

Original Research Article

STUDY OF PREVALENCE, RISK FACTORS AND AWARENESS OF DIABETIC RETINOPATHY AMONG DIABETIC PATIENTS ATTENDING AN EYE CLINIC IN SOUTH-WESTERN RAJASTHAN

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ABSTRACT

Background: Diabetic retinopathy is a major microvascular complication of diabetes mellitus and a leading cause of preventable blindness. Regional data from semi-arid zones like southwest Rajasthan remain scarce. **Aim:** The aim of this study is to estimate the prevalence, evaluate systemic risk factor, and determine clinical correlations of diabetic retinopathy (DR) among diabetic patients presenting to a tertiary eye clinic in south-western Rajasthan.

Materials and Methods: Institutional, observational cross-sectional study was conducted. A total of 2,150 diabetic patients aged over 40 years were evaluated between September 2017 and August 2018 at a tertiary ophthalmic institute. Comprehensive fundus evaluations were performed via dilated slit-lamp biomicroscopy (90D) and binocular indirect ophthalmoscopy (20D). DR staging followed ETDRS criteria. Modified and non-modified risk factors—including HbA1c, blood pressure, lipid profile, and renal metrics—were collected. **Statistical Analysis:** Descriptive metrics, relative risks (RR), Chi-square (χ^2), and Odds Ratios (OR) were analyzed using SPSS 16.0 ($P < 0.05$ considered significant).

Results: The overall prevalence of any DR was 11.4% (n=245). Staging revealed mild non-proliferative DR (NPDR) in 5.6%, moderate NPDR in 3.8%, severe NPDR in 1.8%, and proliferative DR (PDR) in 0.2%. Clinically significant macular edema (CSME) was present in 3.1% of the total cohort and 27.35% of the DR subgroup. DR correlated significantly with duration of diabetes ($P = 0.01$), systemic hypertension ($RR=1.4$, $P < 0.005$), nephropathy ($P = 0.0078$), and poor glycemic control ($HbA1c > 7\%$; $OR = 22.43$, $P < 0.01$). No significant correlations were noted for gender ($P > 0.5$), dyslipidemia ($P > 0.05$), or body mass index ($P > 0.05$).

Conclusions: While overall regional prevalence aligns with the baseline Indian average, local systemic controls remain inadequate. Strict glycemic monitoring, aggressive blood pressure management, and timely screening are crucial within this cohort.

Keywords: Clinically Significant Macular Edema, Diabetic Retinopathy, HbA1c, Hypertension, Microvascular Complications, Rajasthan.

INTRODUCTION

Diabetic retinopathy (DR) is a microvascular complication affecting nearly all type 1 diabetics and over 77% of type 2 diabetics surviving past two

decades with the disease. World Health Organization metrics attribute 4.8% of global blindness cases explicitly to advanced manifestations of retinopathy. Regionally, nationwide surveillance by the Indian Council of Medical Research places the overarching

urban and rural prevalence of diabetes between 5.3% and 13.6% across different Indian states. Despite national shifts, regional discrepancies persist. Data from the National Family Health Survey (NFHS-4) indicated that Rajasthan historically documented some of the lowest baseline public diabetes percentages nationwide. However, changing socio-demographics, transient lifestyles, and deep-seated knowledge deficits surrounding microvascular eye care expose these regions to unmonitored visual updates. Retinal damage often begins silently without visible fundus alterations before surfacing as severe non-proliferative or proliferative states. Identifying specific microvascular profiles within unique geographical sub-populations is essential to enhance ophthalmic care models. This study aims to characterize the prevalence and outline key modifiable and non-modifiable metabolic indicators governing DR in south-western Rajasthan.

