ABSTRACT

Title of Abstract : Survival Analysis of Diabetic Retinopathy Among Type 2 Diabetic Patients: A Systematic Review

Authors of Abstract : Muhammad Muaz Shahriman Teruna1, Tajul Rosli Razak2, Siti Munira Yasin1, Abdullah Ashraf Rafique Ali3, Mohamad Rodi Isa1

Affiliation : Others

Correspondence E-mail : rodi@uitm.edu.my

Background : Diabetic retinopathy (DR) is a major preventable microvascular complication of type 2 diabetes mellitus (T2DM) and a leading cause of visual impairment. Understanding survival time to DR onset and its modifiable predictors is essential for optimizing screening and management. This review synthesizes recent cohort and observational evidence on DR incidence, progression, and prognostic factors in adults with T2DM.

Objective : This study aims to systematically review survival time to the onset or progression of diabetic retinopathy in adults with type 2 diabetes mellitus, evaluate prognostic factors influencing retinopathy-free survival, and compare survival patterns across populations and study designs to inform future prognostic models and prevention strategies.

Research Methods/ Implementation Methods : A systematic search was conducted for articles published between 2016 and 2025 across major databases including PubMed, Scopus, ScienceDirect, and the Cochrane Library. Studies were included if they applied longitudinal, cohort, or survival analysis methods to assess the risk or progression of DR among T2DM patients. Seventeen eligible studies were identified, covering diverse populations across Asia and Europe. Data were extracted on study design, sample size, follow-up duration, key predictors, and outcomes. Findings were synthesized narratively due to heterogeneity in statistical models and outcome definitions.

Results : Across the included studies, the cumulative incidence of DR ranged from 8% to 42% over follow-up periods of 3 to 15 years. Significant predictors of DR onset and progression included poor glycaemic control (HbA1c $\geq$ 7.5%), longer diabetes duration, hypertension, dyslipidaemia, and obesity indices. Novel biomarkers such as the glycaemic risk index (GRI), neutrophil-to-lymphocyte ratio, and vitamin D deficiency demonstrated emerging prognostic potential. Conversely, metformin use and higher physical activity levels were protective against DR development. Time-to-event analyses revealed that patients maintaining a tight glycaemic range (3.9–7.8 mmol/L) and regular physical activity exhibited longer DR-free survival. Geographic variations were observed, with higher incidence reported in East and Southeast Asian cohorts compared to European populations.

Conclusion/Lesson Learned : This systematic review highlights the multifactorial determinants influencing the survival and progression of diabetic retinopathy among individuals with T2DM. Glycaemic variability, metabolic dysregulation, and inflammatory markers remain strong predictors of reduced DR-free survival, while lifestyle modification and pharmacological control confer protective benefits. These findings underscore the importance of integrated, longitudinal monitoring and early preventive strategies in diabetic eye care. Future survival models should incorporate composite risk indices and real-world data to improve prediction accuracy and clinical applicability.

keyword : Diabetic retinopathy, Type 2 diabetes mellitus, Survival analysis, Prognostic factors, Cohort studies, Glycaemic control.