Clinical Ophthalmology

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Depression and Associated Factors Among Diabetic Patients Undergoing Diabetic Retinopathy Assessments at a Tertiary Care Center: A Cross-Sectional Study

Phit Upaphong[1], Janejit Choovuthayakorn[1], Jirachaya Choovuthayakorn[1], Phichayut Phinyo[2,3], Direk Patikulsila[1], Onnisa Nanegrungsunk[1], Voraporn Chaikitmongkol[1], Paradee Kunavisarut[1], Atitaya Apivatthakakul[1], Nahathai Wongpakaran[4], Tinakon Wongpakaran[4]

[1]Department of Ophthalmology, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand; [2]Clinical Epidemiology and Clinical Statistics Center, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand; [3]Department of Biomedical Informatics and Clinical Epidemiology (Bioce), Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand; [4]Department of Psychiatry, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

Correspondence: Janejit Choovuthayakorn, Department of Ophthalmology, Faculty of Medicine, 110 Intavaroros Road, Muang, Chiang Mai, 50200, Thailand, Email janejit.c@cmu.ac.th

Clinical Ophthalmology downloaded from https://www.dovepress.com/
For personal use only.

Purpose: To explore the prevalence of depression and its associated factors among diabetic patients attending the retina unit at Chiang Mai University Hospital for diabetic retinopathy (DR) or diabetic macular edema (DME) screening and/or treatment.

Patients and Methods: This cross-sectional study recruited consecutive diabetic patients scheduled for ophthalmic evaluations between July 1, 2022, and January 31, 2023. Participants completed in-person interviews to provide demographic information, medical history, and mental health status. Depression severity was assessed using the Outcome Inventory-21, while vision-related quality of life (VRQoL) was measured with the National Eye Institute Visual Functioning Questionnaire-25 (NEI VFQ-25). Ocular characteristics were extracted from medical records. The primary outcomes included the prevalence of depression and its association with VRQoL, anxiety, visual acuity, and DR/DME severity.

Results: A total of 304 diabetic patients participated, with 55.6% (n = 169) being male. The mean (standard deviation, SD) age was 56.3 (11.4) years, and the mean (SD) visual acuity (VA) in the better-seeing eye was 0.4 (0.3) LogMAR. Bilateral proliferative DR and bilateral center-involved DME were observed in 50.6% and 18.4% of participants, respectively. The mean (SD) composite score for the NEI VFQ-25 was 79.3 (18.1), with the color vision subscale showing the highest score at 93.3 (18.3). Depression was identified in 11 patients (3.6%, 95% confidence interval: 2.0 to 6.4%). Multivariable linear regression revealed that lower VRQoL and higher anxiety levels were significantly associated with depressive symptoms, while no significant correlation was found with VA or DR/DME severity.

Conclusion: VRQoL and anxiety levels are key factors associated with depression in diabetic patients with DR/DME, with VRQoL exhibiting a stronger association than VA. Incorporating patient-reported outcome measures into clinical care may enhance mental health assessment and overall healthcare quality, enabling earlier detection of depression risk among diabetic patients and supporting timely intervention.

Plain Language Summary: Diabetic eye diseases like DR and DME can affect vision and make daily life more difficult, but their impact is not just physical—it can affect mental health too. This study showed that people who felt their vision problems were interfering with daily life and had higher anxiety were more likely to be depressed, no matter how severe their actual eye condition was. This shows why we need to focus on mental health as part of diabetic eye care. Regular screening for depression and anxiety could help improve both well-being and treatment outcomes.

Keywords: depressive symptoms, mental distress, psychological burden, quality of life, retinal disease, visual-related function

Received: 20 March 2025
Accepted: 29 May 2025
Published: 5 June 2025

© 2025 Upaphong et al. This work is published and licensed by Dove Medical Press Limited. The full terms of this license are available at https://www.dovepress.com/terms.php and incorporate the Creative Commons Attribution – Non Commercial (unported, v4.0) License (http://creativecommons.org/licenses/by-nc/4.0/). By accessing the work you hereby accept the Terms. Non-commercial uses of the work are permitted without any further permission from Dove Medical Press Limited, provided the work is properly attributed. For permission for commercial use of this work, please see paragraphs 4.2 and 5 of our Terms (https://www.dovepress.com/terms.php).

Introduction

The prevalence of diabetes mellitus (DM) has consistently increased over the years, reflecting changes in socioeconomic conditions and lifestyle habits among various populations. This trend is supported by findings from a recent systematic review, which projected a significant growth in the number of individuals aged 18 to 99 living with DM, rising from 451 million in 2017 to an estimated 693 million by 2045.[1] Diabetic retinopathy (DR) represents one of the significant microvascular complications of DM, presenting in various levels of severity and leading to a spectrum of visual impairments. A comprehensive analysis of data from 32 studies assessing DM patients between 2015 and 2019 indicated that 27% of this patient cohort developed DR, while 4.6% experienced diabetic macular edema (DME).[2]

The Vision Loss Expert Group underscored the public health implications of DR. Their analysis of trends in major vision-impairing conditions emphasized that from 1990 to 2020, the age-adjusted prevalence of blindness due to DR significantly increased across multiple regions.[3] To reduce the risk of visual impairment, patients with diabetes have to engage in long-term strategies to maintain optimal blood glucose levels, effectively manage associated systemic conditions, undergo regular eye examinations, and adhere to prescribed ocular treatments. Previous research found that numerous DM/DR patients experienced psychological distress and reduced vision-related quality of life (VRQoL) which reflect the perceived influence of visual function on well-being and daily activities through standardized measures such as the National Eye Institute Visual Function Questionnaire-25 (NEI VFQ-25). Reported depression prevalence among DR patients ranged from 7% to 56%.[4–7] Some studies suggested a bidirectional relationship, wherein psychological distress may hinder glycemic control through poor self-care practices, reduced medication adherence, unhealthy dietary choices, and lack of exercise. This, in turn, could lead to frequent episodes of hypo- or hyperglycemia, thereby increasing the risk of developing DR and further decreasing VRQoL.[6,8–14] The intricate interplay between mental health and VRQoL in patients with DR/DME is also influenced by various factors, including racial and cultural backgrounds, lifestyle behaviors, and the accessibility and affordability of healthcare services.[7,15–21]

Previous studies explored multiple demographic and ocular risk factors associated with depression in diabetic patients, including gender, socioeconomic status, educational background, comorbidities, history of depression, visual acuity (VA), DR severity, history of laser treatment, and VRQoL. However, the associations between VA and depression, as well as DR severity and depression were inconsistent.[6,15,16,18] Furthermore, recent advances in DR/DME diagnosis and treatment, including fundus cameras, tele-screening, intravitreal anti-VEGF injections, and microincisional vitrectomy systems, have significantly improved patient management and improving VRQoL.[22–25] Despite substantial advancements in clinical management of DR/DME, the extent to which these innovations impact patients' psychological well-being remains insufficiently understood.

