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Awareness of Diabetic Retinopathy among Diabetic Patients in a Tertiary Health Care Center

Keerthana S*, Sanjeev Kumar Puri

Department of Ophthalmology, Saveetha Medical College and Hospital, Thandalam, Chennai - 602 105, Tamilnadu, India

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ABSTRACT

The study aimed to assess the awareness of diabetic retinopathy among diabetic patients in a tertiary health care centre. A hospital-based, cross-sectional study was conducted using a pre-tested semi-structured questionnaire on 115 diabetic patients. Male (76%) participated in the study were more than female (39%). Mean age of the study population being 50.44 years. There were no significant statistical associations between the demographic details and awareness of DR. In our study, 80.87% of people with diabetes were aware that DM could cause eye disease and 59.13% were aware that DR is an eye disease due to DM. There was a significant statistical association between them. The importance of regular eye visits was known by only 80% and followed by only 51.3%. Half of the subjects (52.17%) knew that DR could cause blindness. Only 57.39% knew about the treatment modalities of DR. Doctors should convey the importance of the disease and its risk factors to the patients. Thus, better prevention strategies of DR should be implemented among people with diabetes. Lack of awareness and lesser screening practices makes it difficult to prevent DR; thus, steps should be taken towards spreading awareness.

*Corresponding Author

Name: Keerthana S
Phone: +91- 7358314242
Email: keerthana.sivakumar26@gmail.com

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INTRODUCTION

Diabetes mellitus (DM) is a chronic disease that occurs due to insufficient production of insulin by the pancreas or when the body is unable to use the insulin that is produced effectively. It is one of the top four priority non-communicable diseases (NCDs) focused for action by world leaders (International Institute for Population Sciences (International Institute for Population Sciences (IIPS) and ICF, 2017) Recent findings show it is a systemic disease with complications that can affect different parts of the body and results in a global burden (Shaw *et al.*, 2010). Diabetic retinopathy (DR) is one of the microvascular complications of DM (occurring in both Type 1 and Type 2 DM). It occurs in almost all individuals with Type 1 and more than 77% of individuals with Type 2 DM for 20 years or more of the disease (Klein *et al.*, 1984). It is the primary cause of new-onset of blindness in countries that have been industrialized and more frequent cause of blindness in middle-income countries (Resnikoff *et al.*, 2004).

The adults living with diabetes globally in the year 2019 is about 463 million, which accounts for 9.3% of the total adult population (20-79 years of age) as stated by IIPS and ICF- 2017 in NFHS-4. Diabetes can lead to an increase in the risk of various health complications. About 11.35% of deaths in 2019 have been attributed to diabetes. Among this half of the deaths have occurred in people under 60

years of age. According to the International Diabetic Federation, India has 77 million cases of diabetes in 2019 (International Institute for Population Sciences (IIPS) and ICF, 2017).

Diabetic retinopathy is a sight-threatening complication resulting from damage to the retina due to high blood sugar levels. Globally, it has caused 1.9% of moderate or severe visual impairment and 2.6% of blindness among people with diabetes (International Institute for Population Sciences (IIPS) and ICF, 2017)

Awareness of various complication of diabetes in diabetic patients is vital, especially diabetic retinopathy. Diabetic retinopathy is a silently progressive disease; early detection and treatment of retinopathy can cause a significant decrease in visual impairment. The most crucial deciding factor of any screening program is community awareness. Thus, by providing adequate information about diabetes and its complications at the time of diagnoses can improve the regular eye checkup of all diabetic patients for DR screening and providing the necessary treatment at earlier stages. Diabetic patients' awareness of diabetic retinopathy has not been enough in most countries (Sabanayagam *et al.*, 2016).

We conducted this study to document the awareness of diabetes mellitus (DM) and diabetic retinopathy (DR) in the diabetic population as it is the fundamental requirement for the proper compliance of the disease. Also, this may help in future planning of programs for the prevention of diabetes and its complications, especially DR.

METHODOLOGY

Study Design

A hospital-based descriptive cross-sectional study was conducted to assess the awareness of diabetic retinopathy in diabetic patients through a semi-structured questionnaire which was constructed based on previous studies on a similar topic.

Study Area and Sample Size

The study was conducted in a tertiary health care hospital in Tamil Nadu. The sample size of 111 was calculated and rounded to 115, based on the study done by Rajesh *et al.* (2016).

