



# Knowledge, Attitude, and Practices of Diabetic Patients towards Diabetes mellitus and Diabetic Retinopathy: A Demographic analysis in South Indian population

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## KEYWORDS

Diabetes  
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## ABSTRACT:

**Introduction:** Diabetes has emerged as a significant global health challenge, affecting approximately 415 million people in 2015, projected to rise to 642 million by 2040. Diabetic retinopathy (DR) is a leading cause of blindness, particularly among working-age adults, with nearly all diabetes patients developing some form within 20 years of diagnosis. In India, the prevalence of diabetic retinopathy ranges from 7.3% to 25%, with urgent needs for improved screening and education. Early detection and strict glycemic control are crucial to preventing vision loss associated with diabetic retinopathy.

**Objectives:** To assess the knowledge, attitude, and practices (KAP) of diabetic patients regarding diabetes and diabetic retinopathy, and to identify barriers to adherence with recommended follow-up and treatment protocols.

**Methods:** This hospital-based study was conducted at a tertiary eye care centre in South India between March 2024 and August 2024. It included diabetic patients receiving treatment at the centre. The study aimed to assess the presence and severity of diabetic retinopathy and gather data on knowledge, attitudes, and practices regarding diabetes and diabetic retinopathy.

**Results:** The study involved 246 diabetic patients, with a majority aged 46-65 and predominantly female (55.9%). Knowledge of diabetes was good among 55.1% of participants, but only 37.76% were aware of diabetic retinopathy. Attitudes towards retinopathy were mixed, with 48.8% showing a positive outlook. Barriers to regular follow-ups included financial constraints (21.7%) and lack of time (35%). For eye check-ups, poor family support and long distances to hospitals were significant challenges, affecting adherence to recommended care.

**Conclusions:** This study emphasizes the urgent need for comprehensive educational strategies that not only raise awareness of diabetic retinopathy but also encourage regular follow-ups and screenings. Engaging healthcare professionals across various specialties, utilizing mass media campaigns, and integrating health education into primary care can significantly improve outcomes for diabetic patients. Addressing these knowledge gaps and barriers is essential to reducing the incidence of diabetic retinopathy and ultimately preventing visual impairment and blindness in this vulnerable population. Future research should continue to explore the effectiveness of various educational interventions and their impact on managing diabetes.

## 1. Introduction

Diabetes has become a major health issue in the 21<sup>st</sup> century, with around 415 million people affected worldwide in 2015, a number expected to reach 642 million by 2040. This global trend has resulted in diabetic retinopathy (DR) being responsible for approximately 4.8% of all causes of blindness globally

(1). Diabetic retinopathy is particularly worrying as it is a leading cause of new blindness in working-age individuals in developed countries and is increasingly common in middle-income nations (2). This growing diabetic population has resulted in an increasing incidence of diabetic retinopathy, as nearly all individuals with diabetes will develop some form of retinopathy within 20 years of diagnosis (2). Research



from India indicates a prevalence of DR ranging from 7.3% to 25% (2). In the United States, it is estimated that the number of patients with diabetic retinopathy will reach 16 million by 2050, with vision-threatening complications affecting around 3.4 million of them (3). DR is a disorder caused by the long-term effects of diabetes mellitus, potentially leading to vision-threatening damage to the retina and ultimately, blindness. It is the most common cause of severe vision loss in working-age adults in the Western world (4). Early detection and timely intervention are crucial to preventing blindness due to diabetic retinopathy. Strict glycemic control has been demonstrated to be important in clinical trials such as the UK Prospective Diabetes Study (UKPDS) and the Diabetes Control and Complication Trial (DCCT) (4).

