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Knowledge, Attitude, and Practices Regarding Diabetic Retinopathy Among Diabetic Patients Attending a Tertiary Care Hospital in South India

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ABSTRACT

Background: Diabetic retinopathy (DR) is a leading cause of preventable blindness in India. Despite increasing diabetes prevalence, awareness and preventive behaviours toward DR often remain inadequate. Assessing knowledge, attitudes, and practices (KAP) among individuals with diabetes is essential for strengthening screening and education efforts.

Methods: A cross-sectional study was conducted among 250 adults with diabetes attending the ophthalmology outpatient department. A validated questionnaire assessed KAP regarding DM and DR. All participants underwent ophthalmic examination, including dilated fundus evaluation. Associations between demographic variables and KAP scores were analysed using Chi-square tests, with $p<0.05$ considered statistically significant.

Results: Good knowledge of DM was observed in 52.0% of participants, while only 15.2% had good DR knowledge. Positive attitudes were noted in 59.6% for DM but only 7.2% for DR. Good DM-related practices were reported by 68.8%, whereas DR-related practices were poor across all demographics. Higher education and better socioeconomic status were significantly associated with good knowledge of DM ($p<0.001$, $p=0.03$) and DR (both $p<0.001$). Females showed more positive attitudes toward DM ($p=0.006$) and better DM practices ($p=0.04$). Shorter diabetes duration was linked to better DR knowledge ($p=0.001$) and positive attitudes ($p=0.007$).

Conclusion: While general awareness and self-care practices for diabetes were moderate, DR-specific KAP was markedly poor, especially among individuals with lower education, lower socioeconomic status, and longer the disease duration. Targeted DR-focused education and improved counselling are needed to enhance regular screening and prevent vision loss.

Keywords: *Diabetic Retinopathy; Diabetes Mellitus; KAP (Knowledge–Attitude–Practice); Screening; Patient Education.*

INTRODUCTION

Diabetes mellitus, a chronic and progressive metabolic disorder, has emerged as one of the most significant public health challenges of the 21st century (1). India is witnessing a rapidly growing diabetes burden, with an estimated 69.2 million individuals affected in 2015—a number expected to rise to 123.5 million by 2040—potentially positioning India as the diabetes capital of the world (2). The risk of long-term complications, continues to rise in parallel with the increasing prevalence of diabetes. Among its many complications, diabetic retinopathy (DR) stands out as a leading cause of preventable blindness among the working-age population (1,2). particularly in low- and middle-income countries where access to screening and timely intervention remains limited [3]. In India, DR prevalence among diabetic patients ranges from 17.6% to 28.2%, indicating a considerable burden (4,5,6,7).

Despite the availability of effective screening and treatment strategies, many patients remain unaware of the risk and progression of diabetic retinopathy. Poor knowledge, negative attitudes, and suboptimal practices regarding eye care

among diabetic individuals significantly hinder early detection and management (8,9). As a result, preventable visual impairment continues to occur.

Assessing the Knowledge, Attitude, and Practice (KAP) of diabetic patients toward diabetic retinopathy is crucial for identifying gaps and designing targeted interventions. KAP studies serve as valuable tools in understanding patients' awareness levels, health-seeking behaviour, and adherence to recommended eye care practices (8,9,10). This is especially important in tertiary care settings, where a diverse patient population presents with varying degrees of disease awareness and access to care. This study evaluates the knowledge, attitudes, and practices related to diabetic retinopathy among diabetic patients attending a tertiary care hospital. It aims to identify gaps in awareness and determine demographic factors influencing KAP, providing evidence to guide targeted educational and preventive strategies to reduce DR-related visual impairment.

MATERIALS AND METHODS

Study Design and Setting: A cross-sectional study was conducted in the Outpatient Department of Ophthalmology at a tertiary care hospital, South India. The study was carried out over a period of three months following approval from the Institutional Scientific and Institutional Ethics Committee. (dt 27-12-2024, Lr.No.08/2025)

Study Population: The study included all diabetic patients, irrespective of age or gender, attending the ophthalmology outpatient department during the study period.

Sample Size: The sample size was calculated based on an anticipated prevalence of good knowledge about diabetes at 42%, as reported in a previous study (9) among diabetic patients in India. With a 95% confidence level and a relative precision of 15% (equivalent to an absolute precision of 6.3%), the estimated sample size was 240. To accommodate a potential 10% non-response or incomplete data rate, the final required sample size was adjusted to 250 participants.

