

Vision Delhi: A study of primary eye care model operational in urban slums and resettlement colonies of Delhi

Souvik Manna¹, Praveen Vashist¹, Suraj Singh Senjam¹,
Pallavi Shukla², Noopur Gupta³, Amit Bhardwaj¹, Vivek Gupta¹

¹Department of Community Ophthalmology, Dr. Rajendra Prasad Centre, AIIMS, New Delhi, ²Institute Rotary Cancer Hospital, AIIMS, New Delhi, ³Department of Ophthalmology, Dr. Rajendra Prasad Centre, AIIMS, New Delhi, India

ABSTRACT

Background: Family physicians (FPs) encounter numerous patients who need eye care services. For providing eye care services at the primary level, they need to be abreast with the common disorders, their management and appropriate referral. **Objectives:** The aim of this study was to describe the socio-demographic and ocular morbidity profile of the beneficiaries, seasonal pattern of few ocular disorders and to find the proportion of blindness that is avoidable at the primary level. **Methodology:** Study was conducted in 25 vision centers across Delhi. Chart review was done in each center and retrospective data of previous 4 years was analyzed. Socio-demographic, ocular morbidity profile and trend of selected diseases was deduced and causes of blindness were determined. **Results:** Around 62.76% of patients were women and 78.26% were new patients. A seasonal peak of conjunctivitis was observed during the spring season. The common conditions detected by optometrists were refractive errors (34.68%), presbyopia (14.15%), cataract (14.02%), conjunctivitis (9.84%) and diseases of ocular adnexa (1.35%). In the age group ≥ 50 years, the proportion of patients who were blind was 2.5%, 39.0% had VI. The proportion of VI patients in all the categories was higher in women as compared to men. In patients ages ≥ 50 years, 81.4% of the blindness was avoidable. **Conclusions:** Women outnumbered men in availing services at the center and the proportion of visual impairment was also higher in them. The major causes of blindness in the older population were cataract and corneal-opacity, and it is avoidable by strengthening primary eye care services by FPs.

Keywords: Family eye care, integrated people-centric eye-care, primary eye care, vision center

Introduction

Patient-centered care, and targeted techniques of health promotion and disease prevention are hallmarks of family medicine and should be integrated in all settings.^[1] Primary eye care (PEC) is defined as “a ‘frontline’ activity, providing care

and identifying disease before it becomes a serious medical issue”.^[2] The world report on vision released in 2019 had proposed Integrated People-centric Eye Care (IPEC) which refers to eye care services that are managed and delivered to assure a continuum of promotive, preventive, treatment and rehabilitative interventions against the spectrum of eye conditions.^[3] IPEC will also contribute to achieving universal health coverage (UHC) and Sustainable Development Goal 3 (SDG3): “Ensure healthy lives and promote well-being for all at all ages”. Family physicians (FPs) help patients and their family members adjust to acute or chronic illnesses that may significantly

Address for correspondence: Dr. Vivek Gupta,
Department of Community Ophthalmology, Room No. 784,
7th Floor, Dr. Rajendra Prasad Centre for Ophthalmic Sciences,
AIIMS, New Delhi, India.
E-mail: drvivek.gupta@gmail.com

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affect daily life and family function. Ocular dysfunction presents unique challenges to patients and FPs must learn to maximize visual function through the control of environmental factors, the management of disease, and preventive care.^[1] Deterioration of function can be minimized through initiation of appropriate treatment, including rapid referral when necessary. The FPs should know when social and/or psychological intervention or referral to vision rehabilitation services is appropriate for patients who have ocular dysfunction.

India is the second most populous country in the world, with a population of 1.37 billion, based on the “World Population Prospects: 2019 Revision,” from the United Nations Population Division.^[4] Globally, at least 2.2 billion people have a vision impairment or blindness, of whom at least 1 billion have a vision impairment that could have been prevented.^[3] India corresponds to about 20% of the global burden. One of the reasons for such high level of avoidable blindness in India is that eye care services are not integrated fully at the primary care level.