Inclusion and Exclusion Criteria

The patients diagnosed with diabetes Mellitus in both out-patient out-patient and in-patient department in a tertiary health care hospital who had the cognitive ability and could speak English/Tamil was selected for the study.

Diabetic patients less than 18 years of age and non-diabetic patients were excluded from the study.

Study Period

The study was conducted from January 2020 to March 2020.

Data Collection Method

The semi-structured questionnaire used consisted of the first section with demographic details, and the second section had a question on details about the medical history of diabetes, the third section had questions regarding awareness of diabetes mellitus, and the fourth section had questions regarding awareness of diabetic retinopathy and source of information. The additional information on diabetes status and source of information was collected for a better understanding of the study.

The questionnaire was prepared in English as well as in regional language Tamil and was also verbally translated to the illiterate to collect information from the patients. The questionnaire used was pretested by a pilot study and was corrected based on responses and reviews from the pilot study group.

Data Analysis

Numbers and percentages were calculated to summarize categorical and nominal data. And the significance of association was calculated using a chi-square test.

Ethical clearance

The study was conducted after the ethical approval from the Institutional Review Board (IRB) and the Institutional Ethics Committee. Written informed consent was obtained from all the study participants. The purpose of conducting the study was explained to each participant before the commencement of the study by the principal investigator.

RESULTS

A total of 115 diabetic patients accepted to participate in the study. The number of males was 76(66.09%), and females were 39(33.91%). The mean age was 50.44 years ($\pm$15.68), and the commonest age group that has participated in the study was 50-60 years. Educational status of participants was 57(49.56%) graduates, 34(29.56%) professional, 21(18.26%) school level and 3(2.61%) uneducated. Among the 115 participants, 74(64.35%) were employed, and 41(35.65%) were unemployed. [Table 1].

Awareness of Diabetic Eye Diseases

Although almost all patients, 80.87% were aware that DM could affect the eye. However, among 115

Table 1: Demographic characteristics of the study population

Variable	Frequency (n=115)	Percentage
Gender		
Female	39 individuals	34%
Male	76 individuals	66%
Age		
<40	22 individuals	19%
40-49	26 individuals	23%
50-60	43 individuals	37%
>60	24 individuals	21%
Level of Education		
Graduate	57 individuals	49.57%
Professional	34 individuals	29.57%
School-level	21 individuals	18.26%
Uneducated	3 individuals	2.61%
Occupation		
Employed	74 individuals	64.35%
Unemployed	41 individuals	35.65%

Table 2: Awareness of diabetes mellitus and diabetic retinopathy among the study population

Variable	Response	Frequency (n=115)	Percentage
Are you aware that diabetes mellitus can lead to eye problems?	No	22	19.13%
	Yes	93	80.87%
What is the average blood glucose level (mg/dl)?	Correct answer	58	50.43%
	Wrong answer	57	49.57%
Do you check your blood glucose level regularly at your residence?	No	42	36.52%
	Yes	73	63.48%
Is your blood glucose level under control?	No	39	33.91%
	Yes	76	66.09%
Do you go for a regular eye checkup?	No	56	48.70%
	Yes	59	51.30%
Do you think regular eye checkup is important in a diabetic person?	No	23	20.00%
	Yes	92	80.00%
Is Diabetes mellitus a cause of blindness?	No	48	41.74%
	Yes	67	58.26%
Do you know that blindness due to diabetic Mellitus is irreversible?	No	63	54.78%
	Yes	52	45.22%
Is diabetic retinopathy an eye problem due to diabetic Mellitus?	No	47	40.87%
	Yes	68	59.13%
Do you think diabetic retinopathy can cause blindness?	No	55	47.83%
	Yes	60	52.17%
Do you think diabetic retinopathy is preventable by medical methods?	No	58	50.43%
	Yes	57	49.57%
Do you think diabetic retinopathy is preventable by surgical methods?	No	74	64.35%
	Yes	41	35.65%

