Original Research Article

Study of awareness of diabetic retinopathy and its implications among diabetic patients visiting at a tertiary eye care center

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ABSTRACT

Purpose: The aim of this study was to assess the awareness of diabetic retinopathy among diabetic patients.
Materials and Methods: A cross-sectional survey was conducted between from 2017 to 2019. The analysis was based on a representative sample of 624 adult subjects. Multivariable logistic analysis was used to examine socio-demographic factors associated with the levels of awareness, treatment and control of diabetes mellitus.
Results: In our study 624 participants interviewed, among them 62% were males. rest were females. Most of the study subjects were non-vegetarian (74%). and were illiterates (40%). In our study, 92% were of type 2 DM, among them nearly 44.7% were on multidrug treatment. About 31% were diagnosed with DM after developing systemic complications. On examination, it was found 44.1% had proliferative diabetic retinopathy (PDR), 22.1 % required surgical intervention due to vision-threatening complication. Awareness regarding separate eye treatment for diabetic retinopathy was not known among 55 % of the patients. The periodicity of follow-up once treated for eye disease was poor, 74.1% being unaware.
Conclusion: In this study majority of patients were in the advanced stage of diabetic retinopathy and associated with systemic complications. Thus educating the patients about the diabetic disease, diet and multi-organ involvement and its complications and importance of regular follow-up and how to prevent significant ocular and systemic morbidity.

1. Introduction

The World health organization-NPCB survey conveys, over the last 20 years diabetes has emerged as a common cause of ocular morbidity and blindness in India. The global prevalence of diabetic retinopathy is about 8.5%.[1] In India 32 million diabetic patients were reported in the year 2000 and may increase to 80 million diabetic patients by the year 2030.[2] India has become number 6 from 17 (1986-89 to 2001-02 survey report) among the list of causes for blindness in India.[1] Diabetic retinopathy is an important cause of global blindness around 2.6%, due to its long-term accumulated damage to the small blood vessels in the retina.[3] Diabetes and diabetes-related blindness are reaching alarming proportions in developing countries. In India, around 65 million people have diabetes. In a developed country like the US, 65% of the population were aware of diabetes and eye disease but in developing countries, it's only 37%, a study done at Australia.[4,5] Lack of education, socio-economical conditions related to developing countries acts as a barrier in creating awareness about diabetes and its complications. The prevalence of diabetes is high among developing countries due to regional factorsamong diabetic patients and consuming a high carbohydrate diet.[6] The most common cause of early visual impairment is diabetic macular edema.

It's a known fact that two-third of all Type 2 and almost all Type 1 diabetics are expected to develop diabetic

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retinopathy (DR) over some time. High blood sugar can influence various cells and organs in the body if type 2 diabetes goes untreated and also if genetically prone to overweight. Complications of the disease include eye damage, stroke, heart disease, and kidney damage. Hereby it's very important to emphasize educating diabetes patients all about the disease, diet, and the various organ damage related to uncontrolled diabetes. The rising rate of diabetes among youngsters and their suboptimal diabetic control makes DM a silent killer, an imminent public health problem. Once complications sets in, its irreversible damage results in varied morbidity, may lead to early mortality, and also an economic burden to the family. In the early stages of disease patients are mostly asymptomatic and many studies had proven the importance of screening for retinopathy among diabetic patients.[7,8] Early diagnosis, intervention by modifying risk factors towards the progression of diabetic retinopathy makes large difference. This study was conducted to know the severity of diabetic retinopathy among the diabetic patients visiting our tertiary eye care center, assessing the patient knowledge, level of disease, and treatment awareness practice with diabetic retinopathy.

2. Materials and Methods

A hospital-based cross-sectional observation survey was conducted among 624 patients attending our retina clinic. Multivariable logistic analysis was used to examine socio-demographic factors associated with the levels of awareness, treatment, and control of diabetes mellitus were done. The study period from June 2017 to April 2019 at our tertiary eye care hospitalInformed consent was obtained, following which basic demographic data and details regarding the duration of diabetes and treatment history were recorded.

All patients attending our retina clinic having diabetic retinopathy changes were included in the study. Exclusion criteria's in our study were diabetic retinopathy patients associated with other health conditions like mental impairment, pregnancy, connective tissue disorder, immune-compromised, and cancer patients.

They were then asked to respond to a 15-point questionnaire (Table 1) which consisted of questions relating to the awareness and knowledge about diabetes and diabetic retinopathy. The socioeconomic and educational status of each patient was graded using the Modified Kuppuswamy classification.[9] The structured questionnaire used in the study was prepared after a thorough literature review of papers relevant to the awareness of DR. The final questionnaire included sociodemographic characteristics (i.e. age, gender, literacy, chronic illness, and comorbidities), DM-related characteristics (e.g. age, diagnosed with DM, DM duration, type of DM, etc.), and DR awareness.

