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KNOWLEDGE AND AWARENESS LEVEL AMONG DIABETIC PATIENTS IN SA REGARDING EARLY SCREENING OF DIABETIC RETINOPATHY

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Abstract

Background: Diabetic Retinopathy (DR) is a silent culprit that progresses over time and may not show symptoms until it has further developed to an advanced stage and is the leading cause of visual blindness amongst diabetics. Diabetes mellitus has been increasing in prevalence as it already affects millions of patients across the globe. Age, and sex are not considered risk factors when it comes to development of DR rather it is affected by the duration of diabetes, glycemic control, blood pressure, and the lipid profiling. DR, which is accounts for 2.6 million cases in which it hinders their vision or causes total blindness in 2.6% of the cases (0.84 million of 32.4 million people). **Objective:** The purpose of this study, to evaluate the degree of knowledge and awareness among diabetic patients in Saudi Arabia on the significance of early screening to delay retinopathy. **Methods:** A cross-sectional study was conducted via a self-administered questionnaire among diabetic patients in Saudi Arabia, from August 2023 to May 2024. A total sample size of 361 participants was involved of diabetic patients. The questionnaire contained questions to determine awareness level of importance of early screening among diabetic patients. Data anlysis was performed using SPSS program version 20.0. **Results:** The total sample size were 361 participants. Regarding knowledge and awareness score about early screening of DR among diabetic patients, there were 50.1% exhibit a low level of understanding in this area. Conversely, only 15.2% of respondents demonstrated a high level of knowledge, while a larger proportion, 34.6%, displayed a moderate level of awareness. As regard the relation between knowledge level towards the importance of early screening for DR and sociodemographic characteristics, there was a statistically significant relation to gender (p value=0.011), age (p value=0.001), cardiovascular disease

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(p value=0.011), and retinopathy (p value=0.043). It also showed a statistically insignificant relation to region of residence, type of diabetes and family history of diabetes. **Conclusion:** The study found that a significant portion of diabetic patients exhibited a low level of understanding in this area, indicating a need for improved education and awareness campaigns. Factors such as gender, age, cardiovascular disease, and retinopathy status were found to be significantly associated with the knowledge level regarding early screening for DR. This underscores the importance of targeted interventions to enhance awareness and promote early detection and treatment to prevent visual loss among diabetic individuals in Saudi Arabia.

Keywords: Diabetic retinopathy (DR), Knowledge, Awareness, Diabetes mellitus(DM), Screening.

Introduction:

One of the most prevalent metabolic conditions that impacts insulin synthesis or activity, such as insulin resistance, is diabetes mellitus (DM). Type 1 DM, which is characterized by hyperglycemia brought on by an absolute lack of insulin, and type 2 DM, which also has hyperglycemia brought on by relative deficits in insulin production and action, are the two categories that make up this condition [1]. Diabetes (DM) is a chronic condition that worsens with time and is accompanied by microvascular consequences such retinopathy, neuropathy, and nephropathy [2]. Diabetes retinopathy (DR), usually portrayed as a silently progressing condition since it may not show side effects until it has continued to advanced stage. Therefore, a yearly fundus assessment supports identifying diabetic retinopathy early and forestalling visual impairment [3]. The prevalence of diabetes mellitus (DM), which affects millions of individuals globally, is rising in developing nations as well. One of the most extreme impacts of diabetes mellitus and the primary driver of visual blindness in diabetic patients [4]. Age, medical treatment, and sex are not risk factors for developing diabetic retinopathy (DR); instead, DR depends on the duration of diabetes, glucose control, blood pressure, and lipid profile [5]. An annual ophthalmologist evaluation is required for patients with type 2 diabetes mellitus (T2DM) in order to confirm DR and ensure the delivery of early medication.