Table 3: Diabetic status of the study participants

Variables	Frequency (n=115)	Percentage
Glycemic Control		
Good control	47 individuals	40.87%
a high blood glucose level	25 individuals	21.74%
a very high blood glucose level	43 individuals	37.39%
Type of DM		
Don't know	28 individuals	24.35%
Type 1	27 individuals	23.48%
Type 2	60 individuals	52.17%
Duration of DM		
< 1 year	20 individuals	17.39%
>10 years	36 individuals	31.30%
2-5 years	33 individuals	28.70%
6-10 years	26 individuals	22.61%
Treatment Followed by DM		
Insulin injection	18 individuals	15.65%
None	18 individuals	15.65%
Oral diabetic drugs	68 individuals	59.13%
Oral diabetic drugs and insulin injection	11 individuals	9.57%

Table 4: Association between various variables and patient' awareness about diabetic retinopathy is an eye disease due to diabetes

Variables		Patient's Awareness About Diabetic Retinopathy is an Eye Disease due to diabetes.		Total	P-Value
		No	Yes		
Gender	Female	16	23	39	0.980542
	Male	31	45	76	
Occupation	Employed	26	48	74	0.092846
	Unemployed	21	20	41	
Age	≤50	21	33	54	0.684356
	>50	26	35	61	
Level of education	Illiterate	1	2	3	0.787883
	Literate	46	66	112	
Duration of DM	≤5 Years	21	32	53	0.801433
	>5 Years	26	36	62	
Regular eye checkup	Yes	20	39	59	0.118538
	No	27	29	56	
History of Hypertension	Present	16	29	45	0.352659
	Absent	31	39	70	
History of Smoking	Smoker	4	4	8	0.58602
	Non-Smoker	43	64	107	
Use of Insulin	Yes	9	20	29	0.212821
	No	38	48	86	
Glycemic Control	Good	21	26	47	0.489434
	Bad	26	42	68	

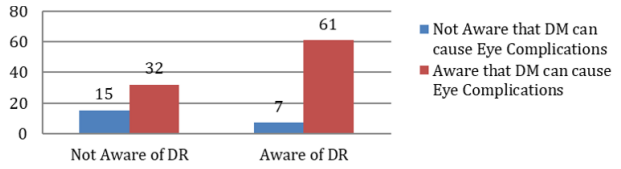

Figure 1: The association between Awareness of Diabetic Mellitus can cause eye complications and Awareness of Diabetic Retinopathy is due to Diabetes Mellitus

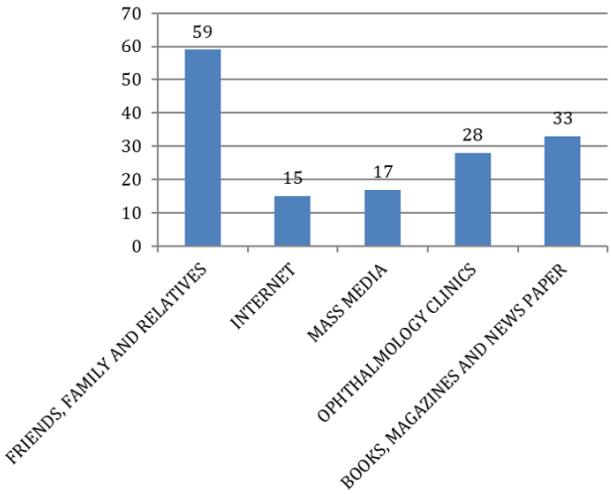

Figure 2: The Source of Information About Diabetes Mellitus and Diabetic Retinopathy

patients, only 58.26% were aware that it could cause blindness, and 41.74% did not know that DM could cause blindness. Only 52(45.22%) people thought that blindness due to diabetes could be irreversible and the rest 63(54.78%) people were not aware of it. The participants were also asked other questions for the assessment of their DM knowledge and how its complications could be managed. A maximum number of people 92(80%) people were aware that regular eye checkup is required for diabetes people. Even though only 59(51.3%) out of 115 patients had a regular eye checkup and 56 (48.7%) did not have a regular eye checkup. [Table 2]

Patients' Diabetes Status

Among the study group, 87 participants were able to specify their type of diabetes; this includes type 1 -27(23.48%) people and type 2 -60 (52.17%) people. Remaining 28(24.35%) were not aware of their type of DM diagnosed. The duration of DM varies from <1 year in 20(17.39%) patients, 2-5 years in 33(28.70%) patients, 6-10 years in 26(22.61%) patients and more than ten years in 36 (31.30%) patients. Reasonable glycemic control was seen in 47(40.87%) participants, and poor glycemic control was seen in 68(59.13%) participants. They were categorized using their random blood glucose levels. The patients were also asked about the history of other comorbid conditions along with diabetes to understand their diabetes status. [Table 3] In which, 45 people had hypertension, 12 people had a cardiac illness, five people had a respiratory illness, two people had hyperlipidemia and 59 people had only diabetes mellitus. The history of smoking was also asked, eight people responded they were smokers, and the rest 107 were non-smokers.

