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Assessment of cataract blindness and cataract surgical outcome in rural and tribal population

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ABSTRACT

Background: Assessment of cataract blindness and cataract surgical outcomes to determine the impact of cataract and the cataract control program on the rural and tribal population.

Methods: 25 clusters each from rural and tribal area with population of minimum 100 people aged above 50 years were selected by stratified cluster sampling. Participants were evaluated for history, vision, and questionnaire regarding cataract surgery as per pre-designed proforma.

Results: In rural area, of 5300 eyes, Severe Visual Impairment (SVI) (visual acuity $<6/60$ to $\geq 3/60$) was noted in 151 (2.84%) eyes and 236 (4.45%) eyes were blind (visual acuity $\leq 3/60$). Prevalence of cataract blindness noted in study population was 3.49%. whereas, in tribal area, of 5082 eyes, SVI was noted in 101 (1.98%) eyes and 134 (2.63%) eyes were blind. Prevalence of cataract blindness noted in study population was 2.14%. In rural area, out of 624 operated eyes, 431 eyes (69.07%) had good visual outcome (visual acuity $\geq 6/18$), 132 eyes (21.15%) had borderline visual outcome (visual acuity $>6/18$ to $\leq 6/60$) while, 61 eyes (9.78%) had poor visual outcome (visual acuity $>6/60$). In tribal area, out of 221 operated eyes, 139 eyes (62.89%) had good visual outcome, 59 eyes (33.62%) had borderline visual outcome, while 32 eyes (14.47%) had poor visual outcome.

Conclusions: Cataract was the major avoidable cause of blindness in rural and tribal population. The policies and programme should be strengthened and penetration of these services in rural as well as tribal area is necessary.

Keywords: Blindness, Cataract, Cataract surgical outcome

INTRODUCTION

Any opacity in the lens or its capsule in the pupillary area, whether developmental or acquired as seen with torch light and causing diminution of vision is called as cataract (presenting visual acuity $<6/18$ and not improving with pin-hole).

At least 2.2 billion people worldwide suffer from near or distance visual impairment, and at least 1 billion of those cases could have been avoided.¹ According to the 2015-2019 National Programme for Control of Blindness and

Visual Impairment (NPCB and VI) survey, 1.99% of those over 50 are blind. Cataract (66.2%), corneal opacity, including trachomatous (8.2%), cataract surgery complications, such as posterior capsular opacification (PCO) (7.2%), posterior segment disease, which excludes diabetic retinopathy (DR) and age-related macular degeneration (5.9%), and glaucoma (5.5%) are the main causes of blindness.²

A survey conducted in India as part of the Rapid Assessment of Avoidable Blindness (RAAB) study found that cataract was responsible for 84.4% of preventable blindness and 77.5% of total blindness.³ In order to attain

a satisfying visual outcome and a better quality of life by 2020, the World Health Organization (WHO) and its "Vision 2020" project are dedicated to eliminating preventable blindness, particularly that caused by cataracts, by increasing the number and calibre of cataract procedures.⁴

According to the Global Burden of Disease, Injuries and Risk Factors Study, it was seen that the single most important cause of blindness is cataract. It is also the second most common cause of moderate and severe vision impairment (MSVI) which accounted to 33.4% of blindness worldwide. In actual numbers, cataract has caused blindness in 10.8 million of overall 32.4 million blind and visual impairment in 35.1 million of 191 million visually impaired individuals.⁵

India was the first nation in the world to launch a publicly funded initiative to prevent blindness as a top health concern for the country. Population-based surveys have been the main source of data regarding the effective implementation and supervision of such eye care initiatives.

METHODS

The population based cross sectional study was conducted in randomly selected villages from the block using stratified cluster sampling. 25 clusters each from both rural area and tribal area with minimum 100 individual per cluster was selected. The study population was aged more than 50 years. The villages were selected randomly with a population of more than 1000. Listing of the names of villages/wards block wise was done from census 2011 report. Rural clusters were taken from Samudrapur taluka of Wardha district while tribal clusters were taken from Dharni taluka (Melghat) of Amaravati district. Villages with a population less than 700 were clubbed together to yield a cluster where 100 individuals aged 50+ were available. The study was done for 2 years (January 2021 to November 2022).