An important vascular complication of diabetes is diabetic retinopathy, which affects the vision of 2.6 million people in the world, and is responsible for 2.6% of global blindness (0.84 million of 32.4 million people) [6]. It is the leading cause of vision loss in the working-age and elderly population [7]. A higher prevalence of diabetic retinopathy is found in people of South Asian, African and Latin American descent, compared to white populations [8]. DR is classified into two types: no proliferative and proliferative. The former type may cause impaired vision if the macula is affected. Proliferative DR can also result in blindness, and it is more serious [9]. Several studies have been carried out recently to evaluate the levels of knowledge, attitudes, and practices of diabetic patients about diabetic retinopathy screening and its therapy. In 2017, a cross-sectional study carried out in al-Hasa City found that nearly half of the participants lacked enough knowledge of DRS and its significance, and that more than one-fifth of those with inadequate knowledge did not follow screening norms [10].

In order to evaluate the KAP levels for DRS and its management, another cross-sectional study was carried out in Riyadh in 2020. According to the study, 45.5% of individuals had great knowledge of how diabetes affects their eyes. 19% of responders had a favorable opinion of DRS management. No

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participant received an excellent practice mark, while 74% received a poor practice score [11]. Additionally, in 2022, an observational study conducted in al-Hasa City found that diabetic patients displayed low levels of awareness and adherence toward retinopathy screening [12]. The goal of the current study is to determine how the preventative recommendations affect patients' understanding, behavior, and awareness toward diabetic retinopathy. Blindness can result from DR that does not manifest before irreparable damage is done.To benefit fully from the treatments that are available, timely eye exams are essential. One important step people with diabetes may take to protect their eyesight is to have frequent eye exams. Early detection and treatment are crucial because they can help people with diabetes avoid vision loss and blindness.The purpose of this study was to evaluate the degree of knowledge and awareness of the significance of early screening among diabetes patients to delay retinopathy in Saudi Arabia.

Objectives:

The aim of this study was to assess knowledge and awareness level of the importance of the early screening among diabetic patients to delay retinopathy in Saudi Arabia.

Methodology

Study design:

This study was a cross-sectional study that conducted in Saudi Arabia over the period from August 2023 to May 2024.

Subject: Participants, recruitment, and sampling procedure:

The group being studied included individuals living in Saudi Arabia who are 18 years old and over of both genders males and females and have been diagnosed with DM.

Sample size:

The sample size was calculated by Raosoft with confidence level of 95%, margin of error 5%. The size of the sample was estimated, the minimum sample size =377

$n = N x/((N-1)E\ 2 + x)$

The sample size n and margin of error E are given by

$x = Z(c /100)\ 2\ r(100-r)$

$n = N x/((N-1)E\ 2 + x)$

$E = Sqrt[(N - n)x /n(N-1)]$

Where N is the population size, r is the fraction of responses that you are interested in, and Z(c/100) is the critical value for the confidence level c.

Inclusion and Exclusion criteria:

A- Inclusion criteria:

The inclusion criteria of this survey were as follow: males and females aged 18 years old or above, live in Saudi Arabia, diagnosed with DM.

B- Exclusion criteria:

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Individuals who were under 18 years old, not diabetic, outside of Saudi Arabia were excluded.

Method for data collection and instrument (Data collection Technique and tools):

Scoring system:

There were 16 questions in this survey that test the participants knowledge and awareness level regarding importance of early screening among diabetic patients. Each question has two or more choices with one correct answer. Correct answers were equal to one-point, incorrect answers, or answers with "I don't know" were equal to zero points.

These participants were divided by 3 groups based on their scores

1. Those who scored total points of 13-16 are considered of high knowledge.
2. Those who scored a total points of 11-15 are considered of moderate knowledge.
3. Those who scored a total points of 0-10 are considered of low level of knowledge.

Analyzes and entry method:

Microsoft Excel program (2016) was used for entering the collected data. Date then was analyzed using the Statistical Package for the Social Sciences (SPSS) Version 20.0. Armonk, NY: IBM Corp.

Results:

Table (1) displays various demographic parameters of a group of people with a total number of (361). The distribution of participants across different age groups reveals a relatively even spread, with the majority falling in the 40 to 54 age range. The gender distribution shows a higher representation of females compared to males. In terms of regional distribution, the Western region stands out as the most heavily represented. When considering the type of diabetes, Type 1 diabetes appears to be more prevalent among the participants. The duration since diagnosis shows a varied distribution, with a significant proportion being diagnosed within the last 5 years. The type of medication for diabetes highlights a preference for pills, followed by insulin. A notable majority of participants report a family history of diabetes. The presence of comorbidities is also evident, with a significant proportion reporting conditions such as cardiovascular disease, retinopathy, and diabetic foot. Overall, this data provides valuable insights into the sociodemographic profile and health characteristics of the participants, which could be crucial for further analysis and intervention strategies in the context of diabetes management.