This study aimed to estimate the prevalence of depression and examine its association with demographic, clinical, and psychosocial variables among diabetic patients undergoing DR/DME assessment at a tertiary ophthalmology center. The results of this study may provide essential insights into this particular patient population and assist clinicians in delivering more appropriate and effective care to these individuals.

Materials and Methods

This cross-sectional study was approved by the Research Ethics Committee of Chiang Mai University Hospital, Faculty of Medicine, Thailand (Study Code: OPT-2565-08988). All procedures complied with the principles of the Declaration of Helsinki. To ensure patient confidentiality, data were collected using Microsoft Excel spreadsheets and anonymized afterward.

The study included consecutive individuals with diabetes who attended scheduled appointments at the outpatient retina unit from July 1, 2022, to January 31, 2023. Eligible participants were those diagnosed with either type 1 or type 2 diabetes for at least 6 months and aged over 20 years. Research assistants not involved in clinical care approached potential participants to explain the study's purpose and the face-to-face interview process. Written informed consent was obtained from all participants before the study began. Participants with additional eye conditions potentially affecting VA assessment were excluded. These conditions included glaucoma, corneal opacities, significant cataracts, uveitis, retinal or macular diseases, previous eye trauma, and prior pars plana vitrectomy (PPV) for reasons unrelated to diabetic

retinopathy. Additionally, individuals with cognitive impairments, hearing issues, or a history of schizophrenia or bipolar disorder (regardless of concurrent antipsychotic medication use) were also excluded.

Prior to the clinical assessment by physicians, one-on-one interviews were conducted to gather sociodemographic data, including age, gender, duration of diabetes, education level, marital status, living conditions, employment status, income level, insulin use, self-reported coexisting systemic diseases, previous DR treatments, and any history of psychological distress. Following these interviews, Snellen VA was measured at a distance of 6 meters using the Early Treatment Diabetic Retinopathy Study (ETDRS) numerical chart. The best-corrected visual acuity (BCVA) was determined based on the vision achieved with either a pinhole or the subject's refractive correction. For each participant, the eye with better visual acuity than the fellow eye by one Snellen line was designated as the better-seeing eye (BSE). If both eyes had equal vision, the right eye was selected as the better eye.

The on-duty clinical staff performed comprehensive ophthalmic examinations, including an anterior segment assessment with slit-lamp biomicroscopy and posterior segment evaluation with a 78-diopter lens. Diabetic retinopathy (DR) severity was categorized according to the international clinical diabetic retinopathy severity scale, which includes no DR, non-proliferative diabetic retinopathy (NPDR)—further divided into mild, moderate, and severe stages—and proliferative diabetic retinopathy (PDR).[26] Wide-field fundus photographs were taken using the Clarus 500™ imaging system from Carl Zeiss Meditec Inc., California, USA.[26] DME was evaluated using spectral-domain optical coherence tomography (SD-OCT) scans from the Spectralis system (Heidelberg Engineering, Heidelberg, Germany). These scans classified the central macular region into 3 categories: no DME, non-center-involving DME (non-CI DME), defined as macular thickening that does not impact the area within a 1,000 μm diameter circle centered on the fovea, and center-involving DME (CI-DME), defined as macular thickening greater than 315 μm in females and 320 μm in males, affecting the area within the 1,000 μm diameter circle centered on the fovea.[27] The presence of DR and DME, as documented in medical records, was evaluated and confirmed by a retinal specialist (JC) by reviewing of fundus photographs and optical coherence tomography (OCT) images.

Psychological Status and Quality of Life Assessment

Trained personnel conducted psychological and quality of life assessments using Thai-language questionnaires, including the Outcome Inventory-21 (OI-21) and the National Eye Institute Visual Functioning Questionnaire-25 (NEI VFQ-25). The order of psychological assessments was randomized using a computer program. The OI-21 consisted of 21 self-reported items that measure four subscales: depression (5 items), anxiety (6 items), somatization (6 items), and interpersonal difficulty (4 items). Each item was scored on a 5-point Likert scale, from 0 (never) to 4 (almost always), with higher scores reflecting greater symptom severity. Wongpakaran et al previously validated the validity and reliability of this instrument. The OI-21 demonstrated a Cronbach's alpha of 0.92 overall, with sub-scale alphas of 0.80 for interpersonal difficulty, 0.82 for anxiety, 0.80 for somatization, and 0.87 for depression.[28]

The NEI VFQ-25, used to assess VRQoL, includes 25 vision-specific items covering 11 subscales—general vision, near activities, distance activities, social functioning, mental health, role difficulties, dependency, driving, color vision, peripheral vision, and ocular pain—along with an additional item on general health. Each item is rated from zero (indicating poor functioning) to one hundred (indicating optimal functioning). Subscale scores are calculated by averaging the scores of items within each subscale, and the overall vision composite score is derived from the average of the eleven vision-targeted subscale scores, excluding general health. Higher scores indicated better visual function.[29] The Thai version of the NEI-VFQ-25 showed good psychometric performance, showing high internal consistency (Cronbach's alpha = 0.80) and reliable test–retest results, along with strong content validity (index = 0.84).[30]

In this study, NEI VFQ-25 scores were converted to a consistent logit scale using the Excel algorithm developed by Goldstein et al.[31] This algorithm employs pre-calibrated Rasch-assigned item measures (indicating item difficulty) to transform raw scores from individual NEI VFQ-25 items, excluding the general health and eyesight quality items, into a single estimated perceived person measure. On this adjusted logit scale, higher positive scores reflect an improved reported visual function.[31]

Patients identified with mental health concerns through the questionnaires were subsequently referred to expert psychologists (T.W. and N.W.) for comprehensive evaluation and management.

