Clinical Profile of Ocular Diseases with the Assessment of Knowledge, Awareness and Eye-care Practices in Newly Diagnosed Diabetics in Working Age Group

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ABSTRACT

Introduction: Ocular complications in diabetes have a significant impact on the working population. Apart from diabetic retinopathy, diabetes can lead to several non-retinal complications like cataract, ophthalmoplegia, dry eye, corneal kerato-epitheliopathy and refractive error. With the addition of substantial number of newly diagnosed diabetics per year there is a significant ever-growing burden on health services.

Materials and methods: It was a hospital-based study conducted at Hi-tech Medical College and hospital where patient diagnosed as diabetics within one year and in the working age-group 30-65 years were included. After the routine ocular evaluation these subjects were administered a concise questionnaire containing questions testing their awareness about diabetes, its ocular complications and eye-care practices.

Results: A total of 727 newly diagnosed diabetics were assessed with mean age 49.64 +/-7.28. The incidence of cataract was 18.7% and DR 9.35% respectively. Although nearly half the study population had some knowledge of diabetes, knowledge about ocular complications was limited. The main source of the information was the prescribing doctor.

Conclusion: Determining the clinical profile of ocular complications with an assessment of knowledge and awareness of eye-care practices in the newly diagnosed diabetics can help to formulate the interventional measures to control the ocular morbidity.

Keywords: Newly Diagnosed, Diabetic Retinopathy, Cataract, Ophthalmoplegia, Awareness, Eye-Care Practice

INTRODUCTION

Diabetes mellitus is the most common metabolic disorder of the world. DM along with its complications are becoming are becoming world's most significant cause of morbidity and mortality. The DM pandemic is spreading steadily affecting both developed as well developing countries and is expected to affect nearly 370 million worldwide by 2030.[1] According to International Diabetic Federation, with over 70 million diagnosed with diabetes, India is the home to second largest number of diabetics and their number is expected to cross 100 million by 2035.[2] In the developed world diabetes is common among the elderly but in contrast 35-64 years is the most commonly affected age group in the developing world.[3]

The term diabetes mellitus describes a metabolic cum vascular syndrome of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, protein and fat metabolism resulting in defects in insulin secretion, insulin action or both leading to microangiopathy as well as macroangiopathy.[4] The chronic complications of diabetes are due to pathological changes affecting the blood vessels of the involved organs. The disease can involve either the small blood vessels (microangiopathy) or the larger blood vessels (macroangiopathy). Diabetic retinopathy and diabetic nephropathy are predominantly the result of microvascular disease.[5]

Ocular complications associated with diabetes mellitus (DM) are progressive and rapidly becoming the world's most significant cause of morbidity and are preventable with early detection and timely treatment. DM can lead to several ocular complications such as diabetic retinopathy, cataract, dry eye disease, and ocular surface diseases and extraocular muscle paralysis.[6]

Diabetic retinopathy (DR), the most common microvascular complication of DM is predicted to be the principal reason of new blindness among working population. There are approximately 93 million people with DR, 17 million with proliferative DR, 21 million with diabetic macular edema, and 28 million with VTDR worldwide. Longer diabetes duration and poorer glycemic and blood pressure control are strongly associated with DR.[7,8]

Diabetics are more prone to develop cataract.[9,10] The risk of cataract increases with increasing diabetes duration and severity of hyperglycemia. Cataracts occur at an earlier age and 2–5 times more frequently in patients with diabetes. The Wisconsin study identified that the ten-year cumulative incidence of cataract surgery was 27% in patients with early onset diabetes and 44% in cases with older onset disease.

