

<https://doi.org/10.48047/AFJBS.6.9.2024.5187-5825>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Measurement of Prevalence of Diabetic Retinopathy in patients suffering from Diabetes

Omayma Mohammed Babekir Dafallah, Maha Mohmoud Abdul-latif, Omnia Abdalla Mahmoud Higazy , Reem Abdelaziz, Hiba Mahgoub Ali Osman, Abdulmajeed Lafi Alruwaili, Khulood Fahad Alabbosh, Isra Omar, Muhab Mohamed Hassan Suliman

College of medicine ,Department of surgery,University, Najran university
Email:omymahabeib44@gmail.com

Ophthalmology Department ,Northern Border University, KSA
Maha.m.latif79@gmail.com

Department of Nursing, College of Nursing and Health Sciences, Jazan University , Saudi Arabia.

<https://orcid.org/0000-0002-6020-5126>
Omniahigazy@gmail.com

Medical Student Health informatics College , University Of Ha'il (s202001182@uoh.edu.sa)
Laboratory Science , College of Applied Medical Science , University OF Bisha Saudia Arabia Email; hmosman@ub.edu.sa

Laboratory specialist, Northern Border Regional Laboratory
Department of Biology, College of Science, University of Hail, Hail 2440, Saudi Arabia.
Department of Clinical Medicine, College of Medicine , Almmarefa University, Riyadh, KSA

Clinical Pharmacology Unit, Department of Basic Medical Sciences, College of Medicine, AlMaarefa University, Diriyah 13713, Riyadh, Saudi Arabia

Volume 6, Issue 9, Sep 2024

Received: 29 Aug 2024

Accepted: 10 Sep 2024

Published: 29 Sep 2024

[doi: 10.48047/AFJBS.6.9.2024.5817-5825](https://doi.org/10.48047/AFJBS.6.9.2024.5817-5825)

Abstract:

Objective: The main objective of this study is to check the burden of Diabetic Retinopathy in population who is suffering from Diabetes Mellitus.

Materials & Methods: Out of the 400 patients, 310 patients were included in the study after the scrutinizing the patients specially those who were not fulfilling the inclusion criteria. Study participants were selected using Non-Probability consecutive sampling technique, which involved selecting every consecutive patient who met the inclusion criteria. Both Male and Females patients participated in this Study. The data for the study was collected from the patients by using a proforma, who were having Diabetes Mellitus from last 10 years and were using Oral Anti-Diabetic or insulin to control Sugar.

Results: Demographic data and Medical details of 310 patients were included. From these patients. The age of Patients were in Between 45-75 years. Total Females in study were 145(46.77%) . Remaining were Male Patients 165(53.22%) . Out of these 310 patients, About 120 (38.70%) developed Diabetic Retinopathy because of having poor control of Blood glucose level. From these 120 positive patients, 60 (50%) developed mild NPDR, 20 (16.66%) patients suffered from Moderate NPDR , About 10(8.3%) patients got severe disease. While the fundus of 30(25%) patients showed PDR.

Conclusion: Burden of Diabetic Retinopathy is increasing day by day due to rapidly increase in prevalence of Diabetes Mellitus. This is serious condition causing the visual deterioration over period of time. Control of Diabetes is necessary to minimize its effects on Retina.

Keywords: Diabetic Retinopathy, Diabetes, DR,

Introduction: Recent estimates suggest that the global number of individuals affected by diabetes is projected to increase substantially from 173 million in 2001 to an alarming 365 million by the year 2030 (1). This trend holds true for both type 1 Diabetes mellitus also abbreviated as T1D and type 2 Diabetes Mellitus set s D2M), both of which are significantly influenced by a person's race/ethnicity (2). One crucial marker that is widely used to assess diabetic care quality and predict the risk of diabetic complications is hemoglobin A1c (HbA1c).

HbA1c is a reliable indicator of average blood glucose levels over an extended period (3). This crucial measure plays an essential role in evaluating the effectiveness of diabetes treatment plans, making timely adjustments, and reducing the risk of long-term complications. Among the various microvascular complications of diabetes, diabetic retinopathy (DR) is one of the most prevalent, and its incidence continues to grow in the developed world (4). DR results from chronic exposure to metabolic alterations induced by diabetes that damage the retina's microvasculature. The long-term consequences of DR can be severe and may lead to legal blindness and severely deteriorate the visual acuity in diabetic population (5).