According to the WHO, India is expected to have the highest number of individuals affected by diabetes mellitus in the world. Almost two-thirds of all Type 2 and nearly all Type 1 diabetics are expected to develop diabetic retinopathy over time (5). To address the issue of DR-related blindness, the All India Ophthalmological Society (AIOS) initiated a program in 2014 to detect the presence of DR among individuals with diabetes in eye clinics across the country. While the study aimed to assess prevalence and explore risk factors for developing DR among known diabetics, it also sought to identify gaps in the current detection process to improve future screening programs (6).

In India, the diabetes crisis is particularly severe, with 69.2 million diagnosed individuals, a number expected to rise to 123.5 million by 2040 (7). In 2000, 31.7 million people in India had diabetes mellitus (DM), with this figure estimated to rise to 79.4 million by 2030 (7). Many diabetic patients visiting tertiary eye care centres in South India exhibit advanced stages of diabetic retinopathy, often without having undergone necessary screening, treatment, or follow-up by established guidelines. Earlier detection of diabetic retinopathy could have prevented irreversible visual impairment in these patients (7). Researchers from India and internationally have raised concerns about gaps in knowledge regarding the disease and the shortcomings of current screening methods for the early detection of this potentially blinding condition.

This situation emphasizes the urgent need to evaluate the Knowledge, Attitude, and Practice (KAP) patterns of diabetic patients concerning diabetes and diabetic retinopathy. Identifying knowledge gaps and barriers to adherence to recommended follow-up and treatment protocols can help in creating targeted educational interventions to improve patient outcomes and prevent the vision-threatening consequences of this disease.

## 2. Objectives

This study aims to assess the knowledge, attitude, and practices (KAP) of diabetic patients regarding diabetes and diabetic retinopathy, focusing on identifying barriers to adherence to recommended follow-up and treatment protocols. By evaluating KAP levels, the research seeks to highlight gaps in understanding and attitudes that may hinder effective disease management. This will inform targeted educational interventions aimed at improving patient outcomes and reducing the incidence of diabetic retinopathy, ultimately preventing vision impairment in this vulnerable population.

## 3. Methods

This hospital-based, cross-sectional study was conducted at a tertiary eye care centre in South India between March 2024 and August 2024. The study population consisted of diabetic patients receiving treatment with oral hypoglycemic agents or insulin in the outpatient clinics and inpatient wards of the hospital. Patients under 18 years of age, those unable to understand English, Tamil, or Hindi, mentally challenged people incapable of providing informed consent or responding meaningfully to questions, patients with bilateral hazy media preventing adequate visualization of the fundus for grading diabetic retinopathy, eyes with retinal vein occlusion or ocular ischemic syndrome were excluded from the study.

Eligible diabetic patients were included in the study. Ethical approval was obtained from the institutional ethical committee at Sree Balaji Medical college and hospital. Voluntary consent was obtained from the participants to fill the questionnaire and the study adhere to the standards of the Declaration of Helsinki. Data were collected using a clinical research form, and the presence and severity of diabetic retinopathy were assessed through dilated fundus examinations using a slit lamp and binocular indirect ophthalmoscopy (8).



Diabetic retinopathy was classified according to the Early Treatment Diabetic Retinopathy Study criteria (8).

We adopted a 45-point, verbally administered standardized questionnaire developed by the investigators Srinivasan NK, John D, Rebekah G, Kujur ES, Paul P, John SS after a thorough literature review to gather data on knowledge, attitudes, and practices (KAP) regarding diabetes and diabetic retinopathy (9). The questionnaire was designed to minimize bias from leading questions, with open-ended questions in the knowledge and practice sections and statements requiring agreement or disagreement in the attitude section. The questionnaire was reviewed by subject matter experts, translated into Tamil, Telugu, and Hindi, and pilot-tested before being finalized. It consisted of 13 questions on knowledge, 8 on attitudes, and 24 on practices.

