Original Research Article

Understanding different causes of Blindness with focus on Diabetic Retinopathy patients: a cross-sectional study

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ABSTRACT

Background: National program for control of blindness and visual impairment is a centrally sponsored programme with the goal of reducing the prevalence of blindness. The data regarding the beneficiaries can help in planning for preventable causes of blindness. Diabetic retinopathy caused by diabetes mellitus is one such important cause that can be prevented with proper control of blood glucose levels and regular screening for DR; possible with appropriate knowledge and awareness among patients about the relationship between DM and Retinopathy.
Methods: A cross-sectional study was carried out comprising two components: desk review of patients (N=1072) including all the beneficiaries of NPCBVI during August-2019 and October-2019 and personal interviews of DR patients (N=62) enrolled during same duration using semi-structured interviews at Tertiary care hospital in Waghodia, Gujarat.
Results: Out of 1072 beneficiaries of NPCBVI, 61.4% were diagnosed with ocular disorders/diseases; 8% had Blindness and 92% had Visual impairment. Highest visual impairment was found due to uncorrected refractive error (62.75%) and highest blindness due to cataract (27.3%). Among 62 DR patients, mean random blood sugar levels was 238 mg/dl (SD±87.80) and majority (85.5%) had HbA1c levels in diabetic range. Out of all DR patients, 77.4% were unaware about the relationship between diabetes mellitus and retinopathy.
Conclusions: Highest visual impairment and blindness were found due to uncorrected refractive errors and cataract respectively. Majority of DR patients showed poor long term control of blood sugar levels noted by high HBA1c levels and presented a noteworthy lack of awareness regarding retinopathy caused by DM.

Keywords: Blindness, Diabetes mellitus, Diabetic retinopathy, Knowledge, Visual impairment

INTRODUCTION

Globally, it is estimated that approximately 1.3 billion people live with some form of distance and near vision impairment. "a global initiative to eliminate avoidable blindness" VISION 2020 is a global collaboration between WHO and the IAPB. It is implemented on the basis of a legally adopted agreement for collaboration on the prevention of blindness.[1] According to Global burden of Vision loss from 650 millions of entire populations 11,760,081 populace were blind and 61,192,929 were MSVI in South-East Asia Region IAPB Vision Atlas (12th October 2017). Diabetes mellitus (DM) is a global epidemic with significant morbidity. Diabetic retinopathy (DR) is the specific micro vascular complication of DM and affects 1 in 3 persons with DM.[2] Epidemiological data from India suggests the prevalence of DR is 18% in the urban and 10.4% in the rural India. It means DR is found in every 5th person with diabetes in the urban and in every 10th person with diabetes in the rural areas of

India. In India, it was the 17th cause of blindness 20 years ago but has now ascended to the 6th position. According to WHO, 31.7 million people were affected by diabetes in India in the year 2000. This figure is estimated to rise to 79.4 million by 2030, the largest number in any nation in the world.[3] DR patients need to be studied to explore its possible causes such as poor management of blood sugar levels, irregular screening and others as it can be prevented by appropriate management of DM. The present study aims to study their clinical profile and knowledge levels regarding various aspects of DR such as cause, treatment and prevention.

METHODS

A cross-sectional study was carried out comprising of two components: desk review for different causes of visual impairment and blindness was carried out for 1072 patients who were beneficiaries of NPCBVI during August-2019 to October-2019 at the Parul Sevashram hospital (tertiary care hospital), Vadodara, Gujarat from the hospital management information system (HMIS). The frequency was calculated per eye of each participant as some patients had multiple ocular diseases in the same or different eye.

Personal interviews among 62 DR patients enrolled in the NPCBVI between August 2019 to October 2019 were done using semi-structured questionnaires which consisted of clinical profile, family history, personal habits, knowledge and awareness regarding DR and physical activity. The early treatment diabetic retinopathy study (ETDRS) classification was used for grading of DR patients. Patients in serious conditions requiring emergency surgeries and intensive care unit services were excluded from the personal interviews. Diagnosis of each patient was done by the qualified ophthalmologist of the hospital. Consent was obtained from each respondent by clarifying the purposes of the study prior to the data collection.

