

Original Article**Demographics, Awareness and Pattern of Diabetic Retinopathy among Diabetic Patients**Anjila Basnet¹, Raghunandan Byanju¹, Samir Thapa¹, Sanjit Kumar Shah¹, Suman Simkhada²¹Department of Ophthalmology, KIST Medical College and Teaching Hospital, LalitpurNepal,²Department of Internal Medicine, KIST Medical College and Teaching Hospital, Lalitpur, NepalArticle Received: 17th October, 2024; Accepted: 18th December, 2024; Published: 31st December, 2024DOI: <https://doi.org/10.3126/jonmc.v13i2.74398>**Abstract****Background**

Diabetic retinopathy is one of the emerging causes of blindness in developing countries. This study was carried out among diabetic patients to determine the demographics, severity of diabetic retinopathy and also to assess the level of awareness of diabetic eye disease.

Materials and Methods

The data, which were collected prospectively from self-designed proforma, we analyzed by using the Statistical Package for the Social Sciences (SPSS) Version 16. Diabetic retinopathy was graded by clinical examination using early treatment diabetic retinopathy study criteria.


Results

Two hundred and forty-nine patients were included in the study. The mean age of the patients was 59 years. Mild non-proliferative diabetic retinopathy accounted for 15.7% followed by moderate non-proliferative diabetic retinopathy in 6% and severe non-proliferative diabetic retinopathy in 2.8%. Newar and Chhetri were the predominant ethnic groups, comprising 26.1% and 25.7% respectively. Majority of the patients were aware of diabetic retinopathy and its potential for blindness.

Conclusion

The occurrence of diabetic retinopathy was found to be higher than other studies done in similar settings. Majority of the patients were aware of diabetic retinopathy and its potential for blindness and the source of awareness was from the health professionals.

Keywords: Awareness, Diabetes mellitus, Diabetic retinopathy

	<p>©Authors retain copyright and grant the journal right of first publication. Licensed under Creative Commons Attribution License CC - BY 4.0 which permits others to use, distribute and reproduce in any medium, provided the original work is properly cited.</p>	<p>*Corresponding Author: Dr. Anjila Basnet Associate Professor Email: dranjilabasnet@gmail.com ORCID: https://orcid.org/0000-0003-2647-0169</p>
---	---	---

Citation

Basnet A, Byanju R, Thapa S, Shah SK, Simkhada S, Demographics, Awareness and Pattern of Diabetic Retinopathy among Diabetic Patients, JoNMC. 13:2 (2024) 9-13, DOI: <https://doi.org/10.3126/jonmc.v13i2.74398>



Introduction

Diabetes mellitus (DM) is one of the fastest growing chronic disease in terms of global prevalence. According to recent data published by the International Diabetes Federation, approximately 537 million adults had diabetes in 2021, while estimates suggests that this figure will increase to 783 million by 2045[1]. Diabetic retinopathy (DR) is an important microvascular complication and occurs in in about 30 % of individuals with diabetes. DR is therefore a leading cause of blindness among adults, particularly in higher-income-countries. With overall incidence of diabetes is rapidly increasing, the number of adults worldwide with DR, vision-threatening DR, and diabetic macular edema (DME) are projected to increase to approximately 161 million, 45 million, and 29 million, respectively [2,3]. DR is a micro-vasculopathy in that the microvasculature leak serum, increased vascular permeability, and capillaries are lost early in the disease. Hyperglycemia, mitochondrial and extracellular reactive oxygen species are toxic to endothelial cells, pericytes, and neurons, resulting in their death early in DR. There is accumulating evidence that low grade inflammation underlies the vascular complications of DR [4,5,6]. Almost one -fourth of people 20 years and older and one-third 40 years and older in urban areas of Nepal exhibited diabetic tendencies in one population-based study from Nepal [7]. Early detection, timely ocular treatment, and good control of the underlying risk factors are key from reducing blindness from diabetic retinopathy. Most of the previous studies were done on the prevalence and risk factors for DR, but very limited data exist regarding the demographics and awareness of diabetic eye problems. This study was conducted to assess the demographic characteristics, awareness and pattern of diabetic retinopathy among diabetic patients at a tertiary care center in Nepal.