A door-to-door survey was conducted in the selected clusters and examination was performed inside every participant's house in the survey locations. After taking informed consent from the patient, Data is collected on a predesigned pattern and questionnaire was of semi-structured type. Data was compiled in MS Excel form. Data was analysed using Statistical Package for Social Science version 27 (SPSS-27.0 version) statistical software.

Demographic details of subject including name, age and gender was recorded. Unique identification number (examples, Aadhar number, voter ID) was noted. Habitat (rural/tribal) was noted and cluster number was mentioned. Contact details (mobile number) was also mentioned.

History of any comorbid condition, history of cataract surgery and use of glasses by subject was also noted.

Presenting distance Visual Acuity (PVA) was tested separately for each eye using an Early Treatment Diabetic Retinopathy Study (ETDRS) chart cut out with "E" optotypes. The 'E' s on one side correspond to 6/60 equivalent of Snellen's chart while the 'E' s on the reverse correspond to 6/18 on the Snellen's chart at 4-m distance. This was done in full day light preferably in the courtyard taking care that the daylight shall not fall on the eyes. Participants who read the largest letter (confirms visual acuity (VA) 6/60) were then shown the other side of chart showing small size letter E (VA 6/18), those who read small size letter E, their visual acuity was recorded as 6/18 or better for each eye. Participants failing to read the largest letter at 4m were again tested at 2-m and visual acuity was recorded as 3/60. When necessary, testing included the ability to count fingers, to detect hand movements, or to perceive light. Participants who could not read 6/18 from either eye had their visual acuity checked again with pin hole and improvement if any was recorded for each eye separately.

Torch light examination was performed inside a room to assess any anterior segment pathology in subject with PVA <6/18 in either eye.

After torch light examination, Distant Direct Ophthalmoscopy (DDO) was done to note the lens status of subjects. The lens status was categorised as clear, cataractous, pseudophakic and aphakic and subluxation/dislocation of the lens was also noted. If the lens which could not be examined, was marked as 'No view of Lens'.

The posterior segment examination was done using Heine Direct ophthalmoscope with subjects with low vision and no media opacities. If any pathology seen was noted.



Figure 1: Assessment and examination of participants.

Questions were asked on utilization of eye care services in the past, including cataract surgery and intraocular lens implantation. The outcome of cataract surgery was based

on the surgical history given by the participant and the clinical examination. If the visual outcome was poor the cause if aphakic blindness or pseudophakic blindness was noted (Figure 1).

RESULTS

Age and gender distribution

The mean age of study population in rural area was 62.78 ± 9.17 years (range 50-96 years). Out of 2650 person, 51.25% (n=1358) were males and 48.75% (n=1292) were females. The mean age of male population was 62.77 ± 9.23 years and mean age of female population was 62.80 ± 9.11 years. Majority of participants in this study were in range of 50-59 years (n=1028).

Presenting visual acuity in rural participants (eyes)

In rural area, 3585 (67.83%) eyes of 2650 person had visual acuity normal/near normal, 1318 (24.86%) eyes had visual impairment (VI). Severe visual impairment (SVI) was noted in 151 (2.84%) eyes and 236 (4.45%) eyes were blind (Table 1).

Table 1: Presenting visual status of rural participants.

Presenting visual acuity	Total (%)
$\geq 6/18$ (normal/near normal)	3595 (67.83)
$<6/18-\geq 6/60$ (visual impairment)	1318 (24.86)
$<6/60-\geq 3/60$ (severe visual impairment)	151 (2.84)
$<3/60$ (blind)	236 (3.64)
Total	5300 (100)

Lens status of participants in rural area

In rural area, 3106 (58.6%) out of 5300 eyes surveyed had normal clear lens. On the other hand, 620 (11.7%) eyes were pseudophakic while 4 (0.08%) were aphakic. Cataractous changes were noted in 1532 (28.91%) eyes. Lens status could not be determined in 31 (0.58%) eyes because of hazy media viz., absent globe/phthisis bulbi, adherent leucoma etc. (Table 2).

Table 2: Distribution of participants according to lens status in rural area.