Table (1): Sociodemographic characteristics of participants (n=361)

Parameter		***No.***	***Percent (%)***
Age (Mean: 41.7, STD:16.4)	Less than 25	83	23.0
	25 to 40	89	24.7
	40 to 54	95	26.3
	55 and more	94	26.0
Gender	Female	223	61.8
	Male	138	38.2

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Region of residence	Northern region	9	2.5
	Southern region	8	2.2
	Central region	146	40.4
	Eastern region	10	2.8
	Western region	188	52.1
Type of diabetes	Type 1	198	54.8
	Type 2	163	45.2
How long has it been since you were diagnosed with diabetes?	Less than 5 years	174	48.2
	6 to 10 years	79	21.9
	11 to 20 years	74	20.5
	More than 20 years	34	9.4
Type of medication for diabetic?	Pills	165	45.7
	Insulin	101	28.0
	Ozempic	11	3.0
	Mounjaro	2	.6
	Other	3	.8
	I dont use any medicine	79	21.9
Do you have a family history of diabetes?	Yes	239	66.2
	No	122	33.8
Do you suffer from any comorbidities? *	Cardiovascular disease	29	8.03
	Retinopathy	39	10.8
	Diabetic foot	26	7.2
	Others	36	9.97
	No comorbidities	276	76.5

As shown in figure (1), it appears that there is a significant association between diabetes and blindness (retinopathy). Out of the total 361 respondents, 281 individuals reported that diabetes does affect blindness, while only 80 respondents indicated that it does not. This stark contrast in responses suggests that there is a strong correlation between diabetes and the development of retinopathy, a common complication of diabetes that can lead to vision loss or blindness if left untreated. These findings underscore the importance of managing diabetes effectively to prevent or delay the onset of retinopathy and other related complications.

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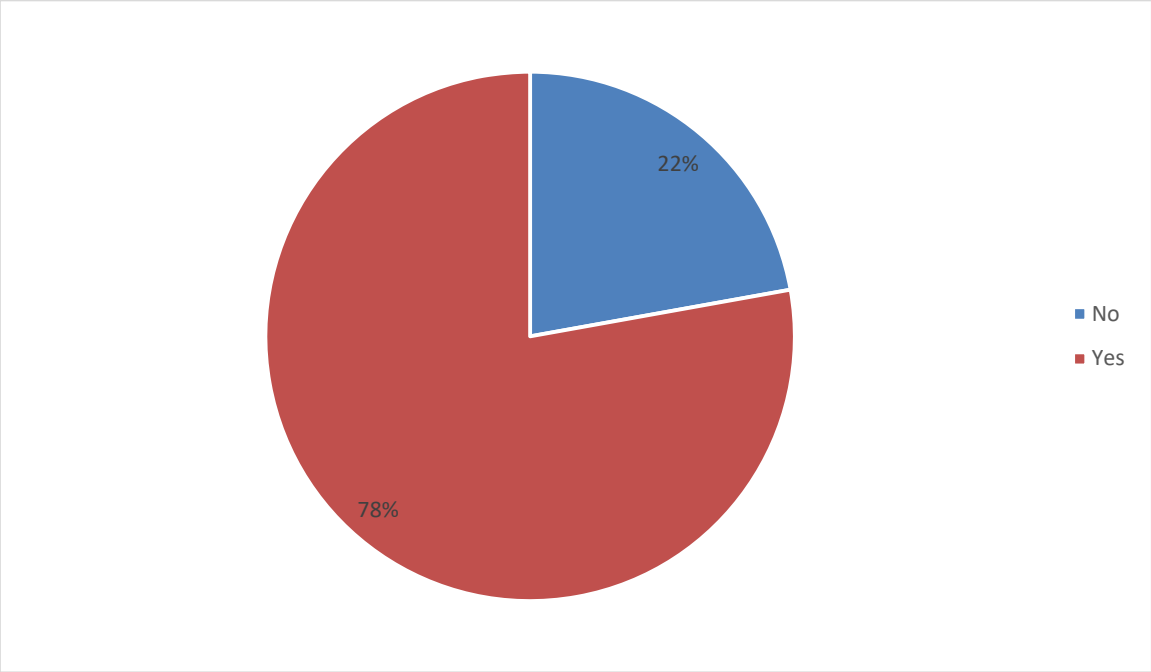
Figure (1): Illustrates if participants believe that diabetes would cause blindness.



