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MINIREVIEWS

Beyond vision: The overlooked burden of depression in glaucoma patients

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Abstract

Glaucoma is more than optic nerve damage - it's a major driver of emotional distress. A growing body of work shows a bidirectional relationship between glaucoma and depression, shaped by chronic stress, fear of vision loss, diminished quality of life, and neurobiological pathways shared with neurodegeneration. Yet depressive symptoms in this population are often missed and undertreated, with clear downstream effects: Poorer adherence, reduced engagement with care, and worse visual outcomes. This article synthesizes emerging evidence to contextualize depression in glaucoma as a clinically significant manifestation of integrated eye-brain dysfunction and underscores implications for screening and care.

Key Words: Glaucoma; Quality of life; Depression; Neurodegeneration; Eye-brain axis; Retinal ganglion cells; Circadian dysfunction; Mental health assessment

Core Tip: Depression is common in people with glaucoma and still too often missed. The slow loss of vision, the fear of blindness, reduced social participation, and the day-to-day burden of complex treatment plans all take a psychological toll and erode quality of life. When depressive symptoms are present, patients are less likely to adhere to medications, sustain self-care, or keep follow-up appointments - behaviors that, in turn, can worsen visual outcomes. Emerging evidence also points to shared biology between glaucoma and depression. Neuroinflammation, mitochondrial dysfunction, and dysregulation of the hypothalamic-pituitary-adrenal axis recurs across both conditions and may help explain their clinical co-occurrence. For these reasons, routine identification and management of depression should be part of glaucoma care: Addressing mental health is not ancillary - it is integral to protecting vision.

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INTRODUCTION

Glaucoma is a chronic, progressive optic neuropathy. Its impact is not only visual: Many patients experience significant psychological distress, with higher rates of depression and anxiety than in the general population[1-3]. The relationship appears to run both ways. Living with glaucoma - fear of blindness, fluctuating vision, complex regimens, loss of autonomy - can precipitate or worsen mood symptoms[4-10]. At the same time, people with depressive symptoms or clinical depression show a higher subsequent risk of being diagnosed with glaucoma in cohort studies[11]. In the United Kingdom Biobank, depression was linked to incident glaucoma [hazard ratio (HR) ≈ 1.35] and the association was bidirectional [odds ratio (OR) ≈ 1.6 in both directions]; proteomic analyses pointed to lipid-related pathways as plausible biological links[12].

Consistently, prolonged exposure to selective serotonin reuptake inhibitors - used here as a proxy for treated depression - was associated with higher glaucoma incidence during follow-up (adjusted OR = 1.36 for > 365 days or higher cumulative doses)[13]. Another United Kingdom Biobank analysis found increased risks of hospitalized depression (HR = 1.54) and anxiety (HR = 2.61) among individuals with glaucoma, alongside evidence of polygenic overlap but without robust Mendelian-randomization support for a direct causal effect[14,15]. At the population level, a systematic review and meta-analysis estimates that roughly 1 patient in 5 patients with glaucoma has depression and 1 in 4 has anxiety, with sleep disturbances also common[16]. Complementary population-based work suggests observational associations and partially shared genetic architecture between glaucoma and mental-health traits, even if global genetic correlation is limited[14].

For clinical practice, the message is straightforward. Anxiety and depression consistently track with poorer adherence, and non-adherence in turn predicts faster visual-field loss over time[17,18]. Higher glaucoma-related distress also forecasts worse adherence[12,19]. Routine screening for mood symptoms and early referral or support are therefore not optional add-ons - they are part of good glaucoma care. Figure 1 summarizes the multi-domain links between glaucoma and depression-epidemiologic signals, psychosocial stressors, neurobiological pathways, and treatment burden-and how these converge into clinical consequences.

EPIDEMIOLOGY AND IMPACT OF DEPRESSION IN GLAUCOMA

Multiple studies have quantified the prevalence of depression (and anxiety) among glaucoma patients, consistently

