

## A study of ocular manifestations of diabetes mellitus in patients attending tertiary care hospital in Pondicherry

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### Abstract

**Introduction:** This study was undertaken to find out the ocular manifestations of diabetes mellitus among diabetics reporting to a tertiary health care facility in Pondicherry.

**Materials and Methods:** Seventy diabetic patients reporting to Ophthalmology outpatient department were studied during the months of August and September 2017. A predesigned questionnaire was used to interview the diabetics, anterior segment examination was carried out using torchlight and slit lamp, and +90D lens was used for fundus examination. The findings were recorded and analyzed using Microsoft Excel and Epidata respectively.

**Result:** Most of the study subjects belonged to the age group 41-70 years, literate, employed, and middle income group. Cataract and retinopathy were found to be higher in those with more than 10 years' duration of diabetes.

**Conclusion:** Healthcare providers need to focus their efforts on preventive measures to delay the onset of complications of diabetes. The importance of screening for diabetes and diabetic retinopathy and regular follow-up cannot be overemphasized in order to reduce the burden of disease and its devastating consequences.

**Keywords:** Diabetes mellitus, Diabetic retinopathy, Risk factors.

### Introduction

Diabetes mellitus (DM) is defined as a metabolic disorder characterized by hyperglycemia resulting from either the deficiency in insulin secretion or its action. Diabetes and its complications are rapidly becoming the world's most significant cause of morbidity and mortality.<sup>1</sup> Poor control of diabetes can lead to damage to various organs, especially the eyes, kidney, nerves, and cardiovascular system.<sup>2</sup> According to International Diabetes Federation, it affects more than 240 million people worldwide and this number is expected to reach roughly 370 million by 2030.<sup>3,4</sup> A study conducted by King H. et al showed that the prevalence of diabetes in adults worldwide was 4.0% in 1995 and would rise to 5.4% by the year 2025.<sup>5</sup> India leads the world with largest number of diabetic subjects hence termed as the "diabetes capital of the world". According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with diabetes in India currently around 40.9 million is expected to rise to 69.9 million by 2025. The most disturbing trend is the shift in age of onset of diabetes to a younger age in the recent years. This could have long lasting adverse effects on nation's health and economy.<sup>6</sup> A cross-sectional study conducted in Puducherry by random sampling of 1013 adults above age 30 years showed that 10.3% of them were diabetic indicating a significant part of the population being affected by DM.<sup>7</sup>

Manifestations of DM are progressive, resulting from chronically high blood levels of glucose caused by impairments in insulin metabolism and biological macromolecules such as carbohydrates, lipids, proteins and nucleic acids.<sup>8</sup> Diabetic eye disease is becoming an

increasing problem among developing countries due to longer life expectancy and a higher incidence of diabetes.<sup>9</sup> Diabetes can lead to several ocular manifestations such as ocular surface diseases, glaucoma, cataract and retinopathy to name a few.<sup>10</sup> Various studies show that patients with diabetes are known to have an increased incidence of recurrent stye and chalazia.<sup>11</sup> Other manifestations include abnormalities of the corneal epithelium, leading to corneal erosions, reduced sensitivity, or corneal ulcers.<sup>12</sup> Studies have also shown a consistent association between diabetes and neovascular glaucoma, with proliferative retinopathy being the leading cause of this type of secondary glaucoma.<sup>13</sup> Diabetic patients are 2-5 times more at risk for cataract formation and are more likely to get it at an earlier age.<sup>14</sup> Extraocular motility disorders may occur in patients with diabetes, secondary to diabetic neuropathy, involving the third, fourth, or sixth cranial nerve.<sup>15</sup> Diabetic retinopathy is the major cause for a higher percentage of visual loss in patients with DM.<sup>16</sup> The incidence of diabetic retinopathy is related primarily to duration and control of diabetes.<sup>17</sup> The objectives of this study are (1) To study socio-demographic details in relation to ocular manifestations of DM (2) To correlate the ocular manifestations with duration of diabetes.

### Materials and Methods

Upon approval from the hospital's ethics committee this study was conducted at Pondicherry institute of Medical Sciences (PIMS) which is a tertiary health care facility in Puducherry catering to patients from urban and rural Puducherry and also the adjoining districts of Tamil

Nadu. The study design was cross-sectional in which patients reporting with diabetes to the hospital were included for the study during the months of August and September 2017. The inclusion criteria were (1) Patients diagnosed to have type 2 diabetes mellitus (2) Age group: 18-80 years (3) Sex: Both. Individuals who had other systemic co-morbidities such as hypertension, leprosy and ocular pathologies unrelated to diabetes were excluded from the study.

