



The economic burden of diabetic retinopathy in Pakistan: A narrative review in the context of national income and health expenditure

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Abstract

Pakistan has the world's highest reported age-standardized prevalence of diabetes mellitus, and diabetic retinopathy (DR), its leading microvascular complication and a major preventable cause of blindness, is a large, poorly quantified source of economic loss. This narrative review synthesizes epidemiological, health economic, and macroeconomic evidence to describe the burden DR places on patients, the health system, and Pakistan's economy, situating it against national income and public health spending. Pooled estimates place DR prevalence among adults with type 2 diabetes at roughly one third, with vision-threatening disease affecting close to one in twelve people with diabetes nationally. No published study has directly costed DR in Pakistan; using available prevalence data, general diabetes cost-of-illness figures, and an international benchmark cost for advanced retinal therapy, this review builds a transparent, illustrative estimate of the affected population and implied expenditure, set against public health spending of well under one percent of GDP. Even conservative assumptions place the cost of managing DR, especially its vision-threatening stages, beyond what many Pakistani households could absorb without catastrophic expenditure or forgone care. The review closes with policy directions, including population-based screening, provincial targeting, and subsidized anti-VEGF therapy, to reduce the long-run cost of this complication.

Keywords: Blindness, Cost of illness, Diabetic retinopathy, Economic burden, Gross domestic product, Health expenditure, Pakistan, Per capita income.

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Contribution of this paper to the literature

This review is, to the author's knowledge, the first to combine Pakistan-specific diabetic retinopathy prevalence data, general diabetes cost-of-illness figures, and macroeconomic indicators into a single, transparently labeled estimate of the economic burden diabetic retinopathy places on Pakistani patients, households, and the health system.

1. Introduction

Diabetes mellitus has moved from a peripheral concern to the center of Pakistan's noncommunicable disease agenda. The 11th edition of the International Diabetes Federation (IDF) Diabetes Atlas ranks Pakistan first in the world for age-standardized diabetes prevalence among adults aged 20 to 79 years, at 31.4%, and projects a further rise to 34.2% by 2050, a trajectory that would keep the country at the top of the global ranking for decades (International Diabetes Federation, 2025). Within the Middle East and North Africa region, to which Pakistan is grouped for IDF reporting purposes, national crude prevalence (a figure calculated on the raw adult population rather than adjusted for age structure, and therefore not directly comparable to the 31.4% age-standardized headline figure above) is reported at roughly one and a half times the regional average, and Pakistan is expected to overtake even the United States in absolute number of people living with diabetes (Bhatti, 2025; International Diabetes Federation, 2025). A large share of this burden remains undiagnosed. IDF figures place undiagnosed diabetes in Pakistan at close to 27% of adults with the condition, equivalent to more than nine million people who are not receiving treatment and are therefore at elevated risk of the vascular complications that follow years of unrecognized hyperglycemia (Bhatti, 2025).

Diabetic retinopathy is the ophthalmic expression of this epidemic. It is a progressive microvascular disease of the retina that, left undetected or untreated, advances from mild nonproliferative changes to vision-threatening proliferative disease and diabetic macular edema, and it remains one of the leading causes of preventable blindness in adults of working age worldwide. Because DR is frequently asymptomatic until relatively late in its course, its true burden is closely tied to the coverage of screening and diabetes care more broadly, a coverage that, in Pakistan, is constrained by a health system that devotes a very small share of national income to public health spending. This combination of a very high prevalence of the underlying disease, a health financing environment dominated by out-of-pocket payment, and a per capita income that leaves little room for households to absorb recurring costs, is what makes the economic burden of DR in Pakistan worth examining directly, rather than assuming it can be read off from the clinical literature alone.

This review draws together the epidemiological literature on DR in Pakistan, the limited but growing cost of illness literature on diabetes and its complications in the country, and macroeconomic indicators on national income and health expenditure, in order to describe the scale, distribution, and policy relevance of the economic burden that DR imposes. Section 2 sets out the specific gap this review addresses, Section 3 describes how the underlying literature was identified, and the remaining sections build from epidemiology through to an explicit, if necessarily approximate, estimate of scale.