Materials and Methods

This is a prospective descriptive study that was carried out in the outpatient Department of Ophthalmology at KIST Medical College and Teaching Hospital, Lalitpur, Nepal. The data of

the patients were retrieved from the self-designed proforma which was kept as a part of research projects in the department of ophthalmology. All patients, aged more than 18 years, who were diagnosed with the diagnosis of diabetes mellitus from 18th June 2023 to 14th June 2024, were included in the study. Ethical approval to carry out the study was obtained from the Institutional Review Committee of KIST Medical College and Teaching Hospital. Critically ill patients and those with known co-morbidities like hypertension and hyperlipidemia that may overlap the pathophysiology of diabetic retinopathy or any ocular disease like cornea or lens opacities that causes media haze resulting in difficulty in fundus examination were excluded from the study. A convenience sampling method was used. The sample size was calculated by using the following formula: $n = Z^2 \times p \times q / e^2$ [$n = (1.96)^2 \times .19 \times 0.81 / (0.05)^2$, $n = 236$, where, $n =$ minimum required sample size, $Z = 1.96$ at 95% Confidence Interval (CI), $p =$ prevalence taken from a previous study, 19.4% [8], $q = 1 - p$, $e =$ margin of error, 5%]. The calculated sample size was 236. However, 249 samples were included in the study. The significant findings from the fundus were documented and diabetic retinopathy characteristics such as no diabetic retinopathy, mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, very severe NPDR, early proliferative diabetic retinopathy (PDR), advanced PDR, clinically significant macular edema (CS ME), diabetic macular edema (DME) and advanced diabetic eye disease were graded according to the Early Treatment Diabetic Retinopathy Study Classification [8].

The values of HbA1c indicate the recent status of glycemic control. An HbA1c level of 6.5% or higher on two separate occasions indicates a subject having DM. An HbA1c level of 7% to 8% has been used as an indicator of uncontrolled hyperglycemia in patients with DM [9]. The data were entered into and analyzed by using the Statistical Package for the Social Sciences (SPSS) version 16. Descriptive statistic in the form of frequencies, percentage and mean were also used to describe relevant data.



Results

Out of 249 diabetic patients, 83(33.3%) had diabetic retinopathy changes in at least one eye. A total of 126 (50.6%) were male and 123(49.4%) female. The age range was 30-82 years with a mean age 59 years. Majority were in the 60-69 years range. Newar and Chhetri were the predominant ethnic groups, comprising 26.1% and 25.7%, respectively. Most of the patients were from Kathmandu valley 162(65.1%) and 87(34.9%) were from out of Kathmandu valley. The predominant group of the patients were homemakers 95 (38.2%), followed by business persons 49(19.7%) and service holder 33 (13.3%) as presented in Table 1.

Table 1: Distribution of socio-demographic characteristics of the study population

Variables	Category	Frequency (n)	Percentage (%)	
Age (in years)	Below 40	10	4.0	
	40-49	32	12.9	
	50-59	77	30.9	
	60-69	97	39.0	
	70 and above	33	13.3	
Gender	Male	126	50.6	
	Female	123	49.4	
	Newar	65	26.1	
Ethnicity	Chhetri	64	25.7	
	Brahmin	52	20.9	
	Mongolian	45	18.1	
	Madhesi	17	6.8	
	Others	6	2.4	
	Kathmandu Valley	162	65.1	
Address	Out of Kathmandu Valley	87	34.9	
	Homemaker	95	38.2	
	Business	49	19.7	
Occupation	Service	33	13.3	
	Retired	29	11.6	
	Agriculture	26	10.4	
	Others	15	6.0	
	Student	2	0.8	
	Education	Simple literate	53	21.3
		Bachelor and above	47	18.9
Intermediate		36	14.5	
Primary level		32	12.9	
Illiterate		29	11.6	
Secondary level		26	10.4	
School Leaving Certificate	26	10.4		

Amongst the total diabetic patients, 211 (84.7%) were aware that diabetes mellitus can affect the eye and result in blindness. Most of them gained their information about diabetic eye disease from the health professionals (79.1%). About 71.9% of the patients were referred by a physicians for an eye checkup. Fundus evaluation was done for the first time in 33.7% of participants as shown in Table 2

Table 2: Awareness of diabetic eye disease among the participants

Variables	Category	Frequency (n)	Percentage (%)	
Awareness of diabetic eye disease	Yes	211	84.7	
	No	38	15.3	
If Yes, Source of awareness	Physicians & Ophthalmologists	Yes	197	79.1
	No	14	5.6	
Friends & Relatives with diabetes	Yes	55	22.1	
	No	156	62.7	
Social media	Yes	12	4.8	
	No	199	79.9	
Reason for visit to EYE OPD for an eye checkup	Doctor's referral	179	71.9	
	Self-awareness	70	28.1	
Fundus examination	First time	84	33.7	
	Follow up	165	66.3	

