

Comprehensive diabetes care: The Goa model

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Diabetes mellitus continues to increase in epidemic proportions globally as well as in India. Poor glycemic control in long-standing diabetes mellitus eventually leads to chronic complications such as retinopathy, nephropathy, neuropathy, and cardiovascular disease. Diabetic retinopathy is emerging as an important cause of avoidable visual impairment and blindness in India across all strata of society. Much of this vision loss can be prevented by improving control of known risk factors, annual fundus screening, with prompt treatment of individuals with sight-threatening retinopathy. The Queen Elizabeth Diamond Jubilee Trust has made a significant contribution by supporting such a program across India, including Goa. The newly established medical retina clinic at Goa Medical College now provides facilities for screening, a detailed evaluation of advanced retinopathy, and therapeutic modalities such as laser and intravitreal injections. The peripheral centers are equipped to screen all people with diabetes mellitus and refer those with sight-threatening retinopathy to the medical college. The provision of a foot scanner to evaluate the risk of foot ulcers and microalbuminuria assessment as part of the nephropathy screening would encompass the entire gamut of diabetic microvascular complications. The next decade would provide evidence if this initiative, with the enthusiastic partnership of the state government, results in reduction of blindness in the people of Goa and an overall reduction in diabetes-related morbidity and mortality.

Key words: Comprehensive care, diabetes, Goa, retinopathy, Trust

The microvascular complications of diabetes mellitus (DM) can affect the eyes (diabetic retinopathy [DR]), kidneys (nephropathy), and nerves (neuropathy) and more than one complication can coexist^[1] The benefits of comprehensive diabetes care, including lipid and blood pressure control, has been confirmed in the landmark Steno 2 trial.^[2]

The objective of the Queen Elizabeth Diamond Jubilee Trust's (the Trust) program was to reduce visual impairment and blindness from DR in India, working in partnership with the State Ministry of Health. The state of Goa was one of the locations for this project.

The prevalence of DR in India is around 20% including 5% with proliferative DR (PDR) and 1% with diabetic macular edema (DME).^[3] Clinically significant DME and PDR are termed sight-threatening DR (STDR). In Goa, the epidemic of diabetes started early and the prevalence of diabetes is high (9–10% among people above 20 years).^[4] As duration of disease is a major risk factor for complications of DM, these are also likely to be high in Goa, with STDR affecting approximately 10% of people with DM (PwDM).

Goa, a small state (population 1.49 million),^[5] has high socioeconomic and demographic indicators. Public

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health facilities consist of tertiary care at Goa Medical College Hospital (GMCH); secondary care at two district hospitals (DHs), one sub-district hospital (SDH), and primary care at 26 primary health centers (PHCs), four urban health centers (UHCs) and four community health centers (CHCs). Basic eye care is provided by ophthalmic assistants (OAs) at primary care facilities. The Trust's DR project included GMCH, DHs, SDH, five CHCs, and four PHCs [Fig. 1]. The Departments of Ophthalmology, Medicine, and Endocrinology Unit were the focal centers at GMCH.

Methods

A memorandum of understanding (MoU) was signed by the Department of Health and Family Welfare, Government of Goa, GMCH and Indian Institute of Public Health (IIPH) for the DR project. H.V. Desai Eye Hospital, Pune was the mentoring institute and GMCH was the nodal center. The aim of the project was to improve the infrastructure and build capacity in the nodal center in a phased manner (for screening, diagnosis, and management) and the peripheral centers for DR screening. Training of state medical officers (physicians) using the Certificate Course in Evidence-Based Management of DR (CCDR) was partly funded through the project. Toward the end of the project, a foot clinic with a foot scanner (neuropathy care) was set up in the endocrinology clinic in GMCH with

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plans for microalbuminuria testing (nephropathy care) to provide more comprehensive diabetes care.

