

**BLINDNESS PREVENTION THROUGH SCREENING FOR DIABETIC  
RETINOPATHY AND GLAUCOMA IN RURAL POPULATION – A NOVEL  
APPROACH**

Bangal Surekha V\*<sup>1</sup>, Somasundaram K.V<sup>2</sup>, Mishra Neeta S<sup>3</sup>

<sup>1</sup>Prof. & Head, Dept. of Ophthalmology, Rural Medical College, PIMS-Deemed University, Loni

<sup>2</sup>Director, Centre for Social Medicine, PIMS-Deemed University, Loni

<sup>3</sup>Professor of Ophthalmology, Rural Medical College, PIMS-Deemed University, Loni

\*Corresponding Author: [svb281@rediffmail.com](mailto:svb281@rediffmail.com)

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**ABSTRACT**

**Background:** Rapid Survey by Government of India (2006-07) estimated the prevalence of blindness as 1% and 0.95% in India and Maharashtra respectively. Diabetic retinopathy (DR) is seen in 3.5% of all and 18% of diabetic cases above 40 years of age. Glaucoma is also one of the potentially blinding diseases that affect 11.2 million persons aged 40 years and above in India

**Objectives:** of the project were to build the capacity of General Practitioners (GPs) & Female Health Volunteers (FHV) for early detection & referral of diabetics cases from the rural area, to establish an effective referral linkage between trained GPs, FHV & Pravara hospital for further evaluation and treatment at referral center.

**Methods:** The Project was implemented for three years (2004-2006) in the contiguous villages from four talukas of Ahmednagar district. Screening of general and high risk population for diabetic retinopathy and glaucoma through diagnostic camps & training workshops for General Practitioners (GPs) and Female Health Volunteers (FHV) were organized. The trained GPs & FHV from the villages of the project area subsequently referred the cases after preliminary screening at the community level to the Specialized DR and Glaucoma clinic

**Results:** During the project period, 6860 individuals were screened by GP, FHV and the specialists. Out of the screened population, 486 cases (7.08%) were diagnosed and treated for glaucoma. Among 5176 individuals screened for DR, 453 cases (8.75%) were diagnosed and treated.

**Conclusion:** Blindness due to DR and glaucoma can be reduced by organizing screening programmes at village level with the help of trained health volunteers and paramedical workers. Early detection, timely referral to higher centers and specialized treatment can prevent the long term morbidity due to blindness and would improve the quality of life.

**Keywords:** Glaucoma; Diabetic Retinopathy; Screening

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**1. INTRODUCTION**

Estimates suggest that there are more than 12 million bilaterally blind people in India, with visual acuity (VA) < 6/60 in the better eye, of which nearly 7 million have VA < 3/60 in the better eye. National Survey conducted during 2001-04 indicated the prevalence of blindness at 1.1% (Rural: 1.63%, Urban: 1.01%, Female: 1.6%, Male: 1.4%) and Rapid Assessment of Avoidable Blindness (RAAB) done in 2006-07, revealed that prevalence at 1.0%. The prevalence of blindness in Maharashtra state

was at 0.95%<sup>6</sup>. The major causes of blindness in the country are Cataract (62.60%), Refractive Errors (19.70%) and The estimated national prevalence of childhood blindness /low vision is 0.80 per thousand<sup>6</sup> It is estimated that diabetic mellitus affects 4% of the world's population; nearly 50% of them have some degree of diabetic retinopathy at any given time<sup>1</sup>. In India, with the increase incidence of Type II diabetes mellitus, as reported by WHO, DR is fast becoming an important cause of visual disability<sup>2</sup>, with

3.5% of all and 18% of diabetic cases above 40 years having the disease<sup>3</sup>. Similarly, glaucoma is also one of the potentially blinding diseases that affect 11.2 million persons aged 40 years and older in India. Primary open angle glaucoma is estimated to affect 6.48 million persons<sup>4</sup>. Visual disability from diabetes and glaucoma is a significant public health problem; however this morbidity can be preventable and treatable through timely interventions. Most of those with disease are undetected and there exist major challenges in detecting and treating those with disease. A community centered project was implemented with the aim to combat blindness through early detection and treatment for DR and glaucoma in rural area of Ahmednagar district of Maharashtra.

