Editorial

Preventing Blindness due to Diabetes in the Developing Countries: Lessons Learned from the Bangladesh Health System

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Vision impairment due to diabetes reportedly represents a major global public health challenge[1] as the World Health Organization (WHO) estimated it among 2.2 billion people, worldwide[2] -which the International Diabetes Federation (IDF) dreaded to be the "Pandemic of unprecedented magnitude"[3] evincing latest epidemiologic estimates of global disease burden (GDB).[4] While complicated diabetes affected people who live with certain degrees of vision impairment, Wong et al figured it out as nearly half of who could have been prevented. This attest Bourne's globally observed blindness prevention strategies focusing mostly on cataract related blindness.[5] Contextually, some well-trained Bangladeshi ophthalmologists like other lower-and-middle-income-countries (LMIC) conducted to follow GDB Study group of VISION 2020's "The Right to Sight"[6]

Similarly, rapidly evolving clinico-epidemiology of blindness yielded a substantial burden of non-communicable diseases (NCD), Diabetes Mellitus (DM) the most that goes vis-a-vis with globally emerging challenges of diabetic retinopathy (DR) type of micro vascular complication of DM leading to vision impairment, mostly among working-age population.[7] Globally, one-third of DM-population reportedly develop DR, while 10% develop vision threatening disease, like proliferative DR or diabetic macular edema.[3] If not detected in early stage may lead to irreversible visual impairment, conditions which mostly occur among working-age population of LMICs.[5-6]

Unlike cataract, DR often remains asymptomatic in early stages requiring lifelong surveillance, repeated interventions and sustained follow up that makes it fundamentally different as complex public health challenge.[8] Unless detected prompt treatment, DR may lead to irreversible visual loss, being the leading cause of preventable blindness among working age population, particularly in developing countries.[5] Contextually, IDF estimated 537 million adult diabetes in 2021, projecting a rise to 783 million by 2045,[9] nearly 80% belonging to LMICs, like Bangladesh where healthcare services face resources and infrastructure constraints.[3]

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Author(s) Affiliation:
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Date of Submission: *29-04-2026*
Date of Review: *29-04-2026*
Date of Acceptence: *30-04-2026*

Burden of Diabetes and Diabetic Retinopathy: Bangladesh Perspectives

Bangladesh is undergoing a rapid epidemiological transition facing an increased burden of NCD, DM being one of significant public health concern that the IDF estimated as more than 13 million Bangladeshi adults who currently live with DM and expected to increase substantially in upcoming decades.[4]

Several studies reported substantially higher prevalence of DR among diabetic individuals. Hospital based studies from a tertiary care institution such as BIRDEM General Hospital -the flagship center of Diabetic Association of Bangladesh (BADAS) reported 20–30% of diabetic patients develop some degree of DR, while 5–10% develop vision threatening diseases requiring urgent interventions.[6] Nevertheless, screening initiatives using digital fundus photography revealed similar concern like another screening program among 50,000 diabetics revealing approximately 1/3rd who had DR-7 in early stages though- which often remain asymptomatic and may retain good visual acuity until the disease reaches advanced stage. Consequently, DR-patients frequently present late with sight threatening complications, when treatment becomes more complicated with minimal visual outcome.

Detailed Role of BADAS: A role model for developing countries

BADAS plays a pivotal role in diabetic care in Bangladesh for the past few decades utilizing its nationwide network of diabetic hospitals and other affiliated centers. BADAS possess a distinctive feature in health care service delivery system. It maintains a unique 'Booklet'' for each patient where all the data-specific observed clinical and laboratory findings of pre-registered patients recorded safely including patient's treatment profile and follow-up record. More importantly, it preserves all old records on periodical ophthalmological examinations that largely facilitate early detection of DR.

Moreover, BADAS provides a standard healthcare services delivery system to thousands of diabetic patients, often in low cost, and free-of-cost insulin therapy or in subsidized rates.[10-12] Additionally, BADAS provides subsidized healthcare services, enabling lower socioeconomic communities for easy access to diabetes care.[13-15]

BADAS also introduced a mobile diagnostic service on mini-

DOI: https://doi.org/10.71177/jcco.v4i02.139

buses being well equipped with retinal imaging systems and laser treatment facilities to country's far reaching-out regions to facilitate service delivery to underserved populations of lower socio-economic population representing an effective community-based approach for diabetic eye care. This example of BADAS may remain as a 'Role Model' for several developing countries.[16-21]

