

Original articles

## Demographics and awareness of diabetic retinopathy among diabetic patients attending the vitreo-retinal service at a tertiary eye care center in Nepal

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### Abstract

**Introduction:** Diabetic retinopathy (DR) is one of the leading causes of blindness in Nepal.

**Objective:** To investigate the demographic characteristics and awareness of diabetic retinopathy among new cases of diabetes mellitus (DM) attending the vitreo-retinal service of a tertiary eye care centre in Nepal.

**Materials and methods:** A hospital-based, cross-sectional study including all consecutive new cases of DM was carried out. Detailed demographics of the subjects and their awareness of potential ocular problems from diabetes mellitus were noted.

**Results:** A total of 210 patients with a mean age of  $57 \pm 10.4$  years were included. Brahmins (34.8 %) and Newars (34.3 %) were the predominant ethnic groups. Housewives (38.6 %) and office workers (18.6 %) were the major groups affected. Two-fifths (37 %) of the cases were unaware of DR and its potential for blindness. Awareness was significantly higher among literate patients ( $P = 0.006$ ). Fundus evaluation was done for the first time in 48.6 %, although almost four-fifths had a duration of diabetes of five years or more. DR was found in 78 % of the cases, with 16.7 % already at the proliferative stage and about 40 % exhibiting clinically significant diabetic macular edema.

**Conclusion:** A lack of awareness of DR coupled with a high proportion of cases already at a sight-threatening stage of retinopathy at their first presentation reflects the need for improved awareness programs to reduce the burden of blindness from DR in Nepal.

**Key- words:** demographics, awareness, diabetic retinopathy, Nepal

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### Introduction

Diabetic retinopathy (DR) is the leading cause of visual impairment and blindness among working-age patients in developed countries (AAO 2009 -

2010). With the recent trend of an increasing number of diabetic patients, it will also be a growing public health problem in the developing world. The prevalence of diabetes mellitus is increasing, with an estimated 366 million people affected worldwide by 2030 according to the WHO, among which more than half will be presumed to be in Asian countries (Wild et al, 2004). This increase has been at-

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tributed to the rapid economic, demographic, and nutritional transition in these developing countries (Chan et al, 2009; Wild et al, 2004). 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 (Singh et al, 2003). Early detection, timely ocular treatment, and good control of the underlying risk factors are key for reducing blindness from DR (ETDRS Research Group, 1981; DRS Research Group, 1985), but limited resources, lower literacy rates, and lack of awareness of potential diabetic complications among the population complicate the situation in developing countries such as Nepal.

There are numerous studies on the prevalence and risk factors for DR, but very limited data exist regarding the awareness of diabetic eye problems. This study was conducted to assess the awareness of potential diabetic ocular problems and the pattern of diabetic retinopathy among new diabetic patients attending the vitreo-retina service at a tertiary eye care centre in Nepal, a developing country where diabetes mellitus is becoming an epidemic public health problem, especially in the urban areas (J Nepal Med Assoc Editorial, 2003).

### Materials and methods

This is a hospital-based, cross-sectional study conducted from March 2009 to January 2010 at Tilganga Institute of Ophthalmology, a tertiary eye care centre in Nepal. The aim of the study was to explore the demographic characteristics, awareness and prevalence of DR among first-visit diabetic patients attending the vitreo-retinal service at the hospital. Ethical approval was obtained from the Institutional Review Board of Tilganga Institute of Ophthalmology, and the study was conducted according to the principles of the Declaration of Helsinki. Informed consent was obtained from the patients before enrollment in the study. All consecutive new diabetic patients attending the vitreo-retinal clinic were included. Patients with a history of prior intervention for DR such as laser therapy and

surgical intervention were excluded from the study. Detailed demographics, education status, occupation, awareness of potential ocular problems from diabetes mellitus, source of awareness, family history of diabetes mellitus, frequency of retinal evaluation, duration of diabetes mellitus, and presence of hypertension and other significant systemic problems were noted. The presenting and best-corrected Snellen visual acuities were recorded. Any anterior segment abnormalities including neovascularization of the iris were noted. Detailed fundus evaluation was done after pupil dilation. Diabetic retinopathy characteristics, including clinically significant macular edema (CSME) and other diabetic macular edema (DME), were graded according to the Early Treatment Diabetic Retinopathy Study classification (ETDRS) (ETDRS Research Group, 1981). Other complications such as neovascular glaucoma and associated hypertensive retinopathy were also recorded.

**Statistics:** The data were analyzed in SPSS version 11.5 (SPSS Inc, Chicago, IL, USA). Logistic regression models were used to estimate any potential risk factors affecting awareness of diabetic retinopathy. We selected variables for simultaneous inclusion in the logistic regression model if candidate variables significantly ( $P < 0.05$ ) contributed to the model.