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The approach to timing for cataract surgery in diabetic patients seems to be changing. Pollack et al proposed that "cataract extraction should not be recommended for eyes with diabetic retinopathy until visual acuity has deteriorated to 20/100–20/200". Today an approach towards earlier cataract surgery allows laser photocoagulation and treatment of macular edema thus preventing progression of diabetic retinopathy.[11-15]

Diabetes mellitus significantly impacts the morphological, metabolic, physiological and clinical properties of the cornea. The corneal abnormalities include clinically detectable changes such as increased corneal epithelial fragility, recurrent erosions, reduced corneal sensitivity, impaired wound healing, predisposition to corneal edema and infectious ulcers.[15-19] Diabetic neuropathy affects tear production and quality by compromising the functional integrity of lacrimal gland as well as by reducing corneal sensitivity.[19-21] Extraocular motility disorders may occur in patients with diabetes involving the third, fourth, or sixth cranial nerve.[22-24] Rarely, simultaneous palsies of multiple extraocular nerves can occur.[24] The Blue Mountain study has reported a higher prevalence of elevated mean IOP among diabetics, while the Rotterdam study associated newly diagnosed and higher blood glucose with normotensive glaucoma.[25,26]

Long duration and poor control of diabetes have been associated with development of various ocular complications. With the addition of substantial number of newly diagnosed DM every year there is additional burden on health services. Assessing the baseline knowledge in these new diabetics can help to access their awareness and plan the interventional programmes accordingly. Our study is a step towards the direction to prevent and manage ocular complications of diabetes by assessing the lacunae in the health awareness of the patients.

Aim of the study was to determine the clinical profile of ocular complications in newly diagnosed type 2 DM among the working population (30-65 years) with special reference to cataract, diabetic retinopathy (DR), ophthalmoplegia and refractive error and to study the awareness of patient regarding diabetes, its ocular complications and eye care practices.

METHOD AND MATERIALS

It was a hospital-based prospective study conducted on the patients presenting to Hi-Tech Medical College and Hospital, Rourkela, District Sundergarh during the period January 2017 to December 2018. The study was carried out on patients in the working age group 30-65 years who had presented to Ophthalmology out-patient department with ocular problems or who had been referred from Medicine department following diagnosis of type 2 diabetes mellitus (DM). For the study, newly diagnosed diabetics were defined as those who had been diagnosed with DM within 1year. Duration was recorded as the time between diagnosis of DM 2 and the presentation of patient in eye department for check-up. It was a combined study done by ophthalmology and medicine department of the institute.

A questionnaire was administered to patient to note their awareness regarding ocular complications of diabetes after explaining to them about the aim of study and taking informed consent. The questionnaire had four parts. First - the demographic details of the patient and diabetic history, second-knowledge about diabetes, third-knowledge about ocular complication of diabetes and fourth about eye-care practice.

The selected patients were subjected to detailed ophthalmic examination including visual acuity, subjective and objective refraction, slit lamp examination, direct ophthalmoscopy, 90D slit-lamp bi-microscopy, indirect ophthalmoscopy, gonioscopy, applanation tonometry for IOP measurement, test for dry eye (Schirmer's test, BUT) and A-Scan ultrasound. Those patients who presented with ocular problems and were diagnosed as DM II during routine tests were also included in the study. Such patients were managed for their ocular symptoms and appropriate anti-hyperglycemic treatment was started consequently.

Patients diagnosed with DM II for duration more than 1 year irrespective of their glycemic control and drug compliance were excluded from study. As the study was aimed to evaluate the ocular complication of diabetes in the working population, patients older than 65 years were also excluded. This was also done to exclude senile cataract which may not be related to diabetic status. Patients who had similar ocular complains prior to their diabetic status example recurrent anterior uveitis, trauma and congenital eye diseases were excluded from study.

Cataract was graded by comparing the lenticular opacities with LOCS III (Lens Opacity Classification System III) standard photographs. For classifying cortical and posterior subcapsular cataract retroillumination was used. In a patient with bilateral cataract, the eye with more severe grading was taken into account. Those who had previously undergone cataract surgery were excluded from study. For patients with diabetic retinopathy eye with worse stage of DR was considered.