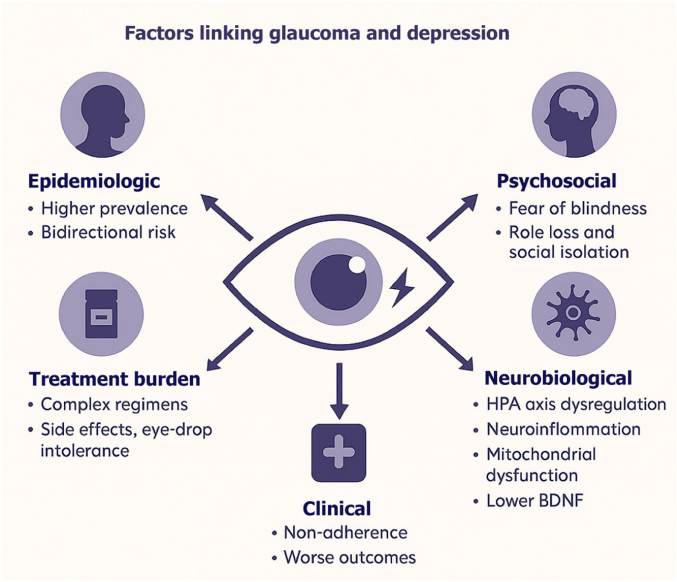

Figure 1 Risk factors for glaucoma and depression. Glaucoma and depression are linked by epidemiology (higher prevalence, bidirectional risk), psychosocial factors (fear of blindness, role loss, and social isolation), neurobiological mechanisms (hypothalamic-pituitary-adrenal-axis dysregulation, neuroinflammation, mitochondrial dysfunction, reduced brain-derived neurotrophic factor), and treatment burden. Clinicians see low adherence and inferior outcomes from these domains. Arrows show relationships, not causes. HPA: Hypothalamic-pituitary-adrenal; BDNF: Brain-derived neurotrophic factor.

finding it higher than in the general population. A 2023 systematic review and meta-analysis (45 studies, about 5 million subjects) reported an overall depression prevalence of about 19% in glaucoma patients and an anxiety prevalence of about 25%, both significantly greater than in control populations[16]. Another recent meta-analysis of 29 studies (13 million individuals) found depression rates ranging from 6.6% up to 57% in glaucoma, and anxiety 12.1% to 49%[20,21] - illustrating variability by setting and measurement, but a clear excess burden of mental health disorders in glaucoma. In a Brazilian multicenter study (2024), 26.9% of glaucoma patients had depression (*vs* about 5.8% national baseline), and 25.7% had anxiety. Notably, that study found depression was more frequent in patients with severe-stage glaucoma, whereas anxiety was prevalent even in earlier stages[22].

It is important to acknowledge that not all studies find a strong association in every context. Priority has been accorded to population-based and longitudinal research, which have yielded the most reliable estimates of depression burden in glaucoma. In contrast, smaller cross-sectional studies have been regarded as hypothesis-generating. For example, a large German population-based study (the Gutenberg Health Study) observed similar depression prevalence in those with self-reported mild glaucoma (about 6.6%) compared to those without glaucoma (about 7.7%), and no significant adjusted association with depression or anxiety was detected[10,23]. The authors suggested that hospital-based samples (often with advanced disease) show higher depression rates. In contrast, community cases of glaucoma (many early or treated) might not experience as much depressive burden[5]. Nonetheless, the majority of evidence indicates that glaucoma patients are at elevated risk for depression. A 2018 nationwide cohort study in Taiwan demonstrated that having glaucoma raised the hazard of developing depression by 71% (adjusted HR ≈ 1.71) compared to non-glaucoma controls[10,23].

Conversely, a 2021 Korean cohort study found that depression itself was a risk factor for subsequent glaucoma, with depressed individuals having about a 12% higher hazard of developing glaucoma (HR ≈ 1.12), rising to 1.36 in those with both clinical depression and depressive symptoms. In that study, the glaucoma incidence risk increased stepwise: Subjects with only depressive symptoms had HR about 1.09, with diagnosed depressive disorder HR about 1.23, and with both depression and symptoms HR about 1.36. These epidemiological findings support a bidirectional relationship: Glaucoma heightens depression risk, and depression may modestly heighten glaucoma risk[11].

Beyond prevalence, depression significantly impacts quality of life in glaucoma. Visual impairment from glaucoma correlates with lower quality of life and functional status, which in turn is linked to depressive symptoms[10,24,25]. Meta-analytic evidence confirms that individuals with visual impairments are nearly twice as likely to experience depression compared to those without vision loss[26]. In glaucoma, patients' fear of eventual blindness, the silent progression of the disease, and the daily challenges (*e.g.*, difficulty driving, reading, or socializing) create chronic stress that can precipitate depression or anxiety[17,20]. Approximately 20% of glaucoma patients experience clinically significant depressive symptoms, and about 40% experience anxiety, far exceeding rates in age-matched healthy peers[16]. This article concentrated on the depressive burden in glaucoma as a novel expression of integrated eye-brain dysfunction.