There was no significant association seen between awareness of DR with the type of diabetes (Chi-square=0.1131, p= .736686), duration of diabetes (Chi-square=2.2272, p=.13559), coexistence of hypertension (Chi-square=0.8639, p=.352659) and history of smoking (Chi-square=0.2966, p=.58602) in the Chi-square significance test. [Table 4]

Among the study population, only 58(50.43%) knew the average fasting blood glucose level, that is 80-100mg/dl. It is noted that only 73(63.48%) people checked their blood glucose level regularly, and 42(36.52%) do not check their blood glucose level regularly. We compared the patients' glycemic control and their response to the question of whether their blood glucose level is in control. Only 76(66.09%) patients think their blood glucose level was under control, and the rest 39(33.91%) stated that their glucose level is not under control. But only 44.74% (34/76) of the patients who think their blood glucose levels were normal had good glycemic control depending on their random glucose levels. Despite 55.26% (42/76) thinking that their blood glucose level is under control, they had a poor glycemic control according to their random blood glucose levels. The diabetic treatment followed by the participants consisted of only oral diabetic drugs [68 (59.13%)], only insulin injection [18(15.65%)], both oral diabetic drugs and insulin injection [11(9.57%)] and some did not follow any medications [18(15.65%)]. [Table 3]

Chi-square test was applied to test the association of awareness of diabetic retinopathy -an eye disease due to DM with glycemic control of diabetic patients and it was found to be non-significant (Chi-square=0.4778, p=.489434) and usage of insulin diabetes also being not significant (Chi-square=1.5522, p=.212814). [Table 4]

Awareness of Diabetic Retinopathy

Awareness of diabetic retinopathy is an eye disease among people with diabetes was 59.13%, and 40.87% were not aware of diabetic retinopathy. On using Chi-square significance test regarding the awareness of diabetic retinopathy (an eye problem) due to diabetes mellitus was significantly associated with the awareness that diabetes can cause eye

problem X^2(1, N=115) =8.3973, P= .003758. [Figure 1]

Nearly half of the patients, 60(52.17%) responded that DR could cause blindness, and the remaining 55(47.83%) patients were not aware that DR could cause blindness. The patients were asked questions regarding the treatment procedures for diabetic retinopathy. Only 57(49.57%) diabetics knew that there is a medical treatment for DR and the rest 58(50.43%) diabetics did not know about the medical treatment available for DR. We also asked the patients whether they knew that surgery could prevent DR only 41(35.65%) people responded positively and the remaining 74(64.35%) responded negatively. [Table 2]

In addition, Chi-square test of significance regarding the awareness status that states "Diabetic retinopathy is an eye disease due to diabetes mellitus" was not significantly associated with patient's gender(Chi-square=0.0006, p=.980542), age (Chi-square=0.1653, p=.684356), level of education (Chi-square=0.0724, p=.787883) and occupation (Chi-square=2.2843, p=.92846). [Table 4]

Source of Awareness

When asked about the source of information regarding DM and DR the subject's response were from friends, family and relatives for 59 people; books, magazines and newspaper for 33 people; internet and mass media for 32 people and ophthalmology clinics and physicians for 28 people which was the least. [Figure 2]

DISCUSSION

India has a large burden of visual impairment which also includes blindness. Since DR is one of the emerging significant cause of visual impairment, this study was undertaken to assess awareness of diabetic retinopathy (DR) among diabetic patients.