The diabetic patients were interviewed in the outpatient department and the ward using a pre-designed questionnaire. Information regarding socio-demography, duration of diabetes, symptoms etc. were recorded. Faculty from the department of Ophthalmology examined the diabetic patients for refraction using a retinoscope and torch light/slit lamp examination was used to assess the ocular structures including fundus. Ocular findings were captured by photographs and analyzed.

Diabetic retinopathy has been classified based on the following criteria: (1) Mild NPDR: Presence of at least one microaneurysm, (2) Moderate NPDR: Hemorrhages and/or microaneurysms in more than 2 quadrants, presence of soft exudates, venous beading, IRMA definitely present, (3) Severe NPDR: Hemorrhages and/or microaneurysms in all four quadrants, or venous beading in two or more quadrants, or IRMA in at least one quadrant, (4) Very severe NPDR: Any two or more of the changes seen in severe NPDR, (5) PDR: Presence of new vessels.<sup>18</sup>

The information collected was entered into Microsoft excel after cross checking the proformas for completeness. Analysis of data was done in Epi Data and the data was represented using percentages and simple proportions.

## Result

A total of 70 patients were interviewed and examined of which 40 (57.1%) were males and 30 (42.9%) were females. Three-fourths of these patients were in the age groups of 41 to 70 years as depicted in Table 1: 27.1% (19) were in the 41-50 years age group; 25.7% (18) were in the 51-60 years age group and 22.9% (16) were in the 61-70 years age group respectively. The education status of these patients are seen in Table 2. Here we find majority 62.9% (44) of the patients were educated of which the highest 31.4% (22) had completed middle school and 18.6% (13) had completed primary school, however more than one third 37.1% (26) of the patients were illiterate. Occupational status of the patients was also enquired into which is shown in Table 3 in which 37.1% (26) of them were found to be unemployed and 35.7% (25) were unskilled workers followed by 14.3% (10) who were skilled workers and 12.9% (9) were semi-skilled workers.

Income of the study subjects was also ascertained, which was classified into five classes where class 1 denotes lowest income and class 5 the highest income

group. The distribution of the study subjects is given in Table 4 where class 4 has the highest 31.4% (22) number of participants followed by class 3 having 30% (21) of the participants and the lowest was class 1 having 8.6% (6) of the participants.

Duration of diabetes among the patients was divided into those less than 10 years and those above 10 years. In 4 patients the left eye could not be visualized as they had mature cataracts and hence the number is 66. Almost two thirds 65.7% (46) of the patients were found to have a duration less than 10 years while the rest one third 34.3% (24) had a duration more than 10 years. Distribution of diabetic retinopathy based on the duration of diabetes is shown in Table 5. The right eye and left eye had almost similar findings with the right eye having diabetic retinopathy in 27.2% (19) of the patients and the left eye having diabetic retinopathy in 21.1% (18) of the patients. In the less than 10 years diabetes group 12.7% (6) patients had diabetic retinopathy in the right eye while in the more than 10 years of diabetes group 56.5% (13) patients had diabetic retinopathy. In the left eye 10.8% (5) patients had diabetic retinopathy in the less than 10 years diabetes duration while 45% (9) patients had diabetic retinopathy in more than 10 years duration. The diabetic retinopathy was classified into mild, moderate, severe and very severe grades. In this study we found that most of the patients had moderate grade of diabetic retinopathy: 17.1% (12) in the right eye and 10.6% (7) in the left eye.

Distribution of cataract based on the duration of diabetes is depicted in Table 6. The duration of diabetes is also divided into less than 10 years and more than 10 years for each right eye and left eye respectively. Here we found that in the right eye 32.9% (23) had cataract. There were 29.8% (14) in less than 10 years while 39.1% (9) in more than 10 years. In the left eye 23% (28) had cataract in the left eye. There were 36.9% (17) in the less than 10 years while 52.4% (11) are in more than 10 years. The cataract was classified into the following stages i) NSC ii) IMC iii) MC iv) early changes. In both the right eye and the left eye, the highest was found in the early changes stage of cataract 12.9% (9) in the right eye and 14.9% (10) in the left eye respectively.