Responses were scored, and patients were categorized based on their performance. In the knowledge and practice sections, patients were classified as having 'good' or 'poor' knowledge and 'good' or 'poor' practice patterns based on the correct responses to essential questions. In the attitude section, responses indicative of a positive attitude were scored, categorizing patients as having a 'positive' or 'negative' attitude (10). This study builds upon the work of Nithin Keshav Srinivasan et al., whose study, "Diabetic Retinopathy: Knowledge, Attitude, Practice (KAP) among Diabetic Patients," was published in the Journal of Clinical and Diagnostic Research (9).

The study also considered the guidelines for diabetic retinopathy screening as outlined by the American Academy of Ophthalmology, emphasizing the importance of timely intervention and follow-up for diabetic patients (12). Furthermore, the prevalence and factors associated with diabetic retinopathy were reviewed to inform the study's design and objectives (11).

#### STATISTICAL ANALYSIS:

The study used SPSS version 20 for statistical analysis. A chi-square test was performed to assess the association for categorical variables. The following variables were identified as potential confounders: duration of diabetes, gender, educational status,

socioeconomic status, and presence of diabetic retinopathy. Information regarding these potential confounders was carefully documented using the clinical research form. The study aimed to determine the association between knowledge, attitude, and practice (KAP) patterns, and their demographic parameters and to identify barriers to compliance with follow-up and treatment regimens for diabetes mellitus and diabetic retinopathy. By analysing the data using appropriate statistical methods and accounting for potential confounders, the researchers could draw meaningful conclusions from the KAP survey results.

#### 4. Results

Two hundred and forty-six patients who fulfilled the eligibility criteria were recruited into the study. The demographic characteristics and retinopathy status of the study population are given in [Table/Fig-1]. The study included a total of 246 diabetic patients. Age distribution revealed that 1.6% were aged 25 to 35, 8.1% were 36 to 45, 32.4% were 46 to 55, 34.4% were 56 to 65, 20.2% were 66 to 75, and 2.8% were 76 to 85. Gender distribution indicated that 43.7% of participants were male and 55.9% were female. Regarding place of residence, 72.9% lived in urban areas while 26.7% resided in rural areas.

Educational qualifications showed that 3.2% were professional or honours graduates, 15.0% were graduates or postgraduates, 5.3% had intermediate qualifications, 24.7% held high school certificates, 23.5% had middle school certificates, 11.3% had primary school certificates, and 16.6% were illiterate. In terms of occupation, 5.3% were professionals, 5.3% were semi-professionals, 4.9% worked in clinical/shop/farm settings, 17.0% were skilled workers, 22.7% were semi-skilled workers, and 44.5% were unskilled or unemployed. Retinopathy status indicated that 61.9% had no retinopathy, 11.8% had mild NPDR, 14.6% had moderate NPDR, 2.4% had severe NPDR, and 9.3% had PDR. The duration of diabetes mellitus among participants showed that 10.9% had diabetes for less than 1 year, 29.1% for 1 to 5 years, 27.1% for 5 to 10 years, and 32.4% for more than 10 years.

Regarding knowledge, 55.1% had good knowledge while 44.5% had poor knowledge of diabetes. In terms of practices, 21.0% had good practices and 78.5% had poor practices towards diabetes. When evaluating



attitude, 48.6% had a positive attitude and 51.0% had a negative attitude towards diabetes. Details regarding knowledge attitude and practice regarding diabetes are given in [Table/Fig-2].

Among the 246 patients in our study, 146 (59.35%) were 'aware' that eyes could be affected by diabetes, but only patients 93 (37.76%) were 'aware' of diabetic retinopathy as an ocular complication of diabetes. The questions to assess knowledge of diabetic retinopathy were administered only to the 93 patients who were aware of retinopathy.

Out of 246 diabetics recruited in the study only 46 (18.69%) had good knowledge about diabetic retinopathy, while a positive attitude towards retinopathy were found in 50 (20.33%) and good practice constituted 23 (9.35%). Details regarding knowledge attitude and practice regarding diabetic retinopathy are given in [Table/Fig-3].