METHODOLOGICAL APPROACH

This article consolidated specific epidemiological, clinical, and mechanistic research to examine the association between

glaucoma and depressed symptoms within a cohesive eye-brain framework. Significant papers have been identified through focused searches of prominent biomedical databases and by reference analysis of pertinent reviews and consensus statements. The selection of studies has emphasized conceptual importance and methodological rigor over comprehensive coverage, aligning with the narrative focus.

Patient management and clinical implications

Depression in glaucoma is common. Patients with depression or anxiety are more likely to use pressure-lowering drops inconsistently or skip visits[1]. The reasons are not only practical (side effects such as ocular irritation or dry eye) but also emotional; both anxiety and drop intolerance repeatedly emerge as barriers to adherence[20,27]. In a veterans' cohort, significant ocular surface discomfort coupled with anxiety symptoms was linked to lower medication compliance[20,28].

Cognitive symptoms of depression - reduced drive, impaired memory, executive dysfunction - add to the problem by undermining follow-up and dosing routines. The result is greater intraocular pressure (IOP) variability, more optic nerve stress, and ultimately faster structural and functional decline[29]. Mood can also color symptom reporting: Some patients describe disability disproportionate to measured field loss[27,29].

Psychological distress may do more than influence behavior. In a two-year study, Shin and colleagues reported that higher anxiety (Beck Anxiety Inventory) correlated with faster retinal nerve fiber layer thinning and more frequent disc hemorrhages, even after accounting for IOP fluctuations[7]. Higher depression scores were associated with worse baseline visual fields and altered autonomic markers (heart rate variability)[7,30,31]. Glaucoma suspects with a history of depression or anxiety also showed higher conversion rates, raising the possibility that emotional stress contributes to onset or progression[3,7,32]. Taken together, these data argue for routine appraisal of mood and coping in glaucoma clinics to flag patients at risk of faster decline and intervene earlier[26,29]. In a 2020 web-based survey conducted at an eye hospital, most eyecare professionals acknowledged the need to assess mental health in patients with chronic eye disease and perceived the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) as useful screening tools, although many reported inadequate trainings to perform such assessments[33]. The PHQ-9 is one of the most widely used self-reported depression screeners in primary care and other clinical settings, and evidence supports robust psychometric performance, including support for one- or two-factor models and measurement invariance across diverse groups[34].

Clinically, mental health care is part of glaucoma care. Brief, validated screeners - PHQ-9 for depression and GAD-7 for anxiety - can be administered by non-psychiatric staff or by phone and reliably identify patients who need support[35,36]. Yet many ophthalmologists do not use them routinely and may underestimate psychiatric burden[2,22,35]. Building awareness, adopting practical tools such as Hospital Anxiety and Depression Scale for busy settings, and establishing clear referral pathways to psychiatry, psychology, or primary care can reduce fragmentation and improve engagement [36]. Psychotherapies - including cognitive behavioral therapy (CBT) and mindfulness-based stress reduction - improve depressive symptoms and health-related quality of life in people with visual impairment[37].

Medication interactions deserve attention. Systemic absorption of topical β-blockers (*e.g.*, timolol) can precipitate depressive symptoms in susceptible individuals[24]. Conversely, selective serotonin reuptake inhibitors (SSRIs) - though generally safe - have been rarely associated with acute angle-closure in predisposed patients and, with high dose or prolonged use, may slightly affect IOP or glaucoma risk *via* serotonergic effects on aqueous dynamics[24,38-40]. Tricyclics and monoamine oxidase inhibitors can raise IOP or provoke mydriasis, posing risks in angle-closure disease; serotonin-norepinephrine reuptake inhibitors (SNRIs) are usually safe, though transient ocular surface symptoms or mild dry eye are reported[41,42]. Joint medication reviews, clear counseling on side effects and instillation technique, and consistent monitoring help balance psychological stability with ocular safety. Non-pharmacological measures - regular physical activity, sleep hygiene, social connectedness - support mood and neurovascular health.