Statistical Analysis

Baseline variables were summarized as mean (standard deviation, SD) for continuous data and as percentages for categorical data. A multivariable linear regression was used to assess the influence of demographics, clinical characteristics, VRQoL, and psychosocial factors on depression. Visual acuity was converted from the Snellen scale to the Logarithmic Minimum Angle of Resolution (LogMAR) for the purpose of statistical analysis. The potential independent variables included age, gender, educational level, living situation, comorbid conditions, mental health status, bilateral eye vision, severity of DR or DME, and prior treatments for DR or DME. The Rasch-transformed NEI VFQ-25 person measures were incorporated into the multivariable linear models for analysis. Additionally, multicollinearity was assessed by calculating variance inflation factors (VIFs). To handle missing person measure data that could not be converted from VFQ-25 in extreme cases, a multiple imputation approach was applied. All data analyses were performed using the STATA software, with statistical significance set at a p-value of less than 0.05.

Based on the study by Poongothai et al,[9] assuming a 27% prevalence of depression in the population (averaged from diabetic patients with and without DR), the study required a sample size of 303 for estimating the expected proportion with 5% absolute precision and 95% confidence.

Results

This study included 304 diabetic patients with a mean (SD) age of 56.3 (11.4) years. Among these participants, 169 (55.6%) were male, and the majority, 287 (94.4%), were diagnosed with type II diabetes mellitus. The mean (SD) duration of diabetes among patients was 11.5 (8.5) years. Table 1 presents the demographics and socioeconomic data of the study population. Regarding ocular characteristics, the mean (SD) VA of 0.4 (0.3) LogMAR units (Snellen equivalent 20/50) in BSE and 0.8 (0.7) LogMAR units (Snellen equivalent 20/125) in worse-seeing eyes. Approximately half of the patients (154, 50.6%) had bilateral PDR. Additionally, one-fifth of the patients (56, 18.4%) exhibited bilateral CI-DME, and 12 (3.9%) had undergone bilateral PPV. Detailed ocular characteristics are provided in Table 2.

The Mental Health Status and Vision Related Quality of Life

Regarding psychosocial well-being, participants had a mean (SD) OI depression score of 1.2 (2.3). A total of 11 patients (3.6%, 95% confidence interval (CI) 2.0 to 6.4%) showed significant depressive symptoms, defined by an OI depression score of ≥7. The mean (SD) scores for anxiety, somatization, and interpersonal difficulties were 2.6 (3.1), 4.2 (3.3), and 1.4 (1.9), respectively.

For vision-related quality of life, the patients had a mean (SD) NEI VFQ-25 composite score of 79.3 (18.1). Among the eleven vision subscales, the general vision subscale had the lowest mean (SD) score at 63.4 (14.1), while the color vision subscale had the highest mean (SD) score at 93.3 (18.3). Figure 1 and Supplement Table 1 provide detailed scores for all

Table 1 Demographic and Socioeconomic Information of Study Patients

Patients' Characteristics (N = 304)	
Mean (SD) age, year	56.3 (11.4)
Female, n (%)	169 (55.6)
DM type II, n (%)	287 (94.4)
Mean (SD) duration of diabetes, year	11.5 (8.5)
Mean (SD) HbA1c, %[a]	7.8 (2.0)
Education level, n (%)	
Primary school and lower	137 (45.1)
Secondary school	62 (20.4)
Post-secondary education	105 (34.5)

(*Continued*)

Table 1 (Continued).

Patients' Characteristics (N = 304)	
Marital status, n (%)	
Single	65 (21.4)
Married and living together	191 (62.8)
Widowed/separated/divorced	48 (15.8)
Living alone, n (%)	31 (10.2)
Income status per month, n (%)	
<10,000 Baht	186 (61.2)
≥10,000 Baht	118 (38.8)
Number of coexisting systemic diseases, n (%)	
<2	100 (32.9)
≥2	204 (67.1)

Note: [a]Data was missing for 62 (20.39%) patients.
Abbreviations: HbA1c, glycosylated hemoglobin; SD, standard deviation.

Table 2 Ocular Characteristics of Study Patients

Characteristics (N = 304 Eyes)	
Visual acuity, n (%)[a]	
6/12 and better	120 (39.5)
6/18 to 6/60	171 (56.2)
Less than 6/60	13 (4.3)
DR classification, n (%)	
None/none, none/NPDR	62 (20.4)
NPDR/NPDR	58 (19.1)
NPDR/PDR	30 (9.9)
PDR/PDR	154 (50.6)
Having CI-DME, n (%)	
In at least one eye	102 (33.55)
History of receiving PRP, n (%)	
In at least one eye	157 (51.65)
History of undergoing PPV, n (%)	
In at least one eye	65 (21.38)
Receiving an intravitreal injection of anti-VEGF, n (%)	
In at least one eye	171 (56.25)

Note: [a]better-seeing eye.
Abbreviations: Anti-VEGF, anti-vascular endothelial growth factor; BCVA, CI-DME, center-involved diabetic macular edema; DR, diabetic retinopathy; NPDR, non-proliferative diabetic retinopathy; PDR, proliferative diabetic retinopathy; PPV, pars plana vitrectomy; PRP, panretinal photocoagulation.