### Results

A total of 210 diabetic patients were recruited during the study period. The age range was 30 - 81 years with a mean age  $57.0 \pm 10.2$  years. About four-fifths of the patients were age 50 years and above, and the majority was in the 50 - 59 year range. Males exceeded females by a ratio of 1.38 : 1. Brahmin and Newars were the predominant ethnic groups, comprising 34.8 % and 34.3 %, respectively. Sixty percent of the patients were from the Kathmandu valley where the eye hospital is located. The predominant group of patients (Table 1) was housewives (38.6 %). This was followed by office workers (18.6 %), business persons (15.7 %), and farmers (14.3 %).

**Table 1**  
**Demographic characteristics of new diabetic patients**

| Demographics |                  | Frequency  | Percentage    |
|--------------|------------------|------------|---------------|
| Age (years)  | < 40             | 13         | 6.2           |
|              | 40 - 49          | 28         | 13.3          |
|              | 50 - 59          | 76         | 36.2          |
|              | 60 - 69          | 72         | 34.3          |
|              | ≥ 70             | 21         | 10.0          |
| Sex          | Female           | 88         | 41.9          |
|              | Male             | 122        | 58.1          |
| Ethnicity    | Brahmin          | 73         | 34.8          |
|              | Chhetri          | 25         | 11.9          |
|              | Mongolian        | 25         | 11.9          |
|              | Newar            | 72         | 34.3          |
|              | Others           | 15         | 7.1           |
| Address      | Kathmandu valley | 126        | 60.0          |
|              | Out of Kathmandu | 84         | 40.0          |
| Occupation   | Housewives       | 81         | 38.6          |
|              | Service          | 39         | 18.6          |
|              | Business         | 33         | 15.7          |
|              | Agriculture      | 30         | 14.3          |
|              | Others           | 27         | 12.9          |
| <b>Total</b> |                  | <b>210</b> | <b>100.00</b> |

About 46 % of the patients were illiterate; whereas only 34 % of the literate patients had completed their school education. The first degree relatives of 79 patients had a history of diabetes mellitus. Among the total diabetic patients, the majority was referred by a primary care physician or a general ophthalmologist (51 %) for fundus evaluation. Only 63 % of the subjects were aware that diabetes mellitus can affect the eye and result in blindness. 7.1 % of cases gained their information about DR from their own family members because of a diabetic family history, and 4.8 % studied newsletters and magazines (Table 2).

**Table 2**  
**Source of awareness, education and timing of fundus evaluation**

| Parameters                        |            | Frequency | Percentage |
|-----------------------------------|------------|-----------|------------|
| Awareness of diabetic eye disease | Yes        | 133       | 63.3       |
|                                   | No         | 77        | 36.7       |
| Source of awareness               | Physicians | 107       | 51.0       |
|                                   | Family     | 15        | 7.1        |
|                                   | Magazines  | 10        | 4.8        |
|                                   | Radio      | 1         | 0.5        |
|                                   | None       | 77        | 36.7       |

| Parameters     |                          | Frequency  | Percentage    |
|----------------|--------------------------|------------|---------------|
| Education      | Illiterate               | 97         | 46.2          |
|                | Simple Literate          | 13         | 6.2           |
|                | Primary level            | 15         | 7.1           |
|                | Secondary level          | 13         | 6.2           |
|                | School level certificate | 27         | 12.9          |
|                | Intermediate             | 19         | 9.0           |
|                | Bachelor and above       | 26         | 12.4          |
| Family history | Yes                      | 79         | 37.6          |
|                | No                       | 131        | 62.4          |
| Fundus exam    | First time               | 102        | 48.6          |
|                | Follow up                | 108        | 51.4          |
| <b>Total</b>   |                          | <b>210</b> | <b>100.00</b> |

Nearly two fifths (41 %) of the subjects had coexisting systemic hypertension. Almost half (51 %) of the patients had diabetes mellitus for more than 10 years duration. Only 3.3 % the cases were diagnosed recently (Table 3).

**Table 3**  
**Duration of diabetes and concomitant hypertension**

|                               |                | Frequency  | Percentage    |
|-------------------------------|----------------|------------|---------------|
| Duration of diabetes mellitus | Recently known | 7          | 3.3           |
|                               | < 5 years      | 49         | 23.3          |
|                               | 5-10 years     | 47         | 22.4          |
|                               | > 10 years     | 107        | 51.0          |
| Hypertension                  | Absent         | 123        | 58.6          |
|                               | Present        | 87         | 41.4          |
| Diabetic retinopathy          | Present        | 163        | 77.6          |
|                               | Absent         | 47         | 22.4          |
| <b>Total</b>                  |                | <b>210</b> | <b>100.00</b> |

The best corrected visual acuity (BCVA) was 6/6 - 6/18 in 133 cases (63.3 %) and less than 6/60 in 40 cases (19 %) in the right eye, and the BCVA was 6/6 - 6/8 in 141 cases (67.1 %) and less than 6/60 in 29 cases (13.8 %) in the left eye. Fundus evaluation was done for the first time in nearly half of the diabetic patients, and diabetic retinopathy was found in 78 % of the total cases, with 35 cases (16.67 %) already at the proliferative diabetic retinopathy stage. CSME was found in right eyes of 77 cases (36.7 %), and non-clinically significant DME was present in 7 (3.3 %). In left eyes, CSME was present in 85 cases (40.5 %) and non-clinically significant DME was noted in 7 cases (3.3 %) (Table 4).