Delhi, being the capital of India, is witnessing rapid urbanization with the resultant growth of slums and resettlement colonies. This unplanned growth creates numerous challenges to policy makers and service providers. The 2011 Census of India estimated that 1.7 million people in Delhi, which is 10.63% of the city’s population, are slum-dwellers.^[5]

The ophthalmologist population ratio of Delhi is one per 17,000 population, whereas the neighboring states of Uttar Pradesh fares even poorly with 1 ophthalmologist per 1,77,000 people,^[6] 70% of the ophthalmologists are located in urban areas where only 23% of the population resides.^[7] It is here that the important role of FPs is felt. With adequate training and orientation, FPs will be able to provide comprehensive eye care services at the primary level.

A primary health care infrastructure is already in place. It may be realistic to integrate eye care with it rather than aim to establish parallel systems requiring separate manpower, infrastructure, and implementation. The integrated model of PEC services with primary health centers and community health centers is cost effective and most suited for our country.^[8] One such model formulated for urban slums of Delhi is named as “Vision Delhi-Comprehensive Community Eye Care Initiative” project and implemented as per guidelines provided by NPCB (National Programme for Control of Blindness) Vision 2020 India.^[9]

This project aims at reducing ocular morbidity in urban slums and resettlement colonies of Delhi. The project is targeted towards the slums of South, South West and East Districts of Delhi, but vision centers (VCs) are functional in total 8 districts of Delhi. RAVI (Rapid Assessment of Visual Impairment) survey based on rapid assessment methodology was conducted earlier as part of this project to provide baseline information about the need of

refractive error services in Delhi.^[10] That survey was the first study highlighting the burden of visual impairment and blindness in the Indian capital and provided a rationale for conducting this study.

The aims of this study were to describe the PEC activities conducted under “Vision Delhi” in urban slum clusters and resettlement colonies, and how it can strengthen primary care practices by FPs. The objective of this study is to describe the socio-demographic and ocular morbidity profile of the beneficiaries, seasonal pattern of few ocular disorders and to find the proportion of blindness that is avoidable at the primary level.

Materials and Methods

This study was conducted in 25 VCs that were functional in 2019 across the urban slums and resettlement colonies of Delhi. Chart review was done in each center and retrospective data of previous 4 years (January 2016 to December 2019) was analyzed.

Operations of vision centers

PEC clinics, also known as VCs had been set up at 25 slum clusters in Delhi NCR (National Capital Region). Outpatient services (OPD) are available once every week from 09:00 am to 1:00 pm in VC. Each VC team includes one optometrist and two health worker. There are total of five teams who daily visit one designated VC and provide services.

PEC services include educating patients about maintaining and promoting healthy vision, performing a comprehensive examination of the visual system, recognizing ocular manifestations of systemic diseases, performing refractions and prescribing glasses and referring to specialists as needed. Screening for diabetic retinopathy (DR) is also performed by a trained optometrist using non-mydratic fundus camera once every month in each center and grading is done according to Scottish Classification.^[11]

Clinical examination and referral at the VCs is being done by skilled optometrist using torch light, portable slit lamp, NCT (Non-Contact Tonometer), ETDRS (Early Treatment Diabetic Retinopathy Study) chart is being used for vision assessment. Refraction is done at the VCs by the optometrist using retinoscope and trial lenses. The main focus is on various diseases responsible for avoidable blindness (e.g. cataract, refractive errors, conjunctivitis, presbyopia etc.) and rest of the conditions which cannot be diagnosed at the primary level are noted as others.

Data management and analysis

A proper recording system is maintained at all VCs. Each patient is given a unique identification number and the same was used in all subsequent analysis to maintain patient confidentiality. All the data was entered in MS excel software and analysis was done using Stata version 15.

Ethics

Ethical approval for the study was obtained from Institutional Ethics Committee of AIIMS, New Delhi and the study was conducted in compliance with the Declaration of Helsinki.