RESULTS

Total data of 1072 was collected in this study to rule out the ocular disorders/diseases causing blindness and visual impairment. The overall diseases burden causing blindness and visual impairment are evaluated with visual acuity in both eyes among them 1316 with ocular disorders/ diseases with that 209 having Blindness; 2397 having visual impairment and 24 with unassessed vision. Here most of the ocular disorders were seen in refractive error (58.36%) with a significant cause of 32 (15.31%) blindness and 1504 (62.75%) visual impairment. Talking about unassessed vision which is excluded as undetermined or unspecified in retinopathy of prematurity for (preterm infants), squint (amblyopic, dislocated IOL), corneal blindness (corneal infiltrates, ulcers and perforation), posterior segment disorder (optic disc pallor, age-related macular degeneration, optic atrophy, retinitis pigmentosa, toxoplasmosis, asteroid hyalosis,

choroiditis), others (facial palsy, uveitis, pterygium, aphakia, nystagmus, choroidal coloboma) which is depicted in (Figure 1-3). The present study shows that the total number of 62 patients having diabetic retinopathy among them two-third are male follows age group significant increase in >50 years than 25 to 50 years of group (Table 1).
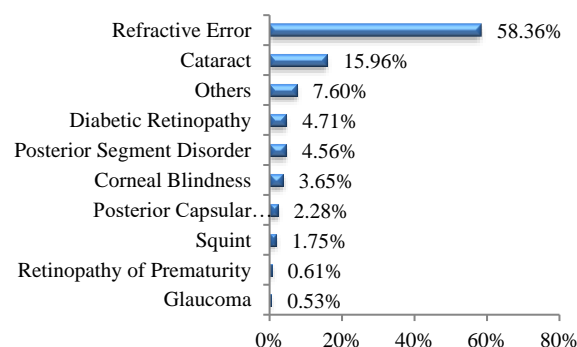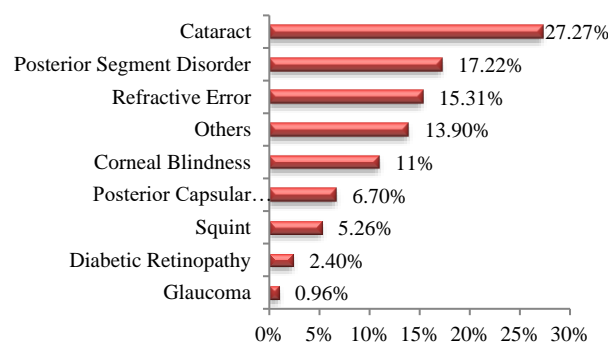

Figure 1: Prevalence of ocular disorders.

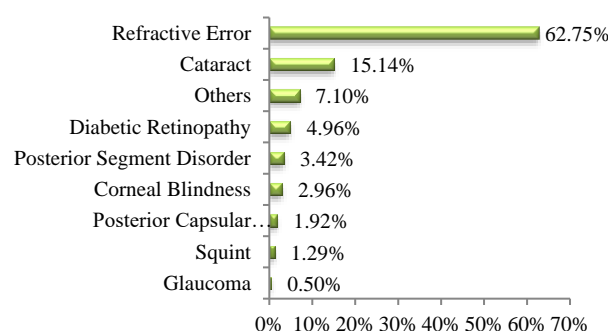**Figure 2: Prevalence of blindness.**

Figure 3: Prevalence of visual impairment.

Relatively education status of the patients half of them are literate and the least with graduation. The clinical profile primary to diabetic retinopathy comparing with Body mass index (kg/m^2) (40%) having normal range >18.5-22.9 BMI having average risk of comorbidities and follows with (39%) having Preobese >22.9-24.9 BMI (Table 2). The current status of diabetes mellitus majority

is having Uncontrolled DM plays a significant role for developing DR. The co-morbid conditions with the (39%) patients suffering from DM having the other diseases like (thyroid, hypertension). Hence, the majority of the patients don't have any associated disease with the diabetic retinopathy.

Table 1: Distribution of diabetic retinopathy patients according to Sociodemographic profile (n=62).

