Research Article

Rapid Assessment of Visual Impairment (RAVI) Survey Results and Barriers to Uptake of Eye Care Services in Surat District, Gujarat, India

Chariwala R[1*], Chaudhari S[1], Patel R[2], Gajiwala U[1]

[1*]*Department of Ophthalmology and Public Health Research, Divyajyoti Trust, Mandvi, District-Surat, Gujarat state, India.*
[2]*Department of Biostatistics, Population Research Center, Vadodara, Gujarat, India.*

Corresponding author: Rohan chariwala, Department of Ophthalmology and Public Health Research, Divyajyoti Trust, Mandvi, District-Surat, Gujarat state, India. E-mail: drrohanchariwala@yahoo.in

Abstract

Purpose: To estimate prevalence and causes of visual impairment (VI) among people ≥40 years and barriers for uptake of services among visually impaired using Rapid Assessment of Visual Impairment (RAVI) survey methodology in Surat district of Gujarat state, India.

Method: A cross sectional population based survey was conducted using 26 random clusters selected by probability proportional to size of sampling. VI was defined as presenting Visual acuity (PVA) <6/18 in better eye. A validated RAVI questionnaire on barriers was introduced to those whose VA did not improve to ≥6/18 with pinhole.

Results: A total of 1560 people were enumerated and out of them 1487 people were examined (response rate 95.3%). The age and sex adjusted prevalence of VI was 27.31% (95% CI 24.6-30.0) which included 30 people with blindness (Prevalence 2.03% (95% CI 1.31-2.76). Refractive error (63%) was found to be major cause of all VI and Cataract was the leading cause of blindness (70%, 21/30). Affordability (36.9%) was found to be main cause of barriers to uptake eye care services.

Conclusion: Cataract and Refractive Errors were found to be major causes. The findings suggest there should be an effective cataract and refractive services provided to the community at free/subsidized rates. This is the first of its kind baseline data which will definitely be useful in planning eye care services in the district.

Keywords: Cataract; Refractive Error; Visual Impairment; Rapid Assessment; Blindness; Barriers

Introduction

There are 2.2 billion people visually impaired globally for near and distant vision both in the year 2019 and of these almost half- 1 billion- cases of Visual impairment (VI) could be avoidable [1]. There are almost 123 million with moderate to severe VI or Blindness due to uncorrected Refractive Errors (UREs) and 65 million with cataract as a cause. In India and in the world almost 80% of blindness is due to Cataract and UREs [2, 3]. These both of which can be treated by cost-effective measures in the form of surgery and prescribing pair of glasses [4, 5]. These are two major objectives of Vision 2020-the right to sight, the global initiative by WHO and International Association of Prevention of Blindness (IAPB) to eliminate avoidable blindness and now are a part of Universal Eye Health initiative [6].

However technological advancements have made cataract surgeries safe with good visual outcomes, it is essential now to make this available and accessible to the remotest rural-tribal parts of the low income countries. Even making available eye care services does not guarantee that people will access them. There is a need to find out barriers for lesser uptake and then we can take necessary actions to improve upon the uptake.

Gujarat state has population of 60 million according to last census of 2011. Surat district with 10 districts has population of 6 million and 57% people living in rural-tribal areas [7]. The district has tribal population on its eastern area, urban population in the vicinity of Surat city and rural-semi-urban in rest of the part. Surat district has thriving textile and diamond business and so many migrant labourers from other states also are living in the district. Urban areas are served by private, Non government organizations and Government hospitals while majority rural and tribal regions are served by Non government organization with regards to eye care provision. We at present don't have any data for the magnitude of Visual impairment in the population and if that is known, we may need to look into the barriers for uptake of those eye care services. Situation analysis of the problem is

necessary for the planning of better eye care services in the area. Understanding the magnitude of the VI among aged ≥40 years and barriers to uptake eye care services will enable us to manage the community based programmes in a systematic manner.

The aim of the study is to determine prevalence of VI, causes of VI and to understand the barriers to uptake of services in the district. This study will provide us baseline data and will also help evaluate the impact of services in future.

Material and Methods

This is a population based, cross-sectional study that was conducted using Rapid Assessment of Visual Impairment (RAVI) survey methodology in the month of April 2013 in 10 blocks of Surat district of Gujarat state, India. RAVI methodology is well established and validated survey methodology [8].

Study Sample

This study employed stratified cluster random sampling. Clusters were selected from sampling frame by systematic sampling with a probability proportional to size (PPS). Households were surveyed by Compact segment sampling (CSS) method wherein clusters were divided into segments and these segments were randomly selected through lottery and each household in the selected segment was approached until 60 subjects aged 40 years or more were examined. If selected segment had less than 60 individuals, the next segment was selected randomly to complete list of 60 individuals.