RESULTS

The study was done on 744 newly diagnosed DM 2 patients during the period January 2017 to December 2018. 17 patients were discarded because of incomplete questionnaire and other reasons. Total of 727 patients were evaluated. Out of them 404 were males while 323 were females (table-1). 582 had been diagnosed with type 2 DM and presented to ophthalmology department for ophthalmic examination while 145 were diagnosed as DM II during the management of their various ocular symptoms. About 180 among the 582 patients diagnosed by medicine department presented to Ophthalmology OPD at diagnosis. The mean age of presentation of newly diagnosed DM 2 patients was 49.64 +/- 7.28 years. The mean age of patients with ocular complication was 52.12 +/- 8 years.

Diabetic retinopathy (DR) was seen in a total of 68 patients (9.35%) out of which 16 patients had diabetic macular edema

Age	Males	Females	Total
31-35	8	10	18
36-40	45	49	94
41-45	61	51	112
46-50	98	68	166
51-55	69	52	121
56-60	68	56	124
61-65	55	37	92
Total	404	323	727

Table-1: Age and sex distribution

Ocular manifestation	Total	Percentage
Cataract	136	18.7
Diabetic retinopathy	68	9.35
Dry eye disease	53	7.29
Xanthelesma	19	2.61
Cataract +DR	19	2.61
DR + DME	16	2.2
Corneal complications	15	2.06
LID complications	12	1.65
Cranial nerve palsy	12	1.65
PVD	9	1.23
Premature presbyopia	8	1.1
Anterior uveitis	7	0.96
Hypermetropic shift	7	0.82
ARMD	6	0.82
POAG	4	0.55
Chronic dacrocystitis with abscess	2	0.27
Myopic shift	2	0.27
BRVO	2	0.27

Table-2: Ocular manifestations in newly diagnosed DM

Grading of cataract	Sex distribution		Total	Percentage
	Males	Females		
PSC	35	29	64	47.05
Cortical	22	24	46	33.8
Nuclear Sclerosis	15	11	26	19.11

Table-3: Sex distribution of types of cataract

Grading of DR	Sex distribution		Total	Percentage
	Males	Females		
NPDR	34	22	56	7.7
Mild	12	11	23	
Moderate	18	8	26	
Severe	4	3	7	
PDR	6	6	12	1.65
Low risk	2	1	3	
High risk	4	5	9	
DME	11	5	16	2.2

Table-4: Grading of diabetic retinopathy

(DME) as well. The majority of DR patients (82.35%) had non proliferative diabetic retinopathy (NPDR) with 26 patients with moderate NPDR (table-3).

About 7% (53) patients presented with symptomatic Dry Eye Syndrome (DES). Corneal complications were present in 15 patients which included corneal ulcer in 6, corneal erosions

Knowledge about Diabetes	Age distribution (in % age)						Sex Distribution		Total	Percent-age
	31-35	36-40	41-45	46-50	51-55	56-60	61-65	Males	Females		
1. What is diabetes?	15	78	86	89	60	40	26	230	164	394	54.1
2. Type of diabetes	6	10	12	19	9	5	2	41	21	62	8.5
3. What are the risk factors for diabetes?	12	41	60	65	49	16	9	136	132	268	34.6
Sugar-rich foods	12	41	59	61	42	16	9	109	132	241	33.1
Overeating	8	27	21	34	27	11	9	80	57	137	18.8
Obesity	2	10	11	10	8	9	6	27	29	56	7.7
Family history	2	16	17	11	9	10	8	31	42	73	10.04
4. What are the symptoms? (any 2)											
Polyuria/ Polydipsia/ Weight loss/Recurrent infections/Asymptomatic	8	20	26	37	21	32	14	89	69	158	21.7
5. Is diabetes preventable?	12	62	63	79	51	36	16	114	121	319	43.8
6. Is diabetes treatable?	15	70	77	87	49	31	12	187	154	341	36.9
7. How can diabetes be detected?											
Blood sugar	16	89	98	115	75	86	45	298	226	524	72.07
Urine sugar	8	10	14	19	14	11	6	52	30	81	11.2
HBA1c	3	7	7	9	6	2	0	25	9	34	4.6