Nearly half (41.8%) of the patients had diabetes mellitus for more than 10 years duration. Family history of diabetes was present among 58.6% of the participants (Table 3)

Table 3: Assessment of risk factors for diabetic retinopathy among the participants

Variables	Category	Frequency (n)	Percentage (%)
Duration of diabetes (in years)	Newly diagnosed	29	11.6
	<5	57	22.9
	5-9	59	23.7
Smoking	10 or more	104	41.8
	Yes	85	34.1
Alcohol consumption	No	164	65.9
	Yes	87	34.9
Family history of diabetes	No	162	65.1
	Yes	146	58.6
Glycemic control	No	103	41.4
	Good	125	50.2
	Poor	124	49.8

Amongst 249 respondents, 83 (33.3%) were found to have diabetic retinopathy. The commonest pattern of diabetic retinopathy was mild NPDR accounted for 39 (15.7%) followed by moderate NPDR in 15 (6%) and severe NPDR in 7 (2.8%) (Figure 1)

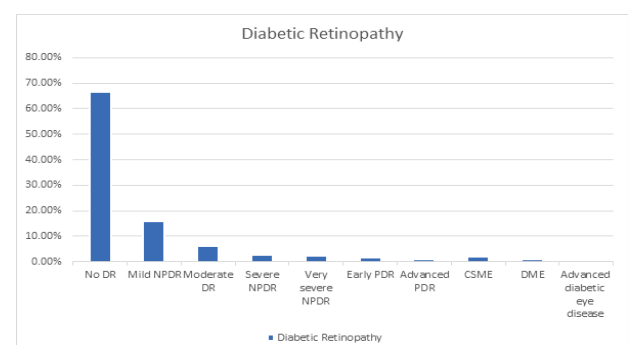


Figure 1: Pattern of diabetic retinopathy according to ETDRS classifications



Discussion

In this study, prevalence of diabetic retinopathy was 83 (33.3%) involving at least one eye. The prevalence of this study was higher to the study done at Dhulikhel Hospital in which the diabetic retinopathy was found to be 18.46% [10]. Other studies conducted in Nepal, mainly hospital based, have found the prevalence of DR to be 19% to as high as 78% [11,12,13,14,15]. The high prevalence of DR may be due to the late presentation of the patients to the hospital, uncontrolled diabetes mellitus, patients not taking anti-diabetic medications regularly and lack of awareness of diabetic retinopathy in the society. In contrast to this study, several studies found low prevalence of DR [8, 10]. The low prevalence of DR in those studies may be due to less duration of diabetes and good glycemic control.

In the present study, by ETDRS classification the prevalence of mild NPDR was the commonest accounting for 39 (15.7%) followed by moderate NPDR in 15 (6%) and severe NPDR in 7 (2.8%). Similarly, other studies also found that the maximum number of participants had mild NPDR followed by moderate NPDR [16,17]

The mean age of our diabetic patients (59.0 years) was similar to other hospital -based studies from Nepal [13, 18] but unlike studies from other developing countries where patients were relatively younger age group [19, 20]. This may be due to late detection of DM and or late presentation for eye examinations in our series. In our study, DR was commonly seen in male compared with female which was similar to other studies [17, 21]. However, in contrast to our study from China found diabetic retinopathy more in female than in male [22]. More males than the females were seen during the study period, this could be due to increased level of awareness and easier access to the hospital because they are more mobile than females in the Nepalese society. Newar and Chhetri were the predominant ethnic groups who presented to our department during the study period. Since our study is hospital-based without comparison group, it is difficult to say whether the diabetic mellitus is more prevalent in these ethnic groups. Meanwhile another study done in Kathmandu valley and Narayanghat found a different ethnic distribution [13,21]. The highest group was from the Newars, which could be due to their high population in the Kathmandu valley from which almost three fifths of the patients originated.

The occupational distribution of diabetic patients in our study was similar to other studies from

Nepal [15,23]. Homemaker constituted the major working group of 38.2% of patients seen during the study period. This may be due to more diabetes among them because of physical inactivity, lack of awareness regarding healthy food habits and lack of exercise, all of these contribute to higher obesity rate, especially in urban areas [7]. Nearly half of the patients had diabetes mellitus for more than 10 years duration. Family history of diabetes was present among 58.6% of the participants which was similar to other studies [15,24,25]

In the present study, 211 (84.7%) were aware that diabetes mellitus can affect the eye and result in blindness. Most of them gained their information about diabetic eye disease from the health professionals (79.1%). Likewise, in a study done in North India found that 79 % were aware that diabetes can affect the eyes and physicians were the main source of information [26]. General practitioners and physicians are usually the primary people to access patients with diabetes. This emphasizes the role of physicians and other health care professionals in creating awareness about diabetes and its complications and therefore need for programs for updating and training them.