Assuming prevalence of VI at 10 % (Lower prevalence of range 10-25% was taken), using power as 80%, relative precision taken as ±20% of prevalence, assuming response rate at 90% with 95% confidence interval and 1.6 (cluster size 60) design effect, a sample size of 1536 was calculated. A total of 26 clusters were chosen according to probability proportional to size. Rapid Assessment of Avoidable Blindness (RAAB) software was used to calculate sample size and ascertaining random sampling [8].

One survey team included two ophthalmic assistants (OAs), 2 field worker and 2 volunteers. OAs were given one week training for RAVI survey at base hospital, a charitable hospital working in the rural-tribal area of Surat district. Training of the team included objectives, background and Methodology of the RAVI survey, standard protocol for examination of subjects, identifying common eye conditions, visual acuity measurement examination for OAs, filling up of survey questionnaire, Inter-observer variation (IOV) assessment, Data entry training for data entry operators, conveying role and responsibilities of every member of survey team.

Study Definitions

Indian definition was slightly different from WHO definition and it was used so as to compare this data with previous data in India with ease. Blindness was defined as PVA less than 6/60 which includes WHO category of Blindness as well as severe visual impairment. Moderate VI was defined as PVA <6/18 to 6/60. Refractive error was defined as Presenting VA< 6/18 but improving to ≥ 6/18 with pinhole. PVA, BCVA and pinhole vision was assessed using chart at the distance of 6 meters. Cataract was defined as opacity in crystalline lens in the pupillary area on distant direct ophthalmoscopy examination causing VI. The principle cause of Visual impairment was recorded for person and each eye separately. If more than one cause was found, most easily treatable cause marked as main cause for Visual impairment. Participants who needed management of their eye problems were referred to base hospital for free treatment.

Visual acuity was measured with tumbling 'E' optotypes of Snellen's chart. Each eye was tested separately by closing opposite eye with ocluder held in front of eye of participants. Participants were shown size 18 'E' optotype of chart from 6 meters distance. Participants needed to answer correctly four consecutive 'E's or 4 out of 5 answer correctly for the forms to be finally filled. If one failed to read correctly, visual acuity was measured again as if it is done first time. If they couldn't see size 18 at 6 meters, pinhole vision was measured. If that too did not improve they were referred to base hospital on agreed day for detailed eye exam they were asked the question why they did not avail eye care services despite they have visual impairment and their response was noted and marked as appropriate barrier in the RAVI standard questionnaire. If participant was able to see distance VA ≥6/18, no further procedure required. Participants were examined with torch inside house or in semi-dark room for ocular conditions.

Data Management

Data was collected on RAVI data collection form and then was entered twice separately (Double data entry) into the SPSS statistical analytical software by two data entry operators on daily basis. Double data entry check and data cleaning was performed using consistency check menu of software. Intra and inter- observer agreement of ophthalmic assistants was assessed during training was found to be within acceptable range. (Kappa coefficient was >0.60). Prevalence of Visual impairment with 95% confidence intervals, its demographic associations with age, gender, area of residence, education are presented in the present study along with barriers to avail eye care services.

Ethical Clearance

The study adhered to the principles and guidelines of Helsinki declaration. Ethical clearances were obtained from ethical committee of DivyaJyoti Trust, Mandvi, Surat district, Gujarat state, India. Informed and written consent was obtained from each participant before they were included for the study.

Results

There were 1487 subjects available for examination out of 1560 (response rate of 95.3%) enumerated. Out of total 73 non-responders, 71 were not available at their home and 2 refused. Response rate was 90.8% among females and 99% among males. The mean age of the males was 52.25 and of females was 51.79. There were 41.8% males and 58.2% females in the study of which 51.4% were educated (males 51.96% % and Females 48.04 %). More women were available for examination compared to males (P value 0.000). There was no significant difference noted with regards to sample and entire survey area under various age group categories (P=0.53). (Table 1)

Table 1. Age and Sex Composition by Sample and Survey Population

Age group (Years)	Sample n (%)			Entire survey area n (%)		
	Male	Female	Total	Male	Female	Total
40-49	299 (48.1)	463 (53.5)	762 (51.2)	443167 (49.45)	447358 (52.96)	890525 (50.68)
50-59	183 (29.4)	164 (19.0)	347 (23.3)	229154 (25.57)	221526 (25.73)	450680 (25.65)
60-69	92 (14.8)	171 (19.8)	263 (17.7)	145234 (16.20)	127084 (14.76)	272318 (15.50)
70+	48 (7.7)	67 (7.7)	115 (7.7)	78718 (8.78)	65057 (7.56)	143775 (8.18)
Total	622 (100)	865 (100)	1487 (100)	896273 (100)	861025 (100)	1757298 (100)