Literature Review

Nonproliferative DR is a less severe form of the disease, which manifests as micro aneurysms, superficial and deep retinal hemorrhages, hard exudates, and macular edema (6). Proliferative DR, on the other hand, is a more severe form of the condition characterized by the development of new blood vessels in the retina, which may ultimately lead to scarring and vitreous damage (7). The diagnosis of DR is usually established using a combination of clinical techniques, such as ophthalmoscopy, optical coherence tomography, retinal

photography, and fluorescein angiography (8). Early detection, prompt intervention, and effective management of DR are critical for preserving vision and reducing the risk of long-term complications in diabetic patients (9)

Several factors have been identified that contribute to the development and progression of diabetic retinopathy (10). These include the type and duration of diabetes mellitus, age, gender, glycemic control, hypertension, body mass index, smoking, serum lipids, and the presence of microalbuminuria (11, 12). For example, people with type 1 diabetes are at higher risk of developing diabetic retinopathy than those with type 2 diabetes (13). Similarly, people with poor blood sugar control, high blood pressure, and high cholesterol are more likely to develop diabetic retinopathy (14).

As the burden of Diabetes is increasing in Asian world socially in Pakistan, so the complications associated with Diabetes are also increasing which includes Diabetic Retinopathy, Diabetic Nephropathy and Diabetic Angioplasty etc. These complications make life of Diabetic patients miserable. Many studies have done which represents the risk factors, treatment and prevention of complications occurred by Diabetes. However this is the study which emphasizes on the importance of Prevalence of disease. It measures that how much burden of Diabetic Retinopathy is present in Population because without knowing this one cannot understand the importance of management of Diabetic Retinopathy.

Materials & Methods:

2.1 The study was done in IBN-e-Siena Hospital to evaluate the Presence of Diabetic Retinopathy in Diabetic Patients irrespective whether they were suffering from Type 1 Diabetes or having Type Diabetes. A total of 400 diabetic patients were included in the study, and their medical records were reviewed to collect data.

2.2 Out of the 400 patients, 310 patients were included in the study after applying inclusion and exclusion criteria. Patients with gestational diabetes were ruled out from this study. The inclusion criteria required patients to have baseline information and no history of hypertension at baseline. Study participants were selected using Non-Probability consecutive sampling technique, which involved selecting every consecutive patient who met the inclusion criteria.

2.3 Both Male and Females patients participated in this Study. The data for the study was extracted from the medical records of the patients who were having Diabetes Mellitus from last 10 years and were using Oral Anti-Diabetic or insulin to control Sugar. The extracted data was then cleaned, coded, categorized, merged, and analyzed using statistical Package of Social Sciences SPSS version 22. This analysis helped to determine the relative importance of each predictor variable in explaining the occurrence of diabetic retinopathy

Results: In this study, Demographic data and Medical details of 310 patients were included. The age of Patients were in Between 45-75 years. Total Females in study were 145(46.77%) . Remaining were Male Patients 165(53.22%). Out of these 310 patients, 210 (67.74%) were taking oral hypoglycemic drugs to control the diabetes Mellitus while only 100 (32.25%) participants were using Insulin to control Diabetes.

From these patients, About 120 (38.70%) developed Diabetic Retinopathy because of having poor control of Blood glucose level.

Diabetic Retinopathy was divided into its two types. Proliferative Diabetic Retinopathy (PDR) and Non-Proliferative Diabetic Retinopathy (NPDR) .The Degree of Non Proliferative Diabetic Retinopathy was measured as mild, moderate and Severe. Mild cases were those who were having only soft/hard exudates and Mild Hemorrhage along with microaneurysm. Moderate= hard exudates+Hemorrhages in 1-3 quadrants. Severe= Hemorrhages in all four quadrants+ IRMA + venous Beading.

While PDR is considered as advanced diabetic Retinopathy with New vessels Formation on Disc (NVDs) and new vessel formation elsewhere (NVEs). From these 120 positive patients, 60 (50%) developed mild NPDR, 20 (16.66%) patients suffered from Moderate NPDR , About 10(8.3%) patients got severe disease. While the fundus of 30(25%) patients showed PDR.