The limitation of this study was the possible risk factors responsible for the development of the different pattern of diabetic retinopathy were not assessed. This was a hospital -based-cross-sectional study. Therefore, the findings of the present study cannot be extrapolated to the entire population.

Conclusion

The prevalence of diabetic retinopathy was found to be higher than other studies done in similar settings. Uncontrolled diabetes affects several system such as damage to the large blood vessels of the heart, brain and legs (macrovascular complications), damage to the small blood vessels , causing problems in the eyes, kidneys, feet and nerves(microvascular complications). Most of the participants were aware of diabetic retinopathy but there existed major deficits in the behavior of diabetic patients toward management of DR. There need to create awareness about DR and emphasize the importance of retinal screening to reduce visual disability by diabetes.

Acknowledgement: We would like to acknowledge all the participants who supported us to accomplish this study.



Conflict of interest: None

References

- [1] Rathmann W, Giani G, Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 27:10 (2004) 2568-9. DOI :10.2337/diacare.27.10.2568. PMID:15451946.
- [2] Cheung N, Mitchell P, Wong TY, Diabetic retinopathy, *Lancet*. 376:9735 (2010) 124-36. DOI:10.1016/s0140-6736(09)62124-3. PMID: 20580421.
- [3] Yang Z, Tan TE, Shao Y, Wong TY, Li X, Classification of diabetic retinopathy: Past, present and future, *Front Endocrinol*. 13:10 (2022) 217-9. DOI:10.3389/fendo.2022.1079217. PMID: 36589807.
- [4] Adamis AP, Is diabetic retinopathy an inflammatory disease ? *Br J Ophthalmol*. 86:3 (2002) 363-365. DOI: 10.1136/bjo.86.4.363. PMID : 11914197.
- [5] Kern TS, Contributors of inflammatory processes to the development of the early stages of diabetic retinopathy, *Exp Diabetes Res*. 2007:10 (2007) 95103. DOI: 10.1155/2007/95103. PMID: 18274606.
- [6] Nodak K, Nakao S, Ishida S, Ishibashi T, Leukocyte adhesion molecules in diabetic retinopathy, *J Ophthalmol*. 2012:12 (2012) 279037. DOI: 10.1155/2012/279037. PMID :22132315.
- [7] Singh DL, Bhattarai MD, High prevalence of diabetes and impaired fasting glycemia in urban Nepal. 20:2 (2003) 170-1 DOI: 10.1046/j.1464-5491.2003.00829_4.x. PMID: 12581274.
- [8] Paudyal G, Shrestha MK, Poudel M, Tabin GC, Ruit S, Thomas BJ, Prevalence and Severity of Diabetic Retinopathy among Diabetic Patients Presenting to a Tertiary Eye Hospital in Nepal. *Middle East Afr J Ophthalmol*. 26:4 (2020) 210-215. DOI: 10.4103/meajo.MEAJO_65_18. PMID:32153332.
- [9] Liu L, Wang F, Gracely EJ, Moore K, Melly S, Zang F et al, Burden of Uncontrolled Hyperglycemia and Its Association with Patients Characteristics and Socioeconomic Status in Philadelphia, USA. *Health Equity*.4:1 (2020) 525-532. DOI: 10.1089/heq.2020.0076. PMID: 34095699.
- [10] Shrestha RM, Shrestha N, Shrestha P, Shrestha JK, Demographics and Awareness of Diabetic Retinopathy among Diabetic Patients Attending Department of Ophthalmology at Dhulikhel Hospital, Kathmandu Univ Med J. 78:3(2022) 183-7. PMID: 37017163.
- [11] Paudyal G, Shrestha MK, Meyer JJ, Thapa R, Gurung R, Ruit S, Prevalence of diabetic retinopathy following a community screening for diabetes. *Nepal Medical College Journal*.10:3 (2008) 160-3. PMID: 19253859.