https://doi.org/10.2147/OPTH.S524850

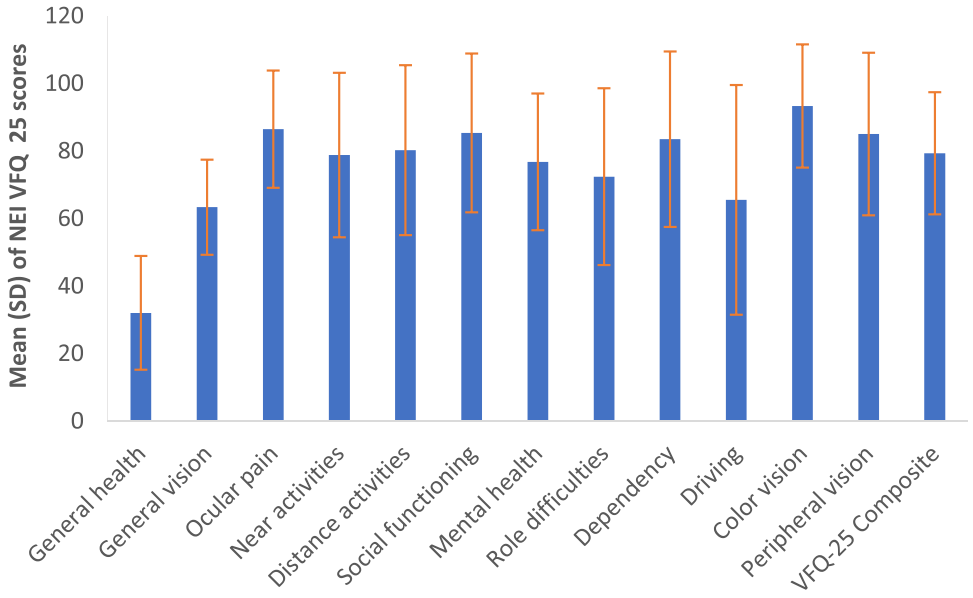

Figure 1 Mean and standard deviation for each subscale of the National Eye Institute Visual Functioning Questionnaire-25 (NEI-VFQ).
Abbreviations: SD, standard deviation; VFQ-25, Visual Functioning Questionnaire-25.

NEI VFQ subscales. A significant correlation was observed when the NEI VFQ-25 score was converted to person measures (Pearson's correlation coefficient = 0.955), with a mean (SD) person measure of 2.8 (2.2) logits. Supplement Figure 1 shows the robust positive correlation between NEI VFQ-25 composite scores and estimated person measures.

In the exploratory multivariable linear regression analysis, depression was significantly associated with both VRQoL (coefficient −0.124, 95% CI −0.232 to −0.017) and anxiety levels (coefficient 0.045, 95% CI 0.030 to 0.059). These findings suggest that patients with reduced VRQoL and increased anxiety were more likely to experience depressive symptoms, while no significant association was observed with VA or DR/DME severity (Figure 2). VIFs for all covariates, except anxiety score and its quadratic term, were <5, suggesting that multicollinearity was not a concern. A non-linear association between depression and anxiety was identified (Figure 3) after adjusting for age, gender, education, living conditions, income, comorbidities, and diabetes duration.

Discussion

This study revealed that 4% of diabetic patients visiting the retina unit at this tertiary center experience depression. The results also showed a significant association between depression and two parameters: anxiety levels and VRQoL. Interestingly, objective clinical measures including VA and the severity of DR did not have a significant impact on depression. These findings suggested the importance of incorporating both clinical insights and patient-reported VRQoL assessments to guide treatment strategies for this population.

Hyperglycemia could initiate a cascade of physiological changes that subsequently lead to various ocular complications.[32,33] Individuals with DR or DME were at increased risk for vision impairment, psychological distress, and reduced VRQoL. Evidence also suggested that delayed or inadequate management of DR could contribute to increased healthcare burden, particularly in populations facing psychosocial challenges.[34] However, the interrelationships between these factors were complex and varied across publications. In this study, which involved in-person interviews, a lower proportion of diabetic patients undergoing DR/DME screening or treatment experienced depression compared to prior studies, which showed rates ranging from 7% to 56%.[4–7] Different methods of depression screening could yield varying detection rates. This effect was demonstrated in a pragmatic clinical trial conducted in an outpatient internal medicine setting, where screenings by medical assistants during in-person visits identified fewer cases of depression compared to those conducted through an online population portal.[35] Additionally, previous research showed that diabetic patients with mental health conditions, such as depression, were less likely to engage in diabetes treatments or attend