2. Rationale

Three bodies of literature currently exist largely in isolation from one another. General cost of illness data for diabetes in Pakistan are available and of reasonable quality: a recent national, community-based study estimated a mean annual cost of USD 235 per patient, comprising direct medical, direct non-medical, and indirect components (Arshad, Alqahtani, & Rasool, 2024). These figures are not broken down by complication and do not isolate what share, if any, is attributable to ophthalmic disease specifically. Separately, a large and methodologically robust meta-analysis has established a pooled estimate of DR prevalence among Pakistani patients with type 2 diabetes, together with detailed regional and demographic subgroup data, but this work is epidemiological in scope and makes no attempt at economic costing (Akhtar et al., 2026). A scoping review of the wider diabetes complications literature in Pakistan states, in narrative terms, that complications including retinopathy impose a great deal of economic burden, without quantifying that burden in any way (Taimur et al., 2024).

No published study known to this reviewer combines these three strands, prevalence, cost of illness, and macroeconomic context, into a single account of what DR costs Pakistan and what that cost represents relative to national income. This is the specific gap this review addresses. Rather than treating the absence of a DR-specific costing study as a reason to stop at description, Section 7 below constructs a transparent, explicitly labeled illustrative estimate from the data that do exist, so that the scale of the problem can be discussed in concrete terms rather than general ones.

3. Methods: Literature Search Strategy

This is a narrative review rather than a systematic review, and no formal PRISMA-style screening or risk of bias assessment was undertaken. Sources were identified through targeted searches of PubMed and Google Scholar for Pakistan-specific studies on diabetes prevalence, diabetic retinopathy prevalence, and cost of illness, supplemented by hand searching the reference lists of the key reviews identified this way. Macroeconomic and health financing indicators were drawn from the International Diabetes Federation Diabetes Atlas, the World Bank, Trading Economics, and Pakistan's official Economic Survey as reported in the domestic press. Where a pooled quantitative estimate was required, this review relies on the most recent and largest available systematic review or meta-analysis rather than recalculating estimates from individual primary studies. Searches were last conducted in early August 2026.

4. Epidemiology of Diabetes and Diabetic Retinopathy in Pakistan

Diabetes prevalence estimates for Pakistan have risen sharply across successive editions of the IDF Diabetes Atlas, from close to 9.6% in earlier estimates to the current age-standardized figure of 31.4%, the highest of any country reported (International Diabetes Federation, 2025). Population-based work such as the second National

Diabetes Survey of Pakistan has underpinned these national estimates, and successive IDF editions have consistently placed Pakistan among the top three to five countries globally for both prevalence and absolute number of adults living with diabetes (Basit, Fawwad, Qureshi, Shera, & NDSP Members, 2018).

Against this backdrop, the epidemiology of DR specifically has been characterized mainly through hospital-based and regional studies rather than a single nationally representative survey. An earlier systematic review covering studies published up to 2017 pooled a DR prevalence of 28.8% among people with diabetes, with vision-threatening diabetic retinopathy (VTDR) affecting an estimated 8.6% of all diabetics nationally, figures that already signaled a substantial ophthalmic complication burden a decade ago (Mumtaz et al., 2018). A more recent and considerably larger systematic review and meta-analysis, incorporating 60 studies and more than 45,000 patients with type 2 diabetes published through September 2025, produced a pooled DR prevalence of 32.9% (95% CI 27.7 to 38.4%), confirming that roughly one in three Pakistanis with type 2 diabetes now has some degree of retinopathy (Akhtar et al., 2026). The same analysis found marked provincial variation, with pooled prevalence highest in Balochistan (54.7%) and Khyber Pakhtunkhwa (47.6%) and lowest in Islamabad (14.7%), alongside a clear time trend: pooled prevalence rose from 21.3% in studies conducted between 2001 and 2009 to 39.6% in studies conducted between 2020 and 2025 (Akhtar et al., 2026). Age over 50 years and diabetes duration of five years or more were the strongest predictors of DR in this pooled analysis, consistent with the broader clinical understanding that retinopathy risk accumulates with prolonged hyperglycemic exposure (Akhtar et al., 2026).

