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Research Article

Factors Interrelated to Declining Vision Among Diabetic Patients in Sudan

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Abstract

Background: Diabetes mellitus (DM) represents a significant global health issue, encompassing a range of heterogeneous disorders characterized by elevated blood glucose levels. Diabetes is classified into two types: type 1 (T1DM) and type 2 (T2DM). Diagnosis primarily relies on fasting blood glucose and HbA1c levels. Investigating the causes of vision impairment in diabetes is crucial for reducing the rates of blindness. Therefore, implementing screening for early diagnosis is essential to delay complications. Methodology: This study is a prospective descriptive analysis conducted from May 15, 2025, to October 20, 2025. The study was conducted at Doctor Khalil Ophthalmology Clinic in El-Obeid, North Kordofan, Sudan. This study included all individuals with diabetes attending the clinic for follow-up (520 patients). We assessed their visual acuity and selected all patients with poor vision uncorrected by glasses or other means of correction. Results: This study analysed 120 diabetic patients with impaired vision, comprising 58% females and 42% males. The most common condition identified was diabetic retinopathy, affecting 55% of participants, followed by cataract at 54%, hypertension at 46%, glaucoma at 25%, and macular oedema at 17%. Three percent of the cases had newly discovered glaucoma and myopia, and three patients had macular holes. Retinal detachments, corneal ulcers, corneal opacities, and endophthalmitis were also observed. Conclusion: Vision impairment associated with diabetes is prevalent in Sudan, largely attributable to ongoing conflict, which has resulted in inadequate health services and a scarcity of medications for glycaemic control in various regions.

Keywords

Diabetes Mellitus, Diabetic Retinopathy, Retinal Detachment, Macular Edema, Sudan War

1. Introduction

Diabetes mellitus encompasses a range of heterogeneous disorders characterized by elevated blood glucose levels. Diabetes is classified into two types: type 1 and type 2. Diagnosis primarily relies on fasting blood glucose and HbA1c levels. Early screening is essential for timely diagnosis to mitigate complications [1]. Diabetes represents a significant global health issue, making the investigation of its association with vision impairment crucial for reducing blindness rates. If

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identified early, many causes of vision deterioration in diabetic patients are either preventable or treatable. This study examines the factors that influence vision impairment in individuals with diabetes. The primary causes of blindness among the elderly worldwide include cataracts, glaucoma, refractive error, age-related macular degeneration, and diabetic retinopathy, with the latter being more prevalent in individuals with diabetes [2]. Despite advancements in the treatment of diabetic macular oedema and diabetic retinopathy, the ongoing conflict in Sudan has resulted in a lack of treatment, delays in referrals, and resource limitations. This complex situation has contributed to delays in the diagnosis and treatment of diabetic retinopathy. The implementation of a diabetic retinopathy screening program in Sudan is crucial. Identifying more specific and sensitive biomarkers is essential for the early detection of diabetic macular oedema and diabetic retinopathy, thereby preventing poor vision and blindness [3]. Diabetes can impact the lens in various ways, leading to cataracts and visual impairment. Patients should undergo thorough preoperative examinations focusing on the ocular surface, cornea, iris, lens, and posterior segment. Phacoemulsification and new intraocular lenses should be utilized [4].

2. Materials and Method

This prospective descriptive study was carried out from May 15, 2025, to October 20, 2025. The investigation took place at Doctor Khalil Clinic, in El-Obeid, North Kordofan, Sudan. This study included all individuals with diabetes who visited the clinic for follow-up (520 patients). We assessed their visual acuity and selected all patients with uncorrected poor vision, whether through glasses or other means. A complete ophthalmic examination was performed using a slit lamp, ophthalmoscope, 90D lens, AB scan, and OCT. Additionally, blood tests, including fasting blood glucose and Hb A1C, were conducted to identify the causes of poor vision.

Ethical consent: all patients who participated in this study have signed a written consent.

Ethical Approval:

The Human Research Ethics Committee at MRCC granted approval for this study's proposal (Approval Number: HREC 0007/MRCC.3/24).

Statistical analysis:

Data sets were imported into the statistical package for social sciences (SPSS Inc., Chicago, IL, version 24), from which the results were derived. The chi-square test deemed P-values less than 0.05 significant.