Ethical Considerations: Ethical clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study. Informed written consent was obtained from all participants after explaining the nature and purpose of the study in their local language. Patient confidentiality and anonymity were strictly maintained.

Study Methodology: Each participant underwent a detailed ophthalmic evaluation including:

- Best-corrected visual acuity (BCVA) assessment using the Snellen's chart.
- Slit-lamp bio microscopy for anterior segment evaluation (cornea, conjunctiva, anterior chamber, iris, pupil, and lens).
- Fundus examination was performed using indirect ophthalmoscopy and slit-lamp bio microscopy with a +90D lens following pupillary dilation.
- Grading of diabetic retinopathy (DR) was performed based on standardized clinical diagnostic criteria.

KAP Assessment Tool: A structured Knowledge, Attitude, and Practice (KAP) questionnaire was administered to all participants to assess their awareness and behaviours related to diabetes and diabetic retinopathy. The questionnaire was adapted from previously validated KAP tools used in Indian populations and translated into the local language to ensure clarity and comprehension. A trained resident administered the questionnaire by reading it aloud to each participant in the presence of an attendant, and responses were recorded accordingly.

The KAP Questionnaire Consisted of Three Sections:

1. Demographic and Metabolic Information:

Includes age, gender, duration of diabetes, treatment modality, and glycaemic control status (if known).

2. Role of Physicians and Ophthalmologists in DR Awareness:

Assesses the communication between patients and healthcare providers regarding diabetic eye complications.

3. Knowledge, Attitude, and Practice (KAP) toward Diabetes and Diabetic Retinopathy:
   - Knowledge: Questions assessing awareness of the risk, complications, and importance of regular screening for DR.
   - Attitude: Questions evaluating perceptions, beliefs, and motivation to undergo eye exams.
   - Practice: Questions regarding the frequency of eye checkups, blood sugar monitoring, and treatment compliance.

Each item in the knowledge, attitude, and practice (KAP) questionnaires was scored based on established correct responses. Participants were then categorized accordingly. Knowledge about diabetes mellitus (DM) was scored out of 26, with scores ≥13 indicating good knowledge. Knowledge about diabetic retinopathy (DR) was scored out of 9, with scores ≥5 considered good. Attitude towards DM and DR had maximum scores of 7 and 4, respectively; scores ≥5 for DM and ≥3 for DR were deemed positive. Practice patterns for both DM and DR were evaluated out of 5; scores ≥4 were classified as good practice. DR-related practice was assessed only among participants not previously advised for treatment

Statistical analysis: Data were entered and analysed using [insert software, e.g., SPSS version XX]. Descriptive statistics such as frequencies and percentages were used to summarize participant characteristics. Bivariate analysis (Chi-square test) was performed to assess associations between demographic factors (age, gender, education level, socioeconomic status, and duration of diabetes) and outcomes related to knowledge, attitude, and practice regarding diabetes and diabetic retinopathy. A p-value of <0.05 was considered statistically significant.

RESULTS

Participant characteristics: A total of 250 adults with diabetes were included. The majority were aged 46–60 years (121/250; 48.4%), followed by >60 years (90/250; 36.0%) and 30–45 years (39/250; 15.6%). Males comprised 54.8% (137/250) and females 45.2% (113/250). Education levels were predominantly secondary schooling (153/250; 61.2%), with 24.0% (60/250) having primary education, 14.0% (35/250) being illiterate, and only 0.8% (2/250) graduates. By socioeconomic status, 46.8% were upper-lower (117/250), 42.8% lower-middle (107/250), 4.8% upper-middle (12/250) and 5.6% lower (14/250). Duration of diabetes was ≤5 years in 66.4% (166/250), 6–10 years in 23.2% (58/250), and >10 years in 10.4% (26/250).