Table-5: Knowledge about Diabetes

Knowledge and awareness about ocular complications of Diabetes	No. of Patients	Percentage
1. Can diabetes affect the eye	253	34.8
2. Can diabetes cause diminution of vision or blindness?	175	24.07
3. What are the ocular complications of diabetes?		
Retinopathy	154	21.1
Cataract	82	11.2
Refractive error	45	6.18
Extra-ocular muscle palsy	11	1.5
Dry eye disease	27	3.7
Corneal complications	0	0
4. How did you know DM can affect eye?		
Doctor	151	20.7
Family & friends	31	4.26
Print / visual media	35	4.81
Internet	74	10.17

Table-6: Knowledge about ocular complications in DM

1. Do you take medicines regularly?	528	72.6
2. Do you know regular eye check- up is important in type DM to prevent ocular complications?	208	28.6
3. Do you think regular blood sugar estimation is important?	321	44.15
4. Do you know strict blood sugar control can prevent future ocular complications?	412	56.7
5. Have you been to eye doctor prior to detection of DM?	195	26.9

Table-7: Eye-care practices

in 5, 2 with corneal opacity and 1 patient each with bullous keratopathy and marginal keratitis. Eyelid complications like recurrent external hordeolum (3), chalazion (2), anterior ulcerative blepharitis (3), posterior blepharitis (2) and lid abscess (2) were present in a total of 12 patients (1.65%). Extra ocular muscle palsies were seen in 9 patients, where 5 had isolated third nerve palsy, 2 with isolated VI nerve palsy, and one each with combined palsy of III nerve with sixth nerve and III nerve with IV nerve respectively apart from lagophthalmos due to VII nerve palsy in 3 patients (table-4). With a help of a questionnaire the newly diagnosed diabetics were assessed regarding their knowledge about diabetes, its ocular complications and their eye care practices. The mean duration between diagnosis and presentation for ocular examination was 4.65 months with nearly one-fourth (180) of the patients presenting at diagnosis.

Although more than half the patients knew diabetes as an increase in blood sugar, their knowledge about its type, symptoms and risk factors was limited. Of the 494 patients who had some idea about diabetes, only 12.5% (62) knew about type of diabetes, 18% about the symptoms and about one-fourth (91) believed obesity, over-eating, 'sugar-rich' foods and family history of diabetes as risk factors for diabetes. More than 70% knew diabetes can be detected by estimating blood sugar levels (table-5).

Nearly half the patients believed that DM can affect the eye and 40% believed that it can cause vision loss. About 15% believed retina is affected in DM but there was minimal knowledge about other ocular complications. Of the 353 patients who claimed of ocular involvement in DM, 60% had been informed by their treating doctor while 20.9% had got the information from internet (table-6).

Drug compliance was good with over 72.9% patients taking their medication regularly. Nearly half the patients believed strict blood sugar control is important for management of diabetes as well as to control its complications (table-7).

DISCUSSION

In our study cataract was the most common ocular manifestation, present in nearly one fifth of the patients with posterior subcapsular cataract (PSC) being the most common type followed by cortical cataract. Various studies like the Blue Mountains Eye Study (BMES) and Arvind comprehensive eye study have documented an association between diabetes and PSC.[12,27] On the other hand, the Beaver Dam Eye Study (BDES) and Schafer et al (documented by Scheimpflug photography) have reported a higher percentage of cortical opacities in diabetics.[28-29] Saxena et al found a 2-fold higher incidence of cortical cataracts in subjects with diabetes mellitus over 5 years but a higher statistically significant association of PSC in newly diagnosed diabetics.[30] The findings are similar to our study where nearly 8.8% of newly diagnosed type 2 DM have PSC. This is in sharp contrast to the study done by Srinivas et al in Tamil nadu where higher incidence of nuclear sclerosis has been reported.[31] The reason may be the fact that our study deals with only working age group while the other study includes all patients greater than 40 years.