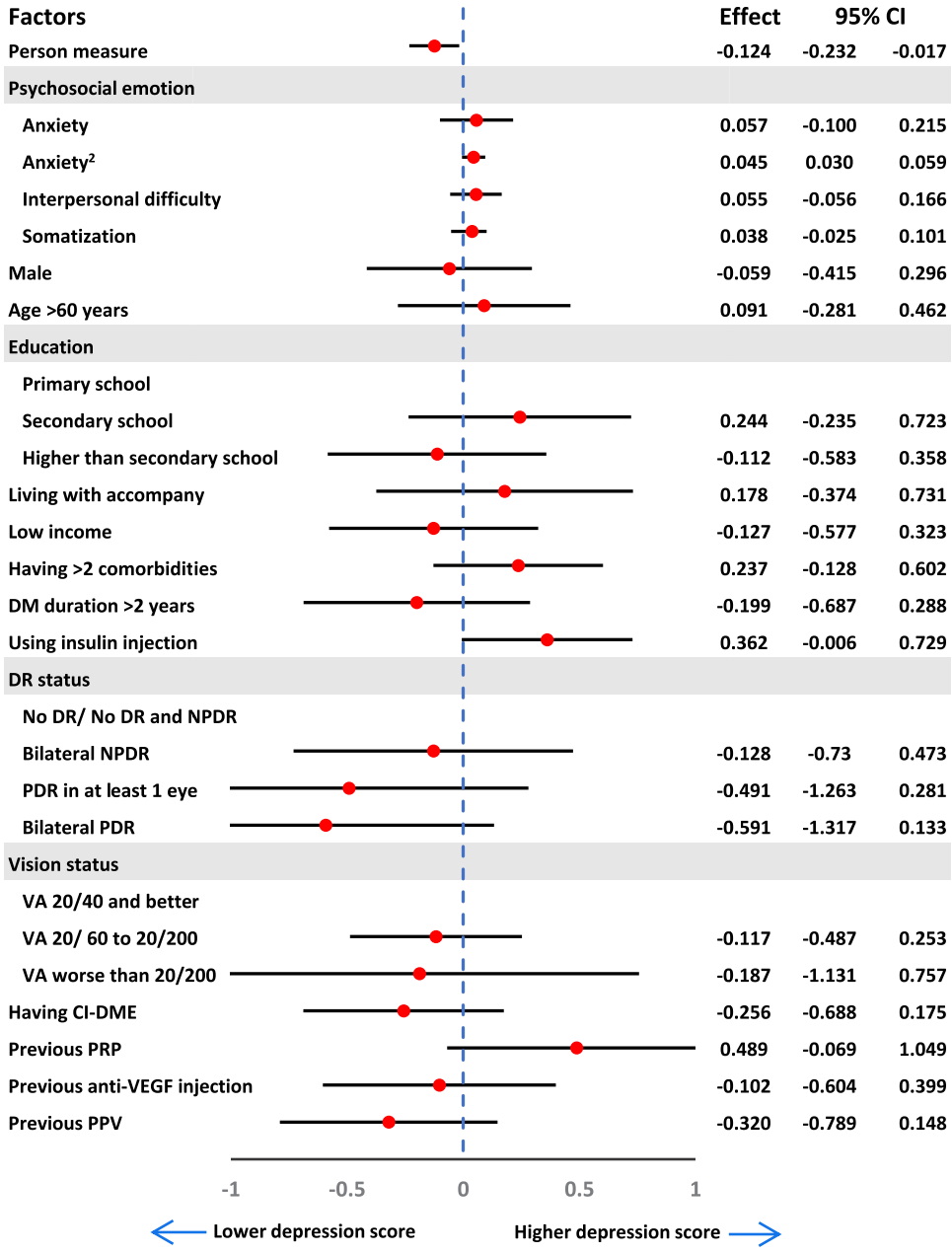

Figure 2 Coefficient plot, derived from multivariable linear regression, illustrating the effects of each factor on Outcome Inventory (OI) depression score. The red dot represents the point estimate, and the solid horizontal black line represents the 95% confidence interval. To account for the curvilinear relationship between anxiety and the outcome variable, we included a quadratic term (Anxiety²) in the model, as the relationship did not follow a simple linear pattern.
Abbreviations: CI, confidence interval; CI-DME, center-involving diabetic macular edema; DM, diabetes mellitus; DR, diabetic retinopathy; NPDR, non-proliferative diabetic retinopathy; PPV, pars plana vitrectomy; PRP, panretinal photocoagulation; VA, visual acuity; VEGF, vascular endothelial growth factor.

appointments, including eye examinations.[36,37] The prevalence of depression within a population might also fluctuate based on study timing, healthcare accessibility, and advancements in DR and DME treatments. Given these factors, this study might underestimate the true prevalence of depression among diabetic patients. Nonetheless, this study emphasized the importance of incorporating mental health screenings into routine care for DR/DME patients, providing valuable insights for optimizing comprehensive care plans.

Studies on depression and associated factors among diabetic patients were conducted across diverse settings. Several demographic features (such as gender, socioeconomic and income status, educational level, other systemic comorbidities, and history of depression) and ocular characteristics (such as VA, DR severity, laser treatment history, and VRQoL) were

https://doi.org/10.2147/OPTH.S524850

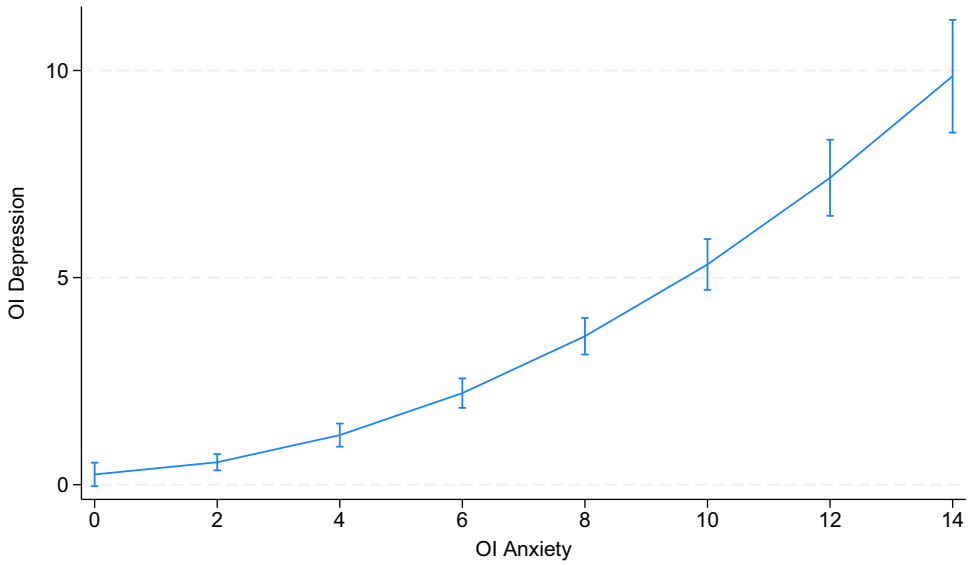

Figure 3 Association between the Outcome Inventory (OI) anxiety score and the overall OI depression score.
Abbreviation: OI, outcome inventory.

found to be associated factors.[6,15] VA and/or visual impairment level were variably associated with depression as an independent risk factor. This might be due to the varying definitions of visual impairment across studies, which included objective assessments of binocular vision, self-reported binocular vision, vision in the BSE, and vision in the WSE.[6,15,38] In this study, VA in the BSE was not found to be a significant independent predictor of depression. While VA and DR severity measured physical impairment, they did not reflect how patients experience vision loss in daily life. In our study, depression was more closely associated with emotional and functional struggles than to clinical severity. VRQoL measured by the NEI VFQ-25 questionnaire showed such an association. VRQoL reflected the impact of vision loss on daily life, social interactions, and emotional well-being. Low VRQoL could lead to feelings of helplessness and depression. Moreover, functional decline could contribute to depression, even when clinical measures remained stable. This might be due to the limitations of best-corrected visual acuity (BCVA), which, although effective for assessing central vision and overall visual function, fails to capture other crucial aspects relevant to daily life, such as contrast sensitivity, glare tolerance, and peripheral vision. As a result, VA testing alone might not fully reflect patients' subjective visual experience or their risk for depression, whereas VRQoL might provide these insights.

