Editorial

Confronting the Looming Crisis of Type 5 Diabetes and Diabetic Retinopathy: An Urgent Call for Systemic Innovation in Indonesia's Healthcare Landscape

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The recent emergence of type 5 diabetes (T5D) was officially recognized by the International Diabetes Federation (IDF) in 2025 as a distinct form of the disease. T5D is a distress signal for global health systems, especially in countries like Indonesia, where epidemiological and demographic trends are colliding with alarming force. It is much more than a scientific reclassification. This recently identified subtype of diabetes, which is predominantly seen in Asia and Africa, is thought to impact 2025 million people globally. It is typified by early-onset insulin resistance in adolescents and young adults (usually aged 1535). T5D is characterized by a unique pathophysiology that combines conventional metabolic abnormalities with chronic inflammation and mitochondrial dysfunction. Significant insulin deficit and poor glycemic control are hallmarks of Severe Insulin-Deficient State (SIDD), the underlying pathophysiology.

T5D, also known as malnutrition-related diabetes, differs mechanistically from other types of diabetes because it seems to be caused mainly by impaired pancreatic development, especially during crucial developmental stages in childhood or adolescence. Given that Indonesia already has 19.5 million people with diabetes (the seventh-highest national burden in the world) and that number is expected to rise by nearly 50% by 2045, the consequences are dire. We're not just facing more diabetes - we're facing a more aggressive form that threatens to blind our working-age population during their prime productive years.[1,2]

This crisis has significant and varied ophthalmological implications. As seen by the dropping cataract surgery rates, which are only half the WHO-recommended threshold at 1,500 surgeries per million population, this faster disease progression is colliding with an eye care system that is already overburdened. The problem is made worse by the geographically unequal distribution of specialists. A large proportion of ophthalmologists are centered in Java, while the surrounding islands continue to be woefully underserved.

In addition to the backlog of cataract cases that predominantly affect the elderly, our system is now confronted with the possibility that hundreds of thousands of young adults will need complicated retinal procedures. Recent findings from Sasongko, et al[3] reveal alarming DR rates among Indonesians with type 2 diabetes: 43.1% overall prevalence, with 26.3% classified as Vision-Threatening Diabetic Retinopathy (VTDR) and 7.7% of VTDR cases resulting in bilateral blindness. These figures underscore the urgent need for systematic screening, particularly as modifiable risk factors like sedentary behavior (>3 hours/day) independently elevate DR risk (OR 1.66 for any DR; OR 1.74 for VTDR).[3] The co-existence of cataract and DR may present dual threats to vision health, particularly in underserved populations. Without robust screening and timely intervention, many patients may present only when vision is irreversibly lost.[4,5]

The emergence of T5D intensifies this challenge. Unlike conventional diabetes, T5D's hallmark insulin deficiency, driven by early-life pancreatic dysfunction, creates a "double-hit" effect on retinal health: (1) unmanaged hyperglycemia from severe insulinopenia, and (2) micronutrient deficiencies (e.g., vitamin A, zinc) that compromise retinal repair.

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This dual pathology may explain why T5D patients in comparable settings develop retinopathy years earlier than those with type 2 diabetes. In Indonesia, where childhood nutrition remains a persistent issue, T5D could accelerate DR progression in a demographic already underserved by eye care infrastructure. Without targeted interventions such as integrating DR screening with nutrition programs in high-stunting regions, Indonesia risks a surge in preventable blindness that could overwhelm its healthcare system and erode economic productivity.[6]