- [12] Shrestha RK, Ocular manifestations in diabetes, a hospital based prospective study, *Nepal Medical College Journal*.13:4 (2011) 254-6. PMID: 23016474.
- [13] Shrestha S, Malla OK, Karki DB, Byanju RN, Retinopathy in a diabetic population. *Kathmandu Univ Med J*, 5:18 (2007) 204-9. PMID: 18604020.
- [14] Thapa R, Joshi DM, Rizyal A, Maharjan N, Joshi RD, Prevalence, risk factors and awareness of diabetic retinopathy among admitted diabetic patients at a tertiary level hospital in Kathmandu, *Nepal Journal of Ophthalmology*. 6:11 (2014) 24-30. DOI:10.3126/nepjoph.v6i11.10760. PMID: 25341843.
- [15] Thapa R, Paudyal G, Maharjan N, Bernstein PS, Demographics and awareness of diabetic retinopathy among diabetic patients attending the vitreo-retinal service at a tertiary eye care center in Nepal, *Nepal Journal of Ophthalmology*. 4:7 (2012) 10-16. DOI: 10.3126/nepjoph.v4i1.5844. PMID: 22343990.
- [16] Bastola P, Khatiwada S, Khadka M, Dahal P, Bastola S, Diabetic Retinopathy among Diabetic Patients at a Tertiary Care Hospital : A descriptive Cross-sectional Study, *J Nepal Med Assoc*. 60:247 (2022) 234-240. DOI:10.31729/jnma.7243. PMID:35633262.
- [17] Pun CB, Tuladhar S, Upadhaya TL, Gurung J, Dhugana D, The prevalence of Diabetic Retinopathy in a Tertiary Centre in Western Region, Nepal, *JGMC Nepal*. 13:2 (2020) 140-3. DOI:10.3126/jgmcn.v13i2.30344.
- [18] Shrestha MK, Paudyal G, Wagle RR, Gurung R, Ruit S, Onta SR, Prevalence of and factors associated with diabetic retinopathy among diabetics in Nepal: a hospital based study, *Nepal Med Coll J*. 9:4 (2007) 225-229. PMID: 18298009.
- [19] Rema M, Premkumar S, Anitha B, Deepa R, Pradeepa R, Mohan V, Prevalence of Diabetic Retinopathy in Urban India, The Chennai Urban Rural Epidemiology Study (CURES) Eye Study. *Invest Ophthalmol Vis Sci*. 46:7 (2005) 2328-33. DOI:10.1167/iovs.05-0019. PMID: 15980218.
- [20] Muninarayana C, Balachandra G, Hiremath SG, lyenger K, Anil NS, Prevalence and awareness regarding diabetes mellitus in rural Tamaka, Kolar: *International Journal of diabetes in developing countries*. 30:1 (2010) 18-21. DOI:10.4103/0973-3930.60005. PMID: 20431801.
- [21] Dahal P, Adhikari H, Diabetic Retinopathy Awareness among Diabetic Patients Attending COMS-TH, *Kathmandu Univ Med J*. 57:1 (2017) 78-82. PMID:29446369.
- [22] Li M, Wang Y, Liu Z, Tang X, Mu p, Tan Y et al, Females with Type 2 Diabetes Mellitus Are Prone to Diabetic Retinopathy: A Twelve -Province Cross-Sectional Study in China. *J Diabetes Res*. 21: 20 (2020) 5814296. DOI: 10.1155/2020/5814296. PMID: 32377522.
- [23] Thapa R, Bajimaya S, Paudyal G, Khanal S, Tan S, Van Rens G, Population awareness of diabetic eye disease and age related macular degeneration in Nepal: the Bhaktapur Retina Study. *BMC Ophthalmology*. 15:12 (2015) 188. DOI: 10.1186/s12886-015-0175-z. PMID: 26714483.
- [24] Anwar SB, Asif N, Naqvi SAH, Malik S, Evaluation of multiple risk factors involved in the development of Diabetic Retinopathy. *Pak J Med Sci*. 35:1(2019)156-160. DOI: 10.12669/pjms.35.1.279. PMID: 30881415.
- [25] Shrestha A, Suwal R, Shrestha R, Khadka D, Burden and Risk Factors of Diabetic Retinopathy. *Nepal J Ophthalmol*. 14:27 (2022) 82-92. DOI:10.3126/nepjoph.v14i1.39723. PMID: 35996907.
- [26] Singh A, Tripathi A, Kharya P, Agarwal R, Awareness of diabetic retinopathy among diabetes mellitus patient visiting a hospital of North India. *J Family Med Prim Care*. 11:4 (2022) 1292-1298. DOI:10.4103/jfmpc.jfmpc.977.21. PMID: 35516672.