A person-centered model that addresses both eye health and mental health improves care. Interventions such as CBT or structured counseling can enhance quality of life and may bolster adherence[43]. In advanced glaucoma, vision loss is irreversible and can compromise everyday functioning across multiple domains; vision rehabilitation should be integrated into care to reduce disability and improve quality of life, with strategies tailored to the patient's needs and pattern of visual damage[44]. CIn a prospective study derived from the veterans affairs low-vision intervention trial, outpatient low-vision rehabilitation produced significant gains in visual ability domains (including reading, mobility, and visual information processing) and improved overall visual ability over follow-up, supporting the functional benefits of rehabilitation in low-vision populations[45].

Coaching, family involvement, and tailored education improve drop routines and reduce isolation[20,46,47]. Low-vision rehabilitation (devices, adaptive strategies, orientation-mobility training) increases independence and confidence, and targeted counseling corrects misconceptions and sets realistic expectations[44,45]. New tools - tele-ophthalmology, smartphone- or app-based adherence tracking, artificial intelligence-assisted mood monitoring, virtual reality- or gamified home visual-field testing - are promising, especially for patients with mobility or access barriers[48-50]. The consistent message for clinicians: Treat depression as part of the glaucoma spectrum, communicate empathically, and co-manage with mental health colleagues to protect vision and quality of life.

Neurobiological intersections

Glaucoma is widely acknowledged as a progressive neurodegenerative condition of the central visual pathway, initiating with the loss of retinal ganglion cells and progressing to anterograde and trans-synaptic alterations within the brain[51]. The involvement of the retina and brain offers a biologically coherent framework for investigating common pathways with mood disorders, as major depressive illness is also linked to neurodegeneration and systems-level failure. A convergent pathway includes chronic stress and disruption of the hypothalamic-pituitary-adrenal axis. Depression is marked by disrupted hypothalamic-pituitary-adrenal feedback and prolonged cortisol increase[32,52]. In glaucoma,

persistent psychological stress associated with the fear of vision loss may similarly elevate sympathetic tone and cortisol levels, thereby impacting ocular perfusion and aqueous humor dynamics[32,53]. A suggested reciprocal stress-neurodegeneration loop suggests that vision loss intensifies stress responses, which further undermine optic nerve integrity[32,54,55].

Neuroinflammatory signaling constitutes an additional common axis. Both glaucoma and depression demonstrate microglial activation and an increase in pro-inflammatory mediators[3,11,24,56,57]. Experimental studies indicate a feed-forward connection between inflammation and mitochondrial damage in glaucoma, exacerbating retinal ganglion cell susceptibility[51]. Cytokines, including tumor necrosis factor-α, interleukin (IL)-1β, and IL-6, are associated with glaucomatous optic neuropathy, whereas elevated levels of IL-6 and C-reactive protein are linked to the severity of depression and treatment resistance[58,59]. Significantly, the regulation of microglial activation in animal models has reduced both retinal degeneration and depressive-like behaviors, indicating shared treatment targets[60,61].

Mitochondrial dysfunction and oxidative stress additionally connect these disorders. Retinal ganglion cells exhibit high metabolic demands, and damage to mitochondrial DNA, compromised respiration, and the formation of reactive oxygen species heighten vulnerability to stress associated with intraocular pressure. Mitochondrial defects have been described across ocular diseases including glaucoma, with mtDNA integrity and the fission-fusion balance highlighted as relevant to respiratory chain efficiency and mitochondrial function[62] In an ocular hypertension model, hypoxic labeling was observed in Müller glia, microglia, astrocytes, and some retinal ganglion cells, alongside reduced glutathione and increased superoxide signal, with evidence of increased autophagic activity (LC3-II/LC3-I ratio), supporting a coupled hypoxia-oxidative stress-glial response axis[63].

Mitochondrial dysfunction and oxidative stress additionally connect these disorders. Retinal ganglion cells exhibit high metabolic demands, and damage to mitochondrial DNA, compromised respiration, and the formation of reactive oxygen species heighten vulnerability to stress associated with intraocular pressure. Similar mitochondrial and metabolic anomalies have been identified in depression, with reciprocal interactions between mitochondrial dysfunction and inflammation constituting a likely common link[51,64]. Associated modifications in neurotrophic support are also significant: Diminished brain-derived neurotrophic factor leads to neuronal shrinkage in depression, whereas disrupted neurotrophic signaling and axonal transport jeopardize retinal ganglion cell viability in glaucoma[11,56,65]. Systemic metabolic dysregulation and modified mitochondrial bioenergetics have been documented in both illnesses[60,66,67].

