

Original Research Article

Prevalence of diabetic retinopathy in type 2 diabetes mellitus patients attending medicine out-patient department of a tertiary care hospital in Alappuzha, Kerala, India

Koushiki Mani*, Rose Davy C.

Department of Physiology, Government T. D. Medical College, Alappuzha, Kerala, India

Received: 21 January 2017

Accepted: 04 March 2017

***Correspondence:**

Dr. Koushiki Mani,

E-mail: koushiki.cmc@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Diabetic retinopathy is a microvascular complication affecting the eyes of both Type 1 and Type 2 diabetes mellitus due to long-term hyperglycaemia. Diabetic retinopathy is the leading cause of blindness among working aged adults around the world. There are various factors leading to the development of diabetic retinopathy namely duration of diabetes, glycaemic control, age at onset of diabetes, uncontrolled hypertension. This is a hospital based cross-sectional study which aimed to study the prevalence of diabetic retinopathy in type 2 diabetes mellitus patients attending Medicine out-patient department of Government T. D. Medical College, Alappuzha, Kerala, India. The factors contributing to the development of retinopathy was also studied.

Methods: 200 already diagnosed type 2 diabetic subjects were included in the study. Subjects were explained about the study and once the consent was received, data regarding age, gender, age at onset of diabetes, duration of diabetes, history of smoking, alcohol intake, and socio-economic status was documented. Height and weight was measured. Blood pressure was recorded with mercury sphygmomanometer. Then the subjects were evaluated for diabetic retinopathy by fundus examination after dilating the eyes. Findings were noted and subjects were categorized as no retinopathy, nonproliferative and proliferative diabetic retinopathy using the ETDRS classification.

Results: In present study, out of 200 subjects, 63 subjects (31.5%) were affected with diabetic retinopathy (non-proliferative retinopathy=22.5%, proliferative retinopathy=9%). Prevalence of mild, moderate and severe non-proliferative retinopathy was 7.5% each. Significant association was found between diabetic retinopathy and duration of diabetes.

Conclusions: Therefore, periodic screening of diabetic patients should be carried out for early detection and prevention of loss of vision.

Keywords: Diabetes mellitus, Diabetic retinopathy, Duration of diabetes

INTRODUCTION

Diabetic retinopathy is a microvascular complication affecting the eyes of both type 1 and type 2 diabetes mellitus. It is one of the leading causes of visual impairment in industrialized countries in the working age group and one of the frequent causes of blindness in developing countries like India. According to World

Health Organisation; diabetic retinopathy is 4.8% of the 37 million cases of blindness throughout the world.¹

India harbours 31.7 million diabetics and the number is going to rise to an alarming 79.4 million by 2030.² In India with the epidemic rise in type 2 diabetes mellitus² as reported by the World Health Organization (WHO) diabetic retinopathy is fast becoming an important cause of visual disability. Although extensive studies have been

carried out to find the prevalence of diabetic retinopathy in Type 1 diabetic subjects, relatively few studies have been attempted regarding the prevalence of diabetic retinopathy in Type 2 diabetes mellitus.

Again, type 2 diabetes is the commonest form of diabetes constituting 90% of the diabetic population of any country. So, the prevalence of retinopathy in type 2 diabetes is fast gaining importance in the field of research. In Kerala, India, there is paucity of literature regarding the prevalence of diabetic retinopathy in type 2 diabetes mellitus.

Prevalence studies of diabetic retinopathy among self-reported diabetics have been carried out in Palakkad district of Kerala³ but very few hospital-based studies have been conducted so far. Thus, this study will help us to ascertain the burden on the health services as well as estimate the risk factors leading to the development of retinopathy.

This study aimed to determine the prevalence of diabetic retinopathy in type 2 diabetes mellitus attending Medicine out-patient department of Government T. D. Medical College, Alappuzha, Kerala, India. The factors contributing to the development of diabetic retinopathy was also studied.