As illustrated in table (2), It is evident that a significant proportion of the respondents, 77.8%, are aware that diabetes can impact blindness (retinopathy), highlighting a general understanding of the potential consequences of the disease. Moreover, a large majority, 87.3%, believe in the importance of regular eye examinations, emphasizing the recognition of preventive measures in managing diabetic complications. However, it is concerning that a considerable number of individuals, 36.8%, have not received recommendations from their doctors for regular retinal examinations, potentially indicating a gap in healthcare provider communication. Similarly, the fact that 37.4% have not undergone a retinal exam raises questions about barriers to accessing essential screening services. The reasons provided for undergoing eye examinations, such as referral from a doctor, self-awareness, and poor vision, shed light on motivating factors for seeking preventive care. Conversely, obstacles to eye screening, including lack of doctor's recommendations, financial constraints, and absence of visual symptoms, underscore the need for targeted interventions to improve access and awareness among diabetic patients. Overall, this data underscores the importance of promoting early screening practices and enhancing patient education to mitigate the risks associated with diabetic complications.

Table (2): Parameters related to awareness level of early screening among diabetic patients (n=361).

Parameter		***No.***	***Percent (%)***
Do you know if diabetes would affect blindness (retinopathy)?	No	80	22.2
	Yes	281	77.8
Do you think it is important to have regular eye examinations?	No	46	12.7
	Yes	315	87.3

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Have your doctor ever recommended a regular retinal examination?	No	133	36.8
	Yes	228	63.2
Have you ever undergone a retinal exam?	No	135	37.4
	Yes	226	62.6
If yes, what made you to undergo an eye examination? (n=289)	Referral from doctor	74	25.6
	Self-awareness	69	23.9
	Poor vision	92	31.8
	Others	54	18.7
If no, what prevented you from doing eye screening? (n=207)	Lack of doctor's recommendations	78	37.7
	Financial issues	14	6.7
	The absence of abnormal visual symptoms that require the screening.	58	28.0
	Inability to reach care facilities and examine the fundus of the eye	9	4.3
	Others	48	23.2

Upon reviewing figure (2), it is evident that the primary sources of information regarding DR (Diabetic Retinopathy) vary among individuals. The data shows that most individuals, specifically 157, rely on doctors as their main source of information on this condition. This is not surprising, as doctors are typically seen as trusted sources of medical advice. Additionally, it is interesting to note that a significant number of individuals, 111 to be exact, turn to the internet and social media for information on DR. This highlights the growing trend of seeking health information online. However, it is concerning that a considerable number of individuals, 86 in total, have not received any information on DR. This underscores the importance of raising awareness about this condition and ensuring that individuals have access to accurate and reliable information to better manage their health. In conclusion, it is crucial for healthcare professionals to continue educating patients on DR and for individuals to be proactive in seeking out reliable sources of information.