Diabetic Retinopathy Screening Initiatives in Bangladesh

Recognizing the growing burden of DR, several initiatives have been implemented in Bangladesh to expand screening services and strengthened referral system with support from World Diabetes Foundation (WDF)13 in collaboration with BADAS.[10,11,12] Thus, structured screening services in multiple diabetic centers were established which already screened out more than 140,000 diabetics for DR and sight threatening diseases including appropriate referrals for appropriate treatment.[8]

Further WDF supported other projects through organizing community screening camps in Bangladesh, when more than 44,000 people were screened out while 9,000 patients were diagnosed with DR and referred for further care and managements. Notably, 'Orbis international'[22] and 'Fred Hollows Foundation'[23] also contributed in DR services in Bangladesh, including Integrated Model of Care for Diabetic Retinopathy within the Health System of Bangladesh (2015–2018).[23]

Noteworthy is, these programs were meticulously focused on establishing retinal screening units at the district level hospitals for ophthalmology technical training manpower on fundus photography and improving referral networks linking peripheral facilities to tertiary retinal centers.[9] Despite all these encouraging initiatives of screening coverage it yielded to be insufficient relative to such rapidly growing diabetic populations.

With support from WDF, BADAS implemented large scale community & district level diabetic retinopathy screening programs between 2011 and 2017, incorporating mobile eye units referral pathways. These initiatives screened thousands of people with diabetes that enabled early detection and referral of large numbers of patients with diabetic retinopathy.

Key technical and implementation support was also provided by international partners including Orbis International and Fred Hollows Foundation (FHF) in strengthening national capacity building for community based diabetic eye care in Bangladesh. These drives justify the direct involvement of FHF in DR screening, referral systems and treatment capacity building in Bangladesh, including 'System strengthening approach' complemented to BADAS by WDF, FHF and Orbis International.[20-23]

Treatment and Curative Services Delivery using Public Sector Initiatives: Advanced level modern retinal treatment yields significantly improved outcome in DR patients in:

i) Laser photocoagulation ii) Intravitreal anti-Vascular Endothelial Growth Factor (VEGF) & iii) Vitreoretinal surgery.

Some of our trained ophthalmologists in Bangladesh thus, carefully planned these services available even to district levels which currently cover many tertiary care eye hospitals and specialized retinal centers. However, access to such advanced treatment remains limited for some patients due to financial constraints.

Most encouraging is National Institute of Ophthalmology (NIO) in Bangladesh has recently initiated some great programs to provide free anti-VEGF injections for eligible patients, demonstrating an important step-forward toward improving access to modern retinal therapy even for the socio-economically disadvantaged populations. Since demand for such treatment exceeds the current delivery capacity it's time to expand the program across regional centers.

Role of Artificial Intelligence (AI) and Future of Retinal Screening Services

Since use of artificial intelligence (AI) is emerging as a very promising tool in DR-screening methods, like: AI-based algorithms analyzing retinal images to detect DR with higher sensitivity and specificity.[23]

In resource limited settings such as Bangladesh, AI assisted screening programs could enable trained technicians or primary healthcare (PHC) workers to capture retinal images while automated systems can perform preliminary gradings. Patients identified with suspected disease could then be referred to ophthalmologists for further evaluation and treatment. Such technologies might have potentials to substantially expand retinal screening coverage thus improving early detection of DR.

The Way Forward

To address the growing burden of DR in Bangladesh it requires a stringently planned coordinated public health strategy with robust commitment. Community awareness programs should be emphasized not only on the importance of regular eye examination of all diabetic pts even in absence of visual symptoms. We sincerely feel that a 'Nationwide Diabetic Retinopathy Screening Program' to be integrated into our existing diabetes care services particularly within the extensive framework of BADAS networking with its mobile retinal screening services. However, this network should be expanded to reach underserved population of the hard-to-reach communities for better approach and supervision. Access to advanced retinal treatment should be improved through expanded government supported anti-VEGF-programs and development of public–private-partnerships (PPP) alliances particularly with all private retinal care centers/ hospitals. Finally, adoption of AI

based screening technologies may significantly enhance the capacity of the healthcare system to detect diabetic retinopathy early and ensure timely referral and treatment.

CONCLUSION

Bangladesh has achieved notable success in reducing cataract blindness through community-based eye care programs. However, the rapidly increasing burden of diabetes presents a new challenge for the country's eye health system. With coordinated efforts involving government institutions, healthcare organizations, NGOs and professional societies, Bangladesh has the potential to significantly reduce diabetic retinopathy related blindness and serve as a model for other developing countries facing similar challenges.

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Acknowledgments:

The author(s) have no acknowledgments to declare.

Conflict of Interest

The author(s) declare no conflicts of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

AI Declaration

No artificial intelligence tools were used in the preparation of this manuscript.