METHODS

This is a hospital- based observational cross-sectional study. The study was conducted in the department of medicine and department of ophthalmology, Govt. TDMC., Alappuzha, Kerala, India. 200 already diagnosed type 2 diabetic subjects were included in the study. Patients with hazy media whose fundi could not be examined and patients with any other eye disease were excluded from the study.

The study was explained to the subject and once the consent was received data regarding age, gender, age at onset of diabetes, duration of diabetes, history of smoking, history of alcohol intake, mode of treatment was documented. Height and weight was measured. Blood pressure was recorded with mercury sphygmomanometer.

Then the subjects were evaluated for diabetic retinopathy by fundus examination after dilating the eyes. Direct and indirect ophthalmoscopy was done. Findings were noted and subjects were categorized as no retinopathy (No DR), non-proliferative (NPDR) and proliferative diabetic retinopathy (PDR) using the ETDRS classification.

RESULTS

Data was entered in Microsoft and Excel software using SPSS version 16. Mean, standard deviation, range and percentage were calculated. All confidence intervals

were presented at 95% and all analyses was conducted at a <0.05 significance level. Pearson Chi-square test and Binary logistic regression analysis was used to find out statistically significance differences.

Table 1 shows age, gender and duration of diabetes in 200 already diagnosed patients who were studied. Duration of diabetes was slightly longer in the female participants.

Table 1: Demographic profile of the population under study.

No. of participants (N= 200)	Age in years (Mean±SD)	Duration of diabetes in years (Mean±SD)
Males (N=102)	59.92±7.48 (67-52)	12.83±7.73 (21-5)
Females (N=98)	61.69±8.313 (70-53)	13.91±9.22 (23-5)

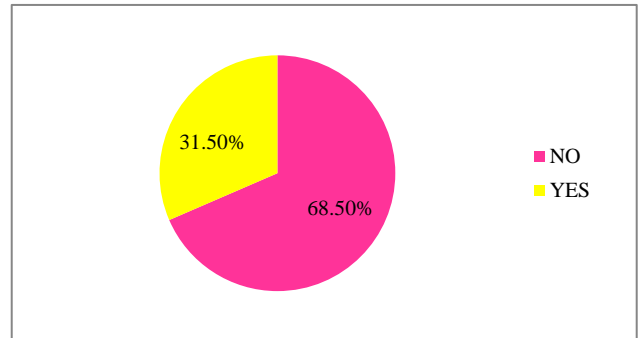


Figure 1: Percentage distribution of sample in terms of diabetic retinopathy.

Figure 1 shows that 63 subjects i.e. 31.5% were having diabetic retinopathy. 68.5% i.e. 137 subjects were having no retinopathy.

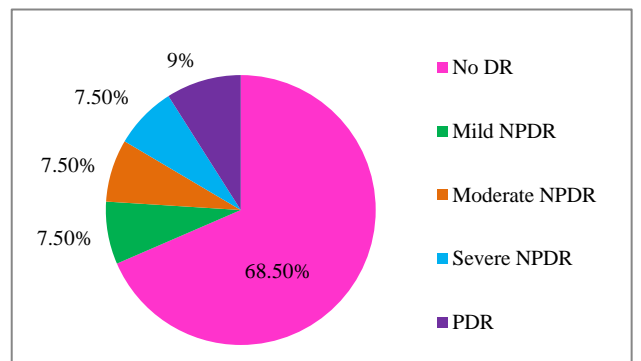


Figure 2: Percentage distribution of sample according to stages of diabetic retinopathy.

Figure 2 shows that out of 63 patients with DR, 45 patients had NPDR -22.5%, 18 patients had PDR -9.0%.

Table 2: Association between age and stage of diabetic retinopathy.

Age (yrs)	No. of patients	No DR (%)	Mild NPDR (%)	Moderate NPDR (%)	Severe NPDR (%)	PDR (%)	*P-value
41-50	31	96.8(30)	0(0)	0(0)	0(0)	3.2(1)	0.00
51-60	69	79.7(55)	10.1(7)	4.3(3)	1.4(1)	4.3(3)	
61-70	84	57.1(48)	7.1(6)	13.1(11)	13.1(11)	9.5(8)	
> 70	16	25(4)	12.5(2)	6.3(1)	18.8(3)	37.5(6)	

*Pearson-Chi Square Test. Statistically significant changes were observed between age and stage of diabetic retinopathy.

