# Diabetic Retinopathy in Asia

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Today, more than half of the global population lives in Asia, with four out of every 10 inhabitants living in China or India.[1] The health of this large segment of the world is rapidly changing as diabetes, obesity, and insulin resistance reach epidemic proportions. Currently, cataracts and refractive error are responsible for most of the visual impairment in Asia, although diabetic retinopathy causes 3% to 7% of the total blindness throughout the region.[2] This proportion is likely to change as the prevalence of diabetes mellitus multiplies in this area of the world.

## Prevalence of Retinopathy and Blindness

The current World Health Organization (WHO; Geneva, Switzerland) data estimate the combined diabetic population of India and China to be 52.4 million. This number is expected to climb to approximately 121.8 million, or onethird of the world's prevalence, by the year 2030.[3] This increase is compounded by a gross lack of awareness about diabetes and the risk factors and complications associated with it.[4] In addition, population demographics in these countries are changing. Between 2000 and 2030, the number of people in China and Asia who are older than 65 years is expected to increase by 168%.[3] Additionally, populations are living longer, and type 2 diabetes is becoming increasingly common in younger people,[5] thus lengthening the time for complications to develop.

The studies pertaining to the prevalence and incidence of retinopathy are highly heterogeneous in terms of case selection, detection methods, and diabetic retinopathy grading, and are, therefore, difficult to compare. Among outpatients, a significantly higher rate of retinopathy was found in mainland China (47.4%) when compared with the pooled rate of 14 WHO study centers throughout the world (35.8%).[6] However, variability due to interobserver bias and the use of direct ophthalmoscopy must be considered. In contrast, a more recent nationwide analysis identified diabetic retinopathy in 34.3% of 24,496 hospital inpatients from 1991 to 2000.7 Population-based studies in China have found prevalence rates ranging from 9.84% to 18.94%, which suggest low rates of the condition among diabetics.[8-10]

Two large, clinic-based Indian studies have pegged the prevalence rates of diabetic retinopathy in patients with type 2 diabetes mellitus in south India at 34.1% and 37% respectively.[11,12] Although these conclusions appear similar to Western studies, they are biased because of the referral of severe cases to tertiary care centers. A recent, large, cross-sectional study utilizing stereo fundus photography reported

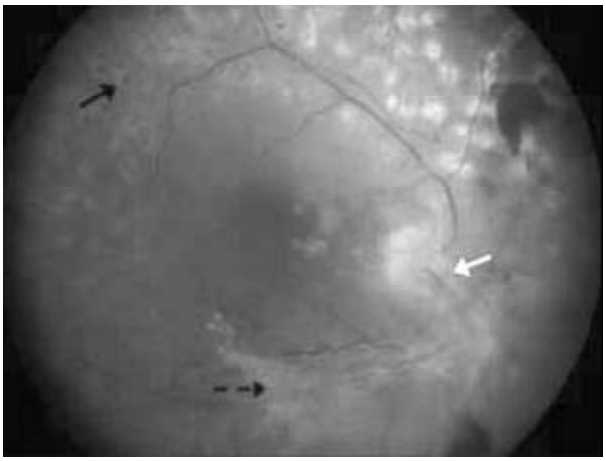

*Figure 1. This image shows a case of diabetic retinopathy. The tractional retinal detachment(dashed arrow) results from the fibrovascular proliferation of the neovascular membrane originating from the optic disc (white arrow). Also note the multiple panretinal photocoagulation scars (black arrow).*

the overall prevalence rate of retinopathy in urban South Indians as 17.6%, which is much lower than in other ethnic groups.[13] However, extrapolating this