Every patient underwent a complete ocular examination including anterior segment and fundus examination using slit-lamp biomicroscope, indirect ophthalmoscopy, by a retina specialist. Diabetic retinopathy changes, if any were noted and graded according to the ETDRS guidelines.[10] At the end of the survey the entire data were meticulously entered into an excel sheet, and responses were analyzed.

2.1. Statistical analysis

The data was entered in Microsoft excel 2010; analyzed using the SPSS version 21 and the results were expressed as simple proportions and percentages. This Statistical software namely SPSS 21 was used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs, tables, etc. The results were analyzed using the following statistical methods: a cross-sectional analytical study has been carried out in the present study. A Chi-square test was done for studying association. Spearman's Correlation was done. P<0.05 is considered statistically significant.

3. Results

Our study included 624 patients of diabetic retinopathy cases. Most of them were diagnosed and already on treatment for diabetes mellitus. The demographic distribution of study patients showed 67% of the Population was of suburban population, followed by 28% belonging to urban and only 5% of the rural population. Nearly 70% (437) belonged to the age group between 40yrs to 60yrs. 24% (150) were of greater than 60 years of age. The mean age was 47yrs. Among them 62% (387) were males and 38% (237) were females. Regarding diet majority of them were non-vegetarians i.e. 74% (461). On analysis regarding the educational status of patients in our study, 40% of our patients were illiterates. 33.5% were educated up to high school, 16.2% primary, and 4.2% up to secondary school. Only 6.1% of them were graduates. About the occupational status majority of them were labourers and farmers nearly 29.4%., professionals were 11.2% compared to nonprofessional i.e. 21.3%.

The majority about 92% had type 2 DM, and 8 % with type 1 diabetes. Hba1c value was found to be more than 7.5 in 50% of them. Duration of diabetic disease analysis showed 24% of them Less than 5 years, 43.4% were 5 to 10 years, 18.2% between 10 to15, and 14.4 % greater than 15 years. HaemoglobinA1c test analysis revealed 61.2% of patients were of HbA1c greater than 8.5% suggesting uncontrolled diabetes.(Table 2) Treatment modalities for DM they were on included, single drug in 36.1%, multiple drug regimen 44.7%, and insulin with a single drug in 17.2% of patients. 2.1% of patients were on no medications. In our study, the common co-morbidity associated was Hypertension in 53.8%, Chronic Kidney disease in 6.7%,

IHD in 6.7%, and Dyslipidaemia in 2.9% of patients.

When patients were asked about how they were diagnosed with diabetes, 44.6% were having symptoms like polyuria and polydipsia. Unfortunately, 30.76% of patients were diagnosed when they already had systemic complications, and significant weight loss was seen in 27.5% of patients. Around 11.7% of patients came to know when they were evaluated to undergo physician fitness for surgical intervention.

When asked about the mode of awareness of diabetic retinopathy, nearly 68.9% of them were diagnosed after a referral from physicians for fundoscopic examination. Patients who had a family history of diabetes (16.7%) were on self-monitoring. Routine ophthalmic evaluation 6.5% were diagnosed with retinopathy during fundoscopy. Radio, Newspapers, magazines, and advertisements on television educational messages helped 6.5% of patients to get diagnosed with DR, and Diabetic friends suggested eye examination in 1.3% of patients.

Regarding diabetic retinopathy status among our patients, nearly 44.1 % had PDR changes, 27% had moderate NPDR and 15% had mild non-proliferative diabetic retinopathy. High-risk PDR associated with vitreous hemorrhage in 10% of cases, retinal detachment in 11.2%, and 1.2% of cases were with sub-hyaloid hemorrhage. On diagnosing DR first time, 14.95% of them were having diabetic maculopathy. (Chart 1) Surgical intervention was required among 22.1 % of patients.

When asked about awareness regarding treatment modalities for diabetic retinopathy, nearly 55% told only control of DM was sufficient. Eye treatment like laser treatments know by 18.9%, 9 % were aware of eye surgery and 4.8% were aware of both the procedure. Awareness regarding eye treatment was not known among 11.5% of patients. When asked about the frequency of follow-up, post diagnosing diabetic retinopathy 74.1% were not aware and that they need to be followed up for DR changes. Although 25.8% knew about follow-up, only 13.6% were aware of the periodicity of follow-up.