Results

VCs were operational starting as early as 2003 in Delhi. The first phase of the Vision Delhi Project was from 2013 to 2016 during which standalone centers were operational with the support of NGOs. However, logistic and operational feasibility were issues for sustaining these centers, hence integrated approach was started in 2016 in collaboration with Delhi Government dispensaries. The switch from standalone to integrated approach took place during March–April 2016 and 16 standalone centers were closed and new centers were opened in their place within Delhi Government dispensaries. It was envisaged that Delhi Government will take-over the operations of these VCs by recruiting manpower like optometrists etc., However, as of date in 2021, the VCs are functioning with NGO support only. For this study, a total of 25 centers which were functional in 2019 were included.

A total of 2,48,302 beneficiaries availed services of the VCs over the period January 2016 to December 2019. Average patient OPD per center per day was 57 (± 29). A skewed gender distribution is being observed at all the VCs. Women comprise about 62.76% of the beneficiaries, whereas men are only 37.24%. This gender difference was found in all the 4 years of observation across all the age groups. The difference was also found to be statistically significant ($P < 0.05$) except in 0–14 years age group where nearly equal proportion of men and women were noted [Table 1]. The predominant age-group availing services from VCs is 15–49 years (48.46%), followed by ≥ 50 years (37.44%) and < 15 years (14.09%). [Figure 1] Nearly 21.7% of the total beneficiaries are old patients, whereas 78.3% are newly registered patients presenting to the VCs for the first time [Table 2]. This pattern of beneficiaries is also expected for family practice in any metropolitan area of India as the men 15–49 years are generally busy with livelihood activities and women cater to the family health needs.

A seasonal trend is observed in the number of beneficiaries presenting to the VCs for availing eye-care services. It is observed that nadir is reached during the autumn season every year which corresponds to the festive season in Northern India. Following the nadir in autumn, a constant rise is observed over the winter months till the peak is reached around the spring season in March–April [Figure 2]. The most common conditions detected by the optometrists at the VCs were refractive errors (34.68%), followed by presbyopia (14.15%), cataract (14.02%), conjunctivitis (9.84%) and diseases of ocular adnexa (1.35%). Other less common diseases include corneal opacity (0.83%), glaucoma suspect (0.75%), DR suspect (0.69%), squint (0.53%), eye trauma (0.36%) and

Table 1: Age and gender distribution of beneficiaries of vision centers over 4 years (2016-2019)

	2016	2017	2018	2019	Total	Total M vs. F within age group
0-14 years						
Male	2729	3479	5156	6160	17524	$\chi^2=4.794$
Female	2821	3490	4974	6187	17472	$P=0.19$
Total	5550	6969	10130	12347	34996	
15-49 years						
Male	6538	8319	11964	13065	39886	$\chi^2=103.2$
Female	14454	17929	23112	24951	80446	$P=<0.01$
Total	20992	26248	35076	38016	120332	
≥ 50 years						
Male	5345	7780	10366	11573	35064	$\chi^2=14.52$
Female	9180	13161	17015	18554	57910	$P=<0.01$
Total	14525	20941	27381	30127	92974	
All ages						
Male	14612	19578	27486	30798	92474	$\chi^2=124.1$
Female	26455	34580	45101	49692	155828	$P=<0.01$
Total	41067	54158	72587	80490	248302	

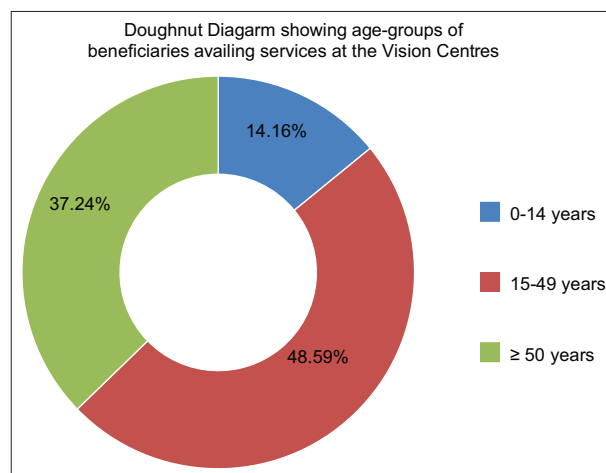


Figure 1: Age distribution of beneficiaries of vision centers over 4 years (2016–2019)

vitamin A deficiency (0.02%). [Figure 3] A seasonal trend of conjunctivitis cases is also evident from the yearly peak during the spring season in India (March–May). [Figure 4] The greater number of conjunctivitis cases are allergic keratoconjunctivitis which show this seasonal pattern. FPs can easily manage these cases by providing antibiotic and anti-allergic eye drops.