Table 3: Association between duration of diabetes mellitus and stage of diabetic retinopathy.

Duration of DM (yrs)	No. of patients	No DR (%)	Mild NPDR (%)	Moderate NPDR (%)	Severe NPDR (%)	PDR (%)	*P-value
1-5	52	98.1 (51)	0 (0)	0 (0)	0 (0)	1.9 (1)	0.000
6-10	38	81.6 (31)	13.2 (5)	2.6 (1)	0 (0)	2.6 (1)	
11-15	24	58.3 (14)	16.7 (4)	12.5 (3)	4.2 (1)	8.3 (2)	
16-20	36	61.1 (22)	8.3 (3)	13.9 (5)	8.3 (3)	8.3 (3)	
21-25	26	46.2 (12)	11.5 (3)	15.4 (4)	15.4 (4)	11.5 (3)	
> 25	24	29.2 (7)	0 (0)	8.3 (2)	29.2 (7)	33.3 (8)	

Table 3: Binary logistic regression for checking which factors contributed to the development of retinopathy.

Variables in the Equation		B	S.E.	Wald	df	Sig.	Exp (B)
Step 1a	Age	0.070	0.058	1.419	1	0.234	1.072
	Sex (1)	0.274	0.501	0.300	1	0.584	1.315
	Socioeconomic status (1)	-0.531	0.387	1.884	1	0.170	0.588
	Age at onset	-0.040	0.060	0.442	1	0.506	0.961
	Duration	0.125	0.058	4.606	1	0.032	1.133
	Hypertension (1)	0.715	0.480	2.221	1	0.136	2.044
	Alcohol (1)	-1.036	0.648	2.557	1	0.110	0.355
	Smoker (1)	1.036	0.656	2.492	1	0.114	2.817
	Weight	-0.544	0.407	1.790	1	0.181	0.580
	Height in centimetres	0.404	0.304	1.766	1	0.184	1.497
	BMI	1.265	0.990	1.632	1	0.201	3.544
	Constant	-67.155	47.090	2.034	1	0.154	0.000

As the highlighted value, i.e. p-value are less than 0.05 (level of significance) so the corresponding variable i.e. duration have significant effect on development of retinopathy.

DISCUSSION

Prevalence of diabetic retinopathy in different parts of India varies. This is can be attributed to the fact that in India, there is a wide geographical, ethnic and life-style variation. Prevalence of DR also varies in population-based and hospital-based studies. The diagnostic criteria for diabetes also differ between studies and reports are based on self-reported diabetes, fasting blood sugar and/or oral glucose tolerance test. Few studies have used retinal photography as screening tools.^{4,5}

The present hospital- based, cross-sectional study showed that the prevalence of diabetic retinopathy (DR) was 31.5% (Figure 1) (NPDR- 22.5%, PDR- 9.0%, Figure 2) in type 2 DM patients. Overall, prevalence of DR in

hospital based studies including present study was higher as compared to those in population based epidemiological studies.^{3,6-10} This may be due to the fact that there was a referral bias among the diabetic patients who were reported to tertiary care centres. Therefore, with larger number of diabetics reporting to the tertiary hospital, it is more likely that prevalence of complications may also be larger.