An imbalance in the autonomic nervous system provides an additional integrative mechanism. Depression and anxiety correlate with diminished heart rate variability and sympathetic dominance, whereas glaucoma, especially normal-tension glaucoma, is associated with vascular dysregulation and autonomic instability. Acute emotional stress can temporarily increase intraocular pressure or diminish ocular blood flow, with clinical evidence recording stress-induced pressure surges and rapid disease deterioration[68]. Neurotransmitter dysregulation may further connect the disorders, since glutamatergic excitotoxicity leads to retinal ganglion cell damage, while monoaminergic deficiencies are associated with mood symptoms[69,70]. From a clinical standpoint, psychotropic medicines may affect intraocular pressure or angle configuration in vulnerable individuals, highlighting the necessity for integrated ophthalmic and mental care[71,72].

Ultimately, central neurodegeneration transcends the visual system. Neuroimaging research has revealed structural and functional brain changes in glaucoma, with some overlap in networks associated with mood regulation[20]. Epidemiological findings are inconsistent: Mendelian randomization analyses do not indicate a direct causal relationship between psychiatric diseases and glaucoma[73], but cohort studies suggest varying relationships with dementia risk[74-76]. These data confirm the notion that glaucoma is a condition impacting widespread eye-brain networks rather than merely an isolated optic neuropathy, with consequences for both neuropsychiatric comorbidity and clinical therapy[71,72].

Tools for screening and psychiatric management

If you treat glaucoma, build mental-health screening into routine care. A simple, integrated approach works. Brief, validated questionnaires - PHQ-9 for depression and GAD-7 for anxiety - fit easily into clinic flow, flag patients who need a closer look, and track change over time[22,34]. They correlate well with clinical diagnoses, and even telephone administration is feasible in chronic ophthalmic populations[33]. Identifying who is at risk is the first step.

Depression is still missed too often in eye clinics - pressed schedules, limited training, and the mistaken idea that distress is "inevitable" after vision loss all play a role. Standardized tools help close that gap. Alongside PHQ-9 and GAD-7, the Hospital Anxiety and Depression Scale and Beck Depression Inventory-II perform well in ophthalmic cohorts; the PHQ-9, in particular, gives a fast, self-scored severity index that suits busy services. Screen at diagnosis, then repeat when treatment is intensified, around surgical episodes, or when objective progression appears. Electronic health record-integrated digital screeners can automate scoring and surface high-risk cases. Combine self-report with what you observe in the room; in older adults, add a brief cognitive check to distinguish depressive "pseudodementia" from neurocognitive disorders. Done systematically - and paired with clear explanations and empathy - screening reduces stigma and normalizes mental-health conversations in eye care[77,78]. Figure 2 outlines a pragmatic, integrated care pathway that embeds routine screening, stepped psychological/pharmacological support, adherence coaching, and scheduled follow-up within glaucoma services.

In this integrated approach, "treatment burden" denotes the aggregate workload associated with glaucoma management and its subsequent effects on everyday functioning and well-being. This framework has addressed the practical requirements of prolonged drop instillation, control of ocular-surface adverse effects, frequent appointments and assessments, regimen intricacy, expenses, and logistical obstacles, as well as the ongoing uncertainty associated with a progressive disease course. Treatment burden is clinically significant since it exacerbates suffering, diminishes adherence and follow-up dependability, and so serves as a modifiable target for enhancing both mental health outcomes and glaucoma management.