Table 1: Demonstrating Demographic Details of patients

Sr. No	Parameter	Frequency	Percent
1	Age (years)	45-75	100%
2	Gender		
	Female	145	46.77%
	Male	165	53.22%
3	BMI (kg/m ²)	28.4-32.6	100%
4	Disease Patients		
	Diabetic Retinopathy	120	38.70%
	No Retinopathy	190	61.30%
5.	Control of Diabetes		
	Oral hypoglycemic	210	67.74%
	Insulin	100	32.25%

GRAPH 1: SHOWING DISEASED &NON-DISEASED PATIENT S

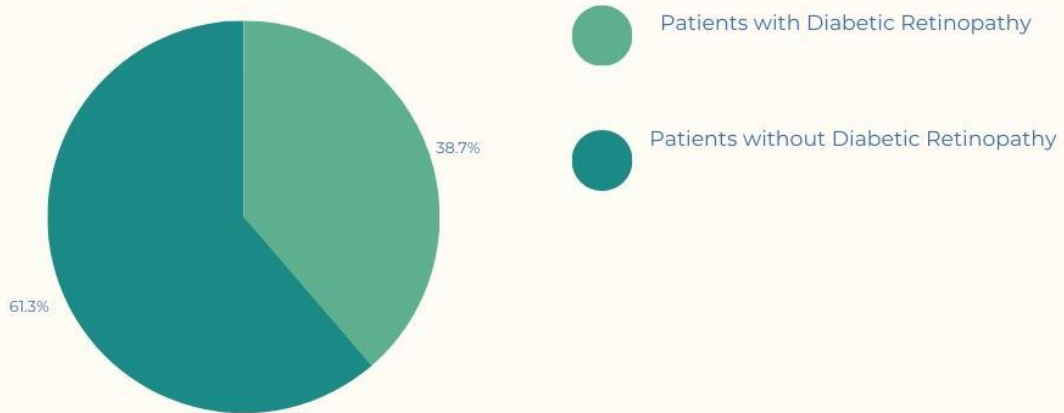


Table 2: showing Degree of Diabetic Retinopathy

Sr.No	Degree	Diabetic Retinopathy (n=120)	Percent
1.	Mild NPDR	60	50%
2.	Moderate NPDR	20	16.66%
3.	Severe NPDR	10	8.3%
4.	PDR	30	25%