Lens status	Rural area (n=2650) (%)
Total	
Clear	3106 (58.60)
Cataract	1532 (28.91)
Pseudophakia	620 (11.70)
Aphakia	4 (0.08)
Subluxated/dislocated	7 (0.13)
No view of lens	31 (0.58)
Total	5300 (100)

Prevalence of cataract blindness in rural area

In rural area, cataract was seen in 1532 eyes out of 5300 eyes. Out of 1532 eyes, blindness due to cataract was present in 12.07% eyes (n=185) eyes. Severe visual impairment was seen in 8.81% (n=135) eyes and visual impairment due to cataract was 79.11% (n=1212). The prevalence of cataract blindness out of study population was 3.49% (Table 3).

Presenting visual acuity in tribal participants (eyes)

In tribal area, 3596 (70.75%) eyes of 2541 person had visual acuity normal/near normal, 1251 (24.61%) eyes had visual impairment. Severe visual impairment was noted in 101 (1.98%) eyes and 134 (2.63%) eyes were blind.

Table 3: Prevalence of cataract blindness.

Causes of blindness			
Visual acuity	Cataract (%) (n=1532)	Other than cataract (%) (n=3768)	Total eyes (%)
$\geq 6/18$	0	3594 (95.38)	3594 (67.81)
$<6/18-\geq 6/60$	1212 (79.11)	107 (2.83)	1319 (24.89)
$<6/60-\geq 3/60$	135 (8.81)	16 (0.42)	151 (2.85)
$<3/60$	185 (12.07)	51 (1.35)	236 (4.45)
Total	1532 (100)	3768 (100)	5300 (100)

Table 4: Presenting visual status of tribal participants.

Presenting Visual Acuity	Total (%)
$\geq 6/18$ (normal/near normal)	3596 (70.75)
$<6/18-\geq 6/60$ (visual impairment)	1251 (24.61)
$<6/60-\geq 3/60$ (severe visual impairment)	101 (1.98)
$<3/60$ (blind)	134 (2.63)
Total	5082 (100)

Lens status of participants in tribal area

In tribal area, 3440 (64.91%) out of 5082 eyes surveyed had normal clear lens. On the other hand, 217 (4.09%) eyes were pseudophakic while 4 (0.08%) were aphakic. Cataractous changes were noted in 1405 (26.51%) eyes. Lens status could not be determined in 16 (0.30%) eyes because of hazy media viz., absent globe/phthisis bulbi, adherent leucoma etc. (Table 5).

Prevalence of cataract blindness in tribal area

In tribal area, cataract was seen in 1405 eyes out of 5082 eyes. Out of 1405 eyes, blindness due to cataract was present in 7.75% eyes (n=109) eyes. Severe visual impairment was seen in 6.69% (n=94) eyes and visual impairment due to cataract was 85.55% (n=1202). The

prevalence of cataract blindness out of study population was 2.14% (Table 6).

Table 5: Distribution of participants according to lens status in tribal area.

Lens status	Tribal area (n=2650) (%)	
	Total eyes	
Clear	3440 (64.91)	
Cataract	1405 (26.51)	
Pseudophakia	217 (4.09)	
Aphakia	4 (0.08)	
Subluxated/dislocated	0 (0)	
No view of lens	16 (0.30)	
Total	5082 (100)	

Table 6: Prevalence of cataract blindness.

Visual acuity	Cataract (%) (n=1405)	Other than cataract (%) (n=3678)	Total eyes
≥6/18	0	3596 (97.77)	3596 (72.72)
<6/18- ≥6/60	1202 (85.55)	49 (1.33)	1251 (24.61)
<6/60- ≥3/60	94 (6.70)	7 (0.19)	101 (1.98)
<3/60	109 (7.75)	25 (0.68)	134 (2.63)
Total	1405 (100)	3678 (100)	5082

Cataract surgical outcome in rural area

In rural area, out of 624 operated eyes, 431 eyes (69.07%) had good visual outcome (VA of 6/18 or better), 132 eyes (21.15%) had borderline visual outcome (VA worse than 6/18 but better or equal to 6/60) while, 61 eyes (9.78%) had poor visual outcome (VA worse than 6/60) (Table 7).

Table 7: Cataract surgical outcome.

Outcome of cataract operation	No of eyes (%)
Good outcome (≥6/18)	431 (69.07)
Borderline (<6/18-≥6/60)	132 (21.15)
Poor outcome (<6/60)	61 (9.78)
Total	624 (100)

Cataract surgical outcome in tribal area

In tribal area, out of 221 operated eyes, 139 eyes (62.89%) had good visual outcome, 59 eyes (33.62%) had borderline visual outcome, while 32 eyes (14.47%) had poor visual outcome (Table 8).

