

# Assessment of Awareness of Diabetic Retinopathy Among the Diabetics Attending the Peripheral Diabetic Clinics in Melaka, Malaysia

Krishna R Addoor\*, MS; Sulatha V Bhandary\*, MS; Rajesh Khanna\*\*, MS; Lavanya G Rao\*,MS; Kamala D Lingam\*\*, MS; Binu V S\*\*\*, MSc; Santhosh Shivaji\*\*, MS; Manjunath Nandannaver\*\*\*\*, MD

\* Dept. of Ophthalmology, Kasturba Medical College, Manipal; \*\* Dept. of Ophthalmology, Melaka Manipal Medical College, Melaka; \*\*\* Dept. of Statistics, Manipal University, Manipal; \*\*\*\* Dept. of Medicine, Melaka Manipal Medical College, Melaka

## SUMMARY

In view of the alarming increase in the incidence of diabetes mellitus in Malaysia, we conducted a study to assess the awareness of complications of diabetes among the diabetics attending the peripheral clinics in Melaka. The study period was from January 2007 to December 2007. 351 patients were included in the study. 79.8% were aware of the complications of diabetes mellitus and 87.2% were aware that diabetes can affect the eyes. However, only 50% of the patients underwent an ophthalmological evaluation. Although awareness was good, the motivation to undergo the assessment was poor.

## KEY WORDS:

*Diabetes mellitus, Awareness, Retinopathy, Malaysia*

## INTRODUCTION

The prevalence of Diabetic retinopathy among the diabetics who are above the age of 40 years and with a duration of diabetes more than five years, in Malaysia is 14.6%<sup>1</sup>. There is an alarming increase in the incidence of diabetes mellitus in Malaysia from the year 1982 (2%) to 1996 (8.3%)<sup>1</sup>. According to the World perspective, the incidence of diabetes mellitus was 2.8% in the year 2000 and about 2.5 million people are blind due to diabetic retinopathy<sup>2,3</sup>. Singapore also has a very high incidence of 11% of their population having diabetes mellitus and 20.1% of visual impairment due to diabetic retinopathy<sup>4</sup>.

The complications associated with diabetes like retinopathy, nephropathy, foot ulcerations, neuropathy, heart diseases are appalling. It is estimated that 10% of the diabetics develop kidney disease and 50% develop neuropathy after over 25 years of having diabetes<sup>1</sup>. Also people with diabetes are two to four times more likely to have heart disease and five times likely to suffer a stroke<sup>1</sup>.

A study conducted by Y K Chew *et al.* which included the academic staff (non medical faculties) of the University of Malaya showed that the awareness about diabetic retinopathy was 83.5%<sup>5</sup>. Another study by Verma L showed that, in spite of the fact that 78.5% were under the care of either a diabetologist or general physician and 87.7% patients had regular follow-up with the physician, only 5.5% of the patients underwent an ocular examination<sup>6</sup>.

Having a high prevalence of diabetes and its complications in Malaysia, there is a need to estimate the awareness of consequences or the end organ damage due to diabetes mellitus among the diabetics. In addition, there is a great need to estimate what percentage of diabetics seeks specialist help for the assessment of the consequences of diabetes like diabetic retinopathy and nephropathy.

Therefore, in our study, we have made an attempt to assess the awareness of consequences of diabetes mellitus among the diabetics and their follow up with the ophthalmologist.

## MATERIALS AND METHODS

This observational study was conducted as a training programme for the undergraduate students of Melaka Manipal Medical College. Sample size for the study was calculated based on estimating the prevalence of awareness of diabetic retinopathy among diabetics. Anticipating a prevalence of 33% awareness with an absolute precision of  $\pm 5\%$  and confidence level of 95%, the minimum sample size required for the study was observed to be 340<sup>5</sup>. The study group was selected by convenient sampling method, which included all the diabetics who were referred for ophthalmological evaluation by the medical officers working in the peripheral clinics in Melaka. The undergraduates were taken to these peripheral clinics four times in a month and they were taught ocular fundus examination. Enrolment of subjects for the study was started from January 2007 and by the end of the year 351 subjects were selected for the study.