Indonesia's struggle with incomplete epidemiological data forms a critical backdrop to understanding the alarming projections of T5D and its devastating economic impact. Unlike nations with comprehensive diabetes registries, Indonesia's health system grapples with fragmented datasets, particularly for emerging conditions like T5D and its ocular complications. The groundbreaking JOGED.COM study by Sasongko, et al[7] represents a significant advance as Indonesia's first comprehensive epidemiological investigation of diabetic retinopathy, successfully enrolling 1,184 type 2 diabetes participants through rigorous community-based methodology. This pioneering work establishes vital baseline data on DR prevalence and risk factors. Current estimates of 6-8% T5D prevalence are derived from malnutrition-associated diabetes studies in Indonesia[8] and South Africa.[9] These may be underestimate the true burden in high-stunting provinces where pancreatic dysfunction remains underdiagnosed. These data gaps have profound implications: economic projections of direct medical costs and productivity losses fail to capture indirect burdens like caregiver strain and community-level economic ripple effects, particularly in rural areas. More critically, this epidemiological blind spot prevents policymakers from accurately gauging the crisis scale. However, the solution lies not in awaiting perfect data but in pursuing parallel strategies such as implementing immediate low-cost DR screening programs while systematically building nationwide T5D registries. The JOGED.COM model demonstrates how community-engaged research can generate actionable insights despite resource constraints. With vision-threatening diabetic retinopathy progressing silently until irreversible damage occurs, delay risks condemning a generation to preventable blindness - an outcome neither medically justifiable nor economically sustainable for Indonesia's developing healthcare system. The time for action predicated on available evidence is now, even as more robust data collection systems are established.

Yet within this crisis lies unprecedented opportunity for systemic innovation. Indonesia's demographic structure with increased percentage of the population currently in the working-age bracket, provides both the imperative and the means for transformation.[10] The scarcity of reliable diabetes data in Indonesia presents an opportunity to advance from traditional surveillance methods through artificial intelligence. Building on proven models like Singapore's SELENA+ platform - which combines AI-powered retinal analysis with cloud- based data aggregation to achieve very high detection accuracy for diabetic retinopathy, Indonesia could develop an integrated digital epidemiology network.[11] The SELENA+ system demonstrates how automated retinal image analysis can simultaneously screen for complications while generating population-level data, a dual function that would be invaluable across Indonesia's archipelago. AI-powered systems could transform passive data collection into active, real-time epidemiological monitoring. The solution framework requires coordinated action across multiple fronts. First, we must revolutionize primary prevention by expanding and adapting the primary healthcare facilities revitalization program such as Puskesmas or Posyandu, to incorporate mobile metabolic health units staffed by nutritionists and community health

workers. By deploying lightweight AI tools on community health workers' smartphones to analyze retinal images and flag probable T5D cases during routine screeningscreating instant, geotagged data points. Second, through natural language processing (NLP) mining of electronic health records across 10,000+ primary healthcare facilities to identify undiagnosed T5D patterns in young patients with malnutrition histories. Third, by establishing an AI-curated national diabetes registry that synthesizes screening results, pharmacy dispensing patterns, and population nutrition data into dynamic risk maps.[12]

The integration of AI-driven screening into Indonesia's health system represents not just a technological upgrade, but a fundamental reimagining of how diabetic eye care can be delivered at scale. Simultaneously, we must re-engineer our tertiary care delivery system. The proven Aravind model from India demonstrates how training mid-level ophthalmic technicians to handle routine monitoring can dramatically expand capacity, allowing ophthalmologists to focus on complex cases.[13] Implementing such an approach in Indonesia will require bold regulatory reforms to redefine scopes of practice and establish new certification pathways - challenging but necessary changes to build a more responsive system. These frontline screenings would then feed into a centralized telemedicine platform where ophthalmologists could remotely validate results and prioritize high-risk cases. Crucially, this model must be built with interoperability in mindseamlessly connecting with Indonesia's own healthcare insurance (BPJS Kesehatan) and the emerging national integrated digital health ecosystem platform (SatuSehat). This will ensure screening results inform comprehensive diabetes care rather than existing as isolated data points. The next phase requires standardizing these workflows nationally while addressing critical implementation barriers including health worker training, patient data security, and sustainable financing models. This acknowledges AI screening not as a cost, but as a cost-saving preventive intervention that averts far more expensive late-stage complications. When fully realized, this AI-enabled system could transform diabetic retinopathy from a leading cause of blindness into a routinely managed complication, preserving both vision and productivity for Indonesia's next generation.[14]

This challenge transcends ophthalmology. It represents a fundamental test of Indonesia's ability to harness innovation at the intersection of demographic change, technological advancement, and health system reform. The tools and models exist; the cost of inaction has been quantified; the path forward is illuminated. What remains is the collective will to undertake nothing less than a national mobilization against blindness due to diabetes. This will preserves both the sight and the potential of Indonesia's next generation. The time for incremental measures has passed; only bold, systemic action can avert the looming crisis of diabetes-related vision loss that threatens to darken our demographic horizon.

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