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ORIGINAL ARTICLE

The Prevalence of Blindness and Cataract Surgery in Rautahat District, Nepal

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ABSTRACT

Purpose: The Gaur Eye Hospital, which provides eye care services to the people in Rautahat and adjacent districts, completed 9 years of operation in 2006. Over 14,000 cataract surgeries were performed during this period. This study aimed to ascertain the impact of the hospital services by estimating the prevalence of blindness, visual impairment and cataract surgical coverage among the older adult population of the Rautahat district.

Methods: People aged 50 years and older were enrolled in this study that used a stratified cluster design. Subjects in 32 randomly selected clusters were identified through door-to-door visits, presenting and corrected visual acuities measurement, and clinical examination by ophthalmologists were conducted at a centrally located site.

Results: Of the 5,533 identified subjects, 85.3% were examined. Blindness was defined as presenting with visual acuity < 6/60 in both eyes. Blindness was found in 17.4% (95% Confidence Interval: 15.1 to 19.7); however, 55.6% of individuals examined had vision < 6/18 in one or both eyes. Cataracts were the principal cause of blindness in 82.1%, and were associated with elder age, illiteracy and female gender. Surgical coverage was found to be 37.3%.

Conclusion: The findings suggest that despite 9 years of hospital and community eye care services the prevalence of blindness in this area is still challengingly high and the cataract surgical coverage unacceptably low. Community outreach awareness programs and accessibility for the Nepali cataract blind to the hospital need to be upgraded.

KEYWORDS: Prevalence; Blindness; Visual outcome; Cataract surgery; Rautahat; Nepal

INTRODUCTION

The World Health Organization (WHO) estimates that in 2002 there were 37 million blind and 124 million with low vision worldwide. In total, 161 million people were reported to be visually impaired.[1]

In Nepal, the Nepal Blindness Survey (1981) showed a prevalence of 0.84% bilateral blindness, 1.7% unilateral blindness and 1.85% with low vision countrywide. The survey also revealed that cataracts were the leading cause of blindness, accounting for almost 71%. Eighty percent of blindness was either preventable or curable. Almost 91% of blind people resided in rural areas. The prevalence of blindness was higher among females.[2] This magnitude of blindness is considered to have a significant impact on financial, social and public health problems in Nepal.

A regional survey conducted in the Lumbini and Bheri zone in 1994[3] revealed that the prevalence of blindness had decreased, surgical coverage had increased to some extent compared to that in the previous decade, but blindness was still challengingly high and outcomes of cataract surgery were very poor. The survey showed that almost 31.0% of cataract surgery cases remained blind or had severe visual impairment.

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Another survey conducted in Gandaki[4] zone in 2002 showed prevalence of blindness has reduced further among the elderly population in hilly area. It showed prevalence of blindness as 2.6% among 45 plus population. Cataract was still leading cause of blindness accounting for 61.6% among the elderly population. Surgical coverage has further improved reaching 59.5%. Cataract surgical burden was detected as 4.1%, which is same as the 1994 survey.

Based on the results of the 1981 survey, a blindness control program was initiated at a national level in the early 80s in Nepal. A geographical sector wide approach was adopted and eye care in Nepal, assisted by a wide range of international and national non-governmental organizations, was coordinated to implement a national strategy to reduce blindness.

In the Narayani zone, there are three eye hospitals for the population of 2,466,132.[17] Our survey was conducted in the Rautahat district (one of five districts in the zone), where the only eye care service provider is the Gaur Eye Hospital (GEH). GEH started its clinical services in 1997. Prior to its establishment, surgical eye camps used to be conducted in this area. Approximately 500 cataract surgeries per year used to be done during these eye camps in the Rautahat district. The common surgical procedure adopted in such eye camps was mainly Intra Capsular Cataract Extraction (ICCE) without an intraocular lens (IOL).

After the establishment of the hospital, extensive community outreach programs such as screening camps, village health post visits and school health programs have been conducted. The hospital and its outreach services have delivered approximately 14,000 cataract surgeries in the last 9 years. In 2005, the hospital and its community service were able to provide surgical services to approximately 4,500 persons, of whom more than 90% were cataract blind. This number is inclusive of 3082 (68.5%) surgical patients coming from India in 2005. The cost of one cataract surgery with IOL implant at GEH is Nepali Rupees 900 (approximately 13 United States Dollars [USD]). There is also the provision for free treatment for poor patients at the hospital, but to obtain this service, the patients need to go through the financial assessment at the administration section of the hospital.