All the patients were interviewed and were asked to answer a questionnaire. The content validation of the questionnaire was done by five experts. The questionnaire included the demographic profile of the patients, and other details regarding diabetes (questionnaire - appendix). The visual acuity, retinopathy status, and presence of other ocular diseases like glaucoma and age related macular degeneration were assessed.

Torch light examination of the anterior segment examination was done. Pupillary dilatation and fundoscopy was performed with a direct ophthalmoscope. Those patients with retinopathy and other ocular diseases were referred for the detailed ophthalmological evaluation to the General Hospital Melaka.

*This article was accepted: 5 April 2011*

Corresponding Author: Krishna R Addoor, Kasturba Medical College Manipal, Ophthalmology, Kasturba Medical College, Main Road, Madhav Nagara, Post Box No 7, Manipal, Karnataka 576104, India Email: kraoaddoor@yahoo.com

**Data analysis:** Data collected were analysed using the 'Statistical Package for Social Sciences' (SPSS) version 15.0 (SPSS Inc., Chicago, IL, USA). Chi square test was used for univariate analysis and forward stepwise logistic regression analysis was used for getting the adjusted odd ratios with entry and exit probability of 0.15 and 0.2 respectively. Statistical significance was determined at 5%.

## RESULTS

The patients were in the age group of 35- 86 years and they were divided into three groups with the age ranging from 35 - 50 years, 51- 60 years and 61 - 86 years. Out of 351 patients, 155 (44.1%) were males and 196 (55.9%) were females. The three major ethnic groups included in the study were Malays-55.8% (n = 196), Chinese 31.7% (n = 111) and Indians 12.6% (n = 44).

The educational status of the patients was as follows: 57.5% had no formal education or primary education, 35.6% had secondary education, and 6.8% were graduates and above. Of the 351 patients, 27 (7.7%) were suspected to have glaucoma and 7 (2%) were detected to have age related macular degeneration.

### Analysis of association between awareness of consequences of diabetes and selected variables

Out of 351 interviewed, 280 (79.8%) patients were aware of the general complications of diabetes mellitus and 306 (87.2%) patients were aware that diabetes can affect the eye.

Univariate analysis showed that awareness was significantly associated with duration of diabetes, educational status and age of the patient (Table I). The patients with the duration of diabetes more than 5 years, higher educational status (secondary education, graduates and post graduates) and younger age group (30-50 years) were more aware of the consequences of diabetes. Ethnicity, sex, treatment by physician/diabetologist, previous follow up for diabetes, previous ophthalmological evaluation did not have a statistically significant effect on the awareness. Multiple logistic regression analysis showed that awareness was significantly associated only with duration of diabetes and educational status (Table II).

### Analysis of association between presence of retinopathy and awareness of retinopathy

Retinopathy was detected in 110 patients. 83.6% of the patients with retinopathy, and 77.9% among those without retinopathy were aware that diabetes can cause blindness. The knowledge that diabetes can affect kidneys was about 80.9% among retinopathy patients and 79.5% among those without retinopathy.

**Univariate analysis of presence of retinopathy and selected variables (Table III)** Univariate analysis showed that duration of diabetes more than 11 years ( $p=0.001$ ) and treatment with insulin ( $p=0.04$ ) had a statistically significant effect on presence of retinopathy. There was no statistically significant association between presence of diabetic retinopathy versus sex, race, age, educational status, blood sugar level and their awareness of retinopathy. Those

individuals with duration of diabetes more than eleven years had 3.7 times more likelihood of developing diabetic retinopathy. Multiple logistic regression analysis showed that presence of retinopathy was significantly associated only with duration of diabetes and last ophthalmologic examination (Table II).

### Duration of diabetes and association with other systemic conditions

Among the patients having retinopathy, 56.7% had hypertension, 17.5 % had hyperlipidemia, 1.8% had nephropathy and 5.5% had diabetic foot. However there was no statistical significant association between development of retinopathy with the presence of hypertension, hyperlipidemia or nephropathy.