On questioning the participants who were aware of retinopathy (n=93) about the source of their knowledge regarding diabetic retinopathy, doctors (both ophthalmologists and physicians) constituted the most important source of information. Media, books, family, and friends were the other sources of information for the patients in the study.

The analysis of knowledge regarding diabetes and diabetic retinopathy among 246 patients showed that 136 had good knowledge (55.1%) while 110 had poor knowledge (44.5%). Chi-square analysis indicated no significant association with age ( $p = 0.223$ ) or gender ( $p = 0.738$ ). The place of residence also showed no significant difference ( $p = 0.467$ ).

Educational qualifications and occupation did not demonstrate significant associations either, with p-values of 0.953 and 0.339, respectively. Retinopathy status analysis revealed no significant correlation ( $p = 0.286$ ), and the duration of diabetes mellitus did not show a significant relationship ( $p = 0.379$ ). Overall, the findings suggest that while there are variations in knowledge and attitudes toward retinopathy, these do not significantly correlate with demographic factors or clinical characteristics in this patient population.

The analysis of attitude of diabetic patients toward diabetic retinopathy among 246 patients showed that 120 (48.8%) had a positive attitude while 126 (51.2%)

had a negative attitude. Chi-square analysis indicated no significant association with age ( $p = 0.337$ ) or gender ( $p = 0.267$ ). Place of residence approached significance with  $p = 0.075$ , indicating a trend where urban residents had a higher percentage of positive attitudes (78.3%) compared to rural residents (21.7%). Educational qualifications and occupation did not demonstrate significant associations, with p-values of 0.471 and 0.548, respectively. Retinopathy status analysis revealed no significant correlation ( $p = 0.429$ ), and the duration of diabetes mellitus did not show a significant relationship ( $p = 0.108$ ). Overall, the findings suggest that while there are variations in attitudes towards retinopathy, these do not significantly correlate with demographic factors or clinical characteristics in this patient population.

The analysis of practice patterns regarding diabetes and diabetic retinopathy among 246 patients showed that 52 (21.1%) had good practices while 194 (78.9%) had poor practices. Chi-square analysis indicated a significant association with age ( $p = 0.049$ ), with the highest percentage of good practices in the 46-55 age group (40.4%). Educational qualification also showed a significant correlation ( $p = 0.047$ ), with the highest percentage of good practices among those with middle school certificates (30.8%). Gender ( $p = 0.604$ ), place of residence ( $p = 0.761$ ), and occupation ( $p = 0.665$ ) did not demonstrate significant associations with practice patterns. Retinopathy status revealed a highly significant correlation ( $p < 0.001$ ), with the highest percentage of good practices in patients without retinopathy (55.8%). Duration of diabetes mellitus did not show a significant relationship ( $p = 0.759$ ). Younger age, higher educational level, and absence of diabetic retinopathy were positively associated with good practices regarding eye care among diabetic patients.

The barriers to regular follow-up among diabetic patients were identified as follows: 21.7% reported they could not afford the necessary care, 18.3% indicated a lack of family support, and 20% did not think it was important. A significant 35% stated they did not find time for follow-up appointments. Additionally, 20.8% believed that checking sugar levels with a glucometer at home was sufficient, and another 20.8% were not aware that regular follow-up is necessary. Other barriers accounted for 10%. The most common reasons that the patients gave for poor compliance were 'did not find



time' and 'Cannot afford'. Followed by Checking sugar levels with a glucometer at home is sufficient and not knowing that regular follow-up is necessary is the next common reason given by patients. The barriers to compliance for regular follow-up are listed in [Table/Fig-4].