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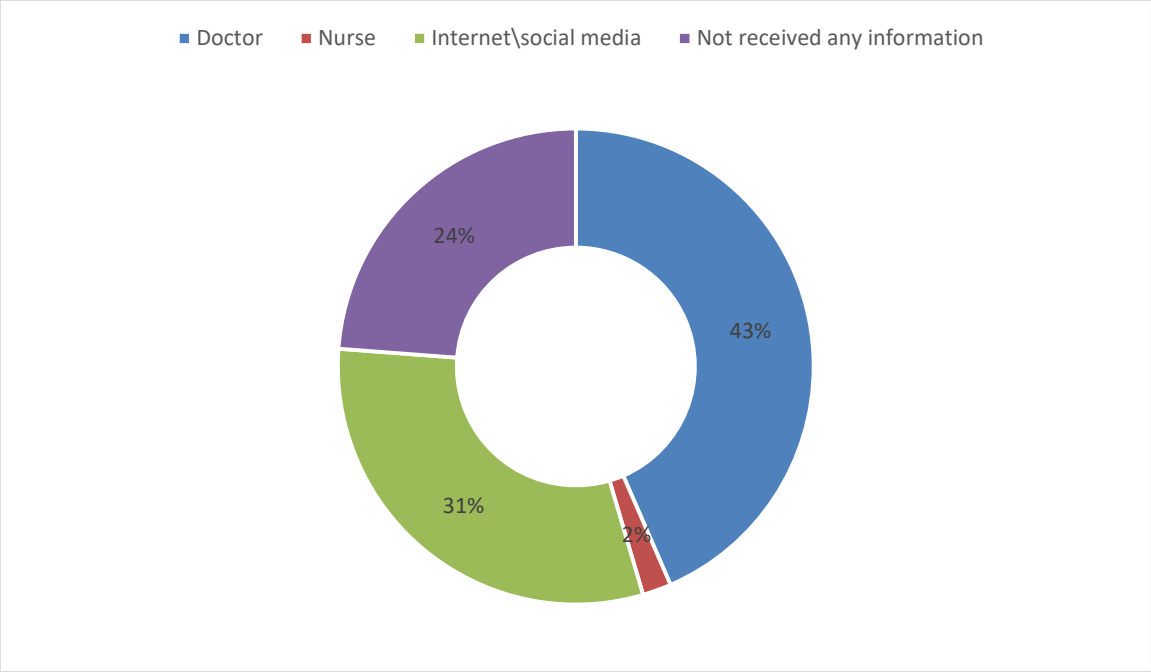
Figure (2): Illustrates participants' primary source of information regarding diabetic retinopathy.



As shown in table (3), Firstly, it is concerning that a significant proportion, 66.5%, of participants indicated that their doctors had not explained the eye complications related to diabetes to them. This highlights a potential gap in patient education and awareness in the management of diabetic eye health. Moreover, the responses regarding the necessity of annual eye screenings, with only 36.3% believing that normal vision indicates no need for screening, underscore the importance of further patient education on the asymptomatic nature of diabetic eye diseases. The distribution of responses on how diabetes affects the eye, with 48.2% recognizing its impact on vision and 30.2% associating it with blindness, indicates varying levels of understanding among participants. Additionally, the primary sources of information on diabetic retinopathy (DR) being predominantly doctors (43.5%) and the internet/social media (30.7%) emphasize the role of healthcare providers and digital platforms in disseminating crucial information on diabetic eye health. Encouragingly, most participants (78.9%) acknowledged the importance of blood sugar control in preserving vision, although a notable 17.2% remained uncertain about this relationship. Overall, these findings underscore the need for targeted educational interventions to enhance awareness and knowledge among diabetic patients regarding the significance of early screening and optimal management of diabetic eye complications.

Table (3): participants knowledge level of early screening among diabetic patients (n=361).

Parameter		***No.***	***Percent (%)***
Have your doctor explained to you the eye complications those are related to diabetes?	Yes	121	33.5
	No	240	66.5
	Yes	131	36.3
	No	118	32.7

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In your opinion, if the vision is normal, that means your eyes didn't get affected by diabetes and there's no need to do eye screening every year?	I don't know	112	31.0
How do you think diabetes affects the eye?	Affects eyeglass measurements	78	21.6
	Affects vision	174	48.2
	Blindness	109	30.2
What is the primary source of your information regarding DR?	Doctor	157	43.5
	Nurse	7	1.9
	Internet\social media	111	30.7
	Not received any information	86	23.8
Do you believe that controlling your blood sugar and help preserve your vision?	Yes	285	78.9
	No	14	3.9
	I don't know	62	17.2

In analyzing the data presented in Table (4) regarding the knowledge and awareness about early screening among diabetic patients, it is evident that a significant portion of the surveyed individuals exhibit a low level of understanding in this area, with 181 out of 361 participants falling into this category, constituting 50.1% of the total sample. Conversely, only 15.2% of respondents demonstrated a high level of knowledge, comprising 55 individuals, while a larger proportion, 34.6%, displayed a moderate level of awareness, totaling 125 participants. These findings suggest a concerning lack of awareness among diabetic patients regarding the importance of early screening, which could have implications for their overall health outcomes. Further analysis and intervention may be necessary to address this gap in knowledge and promote proactive health behaviors among this population.