A separate scoping review of the Pakistani diabetes literature more broadly corroborates this picture, reporting that retinopathy was the most consistently documented microvascular complication across included studies, with a reported range of 14.5% to 43.0%, alongside nephropathy (14.0 to 31.0%) and neuropathy (10.8 to 59.6%) (Taimur et al., 2024). The same review noted that glycemic control among Pakistani diabetic patients is frequently poor, with rates of inadequate control reported between 44.7% and 86.4% across studies, and that this poor control, combined with limited diabetes knowledge and inconsistent treatment adherence, is a plausible driver of the rising complication rates observed over time (Taimur et al., 2024).

These prevalence figures should be read alongside Pakistan's own national blindness data, which offer a longer historical baseline. The second National Blindness and Visual Impairment Survey, conducted in the early 2000s, attributed posterior segment disease to 9.5% of blindness nationally, up from 5.4% in the first survey, but recorded diabetic retinopathy-related blindness at under 0.5% of causes at that time (Bourne et al., 2005; Dineen et al., 2007; Mumtaz et al., 2018). Given that diabetes prevalence and pooled DR prevalence have both risen substantially since that survey was conducted, this figure almost certainly understates DR's current share of national blindness, and it underscores how outdated Pakistan's population-based blindness cause data now are relative to the pace of the underlying diabetes epidemic.

5. Macroeconomic Context: National Income and Health Expenditure

The economic significance of any disease burden must be read against the income base from which the costs are drawn. Pakistan's nominal gross domestic product (GDP) per capita stood at approximately USD 1,644 in 2024, equivalent on a purchasing power parity basis to roughly USD 5,531, figures that place Pakistan firmly in the lower middle-income category and that have grown only modestly in real terms over the preceding decade (Trading Economics, 2026a, 2026b). With a population of more than 250 million and continuing population growth, the country's overall GDP, while large in absolute terms, translates into limited fiscal capacity per person for health and social protection. Health financing in Pakistan reflects this constraint. According to the government's own Economic Survey for fiscal year 2025 to 2026, total public health expenditure amounted to only 0.8% of GDP, essentially unchanged from the previous year despite a nominal increase in rupee terms, and far below the levels, typically cited in the range of 5% to 6% of GDP, considered necessary to make meaningful progress toward universal health coverage (Alam, 2026). This low level of public investment has long meant that a large share of health spending in Pakistan, including spending on chronic disease management and its complications, falls directly on households as out-of-pocket payments. The combination of low per capita income, low public health spending, and a chronic disease epidemic of the scale documented for diabetes creates the specific macroeconomic setting in which the cost of DR must be interpreted. Costs that would be considered modest in absolute international terms can represent a disproportionately large claim on both household budgets and the public purse in Pakistan.

6. Direct Medical Costs Attributable to Diabetes and its Ophthalmic Complications

Formal cost of illness evidence specific to DR in Pakistan remains scarce, but recent work on the economic burden of type 2 diabetes mellitus more broadly provides a useful anchor. A 2024 community-based, prevalence-based cost of illness study of 522 patients across Pakistan estimated the mean annual total cost per patient with type 2 diabetes at USD 235.1, of which direct medical costs made up the large majority, 93.2% of total cost, mean USD 219.2, with direct non-medical costs and indirect costs accounting for smaller shares (Arshad et al., 2024). Because this figure captures costs associated with diabetes as a whole rather than DR specifically, it should be read as a baseline. The addition of retinal photography or fundus examination, optical coherence tomography, laser photocoagulation for proliferative disease, and, for macular edema or more advanced disease, repeated intravitreal anti-vascular endothelial growth factor (anti-VEGF) injections adds a recurring layer of cost on top of routine diabetes management that general cost of illness figures for diabetes do not capture.