To ensure smooth coordination among all stakeholders, a state-level steering committee was set up with Health Secretary, Government of Goa as Chairperson and included representatives from GMCH (Dean and faculty members from Department of Ophthalmology, Medicine and Endocrinology), the Directorate of Health Services (DHS) [Chief Medical Officer, Ophthalmic Cell], the mentor institute and IIPH. A program manager was appointed to coordinate project activities.

Results

The project, which had the following activities, was launched in Goa in May 2016.

Infrastructure upgradation

The equipment provided [Table 1] enabled GMCH to set up a comprehensive DR diagnostic and treatment unit in the ophthalmology department, and screening services at the peripheral centers. The utility of the foot scanner is currently being pilot tested.

Capacity building

Four ophthalmologists (two each from GMCH and DHS) received 6 weeks of training in medical retina at the mentor

institute in a phased manner. Following training, they were able to diagnose and treat DR with laser or intravitreal anti-vascular endothelial growth factor (anti-VEGF). All OAs received 2 days' training in imaging the fundus with a non-mydratic camera at GMCH, followed by a refresher course 2 years later. Trained OAs could grade the images as DR present, DR absent, or poor quality image, with the referral of those with DR or ungradable images.

Fifteen state medical officers were trained in the optimal management of PwDM using the CCDR, which covered the pathophysiology, clinical assessment, and screening strategy for DR. Following training, they identified and referred patients for DR screening to trained OAs or ophthalmologists.

Clinical activities of the project

The major clinical activity was integrating DR screening of all PwDM using a non-mydratic fundus camera at all levels of public health care. Over the course of the project, the quality of images improved and ungradable images reduced from approximately 20% to 6%. Patients' details were recorded on a self-retained card and data were entered into an online database using tablets and computers. This facilitated the tracking of individuals requiring initial/follow-up screening and referral. It also contributed to effective program management by

Table 1: List of equipment provided to upgrade

Name of equipment, location	No.	Date of installation
For DR screening		
Forus mydratic fundus camera (with laptop): GMCH	1	25/10/2016
Non-mydratic fundus cameras: peripheral centers	12	25/10/2016 and 8/06/2019
22" digital vision charts: centers	7	05/04/2017
For diagnosis		
Indirect ophthalmoscopes: GMCH, DHs	3	25/10/2016
OCT machine (Zeiss Primus 200 ®): GMCH	1	03/02/2017
B-scan machine: GMCH	1	25/10/2016
Lenses: 20D, 160 aspheric pan funduscope lens, 78 D: GMCH, DHs	3	25/10/2016
Handheld slit lamp: GMCH	1	25/10/2016
For the treatment of DR		
Diode laser: GMCH	1	25/10/2016
Others		
Foot scan: GMCH	1	18/02/2019
Set of projector: GMCH	1	20/05/2019
Laptop (Lenovo ®): GMCH	1	16/02/2017
Software devices (electronic tablets): four peripheral centers	4	17/03/2017

DR: Diabetic retinopathy, GMCH: Goa Medical College Hospital, DHs: District hospitals, OCT: Optical coherence tomography

Table 2: Number of people with diabetes screened and the proportion with different stages of diabetic retinopathy and diabetic macular edema

	Screened	DR lesions			OCT confirmation	
		NPDR	PDR	STDR	DME	CSME
Male	2748 (51.5%)	464 (16.8%)	134 (4.8%)	273 (9.9%)	189 (6.8%)	85 (3.1%)
Female	2588 (48.5%)	258 (9.9%)	112 (4.4%)	148 (5.8%)	118 (4.6%)	105 (4.1%)
Total	5336	722 (13.5%)	246 (4.6%)	421 (7.8%)	307 (5.7%)	190 (3.5%)

NPDR: Non-proliferative diabetic retinopathy, PDR: Proliferative diabetic retinopathy, STDR: Sight-threatening diabetic retinopathy, DME: Diabetic macular edema, CSME: Clinically significant macular edema, OCT: Optical coherence tomography