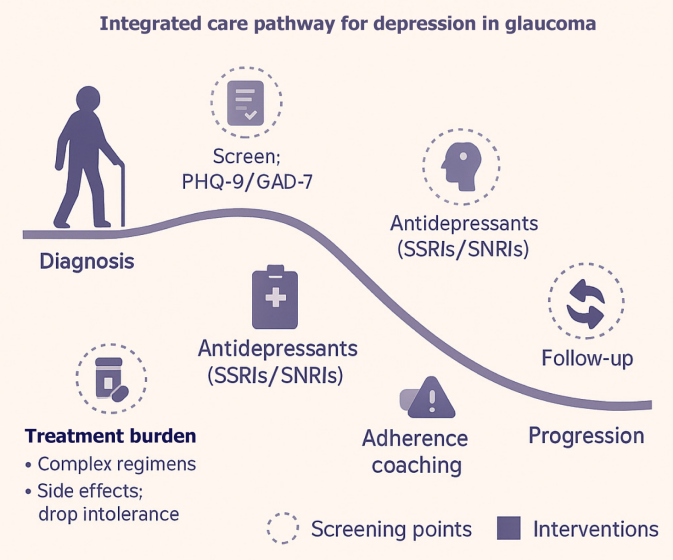

Figure 2 Integrated glaucoma depression care. Workflow embedding mental-health care into glaucoma management: Screen at diagnosis and key milestones (Patient Health Questionnaire-9, Generalized Anxiety Disorder-7), provide stepped interventions (psychoeducation, adherence coaching, cognitive-behavioral therapy, and antidepressants), and give ophthalmology and primary care regular feedback. Legend distinguishes screening points (dotted) and interventions (solid). PHQ-9: Patient Health Questionnaire-9; GAD-7: Generalized Anxiety Disorder-7; CBT: Cognitive-behavioral therapy; SSRIs: Selective serotonin reuptake inhibitors; SNRIs: Serotonin-norepinephrine reuptake inhibitors.

Once you identify depression or anxiety, management should be deliberate and coordinated.

Referral and psychotherapy: Keep the threshold low for involving mental-health professionals when screens are positive for moderate-severe symptoms or when suicidality is disclosed. Collaborative-care models improve outcomes. Psychotherapy is effective for many patients with mild to moderate symptoms: In glaucoma, cognitive-behavioral therapy improved quality of life *vs* controls[43]. Behavioral activation, mindfulness-based work, and acceptance-commitment therapy - adapted for visual impairment - also reduce symptoms and strengthen coping. Group formats add peer validation; departments with on-site mental-health staff or strong referral networks detect more cases and achieve better care uptake[79-81].

Pharmacotherapy (with ophthalmic caveats): The patient's general practitioner or psychiatrist typically starts antidepressants. SSRIs and SNRIs remain first-line for depression and anxiety and are generally compatible with glaucoma care; in patients with anatomically narrow angles, monitor for rare angle-closure risk and educate on warning symptoms[24,38,39]. Tricyclics, because of anticholinergic effects, can precipitate angle closure in susceptible patients and warrant caution. Treating depression often yields indirect ophthalmic benefits - better sleep, more consistent drop use, healthier routines - which matter for IOP control and follow-up. If marked anxiety appears to coincide with IOP spikes, short-term anxiolysis and structured stress-management can be considered[82,83]. For moderate-severe cases, SSRIs/SNRIs remain first-line given their safety profile; close ophthalmology-psychiatry coordination helps monitor systemic effects (*e.g.*, blood pressure with some SNRIs) and ocular-surface dryness[84]. In narrow-angle eyes, avoid strongly anticholinergic or sympathomimetic agents; "start low, go slow" improves tolerability[82]. In treatment-resistant or recurrent depression, augmentation strategies - including transcranial magnetic stimulation - can be combined with psychotherapy[85].

Psychoeducation and practical supports: Explain the links between stress, autonomic tone, and IOP/ocular perfusion; this often motivates patients to prioritize mental health. Mindfulness, relaxation training, and yoga have shown promise for lowering IOP or slowing field loss, likely by dampening systemic stress responses[32]. Encourage social support - loneliness and living alone are risk factors for depression in glaucoma, while resilience and supportive networks correlate with better quality of life[10,86]. Tailored education that meets health-literacy needs reduces catastrophic thinking; group sessions and peer mentorship (with family involvement when possible) reinforce adherence and buffer isolation[87]. Digital options extend care between visits: Telepsychiatry improves access for older or less mobile patients; smartphone-based CBT/mindfulness programs and artificial intelligence-assisted mood trackers support ongoing engagement[88,89]. Emerging tools - including virtual reality environments that simulate vision loss - can rehearse adaptive coping and are likely to become routine complements to standard care as digital literacy grows[90].

Monitoring and follow-up: Fold depression/anxiety checks into glaucoma follow-up (*e.g.*, every 6-12 months). If vision declines, proactively reassess mood; if mood worsens, verify adherence and look for unexplained IOP variability. This two-way vigilance is the core of holistic management. Invest in clinician training - short courses that build communication and screening skills raise confidence and detection rates - and push for institutional standards: Interdisciplinary clinics (ophthalmology, psychiatry, psychology, social work) and policy-level guidance can embed mental health as a core component of eye care rather than an add-on[1,91].

The literature points in the same direction. Ramesh *et al*[1] call for integrated models that combine ophthalmic and psychiatric expertise to deliver truly patient-centered care. Treat the person, not just the optic nerve. Addressing mood improves psychological well-being, supports engagement with therapy, and may ultimately influence visual outcomes[1].