The barriers to regular eye check-ups among diabetic patients were identified as follows: 24.3% reported poor family support, another 24.3% cited long distances to the hospital, and 21.3% faced financial problems. Additionally, 16.9% were physically unwell, and 21.3% were unaware that periodic eye check-ups are necessary. A significant 14.7% believed they "had good vision and did not feel the need for a check-up". Other barriers accounted for 1.5%. These findings highlight the various challenges diabetic patients face in adhering to recommended eye care, including lack of support, accessibility issues, financial constraints, and knowledge gaps. The most common barriers identified were poor family support and long distance to the hospital. The barriers to compliance for eye check-up are given in [Table/Fig-5].

## 5. Discussion

This hospital-based, cross-sectional study highlights significant gaps in knowledge, attitudes, and practices (KAP) regarding diabetes and diabetic retinopathy among diabetic patients in Tamil Nadu. While 55.1% of participants demonstrated good knowledge about diabetes, awareness of diabetic retinopathy was notably low, with only 37.76% recognizing it as a potential complication. This finding aligns with other studies in India, which consistently report inadequate awareness among diabetic patients regarding diabetic retinopathy. For instance, Singh et al. (2022) found that 79% of diabetic patients were aware that diabetes could affect the eyes, but only 26.5% had previously undergone a fundus examination for screening (15). Similarly, Shetgar et al. (2015) reported that only 45.3% of patients were aware of diabetic retinopathy, with a mere 25.3% understanding the importance of regular ophthalmic examinations (14). These findings underscore a persistent trend of low awareness levels, emphasizing the need for comprehensive educational initiatives.

The distinction between awareness and knowledge is crucial; awareness refers to recognizing a condition,

while knowledge encompasses a deeper understanding of its implications and management. In this study, 59.35% of patients acknowledged that diabetes could affect the eyes, yet only 37.76% identified diabetic retinopathy specifically as an ocular complication. This gap indicates a critical need for targeted educational efforts that not only raise awareness but also enhance understanding of the risks and management strategies associated with diabetic retinopathy (13).

Many diabetic patients visiting tertiary eye care centres in South India exhibit advanced stages of diabetic retinopathy, often without having undergone necessary screening, treatment, or follow-up by established guidelines. The presence of moderate NPDR and PDR among patients presenting for the first time to the hospital highlights the lack of awareness and the need for early detection and timely intervention to prevent irreversible visual impairment (16). Earlier detection of diabetic retinopathy could have prevented vision loss in these patients. Despite recognizing the importance of regular follow-ups, 61.1% of patients did not undergo periodic eye examinations, with the most common barrier being a lack of awareness regarding the necessity of these screenings (17). This finding is consistent with Singh et al. (2022), who noted low compliance with routine retinal assessments despite awareness of diabetic retinopathy (15).

In light of these findings, it is imperative to develop and implement comprehensive educational strategies aimed at diabetic patients. These strategies should involve healthcare providers at all levels—general practitioners, endocrinologists, ophthalmologists, and optometrists—who play a vital role in disseminating information about diabetic retinopathy (18). Utilizing mass media, pamphlets, and community outreach programs can enhance awareness, particularly among individuals from lower educational and socio-economic backgrounds (19). Integrating health education into the primary, secondary, and tertiary levels of healthcare is essential. Special campaigns on significant dates, such as World Diabetes Day and World Sight Day, can serve as platforms for raising awareness and promoting regular screenings for diabetic retinopathy (20).

The study also highlights the importance of regular screening for diabetic retinopathy, as early detection and timely intervention are crucial for preventing vision



loss. However, barriers such as lack of access to eye care services, financial constraints, and cultural beliefs can hinder regular screening (21). Addressing these barriers through targeted interventions, such as providing affordable screening services and educating patients on the importance of regular eye examinations, can significantly improve screening rates (22).

Furthermore, the study emphasizes the need for improved collaboration between healthcare providers, policymakers, and patient advocacy groups to develop and implement effective strategies for managing diabetic retinopathy. This includes advocating for increased funding for diabetic retinopathy research, improving access to eye care services, and promoting the integration of diabetic retinopathy management into existing healthcare systems (23). Previous research has shown that a significant proportion of patients with diabetes are unaware of the need for regular eye examinations, which can lead to late presentations of diabetic retinopathy (24). Addressing these knowledge gaps through educational initiatives can significantly improve screening rates and ultimately reduce the incidence of vision-threatening complications (25).

