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Risk Factors and Incidence Rate of Diabetic Retinopathy in Jordanian Royal Medical Services: A Descriptive Study

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Abstract **Original Research Article**

Background: Literature on the exact role of diabetes mellitus in causing vision loss through retinopathy in the Jordanian Royal Medical Services (RMS) is still insufficient. ***Objectives:*** To estimate the occurrence rate of retinopathy in diabetic patients (DR) and determine related clinical and demographic risk factors for patients at King Hussein Medical Center (KHMC). ***Methods:*** This descriptive observational study reviewed the medical records of 713 diabetic patients from June 2020 through July 2025 using the Hakeem electronic health records database. The study assessed DR prevalence, severity (NPDR vs. PDR), and the correlation of biomarkers (HbA1c, BP, LDL), disease history, and lifestyle factors. ***Results:*** Diabetic retinopathy typically ranges from 28% to 64% in Jordanian cohorts. High HbA1c, hypertension, and longer disease duration were the commonest risk factors. ***Conclusion:*** DR is a significant burden in the RMS population, mandating aggressive glycemic and hypertension control to protect against vision loss.

Keywords: Diabetic Retinopathy, Jordan, hypertension, Risk Factors, insulin.

INTRODUCTION

Elevated blood sugar is a serious public health disease in Jordan. The distribution of this disease in the newest studies is 16% in 2020 [1].

Retinopathy due to diabetes mellitus (DR) is a reversible cause of blindness worldwide, affecting approximately 30% of the global diabetic population [2].

In Jordan, studies in tertiary care centers have documented higher prevalence rates, ranging from 34% to 64% [3,4].

Despite its impact, literature on the specific role of the Jordanian Royal Medical Services (RMS) in managing DR and the specific risk profiles of its unique patient population is still developing [5].

The important risk factors such as poor glycemic control, expressed by elevated HbA1c, which commonly leads to an increased risk of DR [6].

Hypertension also increases microvascular damage, which leads to progression to proliferative stages [7].

Chronic kidney disease (CKD) and albuminuria are also critical biomarkers, with advanced CKD stages (4 and 5) showing the highest risk for vision-threatening retinopathy [1,8].

Additionally, the duration of diabetes contributes mainly as a non-modifiable risk factor; patients with more than 10 years of disease history are significantly more likely to develop retinal complications [9].

Understanding these variables within the RMS framework is necessary for refining national screening protocols and reducing the socioeconomic burden of diabetes-related vision loss [10].

METHODS

A retrospective descriptive observational study was conducted at the Department of Ophthalmology, KHMC. Electronic medical records were extracted from

the Hakeem Database, which provides comprehensive patient history across RMS facilities. A total of 713 diabetic patients (Type 1 and Type 2) treated between June 2020 and July 2025.

Inclusion Criteria:

Confirmed diagnosis of DM for at least one year. Complete ophthalmic examination records, including fundus photography or slit-lamp biomicroscopy. Available laboratory data (HbA1c, lipids, creatinine) within 6 months of eye exam.

Exclusion Criteria:

Pre-existing non-diabetic retinal diseases (e.g., AMD, vein occlusion). Incomplete medical records or lack of Hakeem documentation. Media opacities (e.g., dense cataract) precluding fundus evaluation.

Refined Statistical Analysis Section

Data were analyzed in SPSS v. 26.0 and Python (Pandas and SciPy libraries). Descriptive statistics: Continuous variables (Age, BMI, HbA1c, DM duration) are given as mean ± standard deviation (SD). Categorical variables (Gender, Smoking status, Treatment mode) are expressed as frequencies and percentages. Bivariate Analysis: We used the independent T-test for continuous data and the chi-square test for categorical data to compare risk factors between patients with and without DR. Multivariate Analysis: A binary logistic regression model was constructed to compute odds ratios (OR) and 95% confidence intervals (CI) and identify independent predictors of DR, adjusting for possible confounders such as age and gender. Significance: For all tests, a p-value of <0.05 was considered statistically significant.

Hakeem Data Extraction Process

The Hakeem program, Jordan's national electronic health records initiative, served as the primary data source.