Anti-VEGF therapy illustrates how quickly ophthalmic complication costs can escalate relative to routine diabetes care. A 2026 systematic review of the cost-effectiveness of anti-VEGF drugs for diabetic macular edema treats these agents as a substantial recurring expense, reflecting the fact that effective treatment typically requires multiple injections a year, sustained over several years (Hasoumi, Alipour, Ahmadieh, Arabloo, & Jahangiri, 2026). A Spanish hospital pharmacy costing study, used here only as an international order of magnitude benchmark rather than a Pakistan-specific figure, put annual anti-VEGF drug acquisition costs above EUR 7,000 per patient, equivalent to roughly USD 7,500 at recent exchange rates (Ruiz-Moreno, de Andrés-Nogales, & Oyagüez, 2020). Set against a Pakistani GDP per capita of about USD 1,644, a benchmark of this size is more than four and a half times the average person's entire annual income, which makes clear why sustained anti-VEGF treatment is likely to be financially out

of reach for most Pakistani patients under an out-of-pocket financing system, even allowing for the fact that actual Pakistani costs are almost certainly lower than the European benchmark because of the widespread off label use of bevacizumab in place of patented agents. At the health system level, the wider literature on diabetes complications in Pakistan repeatedly identifies retinopathy, alongside nephropathy and neuropathy, as a major driver of the escalating cost of caring for the country's diabetic population, and notes that poor glycemic control, itself linked to gaps in diabetes education, medication adherence, and access to specialist services, is strongly associated with the development of these complications and their associated costs (Taimur et al., 2024). This suggests that a meaningful share of DR-related expenditure in Pakistan is, in principle, avoidable through earlier detection and better upstream diabetes management, reinforcing the case for investment in primary care-based glycemic control and screening rather than reliance on downstream, complication-stage treatment alone.

7. Estimating the Scale of the Burden: An Illustrative Synthesis

Because no published study isolates the cost of DR in Pakistan, this section combines the prevalence and cost figures reviewed above into a single, explicitly labeled illustrative estimate. The purpose is not to claim precision that the underlying data cannot support, but to move the discussion from qualitative statements about a large burden to an approximate, defensible order of magnitude. Every derived figure in Table 1 is marked as an author calculation and rests on the assumptions stated in the notes beneath it; every non-derived figure is drawn directly from a cited source.

Table 1. Illustrative synthesis of the scale of diabetic retinopathy and its cost implications in Pakistan.

Metric	Value	Source/basis
Adults living with diabetes in Pakistan (most recent count based on IDF estimate)	~33.0 million	International Diabetes Federation (2025), likely an underestimate of the 2026 figure
Assumed share with type 2 diabetes	~90%	Standard epidemiological convention, not Pakistan specific
Estimated adults with type 2 diabetes	~29.7 million	Author calculation (33.0M x 90%)
Pooled DR prevalence in type 2 diabetes	32.9%	Akhtar et al. (2026) meta-analysis
Estimated adults with type 2 diabetes and DR	~9.8 million	Author calculation (29.7M x 32.9%)
Estimated adults with type 2 diabetes and vision-threatening DR	~2.6 million	Author calculation (29.7M x 8.6%; VTDR share from Mumtaz et al. (2018), an older and likely conservative figure, see note below)
Mean annual all-cause diabetes cost per patient (Pakistan)	USD 235	Arshad et al. (2024)
That cost as a share of GDP per capita	~14%	Author calculation (235 / 1,644)
International benchmark: annual anti-VEGF drug cost per patient (Spain)	>EUR 7,000 (~USD 7,500)	Ruiz-Moreno et al. (2020)
Benchmark anti-VEGF cost as a multiple of GDP per capita	~4.6x	Author calculation (7,500 / 1,644)
Pakistan public health expenditure	0.8% of GDP (FY2025-26)	Pro Pakistani, 2026, citing Alam (2026)

Rows marked as an author calculation are derived estimates, not measured Pakistan-specific data, and should be read as order of magnitude figures rather than precise national statistics. The DR and VTDR rows use a consistent denominator, the estimated type 2 diabetic population, so that the two figures are directly comparable. The VTDR share itself is drawn from a systematic review of studies conducted up to 2017, whereas the overall DR share is drawn from a meta-analysis showing pooled DR prevalence nearly doubled between studies conducted in 2001 to 2009 and studies conducted in 2020 to 2025; the VTDR estimate in this table should therefore be read as a floor rather than a current best estimate, since a more recent VTDR study would likely report a higher share.