FUTURE DIRECTIONS

Several lines of work probe the eye-brain interface. Large biobank and Mendelian randomization analyses do not support a strong causal genetic link between major psychiatric disorders and glaucoma[68,71,92], and a meta-analysis of cohorts found no clear association between glaucoma and later Alzheimer's disease or dementia[72]. That said, epigenetic effects of chronic stress (*e.g.*, glucocorticoid receptor regulation) remain plausible contributors. Neuroimaging adds another angle: Overlapping brain changes in glaucoma and depression raise the question of whether magnetic resonance imaging markers and optical coherence tomography metrics can capture early, shared neurodegeneration[24]. In some studies, retinal nerve fiber layer thinning correlates with cognitive impairment and depression severity, pointing to the idea - still under investigation - of retinal "biomarkers" for brain health, and vice versa[24,93].

There is also a therapeutic overlap worth testing. Agents that target neuroinflammation or oxidative stress - minocycline, tumor necrosis factor-α inhibitors, citicoline, coenzyme Q10 - have been explored in glaucoma; it is reasonable to ask whether they also improve mood or cognition[94,95]. Conversely, some antidepressants (*e.g.*, SSRIs, SNRIs) have neurotrophic and anti-inflammatory properties; long-term use might, in theory, offer retinal ganglion cell benefits, although this remains speculative and needs prospective evaluation[96].

Several gaps deserve attention. Not all patients with comparable vision loss develop depression. Coping style, resilience, and social support likely shape this heterogeneity. Including psychosocial measures in glaucoma studies could identify protective factors that are amenable to intervention (*e.g.*, resilience training, peer support). Longitudinal cohorts from diagnosis - tracking stress biomarkers such as cortisol and inflammatory mediators - could clarify causal pathways linking chronic ocular disease to changes in mental health[20,86].

From a public-health standpoint, family-centered education is crucial. Patients and caregivers should know the common symptoms of depression - persistent low mood, anhedonia, sleep/appetite change - and feel invited to raise them. Normalizing the conversation in the clinic ("many people with glaucoma feel anxious or down; it's common, and we can help") reduces stigma and increases acceptance of referral. Addressing it is part of good glaucoma care. With an ageing population and an estimated 111 million people living with glaucoma by 2040, the psychological burden will only grow[20,97]. Integrating screening and support into routine management is likely to improve adherence, quality of life, and possibly visual outcomes. The direction of travel is clear: Tighter collaboration among ophthalmologists, psychiatrists, psychologists, and primary-care teams to care for both sight and psyche. Table 1 summarizes the literature and its clinical takeaways.

CONCLUSION

Glaucoma does not stop at the optic nerve - it reaches the patient's mind. The literature consistently shows a tight link with depression, driven by the strain of chronic vision loss, fear of blindness, loss of independence, and broader neurodegenerative processes. Yet depressive symptoms are still easy to miss in the clinic, and when they go unrecognized, they erode adherence and may hasten visual decline. We should treat mood assessment as part of standard glaucoma care: Identify early, refer appropriately, and manage in an integrated way. Doing so improves not only psychological well-being but also the outcomes we track - fields, IOP stability, and real-world functioning. Management cannot be limited to pressure control alone. Quality of life and mental health belong in the treatment plan, side by side with medications, lasers, and surgery. Research on shared stress-neurodegeneration pathways may yield therapies that benefit both the eye and the brain; until then, a collaborative, patient-centered model - ophthalmology working with psychiatry, psychology, and primary care - provides people with the support they need to stay engaged in treatment and preserve vision. Recognizing and treating depression in glaucoma is not "adjunctive care". It is core to optimizing outcomes in a disease that threatens both sight and the person who lives with it.