When asked about the possible complications of poorly controlled diabetes, 2.2 % knew it can involve the heart, kidney, and eye. The majority of them i.e. 30.27% were aware of diabetes-related cardiac complications. Other complications like a diabetic foot in 14% and 7.6% can cause a stroke. Overall only 20.6% knew diabetes can affect the eye

4. Discussion

In today's scenarios, a great number of the population suffer from diabetes, belonging to the economically productive age group 40 to 60 years. Knowledge related to diabetes can help patients not only for early diagnosis also in keeping the disease under control with prompt treatment helps to lead a healthy lifestyle. Diabetes is no more confined to the
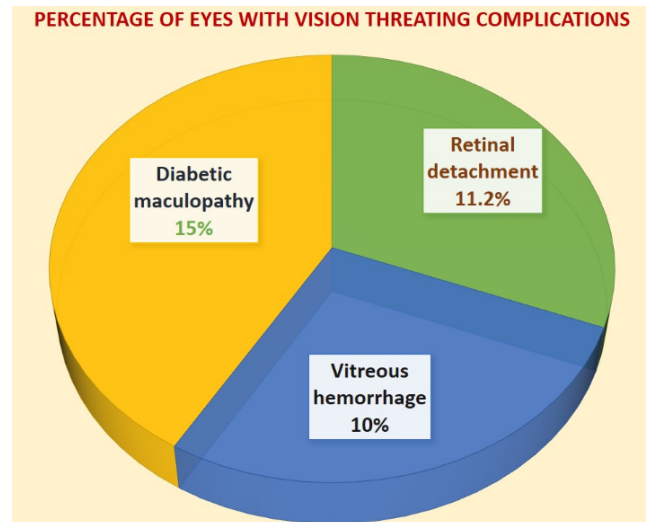

Chart 1: Pie chart showing thepercentage of eyes with the vision-threatening complication of diabeticretinopathy.

urban population, a study by Tripathy et al. reported 61% of residents belonging to the rural population.[11] Majority of patients visiting our hospital were from a suburban population (67%), 5% being from rural background. The main risk factor in various studies was the duration of diabetes for diabetic retinopathy i.e. 6.5% more risk if greater than 15 years, whereas in our study we had 14.4 % of the patients were greater than 15 years of diabetic.[12,13]

In our study 67% were males, similar to the study by Gadkari et al, in contrary Rani et al. reported female preponderance.[14],[15] Study by Tajunisah et al. reported equal gender distribution in their study.[16] The mean age was 52.84 ± 8.64 years, so more were of a middle-aged group of type 2 diabetes, compared to study by Gupta RK et al.[17] Regarding associated comorbidities HTN was the common systemic comorbidity in almost 60% of our patients, in comparison to study by Kiran shah et al., ie74.38%.[18]

We observed Educational level analysis that 40% were illiterates and education only up to high school 33%, in comparison to study by Lian et al 29.8% were illiterate and 28.3% were up to high school among their population.[19] Occupational analysis showed majority nonprofessional workers (38.5%) comparable to study by Lian et al, where 32.7% were employers.[19] This suggests that education is important in creating awareness, also a sedentary lifestyle can be a risk factor for diabetic retinopathy.

The overall awareness about diabetic retinopathy in our study was poor (20.6%), whereas Hipwell AE et al study 79.6% awareness reported.[20] In our study 31.8% had their blood sugar under control, in comparison to Taunisah et al study i.e. 48.9%.[16] Thus among all diabetic retinopathy cases it's alarming to note that 61.2% of them had poor sugar control, Hb1Ac being greater than 8.5%. Though 65% of them knew about the importance of follow-up, only 13%

Table 1: 15-point questionnaire which consisted of questions relating to the awareness and knowledge about diabetes and status of diabetic retinopathy.

1. Patient Name	Age / Sex	Address
Religion: Hindu /Muslim /Christian /Others Locality: Urban /Rural /Suburban.		Diet: Veg / Nonveg Education: Illiterate /Primary /Secondary /High school / Graduates

Occupation: Professionals / non-professionals /Agriculture/ Labourers / Others.

2. Awareness of DM: Polyuria/ Polydipsia/ Weight loss/ Family history/ Undergoing Surgery/ Systemic complications.

3. Type of DM and Duration: Type 1/ T ype2/ Others.

4. Mode of awareness of DM: Physician/ Ophthalmologist/ Himself/ Media (Radio/ Television/ Newspaper)/ Rrelatives/ Friends with DM/ Family history.

5. HbA1c level at 1st visit:

6. Poorly controlled DM can lead to which all complications: Cardiac/ Stroke/ Nephropathy/ Eye problems/ Neuropathy/ Diabetic Ulcer.

7. Treatment for DM patient is taking: Single drug/ Multi Drug regimen/ Insulin.

8. Associated Systemic Co-morbidities: Dyslipidemia/ Hypertension/ IHD/ CKD

9. Do you know DM can affect Eyes: Yes/ No.

10. Control of DM can prevent Eye problems: Yes/ No; If Yes: Completely/ Can prolong DM treatment.

11. Diabetic Retinopathy Status of the patient at 1st visit: Mild NPDR/ Moderate NPDR/ Severe NPDR / PDR/ VH/ TRD/ Maculopathy.