MATERIALS AND METHODS

An institutional, observational cross-sectional study was conducted at the Global Hospital Institute of Ophthalmology (GHIO), Talhati, Abu Road, over a continuous 1-year window (September 2018 to August 2019). Institutional Ethics Committee on Human Subjects Research approval was secured, and valid informed written consent was documented for all study subjects prior to clinical evaluation. The primary target population encompassed 2,150 consecutive diabetic patients aged above 40 years presenting to the outpatient clinic. Sample size confirmations leveraged standard precision equations ($n = z^2 p(1-p)/d^2$) (n =desired sample size, Z = standard error of the mean, p =prevalence of condition being studied and d =precision which with p is determined, utilizing the baseline Indian prevalence assumption of 13.6%. This dictated a minimum enrollment threshold of 180 subjects, which our consecutive enrollment of 245 validated DR cases substantially exceeded. Inclusion criteria mandated all established cases of diabetes mellitus presenting to the ophthalmic clinics. Exclusion criteria involved severe ocular media opacities (e.g., advanced dense cataracts, corneal degenerations) precluding

complete visualization of the posterior pole, alongside confounding retinal disorders such as high pathological myopia, chorioretinitis, or age-related macular degeneration.

Comprehensive clinical check-ups involved visual acuity via Snellen visual charts, slit-lamp biomicroscopy, and bilateral fundus assessments. Retinal staging was done under full pupillary dilation via 90-diopter lens biomicroscopy and 20-diopter binocular indirect ophthalmoscopy. Retina was evaluated severity scales indexed subjects into mild NPDR, moderate NPDR, severe NPDR, PDR, or Clinically Significant Macular Edema (CSME) according to ETDRS paradigms. Modifiable and non-modifiable risk factors were also assessed Systemic markers define diabetes via standard criteria (HbA1c $\geq 6.5\%$ or fasting glucose ≥ 126 mg/dl). Systemic hypertension adhered to the JNC7 parameters (SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg or active anti-hypertensive medication usage). Obesity classifications mirrored standard WHO BMI parameters. Dyslipidemia was logged for serum cholesterol readings exceeding 240 mg/dL or triglycerides reaching ≥ 150 mg/dl. Nephropathy categorization was established via documented presence of micro- or macro-albuminuria. Statistical calculations utilized SPSS Version 16.0. Categorical trends were compared using the Chi-square (χ^2) analysis, risk assessments were estimated via Relative Risk (RR) or Odds Ratios (OR), and significance cutoffs were set firmly at $P < 0.05$.

RESULTS

Out of the 2,150 diabetic individuals screened, 245 patients were diagnosed with retinopathy, establishing an overall study prevalence of 11.4%. Staging distributions showed 5.6% ($n=121$) with mild NPDR, 3.8% ($n=81$) with moderate NPDR, 1.8% ($n=39$) with severe NPDR, and 0.2% ($n=4$) with active PDR. Concurrently, CSME affected 3.1% ($n=67$) of the complete screening volume, which translates to a striking 27.35% within the DR subgroup. Ocular distributions revealed unilateral clinical footprints in 14%, whereas 86% demonstrated bilateral disease.

The demographic and systemic risk metrics are summarized below

Table 1: Systemic Risk Factors and Ocular Correlations with Diabetic Retinopathy

Clinical Variable	DR Group (n=245)	Non-DR Group (n=1905)	Statistical Test / Metric	P-value / Significance
Age Group (Years)			χ^2 Trend Analysis	P = 0.01 (Significant)
* 40–49	11 (5.09%)	205 (94.91%)		
* 50–59	52 (8.50%)	560 (91.50%)		
* 60–69	81 (12.27%)	579 (87.73%)		
* 70–79	69 (14.31%)	413 (85.69%)		
* >79	32 (17.78%)	148 (82.22%)		
Gender			Chi-square	P > 0.5 (Not Significant)
* Male (n=1123)	133 (11.80%)	990 (88.20%)		
* Female (n=1027)	112 (10.60%)	915 (89.40%)		
Systemic Hypertension			Relative Risk	P < 0.005 (Significant)
* Present (n=95)	34 (13.70%)	61 (3.20%)	RR = 1.4	
* Absent (n=2055)	211 (86.30%)	1844 (96.80%)		