In light of providing services for more than 9 years, it was thought necessary to estimate the prevalence of blindness and the impact of the hospital's services in the area, with special focus on cataract.

MATERIAL AND METHODS

This population-based, cross-sectional study was conducted in 2006 in the Rautahat district of the Narayani zone in 32 randomly selected clusters. All people aged 50 years and above, from selected clusters, were enrolled in the study through house to house visits. The Rautahat district is mainly plane land area with a population of 621,165.[17] The majority of the population is poor, with agriculture the subsistence occupation of most people. The district is typical of the Terai area of Nepal where 48.4% of the country's population resides. The total population of the district constituted the sampling frame of the study. Within this sampling frame reference, there were approximately 80,000 people aged 50 and over as potential study subjects. The actual geographic boundaries of the selected segments based on local layouts were defined and a total of 484 clusters created from all the wards of the district. The sample size was calculated based on estimating cataract blindness prevalence (presenting visual acuity <6/60) as 8% within error bound 15% with 95% confidence. With an expected non response of 15%, and the cluster design effect 2.0, the total sample required was 4,619. From the total of 484 clusters, 32 were selected using a simple random sampling method. The fieldworkers, with experience in similar earlier surveys, were provided with 1 week of training on data collection and to familiarize them with the form and field situation. Pre-pilot and pilot studies were conducted in a small village (not a sample cluster) with a population of approximately 500. A study team visited the first selected cluster (1 or 2 days before clinical examination) to identify subjects. Team members visited each household and identified all people ages ≥ 50 years. Study subjects were provided with referral slips and requested to come for an examination by ophthalmologists at a centrally located clinical examination site. The clinical examination sites in each cluster were located within half an hour's walking distance.

An ophthalmic assistant tested visual acuity (VA) at 4 meter of all subjects using a retro-illuminated logMAR chart with tumbling-E optotypes (Precision Vision, Villa Park, Illinois). Refraction (Streak Retinoscopy and Subjective) was assessed in all those presenting VA<6/18 in either eye. Those subjects who wore glasses were tested with glasses and this vision considered as their presenting vision. A basic eye examination of each subject was performed by ophthalmologists using a torch, a 2 X binocular loupe, a portable slit lamp (Kowa SL-15) and a direct ophthalmoscope. All eye examinations were carried out as per the study protocol.

All eyes for which VA did not improve to 6/18 with refraction, except those with a corneal cause or an obvious cataract (defined as a lens opacity precluding view of the fundus), were dilated for detailed evaluation of the posterior segment. Intra ocular pressure was measured using a Perkins hand-held tonometer

for cases suspected of having glaucoma based on optic disc changes, primarily cup-to-disc ratios >0.5 and an unhealthy optic disc rim. Cause of blindness as glaucoma was assigned based on these findings. Eyes with visual acuity <6/18 were assigned a principal cause of impairment/blindness by the examining ophthalmologists.

Subjects physically unable to come to the examination site were offered an abbreviated examination at home. Treatment of minor ocular conditions was provided at the examination site free of charge. Those who required cataract surgery were referred to the GEH for free surgical treatment.

Five vision categories, similar to those used in earlier surveys[4] were defined for analysis and reporting based on presenting vision; (1) normal or near normal vision visual acuity (VA) ≥ 6/18 in both eyes; (2) visual impairment, unilateral or bilateral visual impairment VA < 6/18 to 6/60 in the worse eye and VA > 6/60 in the better eye; (3) unilateral blindness, VA < 6/60 in the worse eye and VA > 6/60 in the better eye; (4) moderate bilateral blindness, VA < 6/60 in worse eye, and VA < 6/60 to > 3/60 in the better eye; (5) severe blindness/social blind, VA < 3/60 in both eyes. Estimates (with 95% confidence intervals [CI]) of impairment and blindness prevalence were calculated along with that attributed specifically to cataracts. Bi-variate analysis and multivariate logistic regression was used to investigate potential associations with blindness.

The cause of blindness was analyzed for each eye. It has been assumed that if cataract of sufficient density to cause the blindness is found, then that would be the assigned cause, even if there were other retinal causes (or glaucoma), just because it would be hard to visualize the posterior segment. The prevalence of cataract blindness and cataract surgery was estimated. Potential associations with age, gender and literacy were explored in a multiple logistic regression model.