## References

- Hussain R, Rajesh B, Giridhar A, Gopalakrishnan M, Sadasivan S, James J, Vijayan PP, John N. Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of a South Indian state and its practice among the patients with diabetes mellitus: A population-based study. *Indian J Ophthalmol.* 2016 Apr;64(4):272-6. Doi: 10.4103/0301-4738.182937. PMID: 27221678; PMCID: PMC4901844.
- Teo ZL, Tham YC, Yu M, Chee ML, Rim TH, Cheung N, Bikbov MM, Wang YX, Tang Y, Lu Y, Wong IY, Ting DSW, Tan GSW, Jonas JB, Sabanayagam C, Wong TY, Cheng CY. Global Prevalence of Diabetic Retinopathy and Projection of Burden through 2045: Systematic Review and Meta-analysis. *Ophthalmology.* 2021 Nov;128(11):1580-1591. Doi: 10.1016/j.ophtha.2021.04.027. Epub 2021 May 1. PMID: 33940045.
- Lundeen EA, Burke-Conte Z, Rein DB, et al. Prevalence of Diabetic Retinopathy in the US in 2021. *JAMA Ophthalmol.* 2023;141(8):747-754. Doi:10.1001/jamaophthalmol.2023.2289.
- Sinclair SH, Schwartz SS. Diabetic retinopathy—an underdiagnosed and undertreated inflammatory, neuro-vascular complication of diabetes. *Diabetes Metab Syndr Obes.* 2020;13:103-115.
- Mohan Rema, Sundaram Premkumar, Balaji Anitha, Raj Deepa, Rajendra Pradeepa, Viswanathan Mohan; Prevalence of Diabetic Retinopathy in Urban India: The Chennai Urban Rural Epidemiology Study (CURES) Eye Study. *Invest. Ophthalmol. Vis. Sci.* 2005;46(7):2328-2333.
- Vashist P, Senjam SS, Gupta V, Manna S, Gupta N, Shamanna BR, Bhardwaj A, Kumar A, Gupta P. Prevalence of diabetic retinopathy in India: Results from the National Survey 2015-19. *Indian J Clin Exp Ophthalmol.* 2021;7(4):460-466.
- Ogurtsova K, da Rocha Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, Cavan D, Shaw JE, Makaroff LE. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Res Clin Pract.* 2017 Jun;128:40-50. Doi: 10.1016/j.diabres.2017.03.024. Epub 2017 Mar 31. PMID: 28437734.
- Early Treatment Diabetic Retinopathy Study Research Group. Classification of diabetic retinopathy from fluorescein angiograms. ETDRS Report Number 11. *Ophthalmology.* 1991;98(5):807-822. Doi:10.1016/S0161-6420(91)32153-2.
- Srinivasan NK, John D, Rebekah G, Kujur ES, Paul P, John SS. Diabetes and Diabetic Retinopathy: Knowledge, Attitude, Practice (KAP) among Diabetic Patients in A Tertiary Eye Care Centre. *J Clin Diagn Res.* 2017 Jul;11(7):NC01-NC07. Doi:10.7860/JCDR/2017/27027.10174.
- Brar AS, Sahoo J, Behera UC, Jonas JB, Sivaprasad S, Das T. Prevalence of diabetic retinopathy in urban and rural India: A systematic review and meta-analysis. *Indian J Ophthalmol.* 2022 Jun;70(6):1945-1955. Doi:10.4103/ijo.IJO\_2206\_21.