## DISCUSSION

The incidence of diabetes in Malaysia has been increasing each year and the prevalence of diabetic retinopathy is about 14.6%<sup>1</sup>. The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030<sup>3</sup>. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030<sup>3</sup>. Diabetic retinopathy was seen in 31.4% of our total study population. There was no statistically significant association between the ethnicity of the patients and the development of retinopathy. In addition, mean blood sugar level, presence of hypertension, hyperlipidemia, and nephropathy did not have a statistically significant effect on the development of retinopathy in our study. In a study by Axer Siegel R *et al.* showed that, HbA1c level  $\leq 7\%$ , serum cholesterol level  $< 200$  mg/dl and blood pressure  $< 130/85$  mmHg were associated with better preservation of vision in patients with type 2 diabetes mellitus<sup>7</sup>.

Our study showed that duration of diabetes for more than eleven years had a statistically significant effect on the development of diabetic retinopathy. It is also important to note that about 26.4% of the patients with diabetes of less than five year duration had also developed retinopathy. Similar results were observed in a study by Soto-Pedre E where they found diabetic retinopathy was higher in those with a longer duration of diabetes, however, about fifty percent of their patients had developed some retinopathy within the first 5 years after the diagnosis of the disease, and only 26.1% of them had received a previous fundus examination<sup>8</sup>.

Awareness about diabetic retinopathy was about 83.5% in the non-medical faculties of University of Malaya<sup>4</sup>. In our study, 83.6% of the patients with retinopathy and 77.9% of those without retinopathy were aware that, diabetes can cause blindness. Although 91.8% of the patients with retinopathy were aware of ocular complication of diabetes and despite 31.4% of them having retinopathy, 42.7% of these patients never had an ophthalmological evaluation. This clearly indicates that, though the patients are aware, they are not willing or not serious enough to undergo examination of their eyes. This lack of motivation was not associated with the educational level of the patients nor was associated with the ethnicity of the patients. According to a study done in U.S., older age, higher socioeconomic status and higher

**Table I: Univariate analysis for association between awareness of complications of diabetes mellitus with various variables**

Variable	Aware N=280 (%)	OR (95% CI)	P value
<b>Age</b>			
35-50 years (N = 65)	58 (89.2)	3.03 (1.28, 7.18)	0.012
51-60 years (N = 133)	110 (82.7)	1.75 (0.99, 3.12)	0.056
>= 61years (N=153)	112 (73.2)	1	
<b>Sex</b>			
Male (N = 155)	1.75(0.99, 3.12)	1	
Female (N = 196)	160 (81.6)	1.3 (0.77, 2.12)	0.33
<b>Race</b>			
Malays (N = 196)	158 (80.6)	1.39 (0.64, 2.99)	0.41
Chinese (N = 111)	89 (80.2)	1.39 (0.64, 2.99)	0.48
Indian (N = 44)	33 (75)	1	
<b>Education level</b>			
Primary or no formal education (N = 202)	147 (85.5)	1	
Secondary education (N = 125)	110 (88)	2.74 (1.47, 5.11)	0.001
Graduate & above (N = 24)	23 (95.8)	8.61 (1.14, 65.26)	0.037
<b>Duration</b>			
=< 5 years (N = 142)	102 (71.8)	1	
6-10 years (N = 90)	77 (85.6)	2.32 (1.16, 4.64)	0.017
>= 11 years (N = 119)	101 (84.9)	2.2 (1.18, 4.09)	0.013
<b>Family history of diabetes</b>			
Yes (N = 208)	165 (79.3)	0.93 (0.55, 1.59)	
No (N = 143)	115 (80.4)	1	0.8
<b>Treatment by</b>			
General Physician (N = 204)	158 (77.5)	1	
Physician (N = 134)	110 (82.1)	1.33 (0.77, 2.31)	0.3
Diabetologist (N = 13)	12 (92.3)	3.49 (0.44, 27.58)	0.24
<b>Follow Up</b>			
=<6 months (N = 325)	262 (80.6)	1.85 (0.77, 4.44)	
> 6 months or irregular (N = 26)	18 (69.2)	1	0.17
<b>Last Ophthalmological evaluation</b>			
=<6 months (N = 104)	86 (82.67)	1.47 (0.8, 2.71)	0.22
7-12 months (N = 13)	10 (76.9)	1.02 (0.27, 3.89)	0.97
>1 yr (N = 51)	44 (86.3)	1.93 (0.81, 4.6)	0.97
Never (N = 183)	140 (76.5)	1	

**Table II: Multiple logistic regression analysis for awareness of complications of diabetes and presence of diabetic retinopathy with various variables**