The barrier questionnaires were administered to 1183 persons having presenting visual acuity < 6/60 due to cataract in either eye to investigate the reason for not undergoing cataract surgery. The questionnaires were administered directly by examining ophthalmologist as soon as the person was diagnosed with cataract, so all cataract blind underwent this questionnaire without any refusal. Similar questionnaires were also used in previous survey conducted in the country.[18]

Cataract blindness burden was defined as the sum of those persons already operated for cataracts in both eyes and the un-operated cataract blind. It was not possible to obtain the preoperative vision status of already operated eyes; thus we made an assumption that both eyes were blind preoperatively if both eyes were operated for cataracts, or if one eye was operated and the other eye was blind at the time of our examination. Surgical coverage was calculated as the number of bilaterally blind cataract cases operated divided by the number who could have been operated. The denominator includes already operated bilateral blind (the numerator) plus the un-operated bilateral blind with a cataract the principal cause of blindness in at least one eye.

Confidence intervals (CI) for prevalence estimates and odds ratios were calculated. A P value <0.05 was considered as significant. Missing values were assumed to be similar in distribution to available data and were ignored during analysis. Verbal informed consent was obtained before examination from all study subjects.

The study protocol and the procedures were based on the experiences of similar studies in Nepal, China, and India.[3–12] The study protocol is approved by the World Health Organization (WHO) Secretariat Committee on Research Involving Human Subjects and the Ethical Review Committee of Nepal Netra Jyoti Sangh (National Society for Prevention of Blindness) and in accordance with declaration of Helsinki.

RESULTS

A total of 5,533 people from 3,363 households were identified as potential subjects. Of these 4,717 (85.3%) were available for an examination. Of them, 34 were examined at their homes due to their inability to come to the examination sites. The response rate was found to be relatively higher in the more elderly population, females and illiterate people.

Among the examined subjects, presenting VA and best corrected visual acuity (BCVA) of 6/18 or better was found in 44.4% and 65.8%, respectively. The prevalence of blindness with presenting and BCVA < 6/60 was found in 17.4% and 12.4%, respectively. As depicted in Table 1, the prevalence of moderate and severe blindness based on presenting and BCVA < 6/60 were 17.4% and 12.4%, respectively. The prevalence of unilateral blind defined as having presenting and BCVA of > 6/60 in the better eye and < 6/60 in the worse eye was 14.0% and 12.7% respectively.

The blindness rate among 50 to 59 years age population was 8.7%, increasing to 19.6% in 60 to 69 year olds, odds ratio (OR) 2.7 (95% CI 2.3–3.1), P value < 0.01 (Table 2). Similarly for the 70 years and above age group, the prevalence of blindness was 37.7%, significantly higher than for the 60 to 69 age group, OR 6.6 (95% CI 5.4–8.0), $P<0.01$. The prevalence of blindness was found associated with female gender and illiteracy, OR 1.4 (95% CI 1.1–1.7, $P<0.01$) and 2.0 (95% CI 1.5–2.8, $P<0.01$), respectively.

Among the bilateral blind cohort, cataracts were the major cause of blindness (81.5%), with refractive error

TABLE 1 Prevalence of vision impairment and blindness based on presenting and best corrected visual acuity

		Better eye visual acuity				
		≥6/18	<6/18 to ≥6/60	<6/60 to ≥3/60	<3/60	All
Worse Eye Visual Acuity	≥6/18	NN 2093 (44.4) 3105 (65.8)				2093 (44.4) 3105 (65.8)
	<6/18 to ≥6/60	VI 1144 (24.3) 430 (9.1)				1144 (24.3) 430 (9.1)
	<6/60 to ≥3/60	UL 659 (14.0, 12.8 – 15.1) 597 (12.7, 11.5 – 13.9)		MB 497 (10.5, 9.3–11.8) 284 (6.0, 5.2 – 6.9)		527 (11.2) 265 (5.6)
	<3/60				SB 324 (6.9, 5.5 – 8.3) 301 (6.4, 5.0 -7.8)	953 (20.2) 917 (19.5)
	All	2687 (57.0) 3693 (78.3)	1209 (25.6) 439 (9.3)	497 (10.5) 284 (6.0)	324 (6.9) 301 (6.4)	4717 (100.0) 4717 (100.0)

MB: moderate bilateral blindness; NN: indicates normal/near- normal vision; SB: severe bilateral blindness; UL: unilateral blindness; VI: Unilateral or bilateral vision impairment. Data are given as number of persons (prevalence percentage, 95% confidence interval). For each pair of numbers, presenting visual acuity is on the top and best corrected visual acuity on the bottom.