The proportion of patients who were blind was 1.25%, severe visual impairment (SVI) was 1.59% and moderate visual impairment (MVI) was 10.22%. Mild visual impairment was found in 9.43% and rest of the patients had normal visual acuity. In the age group ≥ 50 years, the proportion of patients who were blind was 2.57%, SVI 3.29%, MVI 19.05%, Mild VI 16.68%. The percentage of patients having blindness and other visual impairments was higher in ≥ 50 years age group in comparison to 0–49 years and this difference was also found to be statistically significant [Table 3].

Table 2: Old and new patients availing services of vision centers over 4 years (2016-2019)

	Male	Female	Total	Total Old vs. new within age group
All ages				
New	73372	120971	194343 (78.26)	$\chi^2=100$
Old	19102	34857	53959 (21.73)	$P<0.01$
Total	92474	155828	248302	
Total Old vs new within gender	$\chi^2=2764$ $P<0.01$	$\chi^2=3599$ $P<0.01$	$\chi^2=6093$ $P<0.01$	

Table 3: Visual impairment and blindness among patients attending VCs during 2016-2019

	n	Blind (<3/60)	Severe <6/60-3/60	Moderate <6/18-6/60	Mild <6/12-6/18	P*
Age (years)						
0-14	34996	254 (0.73)	215 (0.62)	2248 (6.42)	2283 (6.52)	<0.01
15-49	120332	459 (0.42)	685 (0.57)	5426 (4.51)	5751 (4.78)	
≥50	92974	2391 (2.57)	3061 (3.29)	17709 (19.05)	15512 (16.68)	
Sex						
Male	92456	1269 (1.37)	1652 (1.79)	9011 (9.75)	7759 (8.39)	<0.01
Female	155797	1835 (1.18)	2309 (1.48)	16372 (10.51)	15787 (10.13)	
Total	248302	3104 (1.25)	3961 (1.59)	25383 (10.22)	23546 (9.43)	

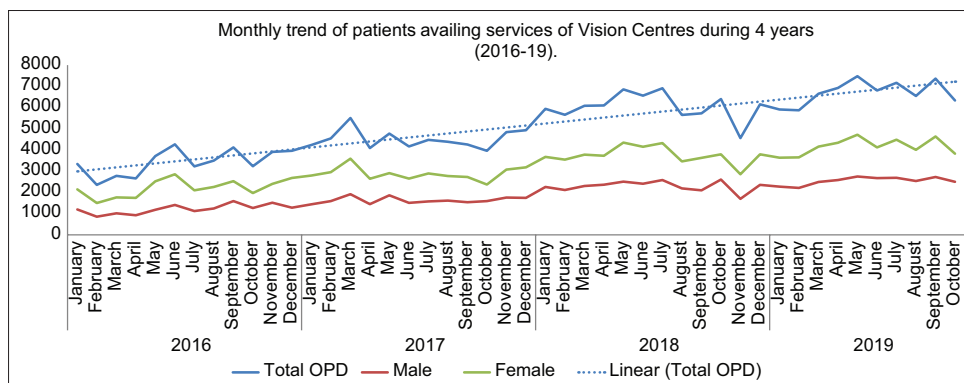


Figure 2: Monthly trend of patients availing services of vision centers during 4 years (2016–2019)