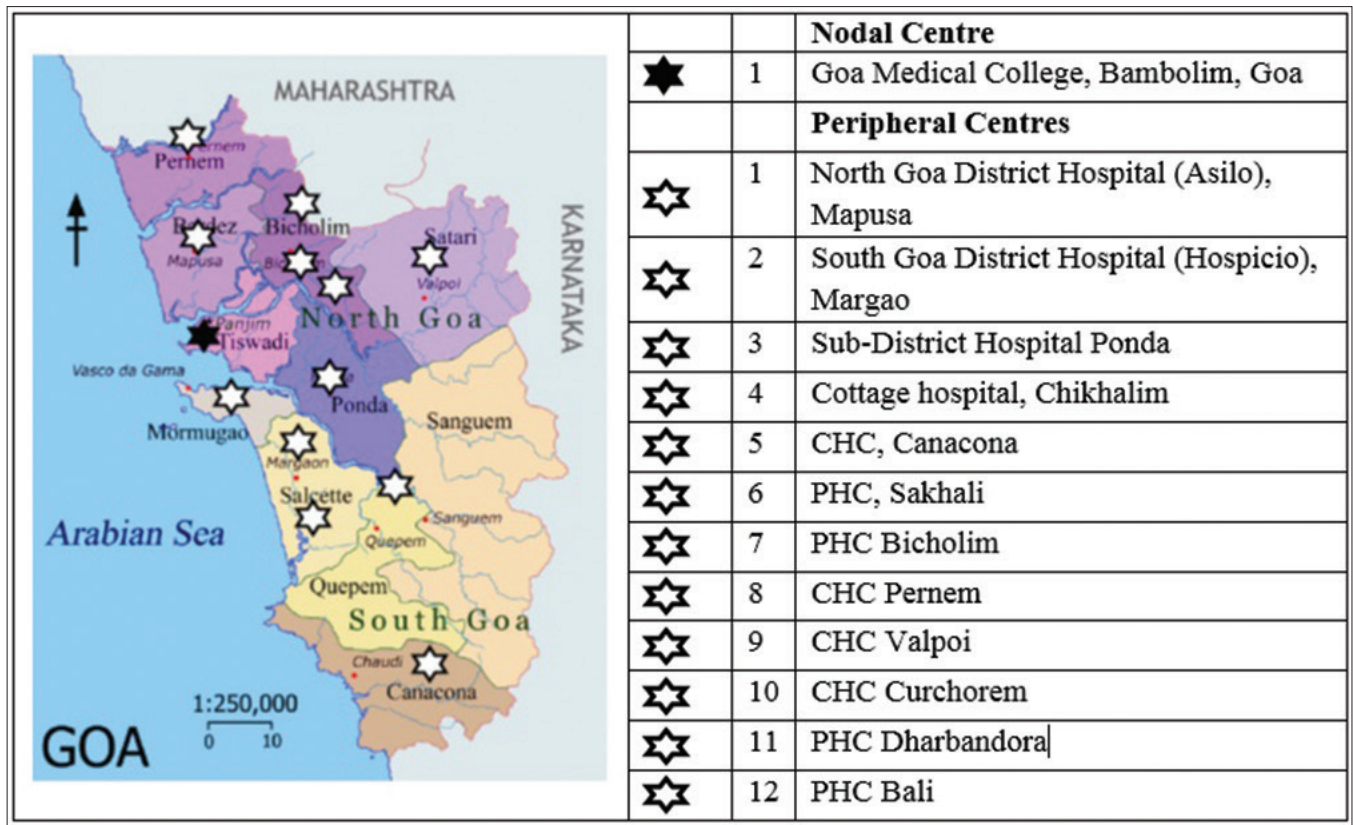


Figure 1: Map of Goa with the location of project centers

identifying centers with poor uptake of services. Regular monitoring of program implementation was undertaken by the state steering committee. Information, education, and communications activities were undertaken at all health care levels to increase awareness about DR.