Two results from Table 1 are worth stating plainly. First, on these assumptions, close to ten million Pakistani adults are living with some degree of DR, and at least 2.6 million with vision-threatening disease, a population roughly comparable in size to a mid-sized country, and likely an underestimate given the dated source for the VTDR share. Figure 1 sets out this cascade visually. Second, even before adding any DR-specific cost to the baseline diabetes figure, routine diabetes care already consumes an estimated one-seventh of average per capita income, and the benchmark cost of sustained anti-VEGF therapy for advanced disease is several times that income. Against public health spending of 0.8% of GDP, neither figure is one the state is currently positioned to absorb on patients' behalf, which is consistent with the household-level financial risk discussed in Section 9 below.

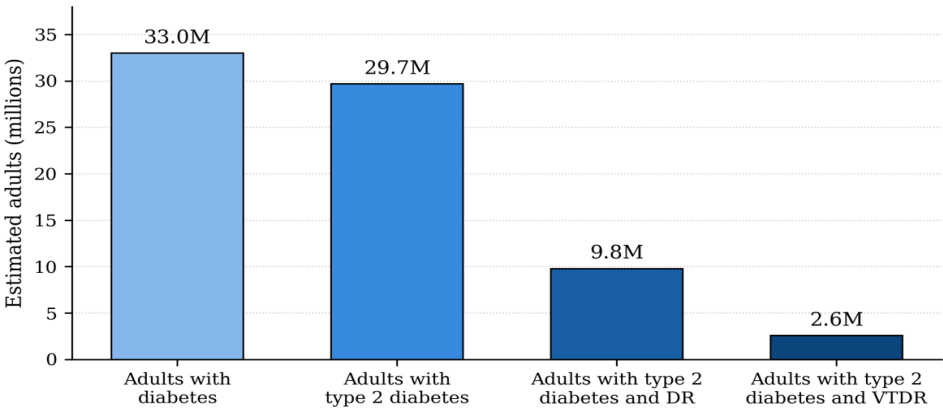


Figure 1. Estimated population cascade from diabetes to vision-threatening diabetic retinopathy (VTDR) in Pakistan.

Source: Derived from Table 1. Each stage is an author calculation as described in Table 1 and its accompanying note, not a directly measured national count.

8. Indirect Costs and Productivity Losses

Beyond direct medical spending, DR imposes indirect costs through lost productivity, caregiver burden, and reduced quality of life, and these costs are particularly consequential in Pakistan because of the age profile of the affected population. A global analysis of the productivity losses associated with vision impairment and blindness found that these losses run into the hundreds of billions of dollars worldwide each year, driven largely by reduced labor force participation and lower earnings among people of working age with uncorrected or untreated vision loss (Marques et al., 2021). This international pattern is directly relevant to Pakistan given the age structure of DR risk documented in the pooled Pakistani meta-analysis: Prevalence in patients over 50 years was 41.2%, compared with 27.0% in younger patients, and prevalence in those with five or more years of diabetes was 47.3%, compared with 18.5% in those diagnosed more recently (Akhtar et al., 2026). A substantial share of those affected are therefore still within, or only recently past, their prime working years, and vision impairment in this group translates into reduced labor force participation and increased dependence on family members who may themselves need to reduce paid work to provide care or accompany patients to repeated hospital visits.

These effects are compounded by the geographic distribution of DR prevalence noted earlier, with the highest pooled rates found in Balochistan and Khyber Pakhtunkhwa, provinces that also rank among the least well-served by specialist ophthalmic and tertiary diabetes care in Pakistan (Akhtar et al., 2026). Patients in these regions often face substantial additional indirect costs simply to access screening or treatment, including travel to distant tertiary centers and multiple days away from income-generating work, costs that are rarely captured in conventional direct cost estimates but that add materially to the total economic burden borne by affected households.