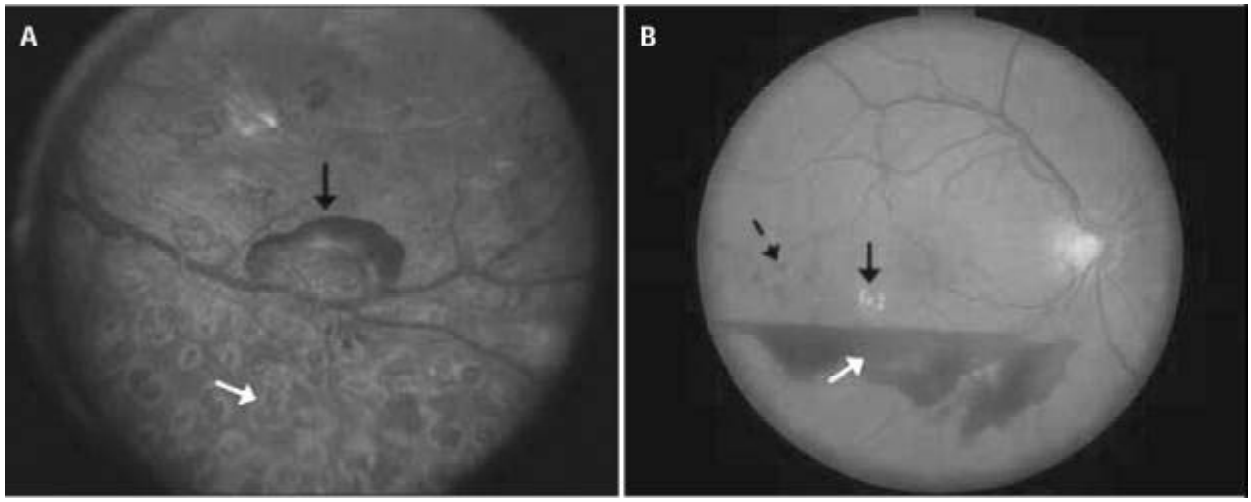


*Figure 2. An area of active neovascularization denotes proliferative diabetic retinopathy (black arrow) along with panretinal photocoagulation scars (white arrow) (A). In a preretinal hemorrhage (white arrow), lipid exudates in the macula (black arrow), and multiple dot-and-blot intraretinal hemorrhages (dashed arrow) are evident (B).*

percentage to all 31.7 million diabetic individuals in India would translate to more than 5.6 million subjects with diabetic retinopathy. Additionally, data suggest that the urban poor in developing countries have a lower incidence of diabetes but a higher rate of complications associated with the disease, compared with the urban poor of developed societies.[14] This incipient diabetic retinopathy poses an enormous public health challenge and financial burden for Asia, particularly because persons who have diabetic retinopathy are 29 times more likely to become blind than are nondiabetic persons of the same gender and similar age.[15]

## Complications and Risk Factors

Evidence of diabetic retinopathy can eventually be identified in nearly all individuals with type 1 diabetes mellitus and in a high proportion of those with type 2 diabetes mellitus.[16] Diabetic retinopathy can be divided into two broad categories: nonproliferative and proliferative. Nonproliferative diabetic retinopathy includes intraretinal hemorrhages, microaneurysms, venous beading, intraretinal microvascular abnormalities, and diabetic macular edema (Figure 1). Proliferative diabetic retinopathy describes neovascular proliferative growth occurring at the optic disc or elsewhere, and it can lead to vitreous hemorrhage and tractional retinal detachment (Figure 2). Diabetic macular edema, vitreous hemorrhage, and retinal detachment may, in turn, lead to visual impairment and blindness in the diabetic population (Figure 3). Proliferative retinopathy may develop in up to 50% of patients with type 1 diabetes mellitus 15 years after diagnosis.[17] with incidence rates approximately half as high among patients with type 2 diabetes mellitus.[16] Blindness from severe proliferative retinopathy develops in approximately 4.8% of individuals with type 1 diabetes mellitus and in 1.6% of those with type 2 diabetes mellitus.[18] Type 2 diabetes mellitus accounts for more than 97% of the total burden imposed by diabetes in Asia and even outnumbers type 1 diabetes mellitus in children and adolescents in some parts of the region.[5] The development of diabetes mellitus at a younger age is a significant epidemiologic transition, given the strong correlation between the duration of diabetes and the development of diabetic retinopathy.[19] Additional risk factors for diabetic retinopathy include hyperglycemia, insulin use, hypertension, family history of diabetes, and nephropathy leading to proteinuria.[18-23] Several investigators have also reported a positive association between serum lipids and the condition.[24-26]