## 2. MATERIAL AND METHODS

The objectives of the project were to build the capacity of General Practitioners (GPs) & Female Health Volunteers (FHV)s for early detection & referral of diabetic's cases from the rural area, to establish an effective referral linkage between trained GPs, FHV)s & PRMCH for further evaluation and treatment at referral center. Pravara Medical Trust (PMT) – is an NGO established in 1972 at Loni in rural western Maharashtra. It is engaged in medical education, medical care, research through Rural medical college and Pravara Rural Hospital, under Pravara Institute of Medical Sciences (PIMS) – Deemed University. The Centre for Social Medicine (CSM) – a constituent unit of PIMS collaborated with the Department of Ophthalmology of Rural medical college, to execute activities of the project. The project was funded by Sight Savers International (SSI), U.K. The Project adopted a two pronged approach to address the issue of reduction of the incidence of blindness due to DR and Glaucoma. Firstly, community level screening & referral of diabetic cases by trained FHV)s & GPs and secondly, further evaluation and treatment by specialists at PRMCH. Project area was spread over 80 Kilometer of radius from the hospital, within four contiguous talukas namely Rahata,

kopargaon, Sangamner and Shrirampur in Ahmednagar District of Maharashtra State of India. The duration of the Project was 3 years (2004 – 2006).The Project mainly focused on the following activities in the project area

- 1 .Training of general practitioners & female health volunteers for preliminary screening and referral. of Diabetic and glaucoma cases.
2. Conducting –eye camps for preliminary screening of Diabetic Retinopathy and Glaucoma by ophthalmologists and trained health workers in villages of the project area .
3. Treatment for patients of Glaucoma and Diabetic Retinopathy at tertiary care center. During three years of the project, 79 outreach camps (39 multi-diagnostic (MD) & 40 Mini Ophthalmic & DR camps) were organized, wherein 13501 patients (7008 patients in MD camps and 6493 patients in Mini Ophthalmic camps) were screened for various ophthalmic disorders by the Department of Ophthalmology. The average numbers of patients screened per camp were 234 in MD camps and 133 in Mini Ophthalmic camps. The Department of Ophthalmology in collaboration with Centre for Social Medicine (CSM) organized three batches of CMEs for medical practitioners (GPs) in the target area, wherein 173 GPs participated. The senior faculty of Ophthalmology was involved in covering various topics dealing with diagnosis and treatment of DR & glaucoma. Importance of enquiring about family history of glaucoma and diabetes, the general symptomatology was explained in local language through video presentation. Estimation of urine sugar level by simple uristrips was demonstrated and taught to FHV)s and GPs by laboratory technicians.. The utility & importance of various equipments used in diagnosis like direct Ophthalmoscopy, Tonometry etc were practically demonstrated in the CMEs to physicians along with video presentation on laser treatment and automated perimetry. Screening for glaucoma was mainly done by Ophthalmologists in the hospital. All patients were finally screened for confirmation of diagnosis by postgraduate students and decision making about treatment by faculty members. Besides, two batches of one day

training programme with a half-day refresher in six months, was organized for Village level Female Health Volunteers (FHV) in early screening of diabetic cases, wherein 98 FHV had actively participated during 2004-06. All the trainees were given printed handouts conveying simple tips to identify the symptoms of diabetes and referral cards. The resource persons for these training included faculty and post graduate students of department of Ophthalmology. The trained FHV were already working with CSM unit of the University since 3 years and were engaged in reproductive and child health, first aid, environmental health promotion activities in their respective villages under Sida supported project. These FHV were paid a basic honorarium of Rs. 300 per month and in addition to cash incentives - Rs. 10 (OPD) and Rs. 50 (IPD) to each referral case to Pravara Hospital. As these FHV came in contact with general public, especially women through house-to-house surveys or SHG meetings etc, were advised to conduct preliminary screening for common signs and symptoms of diabetes and refer the suspected cases to Ophthalmology Department of Rural medical college, for further evaluation for DR & Glaucoma. Their work was monitored on monthly basis by CSM. The treatment facilities at the department of Ophthalmology of Rural Medical College, were strengthened by procuring necessary state of art equipments like Yag Laser, Applanation Tonometer, Humphreys Computerized perimeter, Nd YAG and double frequency diode laser through funds by Sight Savers International. All referrals had a comprehensive eye examination at the Pravara rural hospital, including visual acuity using logarithm of the minimum angle of resolution illiterate E charts and refraction, slit-lamp biomicroscopy, gonioscopy, applanation tonometry, dilated fundus examination, and automated central 24-2 full-threshold perimetry. Glaucoma was diagnosed by using the International Society of Geographical and Epidemiological Ophthalmology Classification. The diabetic patients who directly reported to hospital and also those who were referred through the MD

Camps and Specialty Camps and trained FHV, GPs, were further evaluated for confirmation of DR & Glaucoma.