In our study, most of the patients (n=93, 80.87%) were aware that diabetes could lead to eye diseases. Approximately similar findings were seen in studies done by Venugopal *et al.* (2020) (77.5%), Srinivasan *et al.* (2017) (71.9%) and Saikumar *et al.* (2007) (84%) who also showed higher awareness about DM can cause eye diseases. In contrast, Koshy *et al.* (2012) (48.6%) and Thapa *et al.* (2012) (63.3%) studies stated lower awareness among people with diabetes that DM can cause eye diseases. According to studies done by Hamzeh *et al.* (2019), 67.3% responded that DM could lead to blindness whose results are like our study that showed 58.26% of awareness. Nearly half of the people (n=63, 54.78%) were not aware that blindness due to DM is irreversible in this study, which is comparable to the study of Ramakrishnan and Nair (2017)

In this study, 80% of the people were aware that people with diabetes should go for a regular eye checkup. Similar studies conducted by Rajesh *et al.* (2016) and Venugopal *et al.* (2020) revealed an awareness about diabetic eye check as 75.3% and 77.6% respectively. Regular visits to the eye clinic were not followed by nearly half of the patients (48.7%). However, a study by Hamzeh *et al.* (2019) and Srinivasan *et al.* (2017) have documented that a lesser number of diabetics undergo regular eye visits compared to our study. The diabetics should be encouraged to go for periodic eye visits every six months. It can be helpful for the early diagnosis of diabetic retinopathy, also creating awareness and spreading knowledge about diabetes' complications by doctors.

The random blood glucose levels of the patients were classified into good (40.87%), high (21.74%) and very high (37.39%) blood glucose levels by using data from the national report of National Family Health Survey (International Institute for Population Sciences (IIPS) and ICF, 2017). But 66.09% of subjects think that their blood glucose level is under control in our study, which is closer to the results in Hamzeh *et al.* (2019) study.

In the present study, awareness of DR was not statistically associated with the duration of DM, type of DM, comorbid state of hypertension and history of smoking. In contrast, studies by Dandona *et al.* (1999) and Uthra *et al.* (2008) observed association of DR awareness and duration of DM. Also, a study by Narsaiah *et al.* (2019) showed the association of DR awareness with history of hypertension which is contrary to this study which may be due to the smaller sample size.

A percentage of 59.13% had an awareness of diabetic retinopathy. These results are quite comparable with the study by Lingam *et al.* (2018) (65.3%). Although, the results in studies of Venugopal *et al.* (2020) (29.4%), Srinivasan *et al.* (2017) (17.01%) and Koshy *et al.* (2012) (30.9%) are relatively lower than our study.

We found that awareness of DR and awareness of diabetes can cause eye disease were statistically associated ($p<0.01$) and similar findings were observed in Srinivasan *et al.* (2017) study. Proper actions to educate diabetic patients about this silently blinding disease should be promoted. World Diabetes Day and World Sight day should help to spread awareness of diabetic retinopathy, especially among people with diabetes (Srinivasan *et al.*, 2017)

Knowledge about treatment modalities of DR, according to Venugopal *et al.* (2020) were 85% which was relatively higher compared to our study findings (57.39%). Also, 42.61% did not know about the treatment of DR, which is lower than the findings seen in Hamzeh *et al.* (2019) study (56.9%).

The most common source of knowledge were friends, family and relatives, which is comparable to the data collected by Mumu *et al.* (2014). In addition to this, mass media and doctors were the other standard resources. Mass media is essential for spreading awareness to a large-scale population. Doctors and other health care workers should play a key role in conveying the risk factors and possible complications about diabetes at the time of diagnosis to each patient. The importance of regular eye visits should be conveyed by an ophthalmologist and educate their patients about DR.

CONCLUSION

Diabetic retinopathy is a preventable cause of blindness and visual impairment if detected early and treated adequately. Awareness of diabetic retinopathy should be improved among the diabetic population. The risk factors such as increased duration of diabetes mellitus and associated hypertensive history playing a vital role in the development of diabetic retinopathy should be educated to the diabetics. It is the duty of the doctors to advice diabetic patients about diabetes and its complication, especially diabetic retinopathy. Preventive plans and community-based health education measures should be implemented to spread awareness of diabetic retinopathy at all levels of health care.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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REFERENCES

Dandona, L., Dandona, R., Naduvilath, T. J., McCarty, C. A., Rao, G. N. 1999. Population based assessment of diabetic retinopathy in an urban population in southern India. *British Journal of Ophthalmology*, 83(8):937–940.

Hamzeh, A., Almhanni, G., Aljaber, Y., Alhasan, R., Alhasan, R., Alsamman, M. I., Alhalabi, N., Haddeh, Y. 2019. Awareness of diabetes and diabetic retinopathy among a group of diabetic patients in main public hospitals in Damascus, Syria during the Syrian crisis. *BMC Health Services Research*, 19(1):549.