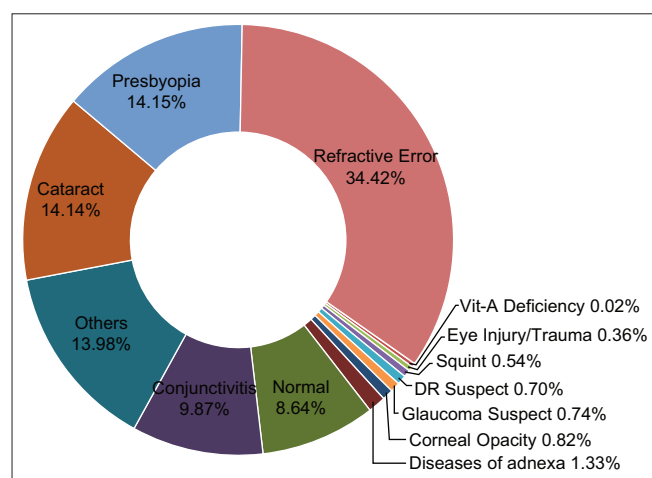


Figure 3: Morbidity profile of patients detected by primary eye care teams at vision centers

The proportion of visually impaired patients in all the categories was higher in women as compared to men. This higher female proportion was also found to be statistically significant ($P < 0.05$)

indicating an association between female gender and visual impairment in beneficiaries of VCs. The proportion of blind patients increased from 1.25% in 50–59 years age-group to 10.27% in the ≥80 years age group. [Figure 5] The major causes of blindness in patients aged ≥50 years is cataract (65.95%), followed by corneal opacity (8.35%), Glaucoma (8.35%), DR (2.02%) and refractive error (0.88%). Other posterior segment diseases which cannot be diagnosed at primary level constitute 18.59% of the blind patients. Similar pattern is seen for visual impairment as well. [Table 4] The major causes of blindness in patients aged 0–14 years is posterior segment disorders (35.11%) followed by refractive errors (11.11%). In the 15–49 years age group, major cause is cataract (44.67%), followed by posterior segment disorders (30.96%), refractive error (7.86%), corneal opacity (7.36%) and glaucoma (4.06%) [Table 4].

In patients ages ≥50 years, the treatable causes of blindness (cataract, refractive errors etc.) constituted 68.06% of the patients. Blindness preventable with primary care activities (injuries, corneal opacity, etc.) include 8.61% and

Table 4: Causes of blindness and visual impairment in beneficiaries on the basis of age

Principal cause	Blindness (%)*			SVI (%)		
	≥50 years	15-49 years	<15 years	≥50 years	15-49 years	<15 years
Cataract	65.95	44.67	2.22	75.52	29.98	1.67
Others (e.g. PSD)	18.59	30.96	35.11	12.27	19.31	16.2
Corneal opacity	8.35	7.36	3.11	2.94	2.19	0.00
Glaucoma suspect	2.68	4.06	0.88	1.54	0.94	0.00
DR suspect	2.02	1.52	0.00	1.26	1.73	0.00
Refractive error	0.88	7.86	11.11	4.72	42.23	79.32
Presbyopia	0.13	0.00	0.00	0.03	0.15	0.00
Conjunctivitis	0.62	1.77	28.88	1.26	1.73	1.67
Diseases of adnexa	0.22	0.00	4.88	0.21	0.15	0.00
Ocular injury	0.26	0.25	0.88	0.03	0.15	0.00
Squint	0.26	1.52	5.33	0.21	1.41	1.11