Variable	Odds ratio & 95% CI for awareness of complications of Diabetes mellitus	P Value
<b>Age in years</b>		
30 – 50	2.53 (0.99, 6.39)	0.052
51 – 60	1.55 (0.85, 2.85)	0.16
61 – 86	1	
<b>Education</b>		
Primary /no formal education	1	
Secondary	2.66 (1.37, 5.15)	0.004
Graduate/post graduate	9.32 (1.19, 73.28)	0.034
<b>Duration of DM</b>		
=<5 years	1	
6 -10 years	2.92 (1.42, 6.02)	0.002
>=11years	3.15 (1.63, 6.1)	0.001
<b>Variables</b>	<b>Odds ratio &amp; 95% CI for presence of diabetic retinopathy</b>	<b>P Value</b>
<b>Duration of DM</b>		
=<5 years	1	
6 -10 years	1.43 (0.76, 2.7)	0.27
>=11years	3.9 (2.23, 6.81)	<0.001
<b>Last Ophthalmological evaluation</b>		
=<6 months	1.94 (1.13, 3.34)	0.017
7-12 months	1.45 (0.43, 4.9)	0.55
>1 yr	1.47 (0.74, 2.91)	0.28
Never	1	

**Table III: Univariate analysis for association between presence of retinopathy with various variables**

variable	Present N=110 (%)	OR (95% CI)	P value
<b>Age</b>			
35-50 years (N = 65)	19 (29.2)	46 (30.1)	
51-60 years (N = 133)	45 (33.8)	1.19 (0.72, 1.96)	0.9
>= 61years (N=153)	46 (30.1)	1	0.5
<b>Sex</b>			
Male (N = 155)	54 (32.7)	1	
Female (N = 196)	56 (28.6)	0.75 (0.48, 1.18)	0.21
<b>Race</b>			
Malays (N = 196)	56 (28.6)	0.64 (0.32, 1.26)	0.19
Chinese (N = 111)	37 (33.3)	0.79 (0.39, 1.64)	0.53
Indian (N = 44)	17 (38.6)	1	
<b>Education level</b>			
Primary or no formal education (N = 202)	67 (33.2)	1	
Secondary education (N = 125)	37 (29.6)	0.85 (0.52, 1.37)	0.5
Graduate & above (N = 24)	6 (25)	0.67 (0.23, 1.77)	0.42
<b>Duration</b>			
=< 5 years (N = 142)	29 (20.4)	1	
6-10 years (N = 90)	23 (25.6)	1.34 (0.72, 2.5)	0.36
>= 11 years (N = 119)	58 (48.7)	1.34 (0.72, 2.5)	<0.001
<b>Treatment by</b>			
Diet and Exercise	9 (28.1)	1	
OHA	86 (29.3)	1.07 (0.48, 2.41)	0.87
Insulin	15 (53.6)	2.95 (1.01, 8.6)	0.04
<b>Last Ophthalmological evaluation</b>			
=<6 months (N = 104)	39 (37.5)	1.71 (1.04, 2.91)	0.037
7-12 months (N = 13)	5 (38.5)	1.81 (0.56, 5.8)	0.32
>1 yr (N = 51)	19 (37.3)	1.72 (0.89, 3.32)	0.11
<b>Awareness of eye complications of diabetes mellitus</b>			
No or Don't know (N = 71)	18 (25.4)	1.97 (0.91, 4.25)	0.084
Yes (N = 280)	92 (32.9)	1	
<b>Blood sugar</b>			
=< 10millimoles/dl (N = 244)	72 (29.5)	1	
>10.1millimoles/dl (N = 107)	38 (35.5)	1.32 (0.81, 2.13)	0.275

educational level among the diabetics were associated with having an annual eye examination<sup>9</sup>. In a study done in Australia, about 71% of the diabetic individuals had undergone examination of their eye within a period of 2 years and about 18% of the diabetics (substantial portion of those not on insulin) never underwent an eye examination before<sup>10</sup>.

The awareness of diabetes among the Singaporean Malay population studied by Huang OS *et al*, showed that, high proportions of the diabetics were unaware of their disease. Also lack of awareness was associated with poorer control of diabetic retinopathy risk factors<sup>11</sup>.