The incidence of diabetic retinopathy (DR) in the present study is 9.35% with 56 (82.35%) patients presenting with non-proliferative diabetic retinopathy (NPDR), and 13 with proliferative diabetic retinopathy. It is slightly higher than that found by M Rema et al in South India with the help of fundus photographs where DR was present in 7.3% of newly diagnosed type 2 DM.[32] In a study in Sri Lanka by Weerasuriya et al incidence of DR was 15%, in Beaver Dam Eye study 10%, Harzallah et al in Tunis 8% while the incidence was

much lower in Bhaktapur Retina Study in elderly population (6.5%) and by Heydari et al in Iran(6%).[33-37] The UKPDS study had a much higher percentage(37%)of patients with DR at diagnosis.[38] This may be due to ignorance among the people in our study region to seek health services for ocular problems unless the condition is severe.

Ophthalmoplegia was seen in 1.23% of the patients with isolated III nerve palsy being most common. Observational registry-based study in Saudi Arabia[39] found 0.32% of diabetics suffering from ophthalmoplegia while Greco et al[40] found the incidence to be 0.54%. Although the most common nerve involved varied in different studies (VI nerve by Al Kahtani and III nerve by Greco and Watanabe), ophthalmoplegia has been found to be more closely related to diabetes as compared to VII nerve palsy[22,39,40]

Transient hypermetropic shift was seen in 7 patients (0.96%) after anti-hyperglycemic therapy. Studies by Okamoto et al and Sonmez et al have suggested transient hyperopic change as the result of glycemic control while Chen et al has associated hypermetropia with HBA1c ≥7 although myopia was the most common refractive error in diabetics.[41,42,43] Barbara et al found out that longer duration of diabetes and those with proliferative retinopathy were likely to have hyperopic shift.[44]

In our study which stressed on working age group, the mean age of participants was 49.64 ± 7.28 years, a little higher than a similar study in Bangladesh on newly diagnosed diabetics (45 ± 9.5 years).[45] More than half (54.1%) of our study population could define diabetes as an increase in blood sugar but only 8.8% knew about the types of diabetes. In the study by Shah et al in Saurashtra more than 60% of the participants did not know about diabetes while in the BQ study by Memon et al 48.2% and Rani et al 41.1% had no knowledge of diabetes.[46-48] Gaddap study respondents had still poorer knowledge with only 35.2% having some familiarity with diabetes and 9.5% having know-how of risk factors. In the present study more than 1/3rd of the patients knew about risk factors of diabetes.[49] Knowledge about risk factors was also inadequate in study population of CURES study although substantial 75.5% had some knowledge about diabetes.[50] Only 21.7% of patients in our study had correct knowledge about symptoms while study by Hawal et al in south India had much better awareness among patients (38.5%).[51] Memon et al found that 62.3% of diabetics believed diabetes can be prevented but their knowledge of different strategies to do so was limited. Our study findings (43.8%) are lower than that study but similar to that of CURES study which showed 41% of diabetics in the study population believed in prevention of diabetes though the knowledge on risk factors was inadequate. Family history of diabetes (38.2%) was suggested as the most common risk factor followed by consuming sweets or high calorie food, while in our study consumption of sugar-rich food (33.1%) was considered a major risk. Knowledge on obesity or sedentary life-style as risk factor was low in both studies. In contrast in BPBDES study in Bangladesh nearly half the population attributed physical inactivity as major risk factor.[52]