Table 2. Age and Sex Adjusted Prevalence of Visual Impairment

	Numbers	Prevalence %(95% CI)
Blindness	30	2.03% (1.31-2.76)
Moderate VI	365	25.28% (22.7-27.9)
All VI (Blindness + Moderate VI)	395/1487	27.31 (24.6-30.0)

Table 3. Prevalence of causes of Visual Impairment (n=395)

	MVI n (%)	Blindness n (%)	Total n(%)
Refractive Error	246 (67.4)	3 (10)	249 (63)
Cataract	100 (27.4)	21 (70)	121 (30.6)
Uncorrected Aphakia	0	1 (3.3)	1 (0.3)
Complications of Surgery	7 (1.9)	4 (13.3)	11 (2.80)
Corneal Opacity	1 (0.3)	0	1 (0.3)
Glaucoma	1 (0.3)	0	1 (0.3)
Posterior Segment Pathology	5 (1.4)	0	5 (1.3)
Others	0	1 (3.3)	1 (0.3)
Total	365 (100.0)	30 (100.0)	395 (100.0)

Table 4. Multiple Logistic Regression Analysis Showing VI and Its Association with Demographic Variables

	Total (n)	No. Of people with VI (n)	Odds (95% CI)	P value
Age groups (years)				
40-49	762	78	1	
50-59	347	110	3.9(2.9-5.5)	0.00
60-69	263	134	9.8(6.9-13.8)	0.00
70+	115	73	17.1(10.8-27.1)	0.00
Gender				
Male	622	177	1	
Female	865	218	0.9(0.6-1.2)	0.37
Education				
Illiterate	764	182	1	
Literate	723	213	1.4(1.0-1.8)	0.03
Area				
Rural	463	169	1	
Urban	1024	226	1.1(0.8-1.4)	0.51
Total	1487	395		

Table 5. Barriers for not Utilizing Eye Care Services

Main Barrier	MVI	Blind	All VI (MVI+Blind)
Cannot Afford Cost of Surgery/Services	38 (27.1)	9 (32.1)	47 (28.0)
Old Age and Need not Felt	34 (24.3)	8 (28.6)	42 (25)
One Eye Adequate Vision/ Need not Felt	13 (9.3)	1(3.6)	14 (8.3)
Cannot Afford Consultation Fees	12 (8.6)	3 (10.7)	15 (8.9)
Waiting for Cataract to Mature	11 (7.9)	0	11 (6.54)
Aware of The Problem, But Do not Feel The Need	10 (7.1)	0	10 (5.95)
Unaware of The Problem	8 (5.7)	0	8 (4.76)
Services not Available or Very Poor	3 (2.1)	3 (10.0)	6 (3.6)
No One to Accompany	3 (2.1)	0	3 (1.78)
No Time Available/Other Priorities	3 (2.1)	0	3 (1.78)
Other Health Reasons	2 (1.4)	2 (7.1)	4 (2.4)
Destiny or God's Will	1 (.7)	0	1 (.5)
Fear of Losing Eyesight/Operation	0	2 (7.1)	2 (1.2)
Others	2 (1.4)	0	2 (1.2)
Total	140 (100)	28 (100)	168 (100.0)

Prevalence and causes of VI and Blindness

Prevalence of VI was 26.56% (395/1487) (95% CI: 24.38-28.87) which included 30 people with blindness (prevalence 2.01%, 95% CI: 1.42-2.87) and 365 people with MVI (prevalence 24.55%, 95% CI: 22.43-26.80). Age and sex adjusted prevalence of VI was 27.31% (95% CI 24.6-30.0) which included prevalence of blindness (2.03%, 95% CI 1.31-2.76) and of MVI (25.28%, 95% CI 22.7-27.9). Prevalence of blindness was 2.0% (30/1487) (95% CI 1.47 – 2.87). Age and sex adjusted prevalence of blindness was 2.03 (95% CI 1.31-2.76). (Table 2)

Refractive error (63%) was found to be major cause of all visual impairment followed by cataract (30.6%). Refractive error was major cause in moderate VI and cataract was major cause of Blindness. (Table 3)

Multiple logistic regression analysis suggested the risk of having VI increase significantly with the age. The risk of having VI among people of age 50-59 is 3.9 times as compared to the people of age 40-49. This risk further increases to 9.8 and 17 times among age group 60-69 and 70+ years. No significant associations were observed by gender, education and area of living. (Table 4)