International Institute for Population Sciences (IIPS) and ICF 2017. National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS. Accessed on 13 August 2020.

Klein, R., Klein, B. E., Moss, S. E., Davis, M. D., Demets, D. L. 1984. The Wisconsin Epidemiologic Study of Diabetic Retinopathy: II. Prevalence and risk of diabetic retinopathy when age at diagnosis is less than 30 years. *Archives of ophthalmology*, 102(4):520–526.

Koshy, J., Varghese, D. L., Mathew, T., Kaur, G., Thomas, S., Bhatti, S. M. 2012. Study on KAP of ocular complications due to diabetes among people with type II diabetes visiting a tertiary teaching hospital. *Indian Journal of community health*, 24(1):27–31.

Lingam, S., Rani, P., Sheeladevi, S., Kotapati, V., Das, T. 2018. Knowledge, attitude and practices on diabetes, hypertension and diabetic retinopathy and the factors that motivate screening for diabetes and diabetic retinopathy in a pyramidal model of eye health care. *Rural and Remote Health*, 18(1):4304.

Mumu, S. J., Saleh, F., Ara, F., Haque, M. R., Ali, L. 2014. Awareness regarding risk factors of type 2 diabetes among individuals attending a tertiary-care hospital in Bangladesh: a cross-sectional study. *BMC Research Notes*, 7(1):599.

Narsaiah, C., Manoj, P., Raju, A. G. 2019. Study on Awareness and Assessment of Diabetic Retinopathy in Diabetic Patients Attending Ophthalmology Clinic at a Tertiary Care Hospital, Telangana State. *International Journal of Contemporary Medical Research [IJCMR]*, 6(11):9–13.

Rajesh, B., Hussain, R., Giridhar, A., Gopalakrishnan, M., Sadasivan, S., James, J., Vijayan, P., John, N. 2016. Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of a South Indian state and its practice among the patients with diabetes mellitus: A

population-based study. *Indian Journal of Ophthalmology*, 64(4):272.

Ramakrishnan, H., Nair, S. B. 2017. Awareness of diabetic retinopathy among diabetic patients attending a tertiary care hospital in rural South India. *Indian Journal of Clinical and Experimental Ophthalmology*, 3(2):125–127.

Resnikoff, S., Pascolini, D., Etya'ale, D., Kocur, I., Pararajasegaram, R., Pokharel, G. P., Mariotti, S. P. 2004. Global data on visual impairment in the year 2002. *Bulletin of the world health organization*, 82(11):844–851.

Sabanayagam, C., Yip, W., Ting, D. S. W., Tan, G., Wong, T. Y. 2016. Ten Emerging Trends in the Epidemiology of Diabetic Retinopathy. *Ophthalmic Epidemiology*, 23(4):209–222.

Saikumar, S. J., Giridhar, A., Mahesh, G., Elias, A., Bhat, S. 2007. Awareness about eye diseases among diabetic patients: a survey in South India. *Community Eye Health*, 20(61):16–17.

Shaw, J. E., Sicree, R. A., Zimmet, P. Z. 2010. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Research and Clinical Practice*, 87(1):4–14.

Srinivasan, N. K., John, D., Rebekah, G., Kujur, E. S., Paul, P., John, S. S. 2017. Diabetes and diabetic retinopathy: knowledge, attitude, practise (KAP) among diabetic patients in a tertiary eye care centre. *Journal of clinical and diagnostic research: JCDR*, 11(7):1–7.

Thapa, R., Paudyal, G., Maharjan, N., Bernstein, P. S. 2012. Demographics and awareness of diabetic retinopathy among diabetic patients attending the vitreoretinal service at a tertiary eye care centre in Nepal. *Nepalese Journal of Ophthalmology*, 4(1):10–16.

Uthra, S., Raman, R., Mukesh, B. N., Kumari, R. P., Sharma, T., McCarty, C. A., Kumaramanickavel, G. 2008. Knowledge of Diabetes and diabetic retinopathy among rural populations in India, and the influence of knowledge of diabetic retinopathy on attitude and practice. *International Journal of Human Genetics*, 8(3):838.

Venugopal, D., Lal, B., Fernandes, S., Gavde, D. 2020. Awareness and knowledge of diabetic retinopathy and associated factors in Goa: A hospital-based cross-sectional study. *Indian Journal of Ophthalmology*, 68(2):383–390.