Overall, prevalence which was observed in present study was similar to that which was observed by Rema et al, and Agrawal RP et al, in spite of the fact that in present study, sample size is small.^{6,8} Prevalence of NPDR and PDR matched well with those which were observed by Agrawal RP et al.⁶ Present results are consistent with those of Ramchandran et al who observed retinopathy in 714 i.e. 23.7% cases out of 3010 patients of type 2

diabetes.¹¹ Knuiman MW reported prevalence of retinopathy at 28% in Perth, Western Australia.¹² Caird et al found a prevalence rate of 36.8% NPDR in a survey which involved 4076 diabetic patients with over ten years duration of diabetes.¹³

In present study, we observed an association between duration of diabetes and diabetic retinopathy ($p < 0.05$) (Table 3). Binary logistic regression analysis also showed an independent association between duration of diabetes and diabetic retinopathy (Table 4). This result supported the fact that duration of diabetes is the strongest predictor for development of DR. In the Wisconsin epidemiologic study of diabetic retinopathy (WESDR), the widest and most prolonged population based ophthalmologic survey, reported that higher prevalence of DR was associated with longer duration of diabetes.¹⁴

According to present study, DR may appear as early as 1-5 years of having diabetes and more than 85% of patients develop DR after 25 years of having the disease. With the increasing duration of diabetes, the chance of PDR was higher. Association with duration of diabetes is well known.^{13,15-20} In India, virtually all studies have shown an increased prevalence of DR as the duration of diabetes increased.^{4,9,21} In the study conducted by Dandona et al in type 2 diabetes, it is reported that 87.5 per cent of those with >15 years duration of diabetes had DR compared with 18.9 per cent of those who had <15 years duration.⁹ In the CURES Eye study⁴, 41.8 per cent had DR after 15 years of diabetes and severity of DR proportionally increased with longer duration of diabetes. Studies had also demonstrated that for every five-year increase in duration of diabetes, the risk for DR increased by 1.89 times.

In the present study, we found significant association between age of the patient and diabetic retinopathy ($p < 0.05$) (Table 2). This further strengthens the fact that with increasing duration of diabetes, the risk of diabetic retinopathy increases, especially PDR. Studies have shown that the chance of developing retinopathy increases with the increase in age of the patient.²²⁻²⁴

Limitations of the study

This was a hospital based study. So, there was a referral bias. Therefore, the actual prevalence of diabetic retinopathy may have been underestimated. No randomization was used for selection of patients in this study. Blood glucose control of the patients was not taken into account. Therefore, the glycaemic status of the patient is not known to us. Sample size of present study is small. Thus, the results of this study are difficult to extrapolate on to a larger population.

CONCLUSION

Thus, to conclude, diabetic retinopathy is a multifactorial disease. Duration of diabetes mellitus is a major risk

factor for diabetic retinopathy. With increasing duration of diabetes mellitus, the chance of developing diabetic retinopathy increases. Therefore, this study highlights the need to conduct screening programmes as well as diabetic education programmes at the grass root level for diabetes mellitus patients.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, Pokharel GP, et al. Global data on visual impairment in the year 2002. *Bulletin of The World Health Organisation.* 2004;82(11):844-51.
2. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Dia Care.* 2004;27(5):1047-53.
3. Narendran V, John RK, Raghuram A, Ravindran RD, Nirmalan PK, Thulasiraj RD. Diabetic retinopathy among self reported diabetics in Southern India: a population based assessment. *Br J Ophthalmol.* 2002;86(9):1014-8.
4. 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, I. *Invest Ophthalmol Vis Sci.* 2005;46(7):2328-33.
5. Raman R, Rani PK, Gnanamoorthy P, Sudhir RR, Kumaramanikavel G, Sharma T. Association of obesity with diabetic retinopathy: Sankara Nethralaya diabetic retinopathy epidemiology and molecular genetics study (SN-DREAMS Report no. 8). *Acta Diabetol.* 2010;47(3):209-15.
6. Agrawal RP, Ranka M, Beniwal R, Gothwal SR, Jain GC, Kochar DK, et al. Prevalence of diabetic retinopathy in type 2 diabetes in relation to risk factors: hospital based study. *Int J Dia Dev Cities.* 2003;23:16-9.
7. Ramavat PR, Ramavat MR, Ghugare BW, Vaishnav RG, Joshi MU. Prevalence of diabetic retinopathy in Western Indian type 2 diabetic population: a hospital - based cross-sectional study. *J Clin Diagn Res.* 2013;7(7):1387-90.
8. Rema M, Ponnaiya M, Mohan V. Prevalence of retinopathy in non-insulin dependent diabetes mellitus at a diabetes centre in southern India. *Diabetes Res Clin Pract.* 1996;34(1):29-36.
9. Dandona L, Dandona R, Naduvilath TJ, McCarty CA, Rao GN. Population based assessment of diabetic retinopathy in an urban population in southern India. *Br J Ophthalmol.* 1999;83(8):937-40.
10. Mohan V. Lighting up diabetes in the Asian young: the ASDIAB study. *Diabetes.* 2002;47(3):20-3.