Glycemic Control (HbA1c)			Odds Ratio	P < 0.01 (Significant)
* Good ($\leq 7\%$, n=1128)	21 (7.18%)	1047 (92.82%)	OR = 22.43	
* Poor ($> 7\%$, n=722)	224 (31.02%)	498 (68.98%)		
Diabetic Nephropathy			Relative Risk	P = 0.0078 (Significant)
* Present (n=335)	49 (20.16%)	286 (15.00%)	RR = 1.35, $\chi^2 = 7.075$	
* Absent (n=1815)	196 (79.84%)	1619 (85.00%)		
Dyslipidemia			Chi-square	P = 0.1206 (Not Significant)
* Present (n=323)	41 (16.93%)	282 (14.80%)	RR = 1.13, $\chi^2 = 2.410$	
* Absent (n=1827)	204 (83.07%)	1623 (85.20%)		
Body Mass Index (BMI)			Chi-square	P > 0.05 (Not Significant)
* Underweight (<18.5 , n=67)	3 (4.48%)	64 (95.52%)	Highest prevalence	
* Normal (18.5--24.9, n=1082)	116 (10.72%)	966 (89.28%)	observed in	
* Overweight (25--29.9, n=664)	76 (11.45%)	588 (88.55%)	overweight subset	
* Obese (≥ 30 , n=337)	31 (9.20%)	306 (90.80%)	(11.45%)	

Disease duration analysis confirmed a strong, sequential expansion of retinopathy prevalence. Retinopathy values increased from a minimum baseline of 4.02% in individuals dealing with diabetes for under 5 years, climbing steadily to 7.10% (6–10 years), 10.56% (11–15 years), 16.96% (16–20 years), 20.90% (21–25 years), and peaking at 26.50% in chronic profiles exceeding a 25-year history ($P = 0.01$). Urban-rural residential mapping, showed that 54% (n=132) of patients were from urban zones, while rural regions accounted for 46% (n=113) of the DR sample.

DISCUSSION

Our investigation reveals an overall DR prevalence of 11.4% among diabetic individuals seeking specialized eye care across south-western Rajasthan. This core regional figure tracks adjacent to standard domestic clinical estimations, such as rural South Indian projections (10.3%) reported by Raman et al and general urban baseline data from Nepal (9.9%) outlined by Mishra et al . However, it remains below the landmark Chennai Urban Rural Epidemiology Study (CURES) metrics, which calculated a prominent 17.6% urban prevalence rate. This difference likely stems from lower regional systemic profiles combined with specific local dynamics, including a large proportion of transient rural nomads who face structural challenges in accessing regular medical follow-ups.

Our multivariable data highlights that poor glycemic management (HbA1c $> 7\%$) functions as a massive driver of microvascular outcomes, showing a high odds ratio of 22.43. This confirms findings from the classic UKPDS and DCCT clinical trials, where strict improvements in long-term metabolic HbA1c metrics produced a 25% drop in microvascular microaneurysm extensions. Clinically, systemic hypertension demonstrated a robust statistical association ($P < 0.005$) and expanded risks (RR=1.4), matching observations by Olafsdottir et al. in Sweden, which emphasized that non-glycemic factors require dedicated, parallel treatment to limit vision loss.

Furthermore, our results show a clear link between retinopathy and diabetic nephropathy ($P = 0.0078$), supporting the well-documented pathophysiological axis connecting systemic capillary basement membranes in both renal glomeruli and retinal structures. Similar to findings by Zhang et al. in Shanghai, the duration of diabetes proved to be a highly predictable predictor of disease progression. The prevalence of DR rose steadily, peaking at 26.50% in patients with a history of diabetes exceeding 25 years.

Interestingly, variations in gender, body mass index, and dyslipidemia did not reach statistical significance in this study population. This lack of association matches clinical reports by Shrote et al , suggesting that while obesity and lipid profiles can influence individual vessel wall health, they do not consistently correlate with macro-level retinopathy scales across diverse patient cohorts. The high rate of clinically significant macular edema (27.35%) among our DR patients highlights a serious public health concern, emphasizing the need for targeted vision-saving interventions in south-western Rajasthan. A primary limitation of this study is its single-center cross-sectional design, which naturally limits the ability to establish definitive temporal relationships between metabolic changes and retinal outcomes over time. Additionally, because this was a clinic-based sample rather than a door-to-door community survey, it may reflect a degree of referral bias.

CONCLUSION

In conclusion, the prevalence of diabetic retinopathy in south-western Rajasthan stands at 11.4%, with long-term diabetes duration, systemic hypertension, poor glycemic control (HbA1c $> 7\%$), and concurrent renal disease serving as the strongest clinical risk factors. These findings highlight the clear need for integrated medical care models that combine strict metabolic control with systematic, dilated retinal screenings to prevent irreversible visual impairment in this population.

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