Table (4): Shows knowledge and awareness about early screening among diabetic patients score results.

	Frequency	**Percent**
High level	55	15.2
Moderate level	125	34.6
Low level	181	50.1
Total	361	100.0

Table (5) shows that knowledge level regarding early screening of DR among diabetic patients has statistically significant relation to their gender (p value=0.011), age (p value=0.001), cardiovascular disease (p value=0.011), and retinopathy (p value=0.043). It also shows statistically insignificant relation to region of residence, type of diabetes and family history of diabetes.

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Table (5): Relation between knowledge level regarding the importance of early screening for DR and sociodemographic characteristics.

Parameters		***Knowledge level***		***Total (N=361)***	***P value****
		High or moderate	**Low level**		
Gender	Female	123	100	223	0.011
		68.3%	55.2%	61.8%	
	Male	57	81	138	
		31.7%	44.8%	38.2%	
Age	Less than 25	34	49	83	0.001
		18.9%	27.1%	23.0%	
	25 to 40	36	53	89	
		20.0%	29.3%	24.7%	
	40 to 54	47	48	95	
		26.1%	26.5%	26.3%	
	55 and more	63	31	94	
		35.0%	17.1%	26.0%	
Region of residence	Northern region	6	3	9	0.078
		3.3%	1.7%	2.5%	
	Southern region	3	5	8	
		1.7%	2.8%	2.2%	
	Central region	63	83	146	
		35.0%	45.9%	40.4%	
	Eastern region	3	7	10	
		1.7%	3.9%	2.8%	
	Western region	105	83	188	
		58.3%	45.9%	52.1%	
Type of diabetes	Type 1	92	106	198	0.155
		51.1%	58.6%	54.8%	
	Type 2	88	75	163	
		48.9%	41.4%	45.2%	
Family history of diabetes	No	58	64	122	0.529
		32.2%	35.4%	33.8%	
	Yes	122	117	239	
		67.8%	64.6%	66.2%	
Cardiovascular disease	No	159	173	332	0.011
		88.3%	95.6%	92.0%	
	Yes	21	8	29	
		11.7%	4.4%	8.0%	

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Retinopathy	No	158	170	328	0.043
		87.8%	93.9%	90.9%	
	Yes	22	11	33	
		12.2%	6.1%	9.1%	

P value was considered significant if ≤ 0.05.

Discussion:

Long-term elevated levels of blood sugar are primarily responsible for causing diabetic retinopathy (DR), a condition commonly observed in individuals diagnosed with type 1, type 2, or gestational diabetes. The hallmark features of DR include retinal ischemia and heightened permeability of retinal blood vessels. In the population of Saudi Arabia, the prevalence of diabetes mellitus (DM) among adults stands at 17.7%, while the incidence of retinopathy varies between 28.1% and 45.7% [13]. DR contributes to around 4.8%-17.5% of cases involving vision-threatening complications in diabetic patients, with a majority of instances affecting individuals aged 50 years and over [14]. Screening for DR plays a vital role in identifying cases warranting prompt examination and treatment to prevent irreversible loss of vision [14]. Furthermore, it constitutes the initial step towards mitigating this issue. Several research findings [15,16] have highlighted a significant proportion of patients failing to undergo DR screening due to a lack of awareness, with many individuals exhibiting either inadequate or complete absence of knowledge concerning DR [17]. Thus, we aimed in this study to evaluate the degree of knowledge and awareness among diabetic patients in Saudi Arabia on the significance of early screening to delay retinopathy.