12. Treatment Modes available for Diabetic Retinopathy: Control of DM/ Intravitreal injection/ Laser/ Surgical.

13. Whether follow up required once patient diagnosed with DR; Yes/ No; If Yes; Yearly/6 monthly/ others.

14. An effect of treatment of DR and follow up: Visual improvement/ Maintenance/ Can deteriorate inspite of treatment.

15. Is control of DM essential after taking treatment for Diabetic Retinopathy: Yes/ No.

Table 2: Hb1Aclevel in various stages of diabetic retinopathy

Diabetic retinopathy: No of patients (%) and HbA1c levels			
Diabetic retinopathy stages	6.5 to 8.5	>=8.5	No of pts
Mild to Moderate NPDR	191(72.6%)	72(27.7%)	263
Severe NPDR to High risk PDR	48(13.2%)	313(86.7%)	361
Total	239(38.3%)	385(61.6%)	624

Table 3: Correlating the duration of diabetes with diabetic retinopathy status, P valve <0.05 found to be significant

Duration of diabetes mellitus	Diabetic retinopathy	
<= 10 years	**Number of eyes**	**Percentage**
11-15 years	420	67.4%
11-15 years	114	18.2%
=>15 years	90	14.4%
Total	624	100%

Chi square=25.5, p=0.001 HS

knew about the regularity of the follow-up in detail in our study. Tajunisah et al. study reported 28% of them being aware of the frequency of follow-up.[16]

A study by Wang et al. reports 18% awareness about the chance of family members being affected by the disease, in comparison to 16.7% in our study.[21] In our study 20.6 % were aware of diabetes affecting the eye, whereas in the Srinivasan et al., study only 4 % were aware of eye involvement.[22] Regarding end-organ complications awareness, Kidney involvement in 24%, heart 30.27%, stroke 7.6% in comparison to study by Foma et al., kidney involvement in 13.5%, heart failure (5.5%) and stroke (4.5%).[23]

In a study by Lian et al, only 17.3% knew about the availability of treatment for diabetic retinopathy, in comparison to our study 18.9%.[19] In our study 36.1% of them were on oral medications, in comparison with the study by Nguyen et al. where 50% of thediabetic population were on oral medications.[24] DR was found to be associated significantly in patients with the multidrug regime and on insulin treatment and 61.8% had poor diabetic control. On comparing the duration of diabetes, retinopathy status, and hb1Ac, the p-value (<0.05) was found to be significant. (Table 3) Suggesting uncontrolled and of a long duration of diabetes patients were associated with advanced diabetic retinopathy changes.

In our study, 44.1% already were in a stage of vision-threatening proliferative diabetic retinopathy stage in comparison to 3.6% and maculopathy in 14.95% in compared to 5.1% by Tajunisah et al study.[16] Surgical intervention needed in 22.1% among them. This clearly alerts us how late patients were being screened in our country, overall 37% having vision threating complications at the time of diagnosis of diabetic retinopathy. Thus we can reduce ocular morbidity and prevent blindness due to diabetic retinopathy, educating all patients is a must. By spreading awareness about eye involvement and retinal examination to detect early diabetic retinopathy through Radio, TV, newspaper, health education posters in all health clinics we can prevent blindness. Educating by conducting periodic CME programs and workshops on diabetic retinopathy and management, involving physician or general practitioners is a must and need of the hour to increase awareness. Training Health care workers and by doing house to house survey for diabetes thereby emphasising patients about need for eye examination can be helpful to diagnose more no. of diabetes retinopathy cases. Thus better understanding about eye disease helps patient's acceptance for need of frequent follow-up and early treatment.

We conclude that educating the patients about eye involvement and timely counseling by all treating physicians, ophthalmologists may help in controlling both systemic and ocular morbidity.

4.1. Limitation of study

Prevalence of diabetic retinopathy may vary in different parts of India and concerning other demographic criteria among diabetic patients, like varying ethnicity, lifestyle data variations were expected. Thus results related to DR which were analyzed vary among various population-based and hospital-based studies. The sample size of the study being limited with more referral cases from the physician in our study, the results of our study are difficult to ascertain on a large general population.

5. Conclusion

This study revealed that most of the population were from suburban and illiterates, with a history of diabetes with long duration. The results we got alarms us to emphasize the importance of education and to increase awareness of diabetic disease complications including diabetic retinopathy. Among the patients who visit our tertiary eye care hospital was already in the advanced diabetic retinopathy stage with the multidrug regime, thereby demanding early screening to prevent visual morbidity.

Thus to conclude we should insist all patients for fundus examination as a routine once diagnosed with diabetes. Educating diabetic patients about the nature of the disease, early treatment, and periodic follow-up makes a difference in not only early detection also by lowering the burden of sight-threatening complications due to diabetic retinopathy.

6. Source of Funding

None.

7. Conflict of Interest

None.

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