11. Molla MD, et al. Prevalence and factors associated with Diabetes retinopathy among type 2 diabetic patients at Northwest Amhara Comprehensive Specialized Hospitals, Northwest Ethiopia 2021. *BMC Ophthalmology*. 2022;22:246. Doi:10.1186/s12886-022-02746-8.
12. American Academy of Ophthalmology. Diabetic Retinopathy Preferred Practice Pattern. *Ophthalmology*. 2017;124(1):121-135. Doi:10.1016/j.ophtha.2016.10.029.
13. Hussain R, Rajesh B, Giridhar A, Gopalakrishnan M, Sadasivan S, James J, Vijayan PP, John N. Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of a South Indian state and its practice among the patients with diabetes mellitus: A population-based study. *Indian J Ophthalmol*. 2016 Apr;64(4):272-6. Doi: 10.4103/0301-4738.182937.
14. Shetgar, Anupama C., Brijesh Patil, Mallikarjun C. Salagar, and Nanditha A. M. "Assessment of Awareness of Diabetic Retinopathy Among Diabetics: A Clinical Survey." *Indian Journal of Clinical and Experimental Ophthalmology*, vol. no. 1 Issue 4, 2015. doi:10.5958/2395-1451.2015.00024.4.
15. Singh A, Tripathi A, Kharya P, Agarwal R. Awareness of diabetic retinopathy among diabetes mellitus patients visiting a hospital of North India. *J Family Med Prim Care*. 2022 Apr;11(4):1292-1298. Doi: 10.4103/jfmprc.jfmprc\_977\_21.
16. Brar AS, Sahoo J, Behera UC, Jonas JB, Sivaprasad S, Das T. Prevalence of diabetic retinopathy in urban and rural India: A systematic review and meta-analysis. *Indian J Ophthalmol*. 2022 Jun;70(6):1945-1955. Doi:10.4103/ijo.IJO\_2206\_21.
17. Khandekar R, et al. Barriers to diabetic retinopathy screening in a rural population. *Oman J Ophthalmol*. 2019;12(2):83-87. Doi:10.4103/ojo.ojo\_51\_19.
18. Al-Yahya A, et al. Impact of educational interventions on knowledge, attitude, and practices regarding diabetic retinopathy among diabetic patients in Riyadh, Saudi Arabia. *Clin Ophthalmol*. 2020 Oct 9;14:3187-3194. Doi:10.2147/OPHTH.S269524.
19. Rani PK, et al. Diabetic retinopathy screening and awareness programs: A review of the literature. *Indian J Ophthalmol*. 2019;67(8):1321-1328. Doi:10.4103/ijo.IJO\_1035\_19.
20. Gupta A, et al. Effectiveness of community-based awareness programs for diabetic retinopathy in improving knowledge among diabetic patients. *Indian J Community Med*. 2021;46(3):432-436. Doi:10.4103/ijcm.IJCM\_101\_20.
21. Tiwari S, et al. The role of health education in increasing awareness of diabetic retinopathy among diabetic patients. *Oman J Ophthalmol*. 2021;14(1):25-30. Doi:10.4103/ojo.ojo\_68\_20.
22. Ramesh SV, et al. Awareness of diabetic retinopathy among diabetic patients in Southern India: A cross-sectional study. *Indian J Ophthalmol*. 2020;68(1):80-84. Doi:10.4103/ijo.IJO\_328\_19.
23. Kaur S, et al. Knowledge, attitude, and practices regarding diabetic retinopathy among diabetic patients in a tertiary care hospital. *J Family Med Prim Care*. 2021;10(3):1234-1240. Doi:10.4103/jfmprc.jfmprc\_214\_20.
24. Molla MD, et al. Prevalence and factors associated with Diabetes retinopathy among type 2 diabetic patients at Northwest Amhara Comprehensive Specialized Hospitals, Northwest Ethiopia 2021. *BMC Ophthalmology*. 2022;22:246. Doi:10.1186/s12886-022-02746-8.
25. American Academy of Ophthalmology. Diabetic Retinopathy Preferred Practice Pattern. *Ophthalmology*. 2017;124(1):121-135. Doi:10.1016/j.ophtha.2016.10.029.
26. Setia MS. Methodology Series Module 3: Cross-sectional Studies. *Indian J Dermatol*. 2016;61(3):261-264. Doi:10.4103/0019-5154.182410.
27. Sedgwick P. Cross sectional studies: advantages and disadvantages. *BMJ*. 2014;348:g2276. Doi:10.1136/bmj.g2276.
28. Delgado-Rodríguez M, Llorca J. Bias. *J Epidemiol Community Health*. 2004;58(8):635-641. Doi:10.1136/jech.2003.008466.
29. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. *J Multidiscip Healthc*. 2016;9:211-217. Doi:10.2147/JMDH.S104807.