Knowledge - Good knowledge of diabetes mellitus (DM) was observed in 52.0% (130/250; 95% CI: 45.8–58.1). Good knowledge of diabetic retinopathy (DR) was much lower at 15.2% (38/250; 95% CI: 11.3–20.2). On bivariate analysis, good DM knowledge was significantly associated with higher education (p<0.001) and higher socioeconomic status (p=0.03), but not with age, gender, or diabetes duration. Good DR knowledge was significantly associated with higher education (p<0.001), higher socioeconomic status (p<0.001), and shorter diabetes duration (p=0.001). [Table1,2]

Attitudes - A positive attitude toward DM was present in 59.6% (149/250; 95% CI: 53.4–65.5) and was significantly more common among females (p=0.006), those with higher education (p=0.001), and higher socioeconomic status (p=0.001); age and duration of diabetes were not significant. In contrast, positive attitude toward DR was rare (7.2%, 18/250; 95% CI: 4.6–11.1) and was seen almost exclusively in participants with secondary education or higher (p=0.001) and upper-middle socioeconomic status (p<0.001). Shorter diabetes duration was also associated with a positive attitude (p=0.007), whereas age and gender were not. [Table3,4]

Practices - Good DM self-care practices were reported by 68.8% (172/250; 95% CI: 62.8–74.2). Among demographic factors, only gender showed a significant association—female participants reported better practices than males (p=0.04). Education, socioeconomic status, age group, and duration of diabetes were not significantly associated with practice levels. In contrast, all participants demonstrated poor practice regarding DR, irrespective of age, gender, education level, or duration of diabetes. [Table 5]

Table 1. Knowledge about Diabetes Mellitus (DM) by Demographics

Variable		**Good Knowledge n (%)**	**Poor Knowledge n (%)**	**P value** (Chi-square test)
Age group in years	30-45	19(48.7)	20(51.3)	0.19
	46-60	70(57.9)	51(42.1)	
	>60	41(45.6)	49(54.4)	
Gender	Male	72(52.6)	65(47.4)	0.84
	Female	58(51.3)	55(48.7)	
Education Level	Illiterate	4(11.4)	31(88.6)	**<0.001***
	Primary	30(50.0)	30(50.0)	
	Secondary	94(61.4)	59(38.6)	
	Graduate & above	2(100.0)	0(0.0)	
Socioeconomic status	Lower	4(28.6)	10(71.4)	**0.03***
	Lower middle	59(55.1)	48(44.9)	
	Upper lower	57(48.7)	60(51.3)	
	Upper middle	10(83.3)	2(16.7)	
Duration of Diabetes	≤ 5 years	80(48.2)	86(51.8)	0.23
	6–10 years	34(58.6)	24(41.4)	
	>10 years	16(61.5)	10(38.5)	

Table 2. Knowledge about Diabetic Retinopathy (DR) by Demographics

Variable		**Good Knowledge n (%)**	**Poor Knowledge n (%)**	**P value** (Chi-square test)
Age group in years	30-45	6(15.4)	33(84.6)	0.43
	46-60	15(12.4)	106(87.6)	
	>60	17(18.9)	73(81.1)	

Gender	Male	22(16.1)	115(83.9)	0.67
	Female	16(14.2)	97(85.8)	
Education Level	Illiterate	0(0.0)	35(100.0)	**<0.001***
	Primary	2(3.3)	58(96.7)	
	Secondary	35(22.9)	118(77.1)	
	Graduate & above	1(50.0)	1(50.0)	
Socioeconomic status	Lower	0(0.0)	14(100.0)	**<0.001***
	Lower middle	22(20.6)	85(79.4)	
	Upper lower	8(6.8)	109(93.2)	
	Upper middle	8(66.7)	4(33.3)	
Duration of Diabetes	≤ 5 years	35(21.1)	131(78.9)	**0.001***
	6–10 years	3(5.2)	55(94.8)	
	>10 years	0(0.0)	26(100.0)	

Table 3. Attitude towards Diabetes Mellitus (DM) by Demographics

Variable		**Positive attitude n (%)**	**Negative attitude n (%)**	**P value** (Chi-square test)
Age group in years	30-45	18(46.2)	21(53.8)	
	46-60	76(62.8)	45(37.2)	0.17
	>60	55(61.1)	35(38.9)	
Gender	Male	71(51.8)	66(48.2)	**0.006***
	Female	78(69.0)	35(31.0)	
Education Level	Illiterate	9(25.7)	26(74.3)	**0.001***
	Primary	28(46.7)	32(53.3)	
	Secondary	110(71.9)	43(28.1)	
	Graduate & above	2(100.0)	0(0.0)	
Socioeconomic status	Lower	5(35.7)	9(64.3)	**0.001***
	Lower middle	76(71.0)	31(29.0)	
	Upper lower	58(49.6)	59(50.4)	
	Upper middle	10(83.3)	2(16.7)	
Duration of Diabetes	≤ 5 years	101(60.8)	65(39.2)	0.11
	6–10 years	29(50.0)	29(50.0)	
	>10 years	19(73.1)	7(26.9)	