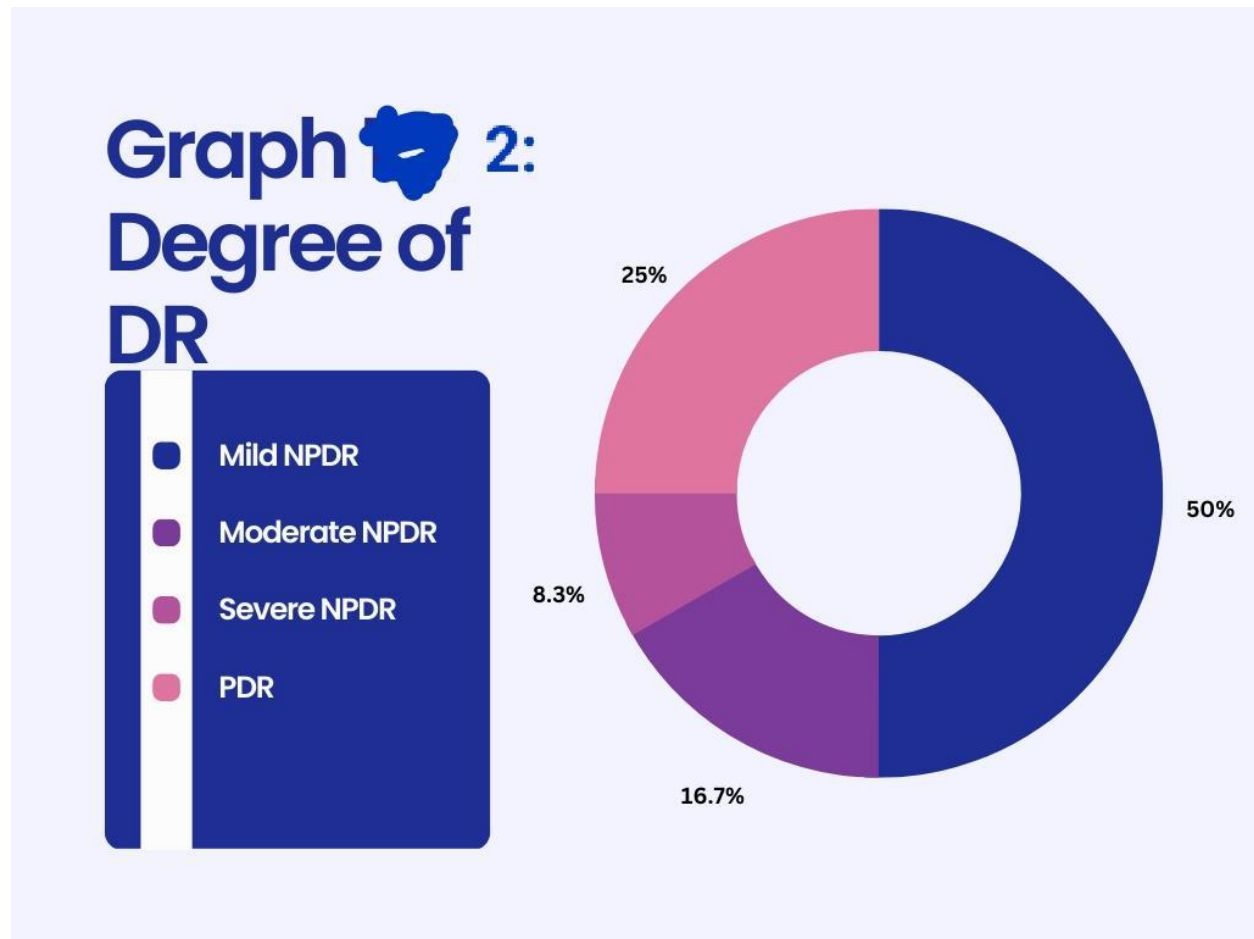


Table 1 showed the demographic details of Patients along their BMI, Gender and about prevalence of Diabetic Retinopathy. Graph 1 is visual illustration of these details. Table 2 is indicating Degree of Diabetic Retinopathy in 120 DR patients while Graph 2 is visual illustration of them .

Discussion:

Diabetic retinopathy is a leading cause of blindness in adults with diabetes (15). The condition is characterized by damage to the blood vessels in the retina, which can lead to vision loss if left untreated. Early detection of diabetic retinopathy is essential to prevent severe visual loss (16). Regular eye exams are important for people with diabetes, particularly those with a long history of the disease or poor blood sugar control (17). In this study male to female ratio affected from Diabetic Retinopathy was almost same except Male population contributing in this regard was little bit higher. Females affected were 46.77% and males affected were about 53.22%.

Body mass index of majority patients was higher as Obesity has strong relationship with Type 2 Diabetes Mellitus. In Type 2 DM, Level of Concentra of insulin is with in the normal range but patient’s glucose level remains high because insulin can not find its targeting tissue because adipose tissues are masking the target cells (18). From the total 310 diabetic patients , About 210 (67.74%) were taking oral hypoglycemic drugs to control the diabetes Mellitus while only 100 (32.25%) participants were using Insulin to control Diabetes. Oral Hypoglycemic drug Metformin is widely used to minimize the blood sugar level also

because of its multiple advantages. This Metformin not only lower the sugar levels in blood but also helpful in weight reduction thus idealizing this drug to control type 2 Diabetes Mellitus (19)

Diabetic Retinopathy was seen more in those patients who were injecting insulin to maintain their sugar levels in blood, as all these patients were not having good control of sugar by using oral Anti-diabetic medication . Because of this uncontrolled Glycaemia, blood sugar affected their retina thus impairing visual acuity as seen in this study that almost 25% patients experienced Proliferative Diabetic Retinopathy needing Laser photocoagulation

Several factors have been identified that contribute to the development and progression of diabetic retinopathy (20, 21).

Regular eye exams are critical for people with diabetes, particularly those with a long history of the disease or poor blood sugar control (22). Eye exams should be conducted at least once a year, and more frequently if there are signs of diabetic retinopathy or other eye problems (23). During an eye exam, an ophthalmologist or optometrist will examine the retina for signs of damage. If diabetic retinopathy is detected, laser photocoagulation may be recommended (24). This procedure uses a laser to seal off leaky blood vessels in the retina, which can help prevent further damage and vision loss (25).