Barriers

Affordability (fees for consultation, surgery and other services all included) (36.9%) was found to be main cause of barriers preventing people with visual impairment from using eye care services in the area followed by Need not felt (Old age, one eye adequate vision included) (33.3%). (Table 5)

Discussion

This research study employed the novel RAVI methodology to estimate prevalence and causes of visual impairment in Surat district of Gujarat state, India. The prevalence of blindness (presenting visual acuity <6/60 in the better eye) in India is 1.1% and cataract is main cause of blindness followed by URE (prevalence 19.7%) [9]. Thus if presenting VA is considered, UREs are the second largest cause of treatable blindness after cataract. There are estimated 11 million blind people and 2.2 million visually impaired due to UREs considering population of India being 1.2 billion. This suggests there is a huge burden of blindness and VI in India. The treatment of UREs is very simple - a pair of spectacles and cheaper compared to cataract and other causes of VI.

The age and sex adjusted prevalence of blindness is 2.03% and that of MVI is 25.28%. This means a lot needs to be done to reduce visual impairment due to these two causes responsible for VI. Although the survey results found to be lesser in Surat district as against prevalence of 6.9% and 35.5% for blindness and MVI among people ≥50 years (2006-07) reported in neighbouring Navsari district which is predominantly rural and as against prevalence of 8% and 16.8% for blindness and MVI respectively as reported in national survey 2006-07 [10, 11]. The reason for the prevalence of VI being lower in Surat district is that it has higher urban population where eye care services are comparatively better than rural population compared to neighbouring Navsari district which is entirely rural. Despite this, the visual impairment due to cataract and refractive errors in Rural-tribal areas needs to be addressed as early as possible as there are very few avenues of getting refraction checked and getting spectacles at very subsidized rates preferably through government settings. Also Surat district attracts huge migrant population for its textile and diamond industries every year. Eye care services provided to people in urban as well as rural-tribal areas will increase their productivity to many folds.

The study revealed risk of having VI increasing significantly with the age. The risk of having VI among people of all age to the tune of 3.9 times as compared to the people of age 40-49 which is consistent with the studies found in India and outside India [11-15]. However significant VI was noted among women in some studies, no significant differential is observed by gender in this study and study done in neighbouring district of Gujarat [10-15].

The impact of refractive errors is many folds and may include loss of educational, employment and economic opportunities [13]. There is lack of evidence to suggest what the economic burden due to refractive errors is in this region but some suggest it to be significant as this affects the most productive age group [13]. Estimated global economic burden caused by distant VI due to UREs is US$ 202 billion which is enormous [16]. If we provide people with refractive errors just pair of glasses, their productivity will increase. This also means that UREs can become a huge market for customized spectacles and is a very good way to introduce sustainability into the hospitals without being dependant on the external funding which is one of the goals of vision 2020- right to sight. Cataract is found to be major cause of visual impairment in blindness category and second most important cause in moderate and overall VI category. These findings are same as in other studies conducted in India [17]. Thus cataract and refractive errors combined contributed to more than 90% of visual impairment that is avoidable both of which are easier to treat compared to other causes.

"Unaffordability to purchase glasses/surgery" was found to be a major barrier for people with visual impairment for not availing services despite their impaired vision. Second most common barrier was "No need felt". Government through National Program for Control of blindness (NPCB) provides free or highly subsidized services for cataract and other subspecialties but there is no provision of providing free spectacles. The barriers like "No Need felt" and personal and familial reasons are very difficult to address. Awareness campaigns and addressing barriers for various eye diseases like cataracts, Refractive Errors are required to improve uptake of these services.

Recommendations

1. Visual impairment needs to be addressed in Surat district in a systematic way.

2. There is need to provide effective cataract surgical services free of cost or by cross subsidization with free transport facilities and need to strengthen refractive error services in the area.

3. The survey revealed that major overall barrier to access eye care facilities is affordability of the services in the form of spectacles and surgery.

Conclusion

The prevalence of VI needs urgent attention in Surat district majority of which caused by refractive errors particularly in younger age groups. Cataract remains the major cause of blindness. The findings suggest there should be an effective outreach program with free transport facility and free or subsidized cataract surgery. Affordability was found to be main cause of barriers preventing people from using eye care services in the area followed by no felt need. There should be effective free/subsidized spectacles distribution system in place for addressing problems of refractive errors. This is the first of its kind baseline data which will definitely be useful in planning eye care services in the district in future.

Acknowledgements

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