Table 1 Evidence linking glaucoma and depression with clinical implications

Domain	Key finding (as reported)	Clinical implication	Ref.
Prevalence	Depression ≈ 19% and anxiety ≈ 25% among glaucoma patients; higher than in controls	Mental-health burden is substantial; routine screening is warranted	[16]
Population-based variance	In the Gutenberg Health Study, depression prevalence was similar in self-reported mild glaucoma (about 6.6%) *vs* non-glaucoma (about 7.7%); no significant adjusted association	Community cases (often earlier/treated) may show lower psychiatric burden than hospital cohorts	[5]
Multicenter (Brazil)	Depression 26.9% (*vs* about 5.8% national baseline) and	Screen across stages, with extra attention in	[22]

	anxiety 25.7%; depression was more frequent in severe glaucoma	severe disease	
Glaucoma → depression	Having glaucoma increased subsequent depression risk (adjusted HR ≈ 1.71)	Monitor mood longitudinally after glaucoma diagnosis	[10,23]
Depression → glaucoma	Depression is associated with a higher incidence of glaucoma (HR ≈ 1.12), rising to ≈ 1.36 with both disorder and symptoms; a stepwise pattern	Depressed patients merit closer ophthalmic surveillance	[11]
Bidirectional/biobank	United Kingdom Biobank: Depression linked to incident glaucoma (HR ≈ 1.35); bidirectional association (odds ≈ 1.6 in both directions); proteomics suggests lipid-related pathways	Supports integrated eye-mental-health models; points to biological links	[12]
Glaucoma → hospitalized MH events	Increased risks among glaucoma patients: Hospitalized depression (HR = 1.54) and anxiety (HR = 2.61); polygenic overlap; limited MR support for causality	Elevated psychiatric risk even without clear genetic causality; clinical vigilance needed	[14,16]
Antidepressants and risk	Prolonged/high-dose SSRI exposure was associated with higher glaucoma incidence during follow-up (adjusted OR = 1.36 for > 365 days/cumulative dose)	Weigh risks in predisposed patients; coordinate with psychiatry/PCP	[13]
Adherence → outcomes	Poorer adherence was associated with faster visual-field loss (CIGTS)	Address mood/anxiety to protect adherence and visual outcomes	[17]
Distress and adherence	Higher glaucoma-related distress forecast worse adherence; coaching factors identified	Incorporate coaching/psychoeducation into care pathways	[19]
OSD + anxiety → compliance	In veterans, ocular surface discomfort with anxiety symptoms linked to lower medication compliance	Treat ocular surface disease and anxiety to improve adherence	[28]
Mood and progression	Higher anxiety correlated with faster RNFL thinning and more disc hemorrhages; higher depression associated with worse baseline fields and altered HRV	Positive screens may flag patients at risk for faster progression	[7]
Screening tools (feasibility)	Brief tools (PHQ-9, GAD-7; HADS; BDI-II) are feasible in ophthalmic care; telephone administration is possible; multicenter implementation supports referral decisions	Embed PHQ-9/GAD-7 at diagnosis and key milestones; create clear referral pathways	[33-37]
Medication caveats	Topical β-blockers may precipitate depressive symptoms in susceptible individuals (conflicting data exist). Rare angle-closure with SSRIs/SNRIs in predisposed patients; case report of duloxetine. Reviews summarize IOP/angle interactions	Review systemic/ocular meds jointly; educate narrow-angle patients on warning signs	[38-40,75,76,82]
Psychological stress and IOP	Acute emotional stress can trigger IOP spikes; experimental/clinical data link stress to IOP changes; RCT explored stress and IOP dynamics	Offer stress-management strategies alongside IOP control	[68,83,92]
Interventions	CBT improved QoL in glaucoma/cataract patients with mild-moderate depression; low-vision rehabilitation was effective; coaching improved adherence; digital adherence monitoring and tele-ophthalmology were useful	Combine psychotherapy, rehab, coaching, and digital tools to support engagement	[43-48,94]
Global burden	Projected 111 million people with glaucoma by 2040; substantial global blindness/VI burden	Scaling integrated eye-mental-health care is a public-health priority	[20,97]

HR: Hazard ratio; MH: Mental health; MR: Magnetic resonance; SSRI: Selective serotonin reuptake inhibitor; OR: Odds ratio; PCP: Primary care physician; CIGTS: Collaborative Initial Glaucoma Treatment Study; OSD: Ocular surface disease; RNFL: Retinal nerve fiber layer; PHQ-9: Patient Health Questionnaire-9; GAD-7: Generalized Anxiety Disorder-7; HADS: Hospital Anxiety and Depression Scale; BDI-II: Beck Depression Inventory-II; SSRIs: Selective serotonin reuptake inhibitors; SNRIs: Serotonin-norepinephrine reuptake inhibitors; IOP: Intraocular pressure; RCT: Randomized controlled trial; CBT: Cognitive behavioral therapy; QoL: Quality of life; VI: Visual impairment; HRV: Heart rate variability.

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