Parameters		N (%)
Gender	Male	43 (69.4)
	Female	19 (30.6)
Age group (years)	6 months to <10	1 (1.6)
	10 to <25	2 (3.2)
	25 to 50	22 (34.9)
	>50	38 (60.3)
Education	Illiterate	13 (21)
	Literate	32 (51.6)
	Up to 10th standard	13 (21)
	Graduation	4 (6.5)
Economic status	Upper class	16 (25.8)
	Upper middle class	23 (37.1)
	Lower middle class	18 (29)
	Upper lower class	4 (6.5)
	Lower class	1 (1.6)

The ETDRS classification is used for grading and distribution of diabetic retinopathy and maculopathy patients is done by qualified ophthalmologist. The study disclose about majority patients having Non-insulin dependent diabetes mellitus with DR with the mean RBS value of the patients were (238.44±87.80) mean±SD (mg/dl). Relatively, glycosylated haemoglobin A1c results to rule out how well diabetes is controlled the majority ranging (6.5% or higher) HbA1c results related to DR. The patients with physical activity more than half having moderate-intensity at work and nearly two-third is having no/light physical activity in personal. The questionnaire composite of 6 questions: 5 of them about diabetes knowledge, 1 question about screening, relatively (77.6%) patients don't think that there is relationship between retinopathy and DM about majorities (96.8%) of the total patients doesn't suppose DM leads to blindness (Table 3). Nearly part of the patients was screened by a doctor last year, widely all the patients don't have the knowledge regarding regular screening of DR even both eyes are good. Nearly, all patients don't think that diabetic patient have eye problems at the same time of diabetes diagnosed, round about all patients think that retinopathy is a treatable condition.

DISCUSSION

The study was undertaken in a tertiary care hospital with a total data of 1072 was collected in this study to rule out the ocular disorders/ diseases causing blindness and visual impairment. The overall diseases burden causing blindness and visual impairment are evaluated with visual acuity in both eyes among them 1316 with ocular disorders/diseases with that 209 having blindness and 2397 having visual impairment. The main cause of prevalence among the study population was uncorrected refractive error (62.75%), followed by cataract (15.14%). However, this is reverse consistent with the results of Vignesh, et al cataract (50.9%), followed by uncorrected refractive error (36%).[4]

Nirmalan, Thulasiraj, Maneksha, et al study presenting bilateral blindness (<6/60) was found in 11.0% of this older adult population. Cataract in one or both eyes accounted for over two thirds of the blindness, with a prevalence in the examined population of 7.7% Correctable refractive error was also important as a principal cause of blindness-over one fourth of those presenting blind improved to normal/near normal vision (≥6/60).[5] Other than this the majority of the male found with cause of Visual Impairment and blindness in current study with a significant cause (63%) were visually impaired and (27%) were blind. Over all, it was possible to reduce the prevalence of blindness to 3.3% with best corrected vision. In India 91.8% of blindness is avoidable (refractive errors, cataract, surgical complications, aphakia, trachoma and corneal scars, diabetic retinopathy). This is higher than what has been reported in most other countries.[6] This is again due to the high prevalence of cataract blindness in India. The prevalence of cataract in current study is 27.27%.

Anwar et al show 57 (57%) male and 43 (43%) female patients majority (82%) of patients had NIDDM higher prevalence of diabetic retinopathy was found in present study 43 (69.4%) male and 19 (30.6%) were female and following (95.2%) of patients had NIDDM. It was revealed that more than 50 years age group has significant higher rate of diabetic retinopathy in both the study.

Most patients (61.4%) were overweight with a BMI value (25 kg/m^2) comparing with (40.3%) was having normal range therefore most of the patients with a profile of uncontrolled DM.[7] The ratio of type 1 to type 2 DM was 1:3.8 for males and 1:1.7 for females. Type 2 DM was more common in the males (73%) than females (62%; p=0.206).[7] While majority of the male showing 95.2% having type 2 diabetes.

As Almalki et al study 79.5% knowing the relationship between retinopathy and DM with at least 22.6% in current study, with 79.4% thinks diabetes mellitus leads to blindness with 3.2% in current study, 62.3% had checked their eyes by doctor last year following 41.9% are gone through check-up last year, majority of 52% thinks that no need for regular screen for DR if both eyes are good from current study only 11.3% responded correct answer. Majority responded 78% 93.5% from the study have a knowledge that good control of diabetes

might prevent DR, Only 14.3% of diabetic patient have eye problems at the same time of diabetes diagnosis, majority 52.3% from that study.[8,9] Therefore, majority of

88.7% thinks that retinopathy is treatable condition following 66.8% from other study.[8]

Table 2: Distribution of diabetic retinopathy patients according to clinical profile (n=62).