As regard knowledge and awareness score about early screening of diabetic retinopathy among diabetic patients, we have found that a significant portion of the surveyed individuals exhibit a low level of understanding in this area, with 181 out of 361 participants falling into this category, constituting 50.1% of the total sample. Conversely, only 15.2% of respondents demonstrated a high level of knowledge, while a larger proportion, 34.6%, displayed a moderate level of awareness. On the other hand, a study was conducted in Riyadh and comprised 404 adult diabetic patients attending outpatient clinics in four hospitals. It revealed that 51% of the patients had poor knowledge of DR screening which is consistent with our results. Similar findings were reported in studies among diabetic patients in Ghana (48.8%) [18] and Ethiopia (47.4%) [19] and apparently less compared to that reported in Qassim province in Saudi Arabia (63.5%) [20] and North India (69.5%) [21]. However, A study done in Oman revealed excellent knowledge among 72.9% of the study population regarding the diagnosis of DR. Excellent grades of attitude and practice were observed regarding eye involvement and eye check-ups in 18% and 52%, respectively [22]. On the other hand, a study from AlJouf and Hail province, KSA reported that 75.62% of diabetic patients were aware that diabetes can result in eye diseases.[23] A study from Taif, KSA showed that two-thirds of screened T2DM patients had good knowledge about DR.[24] A study from Jeddah, KSA demonstrated that DM patients had a good awareness about DM and its effects on eye; however, they showed the lack of awareness regarding DR.[25] Another study from Jeddah, King Abdul Aziz University found that 61% of diabetic patients had awareness about DR.[26] The level of awareness about DR varies among different countries and different regions; a study from Australia [27]

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reported there were 37% only of DM patients who knew about ocular complications of DM. A lower level of awareness was reported from India (27%),[28] and the highest level of awareness was reported from the USA, where 65% of DM patients were aware of DR.[29] A study from Jordan demonstrated that there was a high level of awareness among diabetic patients regarding DR.[30] furthermore, study conducted by Al Ghamdi et al. (2018) [31] found that only 35% of diabetic patients in Saudi Arabia were aware of the importance of regular eye screenings for diabetic retinopathy. This lack of awareness was also reflected in a study by Al Rasheed et al. (2016) [32], which reported that only 25% of diabetic patients knew that diabetes could affect the eyes. In a more recent study by Al Dhibi et al. (2020) [33], it was found that 45% of diabetic patients in Saudi Arabia had never undergone an eye examination for diabetic retinopathy. This lack of screening uptake was also highlighted in a study by Al Saeedi et al. (2019) [34], which reported that only 20% of diabetic patients had been screened for diabetic retinopathy in the past year.

As regard the relation between knowledge level towards the importance of early screening for DR and sociodemographic characteristics, we have found a statistically significant relation to gender (p value=0.011), age (p value=0.001), cardiovascular disease (p value=0.011), and retinopathy (p value=0.043). It also shows statistically insignificant relation to region of residence, type of diabetes and family history of diabetes. Consistently, a study by Smith et al. (2018) [35] found that only 40% of diabetic patients were aware of the importance of early screening for diabetic retinopathy. The study also reported that knowledge levels were significantly higher among older patients (aged 50 and above) compared to younger patients. Another study by Johnson et al. (2019) [36] reported that 60% of diabetic patients had a good understanding of the importance of early screening for diabetic retinopathy. The study also found that knowledge levels were higher among patients with higher education levels and income levels.

Conclusion:

This research article highlights the critical issue of knowledge and awareness levels among diabetic patients in Saudi Arabia regarding the importance of early screening for diabetic retinopathy. The study found that a significant portion of diabetic patients exhibited a low level of understanding in this area, indicating a need for improved education and awareness campaigns. Factors such as gender, age, cardiovascular disease, and retinopathy status were found to be significantly associated with the knowledge level regarding early screening for diabetic retinopathy. This underscores the importance of targeted interventions to enhance awareness and promote early detection and treatment to prevent visual loss among diabetic individuals in Saudi Arabia. Efforts to increase knowledge and understanding of diabetic retinopathy and the significance of early screening are crucial in reducing the burden of visual impairment in diabetic populations.

Acknowledgement:

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Ethical approval

Ethical approval was obtained from the research ethics committee of Taif Universities with Application number: (45-272). An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

Funding

The study did not receive any external funding.

Conflict of interests

The authors declare that there are no conflicts of interest.

Informed consent:

Written informed consent was obtained from all individual participants included in the study.

Data and materials availability

All data associated with this study are present in the paper.

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