**Table 4**  
**Visual acuity and severity of diabetic retinopathy among diabetic patients**

| Parameters           |                  | Right Eye                         | Left Eye                          |
|----------------------|------------------|-----------------------------------|-----------------------------------|
| Visual acuity        | 6/6 - 6/18       | Frequency (Percent)<br>133 (63.3) | Frequency (Percent)<br>141 (67.1) |
|                      | < 6/18 - 6/60    | 37 (17.6)                         | 40 (19)                           |
|                      | < 6/60 - 3/60    | 10 (4.8)                          | 11 (5.2)                          |
|                      | < 3/60 - CFCF    | 17 (8.1)                          | 10 (4.8)                          |
|                      | HM               | 10 (4.8)                          | 5 (2.4)                           |
|                      | PL               | 3 (1.5)                           | 2 (1.0)                           |
|                      | NLP              | 0                                 | 1 (0.5)                           |
| Diabetic retinopathy | None             | 52 (24.8)                         | 49 (23.3)                         |
|                      | Mild NPDR        | 18 (8.6)                          | 23 (10.9)                         |
|                      | Moderate NPDR    | 53 (25.2)                         | 49 (23.3)                         |
|                      | Severe NPDR      | 44 (20.9)                         | 45 (21.4)                         |
|                      | Very severe NPDR | 8 (3.8)                           | 9 (4.2)                           |
|                      | Early PDR        | 11 (5.2)                          | 10 (4.47)                         |
|                      | High risk PDR    | 7 (3.3)                           | 13 (6.2)                          |
|                      | Advanced PDR     | 17 (8.09)                         | 12 (5.7)                          |
| Macular Edema        | CSME             | 77 (36.7)                         | 85 (40.5)                         |
|                      | DME              | 7 (3.3)                           | 7 (3.3)                           |

CFCF: counting finger close to face, HM: hand movement, PL: perception of light, NLP: no light perception, NPDR: non proliferative diabetic retinopathy, PDR: proliferative diabetic retinopathy, CSME: clinically significant macular edema, DME: other diabetic macular edema.

In our series, awareness of diabetic ocular complications was significantly higher among literate patients (OR 2.74, 95 % CI = 1.33 - 5.63, p = 0.006), patients living in the Kathmandu valley (OR 2.24, 95 % CI = 1.08 - 4.64, p = 0.030), patients with a family history of diabetes mellitus (OR 2.34, 95 % CI = 1.07 - 5.13, p = 0.034) and those who had undergone prior fundus evaluation elsewhere (OR 11.94, 95 % CI = 5.66 - 25.18, p < 0.001). Other risk factors which did not significantly affect awareness included sex, occupation, ethnicity, duration of diabetes, presence or absence of diabetic retinopathy, and types of diabetic retinopathy (Table 5).

**Table 5**  
**Significant risk factors affecting awareness of diabetic retinopathy**

| Risk factors                             | Multivariable Odds Ratio (Confidence Interval, 95 %) | P value |
|--|--|---------|
| Education: Literate versus illiterates   | 2.74 (1.33 to 5.63)                                  | 0.006   |
| Family history of DM: yes versus no      | 2.34 (1.07 to 5.13)                                  | 0.034   |
| Address: Kathmandu valley versus outside | 2.24 (1.08 to 4.64)                                  | 0.030   |
| Fundus exam: first time versus follow up | 11.94 (5.66 to 25.18)                                | <0.001  |

## Discussion

The mean age of our new diabetic patients (57.0 years) was similar to other hospital-based studies from Nepal (Shrestha et al, 2007; Shrestha et al, 2007) but unlike studies from other developing countries where patients were of relatively younger age groups (Muninarayan et al, 2010; Rema et al, 2007). This may be due to late detection of DM and/or late presentation for eye examinations in our series.

More males than the females were seen during the study period as opposed to other studies where males were outnumbered by females (Rema et al, 2007; Shrestha et al, 2007; Shrestha et al, 2007), although one study by Khandekar et al, 2003 reported a male predominance similar to our study. This could be due to a recent trend of increased diabetic prevalence in males, increased level of awareness, and easier access to the hospital because they are more mobile than females in the Nepalese society.