3. Results

This study examined 120 diabetic patients with poor vision, including 70 females (58%) and 50 males (42%), resulting in a female-to-male ratio of 1.40:1.00. The most affected age group was those aged 65-70 years (38%), followed by those over 70 years (30%), and then the age groups of 60-64 years and under 59 years, both at 26% (see Table 1).

Table 1. *Illustrates the age distribution of the study participants.*

		≤ 59 Years	60-64	65-70	>70	Total
sex	Males	14	8	16	12	50
	Females	12	18	22	18	70
Total		26	26	38	30	120

In terms of visual acuity, all patients have low vision, with the majority (68%) having a V.A <6/60 (HM-NOPL), followed by V.A 6/60 (22%), V.A 6/36 (10%), and V.A 6/24 (11%), as shown in Table 2.

Table 2. *Illustrates the visual acuity across all age groups.*

Age group	6l24	6l36	6l60	<6l60	Total
≤ 59 Years	0	4	6	16	26
60-64	2	2	8	14	26
65-70	8	2	8	20	38
>70	4	4	4	18	30
Total	14	12	26	68	120

In examining the diseases linked to reduced visual acuity in individuals with diabetes, the most common condition identified was diabetic retinopathy, affecting 66 patients (55%). This was followed closely by cataracts, which were present in 65 patients (54%). Hypertension was noted in 55 patients, while glaucoma and macular oedema were observed in 30 and 20 patients, respectively. The recent findings indicate that glaucoma and myopia were observed in 4 patients each, while macular holes were identified in 3 patients. Additionally, retinal detachments, corneal ulcers, corneal opacities, and endophthalmitis were all noted in two patients. Refer to Figure 1.

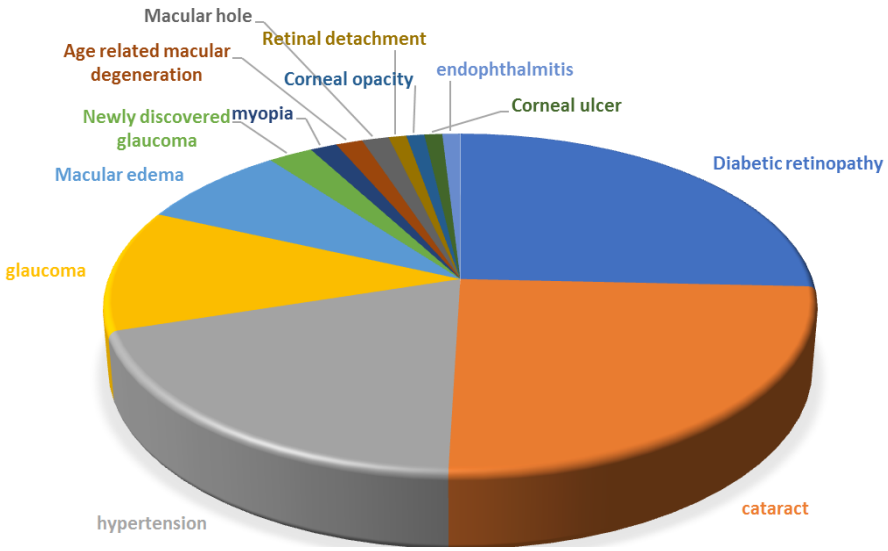

Figure 1. *Illustrates the proportion of diseases linked to decreased vision in diabetic patients.*

Regarding the distribution of diseases associated with a decrease in visual acuity by sex, it was observed that diabetic retinopathy was present in 66 patients (55%), with 30 males (53%) and 36 females (47%). The second leading cause of decreased vision was cataract, which was found in 64 patients (53%). A total of 20 patients were males (31%), and 44 were female (69%). Hypertension was identified as the third leading cause, affecting 50 patients (42%). 14 of them were males (28%), while 36 were females (72%). The fourth common cause identified was glaucoma, which was observed in 30 patients, accounting for 25% of the cases. 12 (40%) of the participants were males, while 18 (60%) were female. The fifth cause identified was macular oedema, which was present in 12 patients (10%). There were 12 males (60%) and 8 females (40%) among the patients. Additionally, newly discovered glaucoma was identified in 6 patients (5%). Four males (67%) and two females (33%) are represented, as illustrated in Table 3 and Figure 2.