In addition to regular eye exams, people with diabetes can take steps to reduce their risk of developing diabetic retinopathy. This includes maintaining good blood sugar control, keeping blood pressure and cholesterol levels within a healthy range, quitting smoking, and maintaining a healthy body weight (26). Managing diabetes is a lifelong process, and it is important to work closely with a healthcare provider to develop a comprehensive treatment plan that includes regular eye exams and other preventive measures (27). Intravitreal injection s are now commonly used to treat Diabetic Retinopathy. IVI is a valuable tool in the management of diabetic retinopathy and can help to prevent vision loss and improve visual acuity in patients with this condition. IVI is often repeated at regular intervals to maintain the effectiveness of the treatment. The frequency of injections varies depending on the severity of the diabetic retinopathy and the response to the medication. In some cases, IVI may be combined with other treatments, such as laser therapy, to further improve the outcome. (28) In Patients who develop Proliferative Diabetic Retinopathy they usually need Laser photocoagulation. Laser photocoagulation is a proven treatment method for preventing further vision loss and preserving visual acuity in patients with diabetic retinopathy. The procedure involves using a laser to create small burns in the retina, which causes the damaged blood vessels to seal off, preventing further leakage of blood and fluid into the retina. This reduces swelling and stabilizes the retina, preventing further damage to the retinal cells (29). Diabetic Retinopathy burden should be reduced in diabetic patients by controlling Diabetes Mellitus.

Conclusion: Burden of Diabetic Retinopathy is increasing day by day due to rapidly increase in prevalence of Diabetes Mellitus. Diabetic retinopathy is a condition that affects the eyes of people with diabetes, causing damage to the blood vessels in the retina. This is serious condition causing the visual deterioration over period of time. Control of Diabetes is necessary to minimize its effects on Retina. Keeping blood sugar levels within a healthy range is crucial to preventing diabetic retinopathy. High blood sugar levels can damage the blood vessels in the retina, causing them to leak or bleed.

Conflict of Interest: In this whole study, Author did not find any conflict of interest

References:

1. Teo ZL, Tham Y-C, Yu M, Chee ML, Rim TH, Cheung N, et al. Global prevalence of diabetic retinopathy and projection of burden through 2045: systematic review and meta-analysis. *Ophthalmology*. 2021;128(11):1580-91.
2. Tilahun M, Gobena T, Dereje D, Welde M, Yideg G. Prevalence of diabetic retinopathy and its associated factors among diabetic patients at Debre Markos referral hospital, Northwest Ethiopia, 2019: Hospital-Based Cross-Sectional Study. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. 2020;13:2179.
3. Euswas N, Phonnopparat N, Morasert K, Thakhampaeng P, Kaewsanit A, Mungthin M, et al. National trends in the prevalence of diabetic retinopathy among Thai patients with type 2 diabetes and its associated factors from 2014 to 2018. *PLoS One*. 2021;16(1):e0245801.
4. Porter M, Channa R, Wagner J, Prichett L, Liu TYA, Wolf RM. Prevalence of diabetic retinopathy in children and adolescents at an urban tertiary eye care center. *Pediatric diabetes*. 2020;21(5):856-62.
5. Wan H, Cai Y, Wang Y, Fang S, Chen C, Chen Y, et al. The unique association between the level of peripheral blood monocytes and the prevalence of diabetic retinopathy: a cross-sectional study. *Journal of Translational Medicine*. 2020;18:1-9.
6. Wang Y, Lin Z, Zhai G, Ding XX, Wen L, Li D, et al. Prevalence of and Risk Factors for Diabetic Retinopathy and Diabetic Macular Edema in Patients with Early-and Late-Onset Diabetes Mellitus. *Ophthalmic research*. 2022;65(3):293-9.
7. Alharbi AMD, Alhazmi AMS. Prevalence, risk factors, and patient awareness of diabetic retinopathy in Saudi Arabia: a review of the literature. *Cureus*. 2020;12(12).
8. Shah S, Feher M, McGovern A, Sherlock J, Whyte MB, Munro N, et al. Diabetic retinopathy in newly diagnosed Type 2 diabetes mellitus: Prevalence and predictors of progression; a national primary network study. *Diabetes Research and Clinical Practice*. 2021;175:108776.
9. Ting DS, Cheung CY, Nguyen Q, Sabanayagam C, Lim G, Lim ZW, et al. Deep learning in estimating prevalence and systemic risk factors for diabetic retinopathy: a multi-ethnic study. *Npj Digital Medicine*. 2019;2(1):24.
10. Ejigu T, Tsegaw A. Prevalence of diabetic retinopathy and risk factors among diabetic patients at university of Gondar tertiary eye care and training center, North-West Ethiopia. *Middle East African Journal of Ophthalmology*. 2021;28(2):71.
11. Zureik A, Julla J-B, Erginay A, Vidal-Trecan T, Juddoo V, Gautier J-F, et al. Prevalence, severity stages, and risk factors of diabetic retinopathy in 1464 adult patients with type 1 diabetes. *Graefes's Archive for Clinical and Experimental Ophthalmology*. 2021;259:3613-23.
12. Cai K, Liu YP, Wang D. Prevalence of diabetic retinopathy in patients with newly diagnosed type 2 diabetes: A systematic review and meta-analysis. *Diabetes/Metabolism Research and Reviews*. 2023;39(1):e3586.
13. Fite RO, Lake EA, Hanfore LK. Diabetic retinopathy in Ethiopia: a systematic review and meta-analysis. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2019;13(3):1885-91.
14. Khan R, Singh S, Surya J, Sharma T, Kulothunga V, Raman R. Age of onset of diabetes and its comparison with prevalence and risk factors for diabetic retinopathy in a rural population of India. *Ophthalmic research*. 2019;61(4):236-42.
15. Thomas R, Halim S, Gurudas S, Sivaprasad S, Owens D. IDF Diabetes Atlas: A review of studies utilising retinal photography on the global prevalence of diabetes related retinopathy between 2015 and 2018. *Diabetes research and clinical practice*. 2019;157:107840.
16. Li M, Wang Y, Liu Z, Tang X, Mu P, Tan Y, et al. Females with type 2 diabetes mellitus are prone to diabetic retinopathy: a twelve-province cross-sectional study in china. *Journal of diabetes research*. 2020;2020.
17. Sun Q, Jing Y, Zhang B, Gu T, Meng R, Sun J, et al. The risk factors for diabetic retinopathy in a Chinese population: a cross-sectional study. *Journal of Diabetes Research*. 2021;2021.
18. Sjöholm K, Carlsson LM, Svensson P-A, Andersson-Assarsson JC, Kristensson F, Jacobson P, et al. Association of bariatric surgery with cancer incidence in patients with obesity and diabetes: long-term results from the Swedish obese subjects study. *Diabetes Care*. 2022;45(2):444-50.