34.8% of the newly diagnosed in our study knew about ocular complications in diabetes. The findings are similar to that by Dinesh et al[53] in rural Sullia (30%) but in contrast to CURES study (15%). There have been varying findings regarding awareness of ocular complications of diabetes in different study populations. Jiskani et al[49] in Karachi found that 17.5% of respondent considered diabetes as the cause of decreased vision with retinopathy as the cause in 7.4%. while Achigbu et al in Nigeria[54] found 40.7% with knowledge of ocular complications, diabetes leading to cataract in 11.6% and blindness in 29.1%. In sharp contrast, study in Jordan by Bakkar et al and Kempen et al in South Africa have demonstrated that over 80% of the patients were aware of ocular complications of diabetes.[55,56] Such high levels of patient awareness have been attributed to higher level of formal education, treatment in private sector and information from health care workers. The other reason may be that our study assessed knowledge in newly diagnosed diabetics. Longer duration of diabetes may be associated with better information about diabetic complications.

More than 70% knew about investigations for diabetes, blood sugar estimation being most common although less than 5% knew about HBA1C. Drug compliance was good with more than 70% taking medicines regularly. This observation may be biased in our study since drug compliance may decrease with longer duration of the disease. Our study did not include follow-up of the patient so could not explore this aspect.

About 21.15% knew about retinopathy, 24.07% about blindness and 11.1% about cataract while they had limited information on other ocular complications like dry eye disease, extra-ocular muscle palsy, keratopathy or refractive error etc. In a study by Rani et al[48], a significant 37.1% of rural diabetics had knowledge about DR after attending awareness meetings and a significant number (65.9%) of which believed in regular eye checkup and controlling blood sugar to reduce ocular complications. The study highlights the advantages of aggressive awareness programmes in inculcating the right self-care practice attitude in diabetics. About 6% of our new diabetics attributed their frequent change in glasses to diabetes which is higher than that in the study by Ovenseri-Ogbomo et al in Ghana[57] (3.8%).

The treating physician (59.6%) was the main source of information in our study patients, while nearly 30% claimed to have gathered facts from internet. Bakkar et al in Jordan (47.3%) and Al-Maskari et al in UAE (87%) also found that the doctor was the main source of information about DR (47.3%).[55,58] The treating physicians are thus the best educators for explaining the ocular complications, their prevention and emphasizing the role of regular eye check-up. A study in rural population in Jammu[3] found 5.65% of the study population using internet for gathering information on DR. Since internet has now penetrated every sections of our society, it can now act as an effective tool for diabetic awareness programmes.

Importance of regular eye check up by ophthalmologist in preventing complications was recognized by 28.6% in our study as against a better positive response in study

by Upadhyay et al in Nepal[59] and Memon et al (58.8%) in Pakistan although among them only 25.6% actually went for retinal examination.

CONCLUSION

Our study is one of the first studies in Odisha to evaluate the ocular involvement in newly diagnosed diabetics in working age group as well as assess their awareness regarding diabetes, its ocular complications and eye care practices. Diabetes can affect each and every tissue of the body causing both retinal and extra-retinal complications. Although retinal complications are most discussed, non-retinal complications like cataract, dry eye disease, kerato-epitheliopathy and ophthalmoplegia may cause significant ocular symptoms. Early detection and treatment of these complications can reduce the ocular morbidity due to diabetes in the productive age-group.

Knowledge about diabetics as well as its different aspects was inadequate. Although the main source of information was the treating doctors, those with some information on ocular complications amounted to just one third of the study population. With the unfavorable doctor: patient ratio and high-volume practice, it is difficult on the part of the treating doctor to educate each and every patient on ocular complications and importance of regular eye evaluation. This paves way for a diabetic counselor who will bridge this gap and create awareness among the target population. Proper information on ocular complication and importance of self-care circulated via the social media can also be an important platform to serve this purpose.

Finally, it is early detection, regular follow up and the compliance of the patient which will help in slowing down the expanding pandemic of diabetes and its ocular complications

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