Table 3. *Represents the distribution of the cases by sex.*

Variable	Males	Females	Total
Diabetic retinopathy	30	36	66
Cataract	20	44	64
Hypertension	14	36	50
Glaucoma	12	18	30
Macular edema	12	8	20
Newly discovered glaucoma	4	2	6
Myopia	2	2	4
Retinal detachment	2	2	4
Age related macular degeneration	4	0	4
Macular hole	0	3	3
Corneal opacity	0	2	2
Corneal ulcer	2	0	2
Endophthalmitis	2	0	2

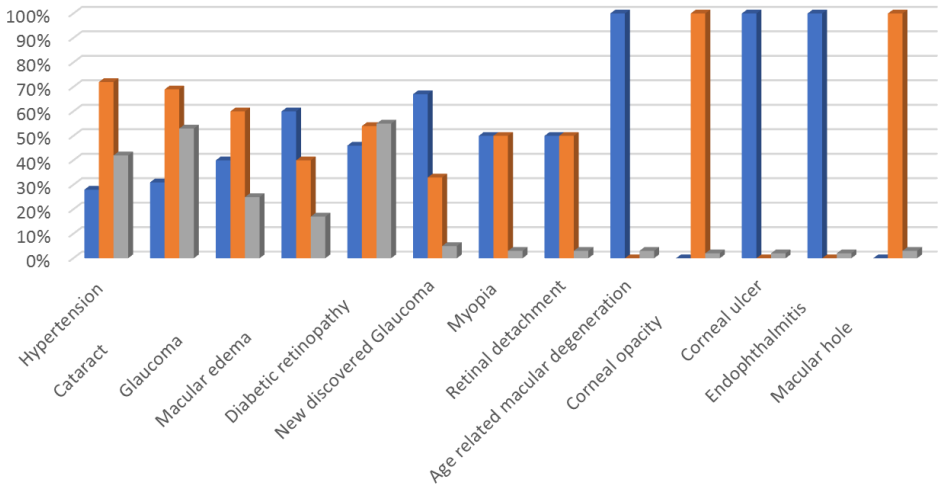

Figure 2. *Represents the proportion of causes of decreased vision by sex.*

The most affected age group in diabetic retinopathy was 60-70 years (33%), followed by >70 years (30%), <59 years (21%), and 65-70 years (16%). Cataracts were most common in the 65-70 age group (34%), followed by the 60-64 age group (28%) and the >70 age group (28%). The age group 9-59 years had 10%. The age group with the highest prevalence of hypertension was >70 years (36%), followed by 65-70 years, 60-64 years, and <59 years (32%, 20%, and 12%, respectively). In glaucoma, the group affection is as follows: (65-70 years), (>70 years), (40-64 years), and (>59 years), with (47%), (26%), (20%), and (7%) correspondingly. See Table 4, Figure 3.

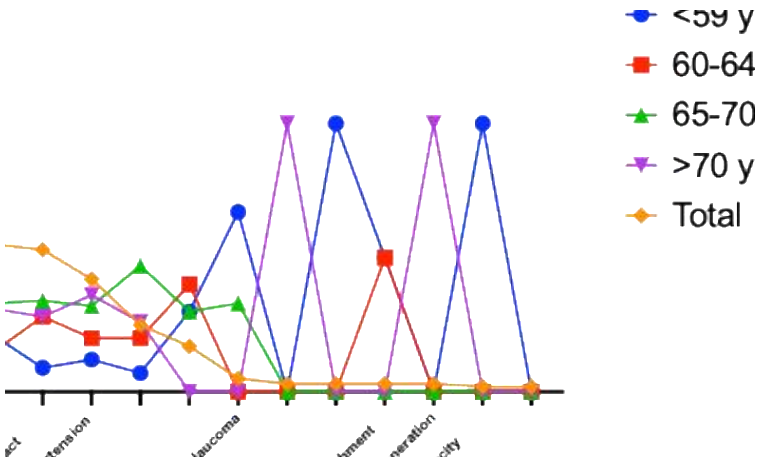

Figure 3. *Represents the distribution of causes of poor vision in diabetes according to age groups.*

Table 4. *Represents the distribution of causes of poor vision in diabetes according to age groups.*