### 3. RESULTS

During the three years of the project (2004-06), out of 6860 individuals, who were screened for glaucoma, by the specialists of Ophthalmology Department, 486 (7.08%) were diagnosed and treated for glaucoma. Glaucoma was treated by medical management in the form of carbonic unhydrase inhibitors and beta blockers. Trabeculectomy was performed in the patients who did not respond to medical management. Out of 5176 individuals, who were screened for DR, 453 (8.75%) were diagnosed and treated for DR. Treatment consisted of antidiabetic drugs and surgical management in the form of laser photocoagulation by Nd yag laser and vitreo retinal surgery. In the present study, the prevalence of DR (8.75%) was more as compared to Glaucoma (7.08%) among screened population (Table 1). The percentage of patients referred by the FHV & GPs for DR had shown progressive rise. The cases diagnosed and treated for DR and Glaucoma had shown good compliance regarding follow up visits. The progressive year wise increase in the cases of DR and glaucoma at PRMCH during 2<sup>nd</sup> and 3<sup>rd</sup> year of the project, was due to the sincere and committed efforts of trained GPs and FHV in screening at periphery. (Table 1). The gender difference of patients treated at the hospital during the project for glaucoma (male 55% & female 45%) was statistically significant ( $p < 0.05$ ). However, when it comes to the patients treated for DR, the gender difference had not shown statistically significant variation (Male 51%, Female 49% and  $p > 0.05$ ) (Table 3). The statistically significant difference in the gender may be due to the higher reporting rate of male than female (Table 2). Majority of cases (78%) of glaucoma were seen in the age group above sixty years. However, the age distribution of cases of DR had shown higher incidence in the age group 50 – 60 years, compared to 40-50 years and above 60 years (Table 3)

#### 4. DISCUSSION

The prevalence of DR ( 8.7%) in known cases of diabetics in the present study was higher as compared to the prevalence ( 5.1% ) reported in the newly diagnosed diabetic subjects .It was much lower in comparison to the reported prevalence ( 20.8%) among known diabetic subjects in the population based study by Chennai Urban Rural Epidemiology Eye Study <sup>7</sup>. Two other population based studies conducted in south India, reported overall prevalence of DR as 22.4 percent and 26.8 per cent respectively<sup>8,9</sup>. A Madurai based study done at a tertiary level hospital revealed that prevalence of DR was 37 per cent among the newly detected diabetic patients<sup>10</sup>. The present study revealed that the prevalence of Glaucoma ( 7.08%) in rural Maharashtra was relatively higher in comparison with other states and regions viz., 2.6% in Southern India<sup>11</sup> , 2.7% in aged 50-59 years & 6.5% in above 80 years in rural West Bengal<sup>12</sup> , 4% in Urban and 1.6% in rural Andhra Pradesh<sup>13</sup> . Against this background of higher prevalence of DR and glaucoma, systems for its early detection and facilities for its effective treatment are extremely inadequate in India in general, and in the rural areas, in particular. As recognized in the vision 2020 action plan, training of personnel and development of adequate infrastructure for medical management of Diabetic Retinopathy (DR) and Glaucoma at the secondary level in rural areas are the priorities of the health care providers (public and private) working in this field. The XIth five year plan has emphasized the need for budget allocation for control of the diseases causing blindness like cataract, diabetic retinopathy and glaucoma .The decision has been taken regarding integration of NPCB with National Rural Health Mission(NRHM) for ensuing optimum utilization of the presently available infrastructure at different levels. Financial provision has been made to strengthen the institutions with instruments, equipments, consumables, teaching and training aids. NGOs can play great role in supporting government's efforts to control blindness. Financial assistance is available from

Government for conducting refresher training of medical officers, medical practitioners, ophthalmic assistants, school teachers, and other health care staff in eye care services. Community link workers like ASHA and Anganwadi workers need to be actively involved in creating awareness in the community regarding this issue.

#### CONCLUSIONS

The health care system in India, especially rural areas needs a focused approach towards the screening programs for early detection of cases of Glaucoma and DR. It will reduce the increasing burden of blindness in the community .Government of India has directed its efforts towards reaching the goal of elimination of avoidable blindness in the country by the year 2020. To convert this dream in to reality, it is essential that the Government and NGOs work together for this noble cause.