Table 8: Cataract surgical outcome.

Outcome of cataract operation	No of eyes (%)
Good outcome (≥6/18)	139 (62.89)
Borderline (<6/18-≥6/60)	50 (22.62)
Poor outcome (<6/60)	32 (14.47)
Total	221 (100)

DISCUSSION

Cataract is the leading cause of reversible blindness and visual impairment all over world. Blindness from cataract is more common in populations with low socioeconomic status and in developing countries than in developed countries.⁶

The mean age of study population from rural area was 62.78 ± 9.17 years (range 50-96 years) and out of 2650 individuals, 1358(51.25%) were males and 1292 (48.75%) were females. The mean age of study population from tribal area was 62.29 ± 7.50 years (range 50-94 years) and out of 2541 individuals, 1290 (50.77%) were males and 1251(49.23%) were females. Similar results were seen in study by Dhawan et al (2020).⁷

In this study, it was found that the prevalence of blindness in rural area was 3.64% and prevalence of visual impairment and severe visual impairment was 24.86% and 2.84% respectively (Table 1), while in tribal area prevalence of blindness, severe visual impairment and visual impairment was 2.63%, 1.98% and 24.61% (Table 4). The study by Singh et al found that, 16.9% had Visual Impairment (VI), 2.9% had severe visual impairment (SVI) and 2.3% had blindness.⁸

In this survey, out of 5300 eyes of rural area, 3106 (58.60%) eyes had clear lens, 1532 (28.91%) eyes had cataractous lens while pseudophakia was present in 620 (11.7%) eyes and aphakia noted in 4 (0.07%) eyes (Table 2), however in tribal area out of 5082 eyes, 3440 (64.91%) eyes had clear lens, 1405 (26.51%) eyes had cataractous lens while pseudophakia was seen in 217 (4.09%) eyes and aphakia noted in 4 (0.08%) (Table 5). The study by Dhawan et al found that, out of 6000 eyes, 4120 (68.7%) had normal clear lens, cataract was seen in 1102 (18.4%) eyes, while pseudophakia was present in 551 (9.2%) eyes and 179 (3.0%) eyes had aphakia.⁷

The prevalence of cataract blindness in rural area was 3.49% (Table 3) and prevalence of cataract blindness in tribal area was 2.14% (Table 6). Similar result was seen in Guruprasad BS study which found that prevalence of cataract blindness was 2.5%.⁹

In rural area, out of 624 operated eyes, 69.07% eyes had good visual outcome (VA of 6/18 or better), 21.15% eyes had borderline visual outcome (VA worse than 6/18 but better or equal to 6/60) while, 9.78% eyes had poor visual outcome (VA worse than 6/60) (Table 7) while in tribal area, out of 221 operated eyes, 62.89% eyes had good visual outcome, 33.62% eyes had borderline visual outcome, while 14.47% eyes had poor visual outcome (Table 8). Similar results were seen in study by Patil et al in rural area found that, in operated eyes the best corrected visual acuity (BCVA) in 88.3% participants was $\geq 6/18$, 8.3% had $<6/18- \geq 6/60$ BCVA, while 3.4% had $<6/60$ BCVA. Also, study by Khanna et al in tribal area found, that among the operated eyes, PVA worse

than 6/18 was seen in 31.8% and PVA worse than 6/60 was seen in 14.1%.^{10,11}

The present study lacks the posterior segment causes of blindness such as ARMD, Diabetic retinopathy which are major factor of blindness in western countries.

CONCLUSION

Cataract is commonest cause of avoidable blindness and visual impairment in developing countries. It holds major proportion in population over 50 years of age. In the present study, prevalence of cataract blindness was 3.49% in rural area and 2.14% in tribal area. Despite of various programme to eliminate blindness, cataract holds maximum proportion of blindness in rural as well as tribal area. Cataract surgeries have increased in last couple of years and outcome of cataract surgeries has improved as microsurgical techniques and facilities have been implemented. Despite of this, awareness about cataract was the major factor for not seeking cataract surgical services in both the population. The policies and programme should be strengthened and penetration of these services in rural as well as tribal area is necessary to counteract this avoidable cause of blindness.

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