## Screening for Diabetic Retinopathy

A variety of techniques can be used to screen for diabetic retinopathy, including direct and indirect ophthalmoscopy, stereoscopic color fundus photography, and mydriatic or nonmydriatic digital color or monochromatic photography. Ophthalmoscopy is the most commonly used technique to screen for diabetic retinopathy. The gold standard for the detection and classification of diabetic retinopathy is stereoscopic color fundus photographs in seven fields, as defined by the Early Treatment Diabetic Retinopathy Study group.[27] Although this technique is accurate and reproducible, it is labor and skill-intensive, expensive, time consuming, and uncomfortable for the patients.[28] Screening by trained caregivers who are not ophthalmologists, such as general physicians or paramedical personnel, has been shown to be reliable in detecting diabetic retinopathy and may be a way to expand current screenings.[29]

## The Challenge Ahead

Screening for and treating diabetic retinopathy may reduce the likelihood of severe vision loss from proliferative diabetic retinopathy by more than 90% and has been shown to be highly cost-effective.[30] Early detection is of vital importance because treatment is not curative, but rather vision-preserving. To enhance detection, more individuals must be screened for diabetes and more individuals with diabetes must be screened for diabetic retinopathy. This undertaking will be challenging because two-thirds of the Chinese population with diabetes has not been diagnosed.[5] In the rural areas of India, where two-thirds of the population lives, more than 70% of diabetic subjects remain undiagnosed.[31] In one Chinese cohort, retinopathy was found in conjunction with diabetes in 21% of individuals at the time of diagnosis, further suggesting significant periods of unrecognized disease.[32] Additionally, patients with vision-threatening diabetic retinopathy may not have symptoms, a fact that decreases the likelihood that they would seek medical attention. When cases are detected, low uptake and follow-up for treatment may be a problem even when offered free of charge.[33,34] An additional barrier to treatment is the higher cost of treating retinopathy compared with the expenses of treating cataracts or refractive error.

The potential strain of diabetes on the ophthalmic care system in China and India is evident; even if as few as 5% to 10% of the projected 121 million develop severe retinopathy, approximately 6 million to 12 million persons may require laser or surgical intervention within the next 2.5 decades. According to one report from India, only 6.7% of those who were aware of their diabetic status had visited an ophthalmologist, [35] so getting these people into the eye care delivery system soon enough to preserve vision could be a major challenge. This problem suggests the need for (1) increased awareness in the community, (2) the deployment of digital and telemedical technology to enhance access to specialist care, and (3) improved networking between internists and ophthalmologists to ensure that all those at risk for visual impairment from diabetes receive appropriate and timely ophthalmic examination and care. Only such a multifaceted approach will effectively eliminate unnecessary and preventable blindness from diabetic eye disease.

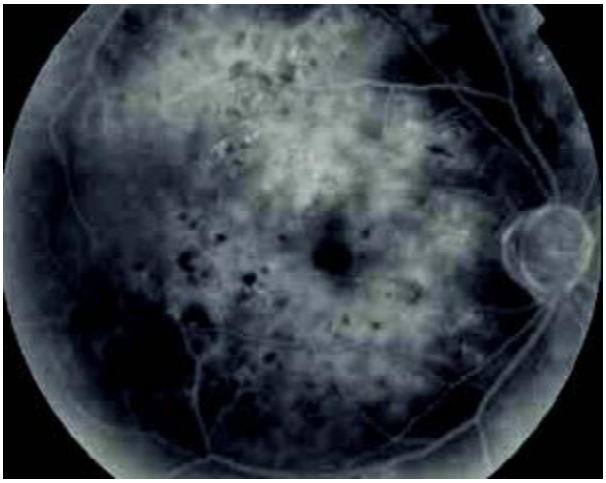

*Figure 3. This fluorescein angiogram demonstrates late leakage in a patient with clinically significant macular edema.Previous grid-photocoagulation scars are also evident.*