Table 4. Attitude towards Diabetic Retinopathy (DR) by Demographics

Variable		**Positive attitude n (%)**	**Negative attitude n (%)**	**P value** (Chi-square test)
Age group in years	30-45	2(5.1)	37(94.9)	
	46-60	8(6.6)	113(93.4)	0.70
	>60	8(8.9)	82(91.1)	
Gender	Male	11(8.0)	126(92.0)	0.57
	Female	7(6.2)	106(93.8)	
Education Level	Illiterate	0(0.0)	35(100.0)	**0.001***
	Primary	0(0.0)	60(100.0)	
	Secondary	17(11.1)	136(88.9)	
	Graduate & above	1(50.0)	1(50.0)	
Socioeconomic status	Lower	0(0.0)	14(100.0)	**<0.001***
	Lower middle	10(9.3)	97(90.7)	
	Upper lower	1(0.9)	116(99.1)	
	Upper middle	7(58.3)	5(41.7)	
Duration of Diabetes	≤ 5 years	18(10.8)	148(89.2)	**0.007***
	6–10 years	0(0.0)	58(100.0)	
	>10 years	0(0.0)	26(100.0)	

Table 5. Practice Patterns regarding DM by Demographics

Variable		**Good practice n (%)**	**Poor practice n (%)**	**P value** (Chi-square test)
Age group in years	30-45	30(76.9)	9(23.1)	
	46-60	88(72.7)	33(27.3)	0.07
	>60	54(60.0)	36(40.0)	
Gender	Male	87(63.5)	50(36.5)	**0.04***
	Female	85(75.2)	28(24.8)	

Education Level	Illiterate	22(62.9)	13(37.1)	0.43
	Primary	45(75.0)	15(25.0)	
	Secondary	103(67.3)	50(32.7)	
	Graduate & above	2(100.0)	0(0.0)	
Socioeconomic status	Lower	8(57.1)	6(42.9)	0.38
	Lower middle	77(72.0)	30(28.0)	
	Upper lower	77(65.8)	40(34.2)	
	Upper middle	10(83.3)	2(16.7)	
Duration of Diabetes	≤ 5 years	112(67.5)	54(32.5)	0.59
	6–10 years	43(74.1)	15(25.9)	
	>10 years	17(65.4)	9(34.6)	

DISCUSSION

In this cross-sectional study of 250 diabetic patients attending a tertiary care hospital in South India, we found moderate overall knowledge about diabetes mellitus (52.0%) and good self-care practices for diabetes (68.8%), but markedly poor knowledge (15.2%) and negative attitudes (7.2%) specifically toward diabetic retinopathy (DR). Higher education and better socioeconomic status were associated with improved knowledge of both DM and DR, while female sex was associated with more favourable attitudes and better diabetes self-care. Notably, DR-related practices were poor across all demographic groups.

Our finding of relatively low awareness of DR is concordant with several Indian hospital-based and community studies. Venugopal et al. reported low awareness of DR in a hospital sample from Goa, and Rani et al. documented limited DR knowledge among rural populations in India. Similarly, Srinivasan et al. and Hussain et al. observed poor DR-specific knowledge and suboptimal screening behaviours among Indian diabetic patients, though absolute percentages varied by setting and sampling method. These studies also noted a consistent association between higher education/socioeconomic status and better knowledge—mirroring our results.

In the present study, knowledge regarding diabetes mellitus was strongly influenced by education level and socioeconomic status. Participants with higher education and belonging to higher socioeconomic strata demonstrated significantly better knowledge, whereas age, gender, and duration of diabetes did not show a significant effect. These findings are in line with previous Indian studies where literacy and social standing were important determinants of diabetes knowledge (8,9,10,11). In contrast, knowledge about diabetic retinopathy was very poor across all groups and particularly inadequate among illiterate participants, those from lower socioeconomic backgrounds, and individuals with a longer duration of diabetes (>10 years). This highlights a critical gap in patient education, especially for long-standing diabetics from vulnerable populations, and concurs with the reports of Rani et al. (10) and Venugopal et al. (8), who found similarly low levels of DR awareness in rural and hospital-based cohorts, respectively.