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#### REFERENCES

1. Aiello LP, Garner TW, King G L, Blankenship G, Cavallerano J D, Ferris FI

- ,Diabetic Retinopathy, Diabetic Care 1998; 21:143-56.
2. Wild S, Roglic G, Green A, Sicree R, King H, "Global prevalence of diabetes, estimates for the year 2000 and projections for Diabetic Care" 2004; 27: 1047-53.
  3. Singh R, Ramaswamy K, Abraham C, Gupta V, Gupta A: *Diabetic Retinopathy: An update*, Indian Journal of Ophthalmology 2008; 56 : 178-88.
  4. George, Ronnie MS; Ve Ramesh S, Vijaya , Lingam: *Glaucoma in India: Estimated Burden of Disease*, Journal of Glaucoma, 2010; 19: 6.
  5. Dandona L, Dandona R, John RK: "Estimation of blindness in India from 2000 through 2020: implications for the blindness control policy", International Centre for Advancement of Rural Eye Care, LV Prasad Eye Institute, Hyderabad, India.
  6. Jose R. "Present Status of the National Programme for Control of Blindness in India", Community Eye Health Journal, 2008; 21(65): 103-104
  7. Rema M, Premkumar S, "Prevalence of DR in Urban India – The Chennai Urban Rural Epidemiology Study (CURES)", Eye Study, Invest Ophthalmol Vis Sci 2005; 46: 2328-33.
  8. Dandona L, Dandona R, Naduvilath TJ, McCarty CA, Rao GN, *Population based assessment of Diabetic Retinopathy in Urban Population in Southern India*, Br. Journal of Ophthalmology, 1999; 83: 937-40.
  9. Narendran V, John RK, Raghuram A, Ravindran RD, Nirmalan PK, Thulasiraj RD, *Diabetic Retinopathy in self reported diabetic in southern India; a population based assessment*, Br. Journal of Ophthalmology, 2002; 86: 1014-8.
  10. Sharma RA, "Diabetic eye diseases in Southern India", Community Eye Health 1996; 9:56-58.
  11. Ramakrishnan R. "Glaucoma in a rural population of southern India – The Arvind Comprehensive Survey" ???
  12. A Raychaudhuri, "A population based survey of the prevalence and types of glaucoma in rural West Bengal: the West Bengal Glaucoma Study", British Journal of Ophthalmology 2005; 89:1559-1564.
  13. Garudadri C, Prevalence and risk factors for primary glaucomas in adult urban and rural populations in the Andhra Pradesh Eye Disease Study, Ophthalmology, 2010; 117(7)???
  14. Lingam Vijaya et. al, "Prevalence of Open-Angle Glaucoma in a Rural South Indian Population", Invest. Ophthalmol. Vis. Sci. 2005; 46: 12.
  15. Jose R, Rathore A S ,V Rajshekhar ,Sachdeva sandeep ,Salient features of the National Program for control of blindness during the XIth five-year plan period. Indian Journal of Ophthalmology,2009;57(5)

**Table 1: Patients screened, diagnosed and treated at Tertiary Hospital for DR and Glaucoma (2004 – 2006)**

Year	Glaucoma		Diabetic Retinopathy	
	Screened	Diagnosed & Treated	Screened	Diagnosed & Treated
2004	3402	154 (4.53%)	2064	111 (5.38%)
2005	1389	182 (13.10%)	1420	215 (15.14%)
2006	2069	150 (7.25%)	1692	127 (7.50%)
Total	6860	486 (7.08%)	5176	453 (8.75%)

**Table 2: Gender wise distribution of patients treated for Glaucoma and DR**

Type of Patients	Male		Female		Total		P value
	Number	Percent	Number	Percent	Number	Percent	
<b>Glaucoma</b>	268	55	218	45	486	100	< 0.05
<b>DR</b>	231	51	222	49	453	100	> 0.05

**Table 3: Age-wise Distribution of Patients Treated for Glaucoma and DR**

Age of the patients (in years)	Patients Treated for Glaucoma		Patients Treated for DR	
	Number	Per cent	Number	Percent
40- 50	32	6.6	98	21.6
50-60	75	15.4	202	44.6
➤ 60	379	78.0	153	33.78
Total	486	100	453	100