Brahmin and Newar were the commonest ethnic groups who presented to our service during the study period. Since our study is hospital-based without comparison groups, it is difficult to say whether the DM is more prevalent in these ethnic groups, but another study done in the Kathmandu valley found a similar ethnic distribution (Shrestha et al, 2007). The high representation of Brahmins may be due to the higher proportion of literate, educated people in this ethnic group, leading to more aware-





ness. The second highest group was from the Newars, which could be due to their high population in the Katmandu valley from which almost three fifths of the patients originated. Many people in these two ethnic groups are involved in business which is associated with a sedentary lifestyle that may be conducive to diabetes (Singh et al, 2003).

The occupational distribution of diabetic patients in our study was similar to another study from Nepal (Shrestha et al, 2007). Housewives constituted the major working group of patients seen during the study period. This may be due to more diabetes among them because of physical inactivity and lack of exercise, lack of awareness regarding the healthy food habits, and the custom of excess feeding after delivery, all of which contribute to higher obesity rates, especially in urban areas (Singh et al, 2003). Likewise, the second most common group was office workers. This could be again due to relative physical inactivity and gradually improving economic status which could lead to altered food habits. The low number of subjects from the agriculture group may be due to more physical activity, less access to tertiary medical care, and consumption of a diet containing less refined foods as compared to those residing in urban areas.

Nearly half of the patients were illiterate. Among those who were literate, only half of them had finished school. These data correlate well with the general literacy rate in Nepal. Although the majority of patients were referred for ophthalmic evaluation, nearly two-fifths of the subjects were not aware that diabetes could affect the eye and result in blindness. The frequency of subjects who were aware of diabetic ocular complications was lower among diabetic patients when compared to studies from other countries (Mohan et al, 2005; Muecke et al, 2008; Sajkumar et al, 2007) but awareness was slightly higher than a previous study from Nepal carried out at a community and secondary level (Shrestha et al, 2007; Paudyal et al, 2008). Among those who were aware of diabetic eye disease, only half of them had received their information from primary care physicians or the referring ophthal-

mologist. This may reflect the small amount of time physicians and ophthalmologists can devote to discussion of diabetic complications with patients in a developing country with a low doctor-to-patient ratio like ours. Despite these challenges, primary care physicians will continue to be the major resource persons for their diabetic patients who can help by referring them for ophthalmic evaluation in a timely manner.

The other source of awareness was from the family members, especially since one-third of cases had a positive family history in at least one first-degree relative. The higher rate of diabetes in the family could be due to genetic predisposition and common environmental factors such as food habits and lifestyle. Media (magazines and radio) played a less important role in disseminating information in our patient group, unlike the study by Saikumar et al (2007) where media was the main source for awareness. This finding emphasizes the need of better media coverage to spread the awareness in our country. Although 51% of the total diabetic patients had a history of diabetes of more than 10 years duration, almost half of the subjects had never had a fundus evaluation prior to this visit. This reflects the lack of awareness about the ocular complications among Nepali diabetics and also poor referral rates from primary-care physicians for ophthalmic evaluation.

Nearly two-fifths of the subjects had coexisting hypertension, a frequency higher than in other reported studies. This may be due to an increasing trend of hypertension in recent times (Shrestha et al, 2007; Shrestha et al, 2007).

The high rate of diabetic retinopathy (77.6%) among diabetic patients presenting for the first time to our vitreo-retinal service may be due to more referral cases for ocular evaluation in contrast to diabetics who present to community and general ophthalmology clinics (Khandekal et al, 2003; Shrestha et al, 2007; Shrestha et al, 2007). Even more striking was the number of patients with vision-threatening diabetic retinopathy, almost three-fifths of which

were in need of urgent intervention to save their vision. The poor vision of less than 6/60 in almost one-fifth of cases reflects the considerable number of cases with advanced diabetic retinopathy.

In our series, awareness of diabetic retinopathy was significantly higher among the literate patients, those living in the Kathmandu valley, those having DM in the family, and those having a history of prior fundus evaluation elsewhere.

The limitation of this study is that the participants enrolled are consecutive cases presenting to a vitreo-retinal service of a tertiary eye care centre which could introduce recruitment bias and contribute to a higher proportion of referred cases needing intervention. The lack of comparative groups in different geographical areas makes it difficult to tell whether DM is more prevalent in the ethnic groups like Brahmin and Newar. Further studies will be required to determine the prevalence of DM in various Nepali ethnic groups.

### Conclusion

Housewives and office workers are the major groups affected by diabetic retinopathy. Two-fifths of the subjects are unaware of DR and its potential for blindness. A lack of awareness of DR coupled with a high proportion of cases already at a sight-threatening stage of retinopathy at their first presentation reflects the need for improved awareness programs to reduce the burden of blindness from DR in Nepal.

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