Currently, medical retina service is provided twice a week at the DHs, once a week at the SDH, and daily screening at the PHCs/CHCs by the OAs. The International Disease Severity Scale Classification of Diabetic Retinopathy and DME are used to grade DR.^[6] All patients with moderate to severe nonproliferative DR (NPDR) and PDR are referred for further evaluation and treatment to the retina clinic at GMCH which is available thrice a week.

During the project, 5,336 PwDM were screened for DR, 26% (n = 1389) of whom were diagnosed with any DR [Table 2]. During the same period, 967 individuals were treated for DR at the GMCH [Table 3] which includes those screened under the project as well as those identified elsewhere (non-project centers and private sector). PwDM with DR are being referred to the diabetic foot clinic. However, as this initiative started recently, no data are available.

State Government support

The state government took an active interest in the DR project with six steering-committee meetings over the 3 years. The state also committed to the annual maintenance of all the equipment provided by the project and to set up a surgical retina center at GMCH.

Table 3: Investigations and treatment of sight-threatening diabetic retinopathy at Goa Medical College during the project period

	B scan	Laser treatment*		Intravitreal anti-VEGF injections*
		PRP	Focal	
Male	229	441	84	126
Female	131	219	27	70
Total	360	660	111	196

*Note: this includes those screened under the project as well as other non-project patients, VEGF: vascular endothelial growth factor, PRP: pan-retinal photocoagulation

Discussion

In this project, screening centers were integrated into the government health system for non-communicable diseases at different levels and were established in 10 states across the country. In Goa, diagnostic and treatment services were also made available in the state medical college. In addition, the Government of Goa has recently established 15 community diabetes centers (CDC) manned by trained diabetes educators at all levels of public health care to help PwDM in self-management as part of its diabetes care program with Novo Nordisk Education Foundation®.

The trained OAs not only reduced the burden on ophthalmologists but also allowed timely feedback to patients. The good distribution of screening services suggests that

about 10% of the PwDM in the state were screened. However, most PwDM seek care from private medical practitioners and greater awareness is needed to increase the uptake of screening, especially among those visiting private providers. During the project period, almost 1,000 PwDM were treated for DR in the newly established medical retina clinic.

A unique feature in Goa was the intention to provide comprehensive screening for other microvascular complications and the feasibility of introducing foot scanning for people with DR is currently being investigated. Comprehensive evaluation needs to train human resources and should improve the quality of diabetes care.

The commitment of the state government was crucial for the success of the program. The Goa DR experience demonstrates that if state ministries of health take a leadership role, it is possible to leverage experience and capacities of non-governmental organizations to build the capacity of public health system to provide integrated care for prevention of blindness from DR. Screening for early identification of DM complications needs to be integrated with usual diabetes care. This ensures efficient uptake of screening services and early referral for advanced complications. An integrated health management information system to improve the tracking of patients needing follow-up and referral is essential to ensure that the neediest receive timely services.

The infrastructure and manpower needed for DR screening have not been considered a priority in the country. The Trust has made the right investment to give impetus to set up the medical retina facilities in Goa.

The future

Ensuring annual fundus examination in every patient with DM is the key. The state government has committed to install a non-mydratic fundus camera at all primary health care centers. Diabetes educators at the CDCs will sensitize the patients about fundus examination. The OAs will perform the retinal examination, grade the images, and advice review or referral as appropriate. The GMCH would provide retinal surgical care.

Conclusion

The Trust envisaged a reduction in the incidence of avoidable blindness from DR. As a result of partnerships and capacity-building, screening and treatment have been

established in a high proportion of public health facilities. With the state government continuing the work after the project closes, we should be able to see measurable changes over the next decade, and taking a holistic approach to DM management should improve the quality of life of our patients.

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Conflicts of interest

There are no conflicts of interest.

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