30. Caruana EJ, Roman M, Hernández-Sánchez J, Solli P. Longitudinal studies. *J Thorac Dis.* 2015;7(11):E537-E540. Doi:10.3978/j.issn.2072-1439.2015.10.63.

[Table/Fig-1]: Demographic characteristics and retinopathy status of the study population.

Factors	Number	Percentage (%)
<b>Age</b>		
25 to 35	4	1.6
36 to 45	20	8.1
46 to 55	80	32.4
56 to 65	85	34.4
66 to 75	50	20.2
76 to 85	7	2.8
<b>Gender</b>		
Male	108	43.7
Female	138	55.9
<b>Place of Residence</b>		
Urban	180	72.9
Rural	66	26.7
<b>Educational Qualification</b>		
Profession Or Honours	8	3.2
Graduate Or Postgraduate	37	15
Intermediate Or Post High School Diploma	13	5.3
High School Certificate	61	24.7
Middle School Certificate	58	23.5
Primary School Certificate	28	11.3
Illiterate	41	16.6
<b>Occupation</b>		
Professional	13	5.3
Semi Professional	13	5.3
Clinical/ Shop/ Farm	12	4.9
Skilled Worker	42	17
Semi-Skilled/ Worker	56	22.7
Unskilled/ Unemployed	110	44.5
<b>Retinopathy Status</b>		
Absence of Retinopathy	153	61.9
Mild NPDR	28	11.8
Moderate NPDR	36	14.6
Severe NPDR	6	2.4





PDR	23	9.3
Duration of DM		
<1 year	27	10.9
1 - 5 years	72	29.1
5 - 10 years	67	27.1
> 10 years	80	32.4

[Table/Fig-2]: KAP regarding diabetes (n=246)

Parameters	Good		Poor	
	Numbers	Percentage	Numbers	Percentage
<b>Knowledge (n=246)</b>	136	55.1	110	44.5
<b>Practice (n=246)</b>	52	21.0	194	78.5
	Positive		Negative	
<b>Attitude (n=246)</b>	120	48.6	126	51.0

[Table/Fig-3]: KAP regarding diabetic retinopathy.

Parameters	Retinopathy Status			
	Good	Percentage	Poor	Percentage
<b>Knowledge (n=93)</b>	46	49.4	47	50.6
<b>Practice (n=93)</b>	23	24.7	70	72.6
	Positive		Negative	
<b>Attitude (n=93)</b>	50	53.7	43	46.3

[Table/Fig-4]: Diabetes and Diabetic retinopathy- Barriers to compliance with regular follow-up.

Barriers	Percentage
Cannot afford	21.7
No family support	18.3
Do not think it is important	20
Did not find time	35
Checking sugar levels with glucometer at home is sufficient	20.8
Did not know that	20.8



regular follow up is necessary	
Any other	10

[Table/Fig-5]: Barriers to compliance with periodic up eye check

Barriers	Percentage
Poor family support	24.3
Long distance to hospital	24.3
Financial problems	21.3
Physically unwell	16.9
Did not know that periodic eye checkup should be done	21.3
Had good vision; did not feel the need for checkup	14.7
Any other	1.5