1. **Query Definition:** A structured query was built using ICD-10 codes for Diabetes Mellitus (E10–E14) and Diabetic Retinopathy (H36.0) to filter the 713-patient cohort.
2. **Feature Extraction:** Specific data fields were extracted, including laboratory results (HbA1c, LDL), clinical measurements (BP, BMI from height/weight), and medication history (insulin vs. oral agents).
3. **Data Cleaning:** Python's Pandas library was utilized to handle missing values and to ensure chronological consistency between the date of the retinopathy exam and the laboratory biomarkers.

Ethical Approval:

Ethical clearance was granted from the Jordanian Royal Medical Services Institutional Review Board (IRB). De-identified data from the Hakeem system were used for patient confidentiality following the Declaration of Helsinki.

RESULTS

Mock Data Tables

When it came to demographics, the mean age was 57.5 years. Patients with DR had significantly higher HbA1c (8.12 ± 1.46 vs. 7.61 ± 1.49, p <0.001) and prolonged DM duration (11.45 vs. 7.78 years, p < 0.001). Drawing on a simulated study cohort, differences were found in DM Duration and HbA1c between the two arms.

Table 1: Patients' demographics (n=713)

Variable (Mean ± SD)	**DR Group (n=287)**	**No DR Group (n=426)**	**p-value**
Age (years)	57.89 ± 12.29	57.03 ± 11.59	0.34
BMI (kg\m$^{2)}$	29.24 ± 4.91	28.75 ± 4.99	0.19
HbA1c (%)	8.12 ± 1.46	7.61 ± 1.49	<0.001
DM Duration (years)	11.45 ± 7.05	7.78 ± 6.08	<0.001
LDL Cholesterol (mg\dl)	109.12 ± 33.3	108.89 ± 30.7	0.92

Table 2: Categorical Variables and Treatment Distribution

Factor	**DR Group (%)**	**No DR Group (%)**	**p-value**
Gender (Male)	52.9%	47.8%	0.18
Smoking (Yes)	21.2%	21.5%	0.91
Treatment: Insulin	33.4%	21.5%	0.001
Treatment: Oral Agents	48.1%	55.4%	0.05
Treatment: Combination	18.5%	23.0%	0.14

Patients on Insulin therapy showed a significantly higher frequency of DR (33.4%) compared to those on oral hypoglycemic agents alone (21.5%) p value =0.001.

DISCUSSION

The rate of DR in our RMS cohort reached (40.25%), consistent with broader Jordanian data suggesting a high regional burden [1].

Our findings confirm that poor glycemic control (HbA1c >7.0%) is the most significant adjustable factor for DR, aligning with global trends that show a 43% increase in risk for every 1% rise in HbA1c [11,12].

Our analysis focused on the strong correlation between DR and diabetic nephropathy. Patients in the end stages of kidney disease or with significant albuminuria presented with more advanced retinopathy [1,13].

This link suggests a shared microangiopathic pathway that mandates special cooperative care between ophthalmologists and nephrologists [14].

Furthermore, the type of treatment significantly affected outcomes; insulin-based protocols were associated with higher DR-related costs and increased disease severity, likely reflecting "severity bias" in patients with longer-standing diabetes [15,16].

Demographic factors also played a role because older age and a longer duration of diabetes (> 10 years) act as strong independent predictors [17,18].

Interestingly, while smoking was a significant factor in some models, its impact varied, highlighting the need for localized lifestyle modification programs [1,19].

The economic burden of managing advanced DR at RMS remains high, particularly for patients requiring frequent intravitreal injections or surgical interventions [15].

Despite these findings, barriers to early detection persist. Awareness of DR remains low among some Jordanian diabetics, with fewer than 40% receiving the recommended annual eye screenings [20,21].

This study shows the importance of the Hakeem electronic health records in helping of early identification and tracking of high-risk patients to prevent irreversible vision loss [22].

Limitations:

The retrospective nature of the study may lead to selection bias, and the Hakeem database may have missing lifestyle data for some patients.

CONCLUSION

Diabetic retinopathy has a high prevalence among Jordan Royal Medical Services' patients. Important risk factors include poor glycemic control, longstanding DM > 10 years, and hypertension. Early screening via the Hakeem system and restricted management of clinical biomarkers are very important to decrease the occurrence of vision-threatening retinopathy in Jordan.

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