Previous studies also found conflicting results about the relationship between DR severity and depression. Some studies showed no correlation between retinal microvascular abnormalities and depressive symptoms, while others reported an increased prevalence of depression in more advanced stages of DR.[6,16,39] This study found that neither the severity of DR nor DME associated with depression in patients with DR. Despite this finding, a recent study indicated that blindness remains the primary concern of diabetic complications among DR patients.[40] Greater awareness of DR, along with advancements in monitoring and treatment, might impact stress, depression, and VRQoL in patients with DR. The use of fundus cameras and tele-screening systems facilitated early detection, enabling timely intervention. Furthermore, innovative therapies such as intravitreal anti-VEGF injections and microincisional vitrectomy systems revolutionized DR/DME management, potentially improving patient outcomes.[22–25] Advancements in diagnosing and treating diabetic eye complications could significantly improve VRQoL and lessen psychological distress in affected individuals.[41] However, perceptions and concerns about health issues and improvements varied widely, even among culturally and socially similar countries.[17] Further research could deepen our understanding of the connections between advanced medical interventions, increased patient demands on patients due to monitoring and treatments, and mental health differences within specific patient populations.

From a VRQoL perspective, numerous studies showed that patients with bilateral DR/DME experienced lower VRQoL and a higher vision-related burden compared to those with unilateral DR/DME or no DR/DME. This evidence highlighted the importance

of managing these mediating factors, including preventing DR onset and slowing its progression in clinical practice.[4,42,43] Additionally, numerous studies indicated other mental health aspects related to depression in DR/DME patients. Having poor social support from friends or family, a lower level of self-care agency, and having a history of anxiety/depression were identified as negative contributors to depressive symptoms in this population.[6,7,44–46] Anxiety was also recognized as an aggravating factor among these patients.[6,7,44–46] Furthermore, research employing network analysis revealed the bridging symptoms within the depression-anxiety network among patients with diabetic retinopathy.[47] The finding from this study aligned with previous findings that support the association between anxiety and depression. Anxiety and depression were closely interconnected, as concerns about disease progression or vision loss could trigger depressive symptoms. Additionally, even when DR or VA remained relatively stable, the fear of worsening vision could intensify anxiety and depression. Interestingly, another study found that individuals with persistent mental health symptoms were significantly less likely to seek medical evaluation for somatic complaints, a behavioral pattern potentially generalizable to DR/DME care.[48] This study emphasized that while clinical measures guide treatment, they do not address emotional well-being. Integrating mental health evaluations and VRQoL assessments into routine care could enhance patient-centered management and might improve treatment compliance in DM and DR.

This study has limitations that may affect the generalizability of the findings. It was conducted in an academic setting with integrated healthcare services, which may enhance patients' trust in their clinicians. Furthermore, patients with bipolar disorder or schizophrenia were excluded. As a result of these factors, the study may underestimate the true prevalence of depression and may not reflect the prevalence observed in broader, population-based settings. Additionally, the non-linearity and discrete nature of Snellen measurements may compromise the accuracy of logMAR conversion. The cross-sectional design limited the ability to establish causal relationships between related factors and depression, which could be more thoroughly examined in further cohort studies. This study also did not account for the severity of diabetic comorbidities or mental health fluctuations, particularly depression, in patients receiving ocular exams after COVID-19. Nonetheless, the findings align with previous studies, emphasizing the importance of integrating patient-reported outcomes and mental health assessments into comprehensive diabetes management. This strategy is crucial for recognizing patients who might be vulnerable to depression and who could gain from clinical support.

Conclusion

As the incidence of diabetes continues to rise globally, a comprehensive approach to patient care is essential. For individuals with diabetes, in addition to monitoring or treating diabetic retinopathy (DR) and diabetic macular edema (DME), it is advantageous to evaluate both vision-related quality of life (VRQoL) and anxiety levels. Patients exhibiting lower VRQoL or elevated anxiety levels are more likely to experience depression. This thorough assessment can aid in identifying diabetic patients at risk for depression, facilitating timely interventions and enhancing overall care.

Abbreviations

BCVA, best-corrected visual acuity; BSE, better-seeing eye; CI, Confidence Interval; CI-DME, Center-Involving Diabetic Macular Edema; DM, diabetes mellitus; DME, Diabetic Macular Edema; DR, Diabetic Retinopathy; LogMAR, Logarithm of the Minimum Angle of Resolution; NEI VFQ-25, National Eye Institute Visual Functioning Questionnaire-25; NPDR, Non-Proliferative Diabetic Retinopathy; OI, Outcome Inventory; OI-21, Outcome Inventory-21; PPV, Pars Plana Vitrectomy; PRP, Panretinal Photocoagulation; SD, Standard Deviation; VA, Visual Acuity; VEGF, Vascular Endothelial Growth Factor; VRQoL, Vision-Related Quality of Life.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Due to ethical and privacy restrictions, individual participant data cannot be shared publicly. Aggregated and anonymized data may be provided upon request in accordance with institutional and ethical guidelines.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically

reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This study received funding support from Faculty of Medicine Endowment Fund, Chiang Mai University, Thailand (Grant number: MC035-65).

Disclosure

Dr Onnisa Nanegrungsunk reports grants, personal fees from Bayer and Roche, outside the submitted work. The authors have no other proprietary or commercial interest in any materials discussed in this article.