**Table 1: Distribution of participants based on age**

Age	N	%
31-40 years	7	10
41-50 years	19	27.1
51-60 years	18	25.7
61-70 years	16	22.9
>71 years	10	14.3
<b>Total</b>	70	100

**Table 2: Distribution of participants based on educational qualification**

Education	N	%
Illiterate	26	37.1
Primary school	13	18.6
Middle school	22	31.4
High school	3	4.3
Higher secondary	3	4.3
Graduate	3	4.3
<b>Total</b>	<b>70</b>	<b>100</b>

**Table 3: Distribution of participants based on occupation**

Occupation	N	%
Unemployed/homemaker	26	37.1
Unskilled	25	35.7
Semi-skilled	9	12.9
Skilled	10	14.3
<b>Total</b>	<b>70</b>	<b>100</b>

**Table 4: Distribution of participants based on income**

Income	N	%
Class 1	6	8.6
Class 2	8	11.4
Class 3	21	30
Class 4	22	31.4
Class 5	13	18.6
<b>Total</b>	<b>70</b>	<b>100</b>

**Table 5: Distribution of diabetic retinopathy in participants based on duration of diabetes.**

Diabetic retinopathy	Right eye			Left eye		
	<10 yrs (%)	10 yrs or more (%)	Total (%)	<10 yrs (%)	10 yrs or more (%)	Total (%)
No DR	41 (87.3)	10 (43.5)	51 (72.8)	41 (89.1)	11 (55.0)	52 (78.9)
Mild NPDR	1 (2.1)	2 (8.7)	3 (4.3)	1 (2.2)	0 (0)	1 (1.5)
Moderate NPDR	3 (6.4)	9 (39.2)	12 (17.1)	2 (4.3)	5 (25.0)	7 (10.6)
Severe NPDR	1 (2.1)	1 (4.3)	2 (2.9)	1 (2.2)	2 (10.0)	3 (4.5)
Very severe NPDR	1 (2.1)	1 (4.3)	2 (2.9)	1 (2.2)	2 (10.0)	3 (4.5)
<b>Total</b>	<b>47 (100)</b>	<b>23 (100)</b>	<b>70 (100)</b>	<b>46 (100)</b>	<b>20 (100)</b>	<b>66 (100)</b>

**Table 6: Distribution of cataract in participants based on duration of diabetes.**

Cataract	Right eye			Left eye		
	<10 yrs (%)	10 yrs or more (%)	Total (%)	<10 yrs (%)	10 yrs or more (%)	Total (%)
Absent	33 (70.3)	14 (60.9)	47 (67.1)	29 (63.1)	10 (47.6)	39 (58.3)
NSC	5 (10.6)	3 (13.0)	8 (11.4)	6 (13.0)	4 (19.0)	10 (14.9)
IMC	4 (8.5)	2 (8.7)	6 (8.6)	5 (10.9)	2 (9.6)	7 (10.4)
MC	0 (0)	0 (0)	0 (0)	0 (0)	1 (4.8)	1 (1.5)
Early changes	5 (10.6)	4 (17.4)	9 (12.9)	6 (13.0)	4 (19.0)	10 (14.9)
<b>Total</b>	<b>47 (100)</b>	<b>23 (100)</b>	<b>70 (100)</b>	<b>46 (100)</b>	<b>21 (100)</b>	<b>67 (100)</b>

## Discussion

Diabetes and its complications are a significant cause of morbidity and mortality. The insidious onset of the disease makes it imperative that patients be screened for the disease and its various manifestations which lead to debilitating consequences.

From the observations made and results obtained from this study, it is evident that more than half 57.1% of the affected patients were males as compared to females. However, according to a study by Kautzky Willer A et al, diabetes is more common among females.<sup>19</sup> Most of the participants were between the age groups of 41-60 yrs., belonged to lower socio-economic status and were involved in unskilled labour or were unemployed which is similar to the findings in various studies. A study by Brown AF et al indicates that older

adults are affected commonly.<sup>20</sup> Many studies state that persons with a lower socio-economic position consistently have a higher prevalence of diabetes.<sup>21,22</sup> Another study by C Hedén Stahl et al showed that men with unskilled and semi-skilled manual occupations had a significantly higher risk of diabetes than high officials.<sup>23</sup>

Diabetic retinopathy was more in participants having diabetes for a duration of 10 or more years which was similar to the findings in many studies where disease duration was found to be a significant risk factor for diabetic retinopathy, and independent of adequacy of glycemic control.<sup>24,25</sup> More than one-third, 37% of the participants were affected by cataract and more among chronic diabetics, which is similar to a cross-sectional

study by Foster PJ et al where increasing age was associated with all cataract types.<sup>26</sup>

### Conclusion

The findings of this study reveal that diabetes is a larger problem among males, literate, middle income group and in those who are employed in occupations requiring skill. Diabetic retinopathy and cataract is much more common in persons having diabetes for a longer duration. Healthcare providers need to refine their preventive strategies to focus on persons belonging to the categories stated above. Diabetes patients need to be screened for diabetic retinopathy and cataract as early as possible for initiating treatment that would reduce complications.

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