*Percentages do not add to 100 owing to rounding

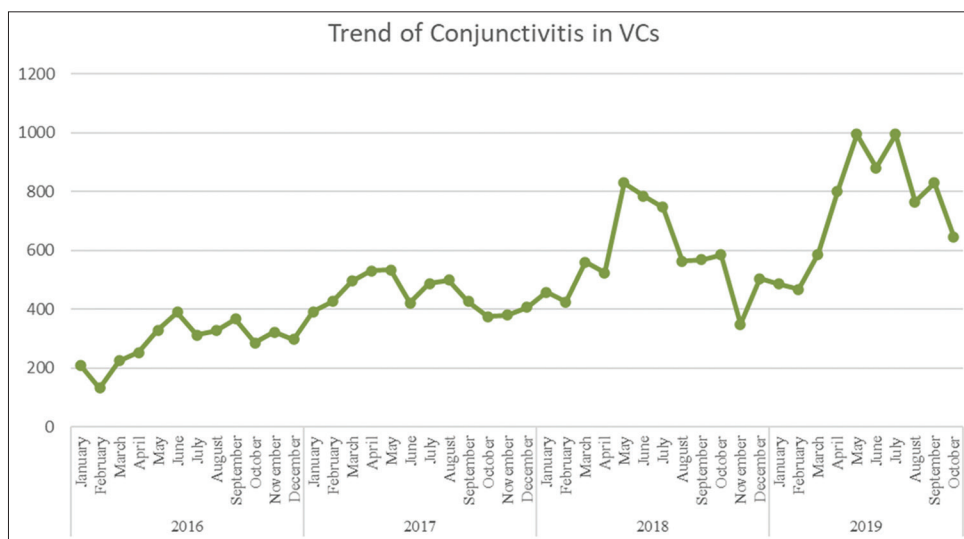


Figure 4: Seasonal trend of conjunctivitis cases presenting at the vision centers

preventable by ophthalmic services (glaucoma, DR) constitute 4.7% of the cases. Also, 18.6% of the patients were blind due to unavoidable causes (posterior segment diseases etc.) [Figure 6] A major finding of this study is that nearly 80% of the blindness is avoidable i.e. either treatable or preventable.

Discussion

FPs help patients and their family members adjust to acute or chronic illnesses that may significantly affect daily life and family function, including ocular diseases.^[1] Various models for delivering PEC has been proposed. PEC through fixed centers located in the slum areas seems promising strategy for urban vulnerable population as reflected in our results. Previous literature supports ocular morbidity to be associated with the sex (F > M), occupation, literacy rate, socio economic status, marital status and caste of the individuals.^[12]

Female gender has been reported as a barrier to cataract surgery uptake in a number of blindness prevention programs in middle- and low-income countries (LMICs),

and specific strategies have been recommended to deal with this gender inequity.^[13] The reverse gender inequity in our patients is, therefore, interesting and noteworthy. The female preponderance can be explained by the fact that government healthcare delivery services are more targeted towards MCH (Maternal Child Health) activities and hence more women than men avail services of these centers. This observation is interesting because cataract surgical coverage (CSC) is always higher in men in comparison to women.^[14] Community-based studies persistently reproduce this finding of higher CSC in men, but center-based data shows a female preponderance in availing eye-care services.

A recent study from South India revealed that a higher proportion of women attended walk-in subsidized (56%) or free camp sections (55%) compared to walk-in paying system that remained significant after adjustment with other socio-economic variables. The study highlighted the need for public sector services for reaching out to women.^[15] A systematic review on interventions to improve gender equity in eye care in LMICs showed that where rural community volunteers were involved to identify, educate and

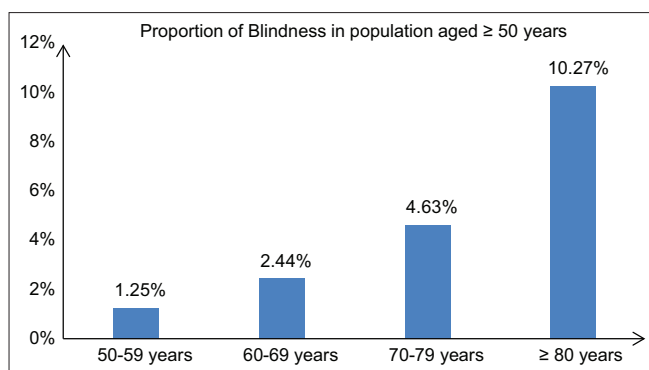


Figure 5: Age-wise proportion of blindness in patient aged ≥ 50 years

assist people with unmet need for eye care, that led to reduced gender inequity in various eye care parameters.^[16]

Cataract screening is always targeted towards older age groups (≥50 years) and refractive error is found in all age-groups. India is a relatively young country with greater proportion of the population in the productive age group (15–64 years). These people avail services of the VCs which together constitute about 85% of the beneficiaries. The seasonal phenomenon is due to the preference of patients to be operated during the winter months and the seasonal variation in diseases like conjunctivitis etc. North India witnesses cold and dry winters which is the preferred time of people for getting operated for cataract surgery. The ratio of old and new patients is fairly constant at 1:4 i.e. every 5th patient is an old patient. The proportion of new patients stands at around 80% which is expected from these VCs as the beneficiaries are mainly mobile and migrant populations who moved to the city in search of livelihood opportunities. Providing care on a continuous basis is always a challenge in these kinds of population.