Category	<59 years	60-64 years	65-70 years	>70 years	Total
Diabetic retinopathy	14	10	22	20	66
Cataract	6	18	22	18	64
Hypertension	6	10	16	18	50
Glaucoma	2	6	14	8	30
Macular edema	6	8	6	0	20
Newly discovered glaucoma	4	0	2	0	6
myopia	4	0	0	0	4

Category	<59 years	60-64 years	65-70 years	>70 years	Total
retinal detachment	2	2	0	0	4
Age related macular degeneration	0	0	0	4	4
Macular hole	0	0	0	3	3
Corneal opacity	2	0	0	0	2
Corneal ulcer	2	0	0	0	2
Endophthalmitis	0	0	0	2	2

4. Discussion

The prevalence of visual impairment constitutes a significant health concern in Sudan, especially among the female population. The results of the present study revealed that a significant proportion of the patients were female. Previous reports from Dongola, Sudan, indicated that the female percentage was 63.9, which is quite close to our observed figure of 58% [5]. The age group most significantly impacted is those aged 65 to 70 years, followed closely by individuals over 70 years, indicating a greater susceptibility among the elderly population. Regarding visual acuity, a significant proportion of patients exhibit visual acuity classified as hand motion to no light perception, accounting for 68%. Consequently, these individuals are predisposed to a greater incidence of complications associated with diabetes.

Diabetes represents a significant health issue on a global scale, influencing the economic stability of nations through its impact on workforce productivity and healthcare expenditures. A critical complication associated with diabetes is diabetic retinopathy, a microangiopathy that compromises the integrity of small blood vessels. In this study, diabetic retinopathy was identified as the primary factor contributing to diminished vision in diabetic patients, accounting for approximately 66 individuals (55%). The male-to-female ratio is approximately 0.8:1. A study conducted by Teo ZL and colleagues indicated that diabetic retinopathy is a prevalent complication of diabetes, significantly contributing to preventable blindness among young and working adults [6]. Cataracts significantly contribute to the deterioration of vision in individuals with diabetes. It was observed to impact 53% of the study population, with a pronounced effect on individuals aged over 60 years, accounting for 88% of those affected. There are multiple factors that contribute to the development of cataracts, including diabetes as a secondary cause and the natural process of aging.

Also, we find that there is a strong correlation between diabetes and hypertension in decreasing visual acuity, so hypertension is found in 42% of the study population. It was discovered that hypertension increases the activation of epithelial sodium channels, impacting the walls of blood vessels and extracellular vesicles, potentially exacerbating diabetes by worsening diabetic retinopathy [7]. Furthermore, the interplay between diabetes and hypertension contributes to ischemic damage, as both hypertension and hyperglycemia compromise the integrity of the neurovascular unit, ultimately leading to the deterioration of peripapillary microvasculature [8]. Glaucoma has been identified as a significant factor in the decline of vision among diabetic patients, occurring in 30% of cases, with a higher prevalence observed in females compared to males [9]. This study reveals that the relationship between diabetes and glaucoma is complex and contentious. It suggests that diabetes could exacerbate optic neuropathy, resulting in a decline in vision. Therefore, a more thorough and comprehensive investigation into this connection is warranted.

A systemic review and meta-analysis revealed that approximately 12% of patients with diabetic retinopathy also have glaucoma, which contributes to a reduction in visual acuity [10]. Macular issues were identified in 20 patients (16%), representing a significant contributor to diminished vision and visual impairment in individuals with diabetes [11]. This condition is serious and can manifest at any stage of diabetic retinopathy, necessitating prompt intervention to safeguard vision [12]. Additionally, myopia has been identified as a contributing factor to diminished vision in individuals with diabetes, accounting for 3.5%. One study revealed a correlation between myopia and diabetes, particularly among women [13]. Retinal detachment significantly impacts vision in individuals with diabetes and can result in persistent visual impairment. It refers to the separation of the neurosensory retina from the retinal pigment epithelium layer [14].

Abbreviations

DM	Diabetes Miletus
T1DM	Type 1 DM
T2DM	Type 2 DM

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Author Contributions

Khalil Ali Ibraheim is the sole author. The author read and approved the final manuscript.

Data Availability Statement

Data concerning this study are available from the corresponding author.

Conflicts of Interest

The author declares no conflict of interest.

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