19. Ampofo AG, Boateng EB. Beyond 2020: Modelling obesity and diabetes prevalence. *Diabetes research and clinical practice*. 2020;167:108362.
20. Hamzeh A, Almhanni G, Aljaber Y, Alhasan R, Alhasan R, Alsamman MI, et al. Awareness of diabetes and diabetic retinopathy among a group of diabetic patients in main public hospitals in Damascus, Syria during the Syrian crisis. *BMC health services research*. 2019;19:1-10.
21. Haider S, Sadiq SN, Moore D, Price MJ, Nirantharakumar K. Prognostic prediction models for diabetic retinopathy progression: a systematic review. *Eye*. 2019;33(5):702-13.
22. Simó-Servat O, Hernández C, Simó R. Diabetic retinopathy in the context of patients with diabetes. *Ophthalmic research*. 2019;62(4):211-7.
23. Bora A, Balasubramanian S, Babenko B, Virmani S, Venugopalan S, Mitani A, et al. Predicting the risk of developing diabetic retinopathy using deep learning. *The Lancet Digital Health*. 2021;3(1):e10-e9.
24. Flaxel CJ, Adelman RA, Bailey ST, Fawzi A, Lim JJ, Vemulakonda GA, et al. Diabetic retinopathy preferred practice pattern®. *Ophthalmology*. 2020;127(1):P66-P145.
25. Arcadu F, Benmansour F, Maunz A, Willis J, Haskova Z, Prunotto M. Deep learning algorithm predicts diabetic retinopathy progression in individual patients. *NPJ digital medicine*. 2019;2(1):92.
26. Jones CD, Greenwood RH, Misra A, Bachmann MO. Incidence and progression of diabetic retinopathy during 17 years of a population-based screening program in England. *Diabetes care*. 2012;35(3):592-6.
27. Kropp M, Golubnitschaja O, Mazurakova A, Koklesova L, Sargheini N, Vo T-TKS, et al. Diabetic retinopathy as the leading cause of blindness and early predictor of cascading complications—risks and mitigation. *EPMA Journal*. 2023:1-22.
28. Tan Y, Fukutomi A, Sun MT, Durkin S, Gilhotra J, Chan WO. Anti-VEGF crunch syndrome in proliferative diabetic retinopathy: a review. *Survey of Ophthalmology*. 2021;66(6):926-32.
29. Shahwan MJ, Gacem SA, Zaidi SK. Prevalence of diabetic nephropathy and associated risk factors among type 2 diabetes mellitus patients in Ramallah, Palestine. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2019;13(2):1491-6.