Similarly in an awareness study done in Myanmar by Muecke JS *et al*, found that although both the general practitioners and diabetic patients were aware of the need for regular fundal screening, just over half the patients had been screened<sup>12</sup>.

In the present study, all the patients detected to have diabetic retinopathy were referred to higher center for detailed evaluation and further management. Thus peripheral center screening of the diabetic population indeed helps the patients to have an insight into their problems and also helps them to

get the necessary care. The duration of diabetes has a major role in development of complications. Therefore, there is a constant need to motivate the patients to undergo ocular, renal, feet and cardiac examination regularly regardless of their glycemic control.

Limitations of our study: We included the patients attending only two peripheral clinics as it was not feasible for us to conduct the study in many centers.

**CONCLUSION**

With the increasing incidence of diabetes mellitus in Malaysia, retinopathy awareness and the motivation of the diabetics to undergo retinal examination is very essential. In our study, although 79.8% were aware of the complications of diabetes mellitus, and 87.2% were aware that diabetes can affect the eyes. However, only 50% of the patients underwent an ophthalmological evaluation. This emphasizes the need for active motivation of the diabetics to undergo an ophthalmological evaluation during the awareness campaigns to be conducted in the future.

### ACKNOWLEDGEMENT

Melaka Manipal Medical College, Melaka, Malaysia, General Hospital, Melaka, Klinik Kesihatan Peringgit, Melaka Klinik Kommunity Ayer Keroh, Melaka, Dr Aadi Negera, Department of Community Medicine, Melaka Manipal Medical College. We would thank the above for helping us to conduct the study and those patients who participated in our study.

### REFERENCES

1. Shafie O, Fatanah I, Noor Azah D. Diabetes Program in Malaysia – Current and Future. *NCD Malaysia* 2004; 3(2): 6-12.
2. O'Shea JG. Screening: An old review screening and monitoring diabetic retinopathy. 1999. [www.diabeticretinopathy.org.uk](http://www.diabeticretinopathy.org.uk). (Accessed on 8th December 2007)
3. Wild S, Green A, Sicree R. Global prevalence of diabetes estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; 27: 1047- 53.
4. Lim KH. Vision 2020 and prevention of blindness: Is it relevant or achievable in the modern era? *Ann Acad Med Singapore* 2006; 35: 215- 22.
5. Chew YK, Reddy SC, Karina R. Awareness and knowledge of common eye diseases among the academic staff (non medical faculties) of University of Malaya. *Med J Malaysia* 2004; 59 : 305-11.
6. Verma L, Elankumaran P, Prakash G, Venkatesh P, Tewari HK. Awareness of diabetic retinopathy among diabetics. *Indian J Ophthalmol* 2002; 50: 355.
7. Axer- Siegel R, herscovici Z, Gabbay M, *et al*. The relationship between diabetic retinopathy, glycemic control, risk factor indicators and patient education. *Isr Med Assoc J* 2006; 8: 523 - 26.
8. Soto-Pedre E, Hernaez-Ortega MC, Pinies JA. Duration of diabetes and screening coverage for retinopathy among patients with type 2 diabetes. *Ophthalmic Epidemiol* 2007; 14: 76-9.
9. Brechner RJ, Cowie CC, Howie LJ, Herman WH, Will JC, Harris MI. Ophthalmic examination among adults with diagnosed diabetes mellitus. *JAMA* 1993; 270: 1714 –18.
10. Tapp RJ, Zimmet PZ, Harper CA, Balkau B, Mc Carty DJ, Taylor HR, Welborn TA *et al*. Diabetes care in an Australian population. *Diabetes Care* 2004; 27: 688-93.
11. Huang OS, Tay WT, Tai Es, Wang JJ, Saw SM, Jeganathan VS, *et al*. Lack of awareness amongst community patients with diabetes and diabetic retinopathy: the Singapore Malay eye study. *Ann Acad Med Singapore*. 2009; 38(12): 1048-55.
12. Muecke JS, Newland HS, Ryan P, Ramsay E, Aung M, Myint S, *et al*. Awareness of diabetic eye disease among general practitioners and diabetic patients in Yangon, Myanmar. *Clin Experiment Ophthalmol*. 2008; 36(3): 265-73.