palsy. 1.0% had 4th nerve palsy. No patient had 6th nerve palsy. 4.5% had 7th nerve palsy.

DISCUSSION

In our study, we evaluated anterior segment in 200 diabetic subjects based on inclusion and exclusion criteria. The mean age of the patients was 53.90±10.45 years with range 32 - 88 years and the median age was 52.50 years. Test of proportion showed that the proportion of the patients in the age group 40-59 years (62.0%) were significantly higher than other age group. Only 7.0% were with age between 30-39 years and also with age ≥70 years. Test of proportion showed that proportion of males (54.5%) was higher than that of females (45.5%) but was not significant. The ratio of male and female was 1.2:1.0. The mean age of males was 53.69±9.87 years with range 32 - 80 years and the median age was 53.0 years and in females it was 54.14±11.17 years with range 32 - 88 years and the median age was 52.00 years. In our study, most of the patients were having visual acuity of right eye between 6/6 to 6/18 (78.0%) which was significantly higher (Z=9.22; p<0.0001) and visual acuity of left eye between 6/6 to 6/18 (74.5%) which was significantly higher (Z=8.52; p<0.0001) compared to other visual acuity finding. In a hospital based prospective study conducted by Shrestha et al 85.93% of the patients had visual acuity between 6/6-6/18 in right eye and 84.37% of the patients had visual acuity of 6/6 to 6/18 in left eye. Diabetes mellitus is a well-documented risk factor for recurrent styes and multiple chalazion. A finding of recurrent styes should therefore arouse further examinations for diabetes mellitus. Lid examination was done and the findings were warts in 31 (15.5%) patients, chalazion in 14 (6%) patients, stye in 19 (9.5%) patients, dermatochalasis in 26 (13%).^{20,21}

In our study, the conjunctival examination under slit lamp showed the following significant findings - 23.0% of the patients had tortuosity of vessels, 16.5% of the patients had Pterygium and 16.5% of the patients had Pinguecula these findings are in accordance with the study conducted by Adeoti et al.²³Changes of tear function parameters in diabetes have been studied, but the results remain controversial. In addition, there has been a lack of research related to the changes of ocular surface in diabetic patients to clinical parameters of diabetes.²³ In our study 23.5 % and 20.5% of the patients under our study had abnormal schirmer test value in right and left eye respectively while 36% and 33 % of the patients had an abnormal TBUT value in right and left eye respectively. This is in accordance with the study conducted by Yoon et al.

Keratoepitheliopathy is a well-described ocular complication of diabetes. Specifically, patients are at higher risk of developing several corneal complications including superficial punctate keratitis, recurrent corneal erosions and persistent epithelial defects. In our study 12.5% of the patients had keratoepitheliopathy which comprised of findings such as recurrent corneal erosions, superficial punctate keratitis, filamentary keratitis. We found one patient having corneal ulcer similar to Adeoti et al.

Cataract occurring in diabetic patients can be due to the diabetes itself or to accelerated senile cataract in which cataract occurs earlier than normal. As with retinopathy, the duration and control of the diabetes are important factors in cataract development and management. In our study, we found that 107 patients (53.5%) had cataract in right and 103 patients (51.5%) had cataract in left eye. This finding is similar to the study conducted by Adeoti et al.

In our study the commonest finding during the examination of iris was atrophy (12.5%). This, however, may be partly due to aging, as the mean age of the patients was 57.51 years or ischemia found in diabetes mellitus. Abnormal vessels on the iris in diabetes mellitus are usually associated with advanced diabetic retinopathy, and these may bleed spontaneously. 3.0% of the patients in our study had neovascularization of iris.

Hymowitz et al in a study concluded that diabetic patients with uncontrolled blood sugar level have a consistent elevation in the mean IOP in their population group. The mean IOP in our study in the right eye was found to be 16.37±4.26 mmHg and in the left eye was 15.59±3.30 mmHg which can be considered to be elevated. 8.0% and 6.5 % of the patients in our study population had IOP>21 mmHg in right and left eye respectively. The association between diabetes mellitus and glaucoma in the literature is equivocal. Some researchers have not found an association, whereas others in Australia found the prevalence of open-angle glaucoma to be greater in people with diabetes than in the normal population.

On gonioscopy 1.5% of the patients had neovascularisation of angle which is similar to the finding in study conducted by Adeoti et al who found it in 1.66% patients. In our study, 4.5% patients had 7th cranial nerve palsy, 3% patients had 3rd cranial nerve palsy, 1% had 4th cranial nerve palsy while no patient had 6th cranial nerve palsy. Cranial nerve palsies are common in diabetes mellitus, with the facial nerve being the most commonly affected, followed by the abducent, oculomotor, and trochlear. In a study conducted by Adeoti et al Seventh nerve palsy was found in 3.87% patients, third palsy in 2.21% patients, and fourth palsy in 0.55% patient. No patient had sixth nerve palsy.

CONCLUSION

Diabetes mellitus is a global problem with the greatest frequency in developing countries. It has been postulated that there is a need for global surveillance programs for primary, secondary, and tertiary prevention of diabetes and its complications. Also, it has been shown that blinding complications such as diabetic retinopathy can be significantly reduced by early intervention with laser treatment. Effective treatment therefore has to be initiated at an early stage before the patient is aware of any symptoms. This can be achieved only by systematic screening. This study stresses the fact that medical practitioners must be aware of the anterior segment findings in diabetes mellitus and of their role in referring these patients promptly before sight-threatening complications such as diabetic retinopathy occur. In addition, an effective partnership between the person with diabetes, the primary care physician, and the eye care professional is essential in order to ensure appropriate eye care. The need for an age-matched case-control study (the object of a future study) cannot be overemphasized.

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