References

1. Cho NH, Shaw JE, Karuranga S, et al. IDF diabetes atlas: global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabet Res Clin Pract*. 2018;138:271–281. doi:10.1016/j.diabres.2018.02.023
2. Thomas RL, Halim S, Gurudas S, Sivaprasad S, Owens DR. IDF diabetes atlas: a review of studies utilising retinal photography on the global prevalence of diabetes related retinopathy between 2015 and 2018. *Diabet Res Clin Pract*. 2019;157:107840. doi:10.1016/j.diabres.2019.107840
3. Collaborators GBaVI, Study VLEGot GBoD. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the right to sight: an analysis for the global burden of disease study. *Lancet Glob Health*. 2021;9(2):e144–e160. doi:10.1016/S2214-109X(20)30489-7
4. Bao YK, Miller CJ, Narayanan SS, Gaddis M, Drees BM. Prevalence and risk factors of major depression in patients with diabetic retinopathy in a nationally representative survey. *Ophthalmic Epidemiol*. 2023;30(5):462–467. doi:10.1080/09286586.2023.2172189
5. Sun N, Lou P, Shang Y, et al. Prevalence and determinants of depressive and anxiety symptoms in adults with type 2 diabetes in China: a cross-sectional study. *BMJ Open*. 2016;6(8):e012540. doi:10.1136/bmjopen-2016-012540
6. Rees G, Xie J, Fenwick EK, et al. Association between diabetes-related eye complications and symptoms of anxiety and depression. *JAMA Ophthalmol*. 2016;134(9):1007–1014. doi:10.1001/jamaophthalmol.2016.2213
7. Abu Ameerh MA, Hamad GI. The prevalence of depressive symptoms and related risk factors among diabetic patients with retinopathy attending the Jordan University Hospital. *Eur J Ophthalmol*. 2021;31(2):529–535. doi:10.1177/1120672120912691
8. Collins MM, Corcoran P, Perry IJ. Anxiety and depression symptoms in patients with diabetes. *Diabet Med*. 2009;26(2):153–161. doi:10.1111/j.1464-5491.2008.02648.x
9. Poongothai S, Anjana RM, Pradeepa R, et al. Association of depression with complications of type 2 diabetes--the Chennai Urban Rural Epidemiology Study (CURES- 102). *J Assoc Physicians India*. 2011;59:644–648.
10. Ducat L, Philipson LH, Anderson BJ. The mental health comorbidities of diabetes. *JAMA*. 2014;312(7):691–692. doi:10.1001/jama.2014.8040
11. Yu Y, Feng L, Shao Y, et al. Quality of life and emotional change for middle-aged and elderly patients with diabetic retinopathy. *Int J Ophthalmol*. 2013;6(1):71–74. doi:10.3980/j.issn.2222-3959.2013.01.15
12. Pereira DM, Shah A, D'Souza M, et al. Quality of life in people with diabetic retinopathy: Indian study. *J Clin Diagn Res*. 2017;11(4):NC01–NC06. doi:10.7860/JCDR/2017/24496.9686
13. Alinia C, Mohammadi SF, Lashay A, Rashidian A. Impact of diabetic retinopathy on health-related quality of life in Iranian diabetics. *Iran J Public Health*. 2017;46(1):55–65.
14. Roberts-Martínez Aguirre I, Rodríguez-Fernández P, González-Santos J, et al. Exploring the quality of life related to health and vision in a group of patients with diabetic retinopathy. *Healthcare*. 2022;10(1). doi:10.3390/healthcare10010142
15. Xu X, Zhao X, Qian D, Dong Q, Gu Z. Investigating factors associated with depression of type 2 diabetic retinopathy patients in China. *PLoS One*. 2015;10(7):e0132616. doi:10.1371/journal.pone.0132616
16. Khoo K, Man REK, Rees G, Gupta P, Lamoureux EL, Fenwick EK. The relationship between diabetic retinopathy and psychosocial functioning: a systematic review. *Qual Life Res*. 2019;28(8):2017–2039. doi:10.1007/s11136-019-02165-1
17. Wang P, Liu GG, Jo MW, et al. Valuation of EQ-5D-5L health states: a comparison of seven Asian populations. *Expert Rev Pharmacoecon Outcomes Res*. 2019;19(4):445–451. doi:10.1080/14737167.2019.1557048
18. Fenwick EK, Xie J, Pesudovs K, et al. Assessing disutility associated with diabetic retinopathy, diabetic macular oedema and associated visual impairment using the vision and quality of life index. *Clin Exp Optom*. 2012;95(3):362–370. doi:10.1111/j.1444-0938.2012.00742.x
19. Gabrielian A, Hariprasad SM, Jager RD, Green JL, Mieler WF. The utility of visual function questionnaire in the assessment of the impact of diabetic retinopathy on vision-related quality of life. *Eye*. 2010;24(1):29–35. doi:10.1038/eye.2009.56
20. Hariprasad SM, Mieler WF, Grassi M, Green JL, Jager RD, Miller L. Vision-related quality of life in patients with diabetic macular oedema. *Br J Ophthalmol*. 2008;92(1):89–92. doi:10.1136/bjo.2007.122416
21. Li B, Zhou C, Gu C, et al. Modifiable lifestyle, mental health status and diabetic retinopathy in U.S. adults aged 18-64 years with diabetes: a population-based cross-sectional study from NHANES 1999-2018. *BMC Public Health*. 2024;24(1):11. doi:10.1186/s12889-023-17512-8
22. Bressler NM, Varma R, Suñer IJ, et al. Vision-related function after ranibizumab treatment for diabetic macular edema: results from RIDE and RISE. *Ophthalmology*. 2014;121(12):2461–2472. doi:10.1016/j.ophtha.2014.07.008
23. Garweg JG, Stefanickova J, Hoyng C, et al. Vision-related quality of life in patients with diabetic macular edema treated with intravitreal aflibercept: the AQUA study. *Ophthalmol Retina*. 2019;3(7):567–575. doi:10.1016/j.oret.2019.03.012
24. Sivaprasad S, Ghanchi F, Kelly SP, et al. Evaluation of care with intravitreal aflibercept treatment for UK patients with diabetic macular oedema: DRAKO study 24-month real-world outcomes. *Eye*. 2023;37(13):2753–2760. doi:10.1038/s41433-023-02409-y