The percentage of patients having blindness and other VIs was higher in ≥50 years age group in comparison to 15–49 years. The proportion of blindness and SVI was higher in men, whereas that of MVI and mild VI was higher in women as compared to men. Previous studies have consistently reported that women have significant excess risk of VI.^[17,18] The proportion of blind patients increased from 1.25% in 50-59 years age-group to 10.27% in the ≥80 years age group. This finding of rising burden with age is also well established in literature.^[19]

The major causes of blindness in patients aged ≥50 years is cataract (65.95%), followed by corneal opacity (8.35%), Glaucoma (8.35%), DR (2.02%) and refractive error (0.88%). Other posterior segment diseases which cannot be diagnosed at primary level constitute 18.59% of the blind patients. Cataract, followed by refractive errors, glaucoma and posterior segment disorders have been reported as the main causes of blindness in India by NPCB.^[20]

Sustainability of PEC services through various models in urban or rural communities principally depends on its pre-defined and

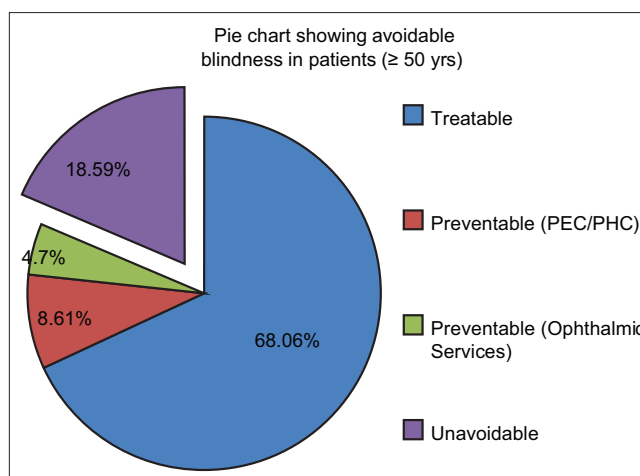


Figure 6: Proportion of avoidable blindness (PVA <3/60 in better eye) in patients ≥ 50 years

well thought out approach. All important aspects like funding, community participation, availability of FPs and their training, monitoring and performance indicators should be prepared in advance for creating the sustainable PEC model. Thorough understanding of the community structure, their cultural and social beliefs, level of awareness about eye care is another important aspect for setting up any VC in a specified community.

There are a few weaknesses with our study. This was a retrospective case note review and not a prospective study. Further, our beneficiaries are mainly drawn from the VCs, and it might not be a true representation of the community. This study also provides many future directions. Even after a special initiative in the previous five year plans, VCs had not been established as per norms in majority of states. Improvements in infrastructure are largely focused on secondary and tertiary level, PEC by and large is a neglected area requiring concerted focus for future strategies. Though primary health care system in the countries has been improving for providing access to care, eye health has not been integrated well into this system. So, the major recommendation of this study is the integration of VCs in primary health-care by involvement of FPs.

Our study clearly highlights the crucial role FPs can play in strengthening primary eye-care services. Patients suffering from cataract need a comprehensive visual examination by FPs and appropriate referral for surgical services. Refractive error can be identified easily at the primary care level by determining near and distance visual acuity (VA), both presenting as well as pinhole. FPs can easily determine pinhole improvement in distance VA i.e. refractive errors and advice glasses/contact lenses for such patients. Diabetic patients can be offered DR screening annually by FPs using a simple non-mydratic fundus camera. Early identification for DR and glaucoma can significantly reduce morbidity of such patients. A spike in red eye cases during spring can also be anticipated and appropriate primary management can be provided. The burden of blindness and VI can be reduced only when FPs are involved in delivery of PEC activities, and

a successful model of integration between eye-care and family medicine is established.

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Conflicts of interest

There are no conflicts of interest.

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