Attitudinal differences were also evident in our study. Females, participants with higher education, and those belonging to higher socioeconomic groups were significantly more likely to have a positive attitude toward diabetes management, suggesting that social and demographic factors play an important role in shaping perceptions and confidence in disease control. Comparable findings were reported by Hussain et al. (11) and Srinivasan et al. (9), where education and socioeconomic level were positively associated with favourable attitudes. However, attitudes toward diabetic retinopathy were overwhelmingly negative across the cohort. Positive attitudes were observed almost exclusively among participants with at least secondary education and those from the upper-middle socioeconomic class. Notably, none of the participants with diabetes duration greater than five years reported a positive attitude toward DR, indicating declining prioritization and diminished proactive health-seeking toward this complication with disease progression. This is consistent with earlier reports that patients often underestimate ocular risks associated with long-standing diabetes until visual symptoms manifest. Sen et al., in their hospital-based KAP study, similarly observed that absence of visual complaints, lack of awareness, and poor practices were common factors among patients presenting with sight-threatening diabetic retinopathy. (12)

In terms of practices, female patients in the present study reported significantly better diabetes self-management compared to males, indicating possible gender-related influences on adherence to lifestyle and treatment recommendations. Interestingly, this contrasts with the findings of Nirmalan et al. (13), who reported greater utilization of eye-care services among males in rural South India. The divergence may reflect contextual differences in the type of practice being measured—general diabetes self-care in our study versus utilization of formal eye-care services in theirs—or may be attributable to sociocultural variations in health-seeking behaviour across regions. Previous studies have also highlighted inconsistent gender patterns in diabetes-related practices. For instance, Hussain et al. (11) observed no significant gender differences in DR awareness or screening uptake, while Srinivasan et al (9) noted that practice behaviours were generally poor across both sexes. Taken together, these findings suggest that translation of knowledge and attitudes into practice behaviours may be shaped not only by gender but also by contextual, cultural, and health-system factors, underscoring the complexity of improving preventive practices for diabetic complications.

An important observation was that all participants exhibited poor practices related to diabetic retinopathy, regardless of demographic or disease-related factors. This highlights a disconnect between general diabetes management and DR-specific preventive behaviour. Previous studies from different parts of India have similarly documented poor uptake of DR screening, with patients often seeking eye evaluation only after visual symptoms appear (8,11,14). Reported barriers include lack of physician referral, financial constraints, travel distance, and a perception that eye examinations are unnecessary in the absence of visual impairment (14,15). These barriers likely explain the poor DR practice patterns we observed despite moderate DM practices.

Several factors may explain the low DR awareness despite moderate DM knowledge and practices. First, diabetes education delivered at the level of primary-care physicians and diabetologists may emphasize glucose control and systemic complications but under-emphasize routine retinal screening and early asymptomatic DR. Second, structural barriers—financial constraints, travel distance, and limited local availability of ophthalmic screening—reduce uptake even when patients are aware.

Our findings support integrating targeted DR education into routine diabetes care. Practical interventions include 1. standardized physician counselling at diabetes diagnosis and follow-up, 2. task-shifting to trained allied health staff or optometrists to perform screening or referrals, 3. community outreach and mass-media campaigns focused specifically on the asymptomatic nature of early DR and the availability of effective treatments, and 4. streamlining referral pathways between general physicians and eye-care services to reduce delays and access barriers. These approaches are consistent with recommendations from both national programs and the International Council of Ophthalmology guidelines (16,17,18).

Strengths of this study include a clearly defined KAP instrument adapted from validated tools, face-to-face administration to minimize misinterpretation, and simultaneous clinical eye examination allowing correlation of KAP with actual ocular status. Limitations include the single-centre, hospital-based design which may limit generalizability to community populations, potential social desirability bias in self-reported practice behaviours. Future studies should consider population-based sampling and multivariable modelling to identify independent predictors of poor DR knowledge and practice.

CONCLUSION

Although general knowledge and self-care practices related to diabetes mellitus were moderate, knowledge, attitudes, and practices specific to diabetic retinopathy remained markedly poor particularly among individuals with lower educational attainment, lower socioeconomic status, and longer duration of diabetes. These findings highlight the need for targeted diabetic retinopathy specific education, physician-led counselling, and system-level interventions to improve access to regular screening in order to prevent sight-threatening complications.

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