Parameters		N (%)
BMI (kg/m²)	Underweight	5 (8.1)
	Normal range	25 (40.3)
	Overweight (Preobese)	24 (38.7)
	Obese class 1	8 (12.9)
Current Status	Uncontrolled DM	36 (58.1)
	Controlled DM	18 (29)
	Newly detected DM	7 (11.3)
	Prediabetes	1 (1.6)
Associated disease	Coronary heart disease	3 (4.7)
	Renal disease	4 (6.3)
	Other disease	25 (39.1)
	No associated disease	35 (54.7)
Type of DM	IDDM	3 (4.8)
	NIDDM	59 (95.2)
Diabetic Retinopathy	Mild NPDR	35 (56.5)
	Moderate NPDR	21 (33.9)
	Severe NPDR	4 (6.5)
	Very severe NPDR	0 (0)
	PDR	2 (3.2)
Diabetic Maculopathy (n=16)	Mild NPDR	5 (31.3)
	Moderate NPDR	9 (56.3)
	Severe NPDR	1 (6.3)
	Very severe NPDR	0 (0)
	PDR	1 (6.3)
RBS (Mean ± SD)(mg/dl)		238.44 ± 87.80
HbA1c	Diabetes	53 (85.5)
	Prediabetes	7 (11.3)
	Normal	2 (3.2)
Physical Activity at Work	Vigorous-intensity	5 (8.1)
	Moderate-intensity	40 (64.5)
	No	17 (27.4)
Physical Activity in Personal	Vigorous-intensity	0 (0)
	Moderate-intensity	8 (12.9)
	No	54 (87.1)

As per the American journal of lifestyle medicine most of the cohort, 74.7% (n=298/399) reported that they exercised on a regular basis. Walking, gardening and housework were defined as non-vigorous activities in the questionnaire; majority 87.1% (n=54/62) is done in personal and 27.4% (n=17/62) at work in current study. Whereas running, cycling, swimming and weightlifting were defined as vigorous activities.[10] While 41.9% (n=125/298) of those who exercised, reported that their activities were vigorous and only 8.1% (n=5/62) were reported in current study whereas none physical activity in personal. There are known metabolic advantages to physical activity. Current physical activity recommendations for adult Americans are 150 min of at

least moderate physical activity every week. Low intensity leisure time physical activity was associated with higher risk of diabetic retinopathy.[11] On a scale relative to an individual's personal capacity, moderate-intensity of 64.5% is at work and following 12.9% is in personal. Krishna et al previous study highlights the need of assessment of stress in diabetic patients, our study results are in accordance with the earlier studies which are reported high prevalence of stress in diabetic patients. Majority of 95.2% are able to balance work life and least 3.2% attended stress relieving program with following 40.3%, 11.3% and 8.1% are having a stress at work, caused by their relation with another employee and family member has been sick or died.[12]

Table 3: Distribution of diabetic retinopathy patients according to knowledge and awareness questions (n=62).

Parameters		N (%)
Do you think there is a relationship between Retinopathy and DM?	Correct	14 (22.6)
	Incorrect	48 (77.4)
Do you think diabetes mellitus may lead to blindness?	Correct	2 (3.2)
	Incorrect	60 (96.8)
Have your eyes been checked by a doctor last year?	Yes	26 (41.9)
	No	36 (58.1)
Is there a need for the regular screening for DR if both eyes are good?	Correct	7 (11.3)
	Incorrect	55 (88.7)
Can a diabetic patient have eye problems at the same time of Diabetes diagnosis?	Correct	9 (14.5)
	Incorrect	53 (85.5)
Do you think retinopathy is a treatable condition?	Correct	55 (88.7)
	Incorrect	7 (11.3)

CONCLUSION

Highest visual impairment and blindness were found due to uncorrected refractive errors and cataract respectively. Majority of DR patients showed poor long term control of blood sugar levels noted by high HBA1c levels and presented a noteworthy lack of awareness regarding retinopathy caused by DM.

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