9. Household Financial Risk and Catastrophic Health Expenditure

Read against Pakistan's per capita income, the cost figures reported for diabetes and its complications imply considerable financial risk for the average household. A mean annual diabetes related cost in the range of USD 235 per patient already represents close to one seventh of a nominal per capita GDP of roughly USD 1,644, before accounting for the fact that household income, rather than a per capita macroeconomic average, is the more relevant comparator and is frequently lower, particularly in rural and lower income households where DR prevalence has been shown to be highest (Arshad et al., 2024; Marques et al., 2021; Trading Economics, 2026a). Because health financing in Pakistan relies heavily on out-of-pocket payment against public health spending of well under 1% of GDP, there is limited pooled or insurance-based protection to buffer households against the recurring, and in the case of advanced DR, escalating costs of ophthalmic care (Alam, 2026). Diabetes and its complications are well recognized in the health economics literature as a leading contributor to catastrophic health expenditure in low- and middle-income settings, and the Pakistani cost of illness evidence reviewed here, together with the illustrative figures in Table 1, is consistent with that pattern even without a complication-specific costing study isolating the marginal cost of DR alone (Arshad et al., 2024).

10. Health System Capacity, Screening Gaps, and the Cost of Late Presentation

A recurring theme across the Pakistani DR literature is that a large share of disease is detected late, often only once patients present with visual symptoms rather than through systematic screening (Mumtaz et al., 2018; Taimur et al., 2024). This pattern has direct economic consequences. DR detected and treated at an early, nonproliferative stage can often be managed with comparatively low-cost interventions such as improved glycemic control and monitoring, whereas disease detected at a vision-threatening stage requires the more expensive interventions discussed above, including laser photocoagulation, vitrectomy, or repeated anti-VEGF injections (Akhtar et al., 2026; Hasoumi et al., 2026). With undiagnosed diabetes affecting an estimated nine million or more adults nationally, and with formal, population-based DR screening programs still limited in coverage relative to the size of the at-risk population, the current trajectory favors late, costlier presentation over early, cheaper intervention (Akhtar et al., 2026; Bhatti, 2025).

This dynamic is reinforced by the low share of GDP devoted to public health spending, which constrains the public sector's ability to fund the primary care infrastructure, retinal imaging equipment, and trained personnel that population-based screening requires (Alam, 2026). The result is a health system in which the costs of DR are shifted disproportionately toward the complication treatment end of the disease course, precisely the segment of care that is most expensive, least accessible to lower-income households, and least likely to be reimbursed.

11. Policy Implications

The evidence reviewed here points toward five policy directions, grouped by the point in the disease and financing pathway at which each intervenes. None requires new epidemiological discovery so much as better use of what is already known.

11.1. Screening and Early Detection

Because DR is frequently asymptomatic until relatively advanced, integrating structured screening, using low-cost fundus photography or tele-ophthalmology reading models, into existing primary care diabetes services is the intervention most likely to change the cost trajectory described in this review. Embedding screening within routine diabetes visits, rather than a separate referral step, would reduce the share of patients who first present with vision-threatening disease and lower average treatment cost per case (Akhtar et al., 2026; Mumtaz et al., 2018).

11.2. Provincial and Geographic Targeting

Pooled DR prevalence ranges from 54.7% in Balochistan to 14.7% in Islamabad, a roughly forty-point gap between the best- and worst-served regions, and the highest-burden provinces are also among the least well-served by specialist care (Akhtar et al., 2026). A uniform, population-weighted allocation of new resources would leave these regions proportionally underserved; targeting Balochistan and Khyber Pakhtunkhwa specifically would likely cut national economic burden more per rupee spent than a uniform formula (Akhtar et al., 2026).