25. Abu-Ameerh M, Alni'mat A, AlShawabkeh M, AlRyalat SA. Vision-related quality of life after vitrectomy: cross-sectional study from Jordan. *Clin Ophthalmol*. 2021;15:1831–1838. doi:10.2147/OPTH.S297896
26. Wilkinson CP, Ferris FL, Klein RE, et al. Proposed international clinical diabetic retinopathy and diabetic macular edema disease severity scales. *Ophthalmology*. 2003;110(9):1677–1682. doi:10.1016/s0161-6420(03)00475-5
27. Wong TY, Sun J, Kawasaki R, et al. Guidelines on diabetic eye care: the international council of ophthalmology recommendations for screening, follow-up, referral, and treatment based on resource settings. *Ophthalmology*. 2018;125(10):1608–1622. doi:10.1016/j.ophtha.2018.04.007
28. Wongpakaran N, Wongpakaran T, Kövi Z. Development and validation of 21-item outcome inventory (OI-21). *Heliyon*. 2022;8(6):e09682. doi:10.1016/j.heliyon.2022.e09682
29. Mangione CM, Lee PP, Gutierrez PR, et al. Development of the 25-item national eye institute visual function questionnaire. *Arch Ophthalmol*. 2001;119(7):1050–1058. doi:10.1001/archopht.119.7.1050
30. Setthawatcharawanich S, Aui-aree N, Sathirapanya P, Phabphal K, Limapichat K. Validation of a disease-specific questionnaire for health-related quality of life in Thai patients with blepharospasm. *Songkla Medl J*. 2009;27(3):249–257.
31. Goldstein JE, Bradley C, Gross AL, Jackson M, Bressler N, Massof RW. The NEI VFQ-25C: calibrating items in the national eye institute visual function questionnaire-25 to enable comparison of outcome measures. *Transl Vis Sci Technol*. 2022;11(5):10. doi:10.1167/tvst.11.5.10
32. Casson RJ, Chidlow G, Wood JP, Osborne NN. The effect of hyperglycemia on experimental retinal ischemia. *Arch Ophthalmol*. 2004;122 (3):361–366. doi:10.1001/archopht.122.3.361
33. Simó R, Hernández C, (EUROCONDOR) ECftEToDR. Neurodegeneration in the diabetic eye: new insights and therapeutic perspectives. *Trends Endocrinol Metab*. 2014;25(1):23–33. doi:10.1016/j.tem.2013.09.005
34. Pennisi F, Gentile L, Borlini S, Gianfredi V, Signorelli C. Direct and indirect healthcare costs of ocular diseases in Italy: a literature review on glaucoma, diabetic retinopathy, and macular degeneration. *Ann Ig*. 2025. doi:10.7416/ai.2025.2676
35. Franco MI, Staab EM, Zhu M, et al. Pragmatic clinical trial of population health, portal-based depression screening: the PORTAL-depression study. *J Gen Intern Med*. 2023;38(4):857–864. doi:10.1007/s11606-022-07779-9
36. Frayne SM, Halanych JH, Miller DR, et al. Disparities in diabetes care: impact of mental illness. *Arch Intern Med*. 2005;165(22):2631–2638. doi:10.1001/archinte.165.22.2631
37. Bradley ER, Delaffon V. Diabetic retinopathy screening in persons with mental illness: a literature review. *BMJ Open Ophthalmol*. 2020;5(1): e000437. doi:10.1136/bmjophth-2020-000437
38. Almidani L, Miller R, Varadaraj V, Mihailovic A, Swenor BK, Ramulu PY. Vision impairment and psychosocial function in US adults. *JAMA Ophthalmol*. 2024;142(4):283–291. doi:10.1001/jamaophthalmol.2023.6943
39. Sun C, Tikellis G, Klein R, et al. Are microvascular abnormalities in the retina associated with depression symptoms? The cardiovascular health study. *Am J Geriatr Psychiatry*. 2007;15(4):335–343. doi:10.1097/01.JGP.0000247161.98311.0f
40. Bloom JM, Mason JO, Mason L, Swain TA. Fears, depression, and anxieties of patients with diabetic retinopathy and implications for education and treatment. *J Vitreoretin Dis*. 2020;4(6):484–489. doi:10.1177/2474126420936118
41. Sakamoto T, Shimura M, Kitano S, et al. Impact on visual acuity and psychological outcomes of ranibizumab and subsequent treatment for diabetic macular oedema in Japan (MERCURY). *Graefes Arch Clin Exp Ophthalmol*. 2022;260(2):477–487. doi:10.1007/s00417-021-05308-8
42. Willis JR, Doan QV, Gleeson M, et al. Vision-related functional burden of diabetic retinopathy across severity levels in the United States. *JAMA Ophthalmol*. 2017;135(9):926–932. doi:10.1001/jamaophthalmol.2017.2553
43. Man RE, Fenwick EK, Sabanayagam C, et al. Differential impact of unilateral and bilateral classifications of diabetic retinopathy and diabetic macular edema on vision-related quality of life. *Invest Ophthalmol Vis Sci*. 2016;57(11):4655–4660. doi:10.1167/iovs.16-20165
44. Ding X, Rong S, Wang Y, et al. The association of the prevalence of depression in type 2 diabetes mellitus with visual-related quality of life and social support. *Diabetes Metab Syndr Obes*. 2022;15:535–544. doi:10.2147/DMSO.S343926
45. Zhang B, Wang Q, Zhang X, Jiang L, Li L, Liu B. Association between self-care agency and depression and anxiety in patients with diabetic retinopathy. *BMC Ophthalmol*. 2021;21(1):123. doi:10.1186/s12886-021-01883-w
46. Hernández-Moreno L, Senra H, Moreno N, Macedo AF. Is perceived social support more important than visual acuity for clinical depression and anxiety in patients with age-related macular degeneration and diabetic retinopathy? *Clin Rehabil*. 2021;35(9):1341–1347. doi:10.1177/0269215521997991
47. Zhang Y, Cui Y, Li Y, et al. Network analysis of depressive and anxiety symptoms in older Chinese adults with diabetes mellitus. *Front Psychiatry*. 2024;15:1328857. doi:10.3389/fpsyt.2024.1328857
48. Pennisi F, Ricciardi GE, von Wagner C, et al. Impact of self-reported long-term mental health morbidity on help-seeking and diagnostic testing for bowel-related cancer symptoms: a vignette study. *Cancer Med*. 2024 ;13(23).doi:10.1002/cam4.70426

Clinical Ophthalmology

Dovepress
Taylor & Francis Group

Publish your work in this journal

Clinical Ophthalmology is an international, peer-reviewed journal covering all subspecialties within ophthalmology. Key topics include: Optometry; Visual science; Pharmacology and drug therapy in eye diseases; Basic Sciences; Primary and Secondary eye care; Patient Safety and Quality of Care Improvements. This journal is indexed on PubMed Central and CAS, and is the official journal of The Society of Clinical Ophthalmology (SCO). The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit http://www.dovepress.com/testimonials.php to read real quotes from published authors.

Submit your manuscript here: https://www.dovepress.com/clinical-ophthalmology-journal