11. Ramachandran A, Snehalatha C, Vijay V, Viswanathan M. Diabetic retinopathy at the time of diagnosis of NIDDM in South Indian subjects. *Dia Res Clin Pract.* 1996;32(1-2):111-4.
12. Knuiman MW, Welborn TA, McCann VJ, Stanton KG, Constable IJ. Prevalence of diabetic complications in relation to risk factors. *Diabetes.* 1986;35(12):1332-9.
13. Burditt AG, Caird FI, Draper GJ. The natural history of diabetic retinopathy. *Q J Med.* 1968;37(146):303-17.
14. Klein R, Klein BE, Moss SE, Cruickshanks KJ. The Wisconsin Epidemiologic study of diabetic retinopathy: XVII. The 14-year incidence and progression of diabetic retinopathy and associated risk factors in type 1 diabetes. *Ophthalmology.* 1998;105(10):1801-15.
15. Kohner EM, McLeod D MJ. Diabetic eye disease. In: Keen H Jr, editor. complications of diabetes. 2nd ed. Edward Arnold; 1982:19-108.
16. Jenchitr W, Samaiporn S, Lertmeemongkolchai P, Chongwiriyannurak T, Anujaree P, Chayaboon D, et al. Prevalence of diabetic retinopathy in relation to duration of diabetes mellitus in community hospitals of Lampang. *J Med Assoc Thai.* 2004;87(11):1321-6.
17. Agardh E, Agardh CD, Koul S, Torffvit O. A four-year follow-up study on the incidence of diabetic retinopathy in older onset diabetes mellitus. *Dia Med.* 1994;11(3):273-8.
18. Cohen O, Norynberg K, Neumann E, Dekel H. Complication-free duration and the risk of development of retinopathy in elderly diabetic patients. *Arch Intern Med.* 1998;158(6):641-4.
19. Yoshida Y, Hagura R, Hara Y, Sugawara G, Akanuma Y. Risk factors for the development of diabetic retinopathy in Japanese type 2 diabetic patients. *Dia Res Clin Pract.* 2001;51(3):195-203.
20. George M, Harper R, Balamurugan A. RTI International - Diabetic retinopathy and its risk factors in a population-based study. *J Prim Care Comm Heal.* 2011;2(2):334-42.
21. Rema M, Shanthirani C, Deepa R, Mohan V. Prevalence of retinopathy in a selected South Indian population in the Chennai Urban Population Study (CUPS). *Diabetes Res Clin Pract.* 2000;50:252.
22. Karadeniz ZS, Yilmaz MT. Duration of diabetes and prevalence of diabetic retinopathy: Istanbul diabetic retinopathy study- IDRS results I. *Dia Metab Syndr Clin Res Rev.* 2007;1(1):43-8.
23. Cahill M, Halley A, Codd M, O'Meara N, Firth R, Mooney D, et al. Prevalence of diabetic retinopathy in patients with diabetes mellitus diagnosed after the age of 70 years. *Br J Ophthalmol.* 1997;81(3):218-22.
24. Tan CSH, Gay EMQ, Ngo WK. Is age a risk factor for diabetic retinopathy? *Br J Ophthalmol.* 2010;94(9):1268.

Cite this article as: Mani K, Davy RC. Prevalence of diabetic retinopathy in type 2 diabetes mellitus patients attending medicine out-patient department of a tertiary care hospital in Alappuzha, Kerala, India. *Int J Res Med Sci* 2017;5:1532-6.