11.3. Financing Advanced Ophthalmic Therapy

Table 1's benchmark, several times Pakistan's per capita income for a year of anti-VEGF therapy, is not a cost an out-of-pocket system can expect households to bear (Hasoumi et al., 2026; Ruiz-Moreno et al., 2020). Pakistan's national insurance vehicle, the Sehat Sahulat Program, already extends cash-free hospital coverage to most low-income households, but its coverage is built around inpatient hospitalization and does not appear designed for recurring, outpatient, injection-based treatment (Hasan, Mustafa, Kow, & Merchant, 2022; Punjab Health Initiative Management Company, 2018). Extending it to scheduled outpatient anti-VEGF therapy, alongside negotiated procurement and continued reliance on off-label bevacizumab where appropriate, would close this gap without building a new mechanism from scratch (Hasoumi et al., 2026).

11.4. Upstream Diabetes Care and Health Literacy

Poor glycemic control and low diabetes knowledge, with inadequate control reported as high as 86.4% across studies, are repeatedly identified as upstream drivers of complication rates in Pakistan (Taimur et al., 2024). Investment in diabetes education, adherence support, and routine glycemic monitoring at the primary care level acts on DR risk before a patient ever needs a retinal specialist, and is comparatively low-cost relative to laser treatment, vitrectomy, or anti-VEGF therapy (Taimur et al., 2024).

11.5. Strengthening the Evidence Base

The gap identified in Section 2 is itself policy-relevant: no published study has directly costed DR in Pakistan, and the country's only national blindness survey dates to the early 2000s, predating the rise in diabetes and DR prevalence documented here (Bourne et al., 2005; Dineen et al., 2007). A dedicated costing study paired with an updated blindness survey would let future resource allocation rest on measured data rather than the illustrative estimates constructed in this review.

12. Limitations

This review has several limitations inherent to the current state of the literature. Cost of illness data specific to DR in Pakistan, as opposed to diabetes generally, remain unavailable, so the economic conclusions drawn here, and the illustrative estimate in Table 1 in particular, are necessarily inferential, combining general diabetes cost data with DR prevalence and severity data and one international cost benchmark rather than drawing on a single integrated national costing study. The prevalence literature itself, while now anchored by a large recent meta-analysis, is characterized by very high between-study heterogeneity, an I squared of 98.8% in the most recent pooled analysis, reflecting differences in study setting, diagnostic method, and population, and pooled national estimates should therefore be interpreted as an average rather than a precise figure (Akhtar et al., 2026). The 33 million count used as the population base in Table 1 is drawn from the 2021 IDF Atlas and is likely an underestimate of the true 2026 figure, meaning the population and cost estimates in Table 1 are, if anything, conservative. The VTDR share used in the same table is drawn from a 2018 systematic review of older studies rather than from the more recent 2026 meta-analysis, which did not separately report vision-threatening disease, so the VTDR estimate should be treated as a lower bound. The 90% types 2 diabetes share used to derive the type 2 diabetic population in Table 1 is a standard global epidemiological convention rather than a Pakistan specific measured figure, and no nationally representative type 1 versus type 2 breakdown was located during this review; this assumption is the single largest source of uncertainty in the table and would be the first parameter to replace if a Pakistan specific figure becomes available. Finally, macroeconomic indicators such as GDP per capita and public health expenditure share are national averages that mask substantial regional and socioeconomic variation, meaning the household-level financial risk described here is likely understated for lower-income and rural populations and may be overstated for higher-income urban households.

13. Conclusion

Pakistan's position as the country with the highest reported diabetes prevalence in the world, combined with a pooled DR prevalence approaching one in three people with type 2 diabetes and public health spending below one percent of GDP, together describe a setting in which the economic burden of diabetic retinopathy is large, rising, and disproportionately borne by households rather than the state. The illustrative synthesis presented here suggests that close to ten million Pakistani adults may currently be living with some degree of DR, that routine diabetes care alone already consumes a substantial share of average income, and that the cost of advanced ophthalmic treatment, benchmarked internationally, is several times that income. Addressing this burden will require earlier detection through expanded screening, targeted investment in underserved provinces, and financing mechanisms that bring high-cost but effective treatments such as anti-VEGF therapy within reach of the households who need them, interventions that, on the evidence reviewed here, are likely to be economically as well as clinically justified.

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