TABLE 2 Prevalence of presenting bilateral blindness (<6/60) in persons by age, gender and literacy

	Number examined	Blindness prevalence No. (%)	Adjusted odds ratio (95% CI)
Age (yrs)			
50–59	2355	206 (8.7)	1.0
60–69	1519	298 (19.6)	2.7 (2.3–3.1)†
70+	843	317 (37.7)	6.6 (5.4–8.0)†
Gender			
Male	2158	345 (16.0)	1.0
Female	2559	476 (18.6)	1.4 (1.1–1.7)†
Literacy*			
Literate	322	27 (8.4)	1.0
Illiterate	4392	792 (18.0)	2.0 (1.5–2.8)†
All	4717	821 (17.4)	

*Not including 3 persons with missing literacy value
†$P < 0.001$

the second (5.7%). Among the refractive error blindness cohort 14.9% were in those who had previous cataract surgery with uncorrected aphakia. The cause of visual loss in both eyes was similar.

Cataracts were the leading cause of blindness in this study. Cataracts accounted for 85.9% of bilateral blindness and 72.5% of unilateral. In this study, cataracts were found to be responsible for 82.1% of all blind eyes. Refractive error was the second major cause of blindness, being responsible for 7.3% in bilateral and 8.8% among the unilaterally blind (Table 3). As well, uncorrected refractive error, including aphakia, was responsible for 7.7% of the blindness. The study revealed that 93.2% of bilateral blindness, 81.3% of unilateral and 89.8% of overall blindness could be avoided with simple cataract surgery or with appropriate correction using glasses. Blindness due to surgical complication (0.1%) and posterior capsule opacification (0.5%) also existed, but at very low level.

A questionnaire on barrier was administered among the cataract blind (data not shown in table) in response to which 38.5% mentioned the financial reason, 27.1% replied that they were unaware of the fact that treatment could improve their vision, another 23.8% stated that they had no attendant to take them to hospital for service, and the remaining 10.6% reported other reasons like the cataract yet to mature, fear of surgery and still having some vision to manage their day to day chore as the reasons for not seeking the treatment.

Table 4 shows the cataract blindness burden and surgical coverage. Cataract blindness burden was very high in the Rautahat District (23.8%). The 50–59 years age group had a prevalence of never operated cataract blindness of 6.9%, and a cataract blindness burden of 11.9% which increased to 17.5% for the prevalence of never operated cataract blindness. In the 60 to 69 age group, the cataract blindness burden was 27.4%. In the 70+ age group it was even higher at 32.4% for never operated cataract blindness with a cataract blindness burden of 50.2%. Overall cataract surgical coverage in this district was 37.3%.

The data obtained from multiple logistic regression highlights the prevalence of never operated cataract blindness. As well, the over all cataract blindness burden is significantly higher in older age groups, female gender and for illiterate persons. However, the differences in surgical coverage are not significant in all three groups.

Among bilateral aphakic persons only 22.5% of persons had normal presenting vision of 6/18 or better in both eyes. Twenty percent of bilateral aphakics fell into

the category of blindness presenting VA<6/60. Among bilateral pseudophakic subjects, 40.0% had normal presenting vision of 6/18 or better in both eyes, while just 6.1% had VA<6/60 (data not shown in table).

Among the aphakic eyes we examined, 23.7% had presenting visual acuity of 6/18 or better, which climbed to 61.2% after the best correction (Table 5). Among subjects with psedophakia, these percentages were 56.6 and 84.6 after best correction.

The overall visual outcome after cataract surgery was better in pseudophakic eyes, irrespective of gender, literacy, location or age (Table 6). Among aphakic subjects, gender, literacy, and location of surgery were not significantly associated. Among pseudophakic

TABLE 3 Principle causes of blindness in eyes

Principal cause	Eyes of bilaterally blind persons no. (%)	Eyes of unilaterally blind persons no. (%)	All blind eyes no. (%)
Cataract	1410 (85.9)	478 (72.5)	1888 (82.1)
Refractive error	119 (7.3)	58 (8.8)	177 (7.7)
Corneal opacity	38 (2.3)	53 (8.0)	91 (4.0)
Retinal detachment	13 (0.8)	10 (1.5)	23 (1.0)
Glaucoma	11 (0.7)	24 (3.6)	35 (1.5)
Globe disorders	1 (0.1)	4 (0.6)	5 (0.2)
Optic atrophy	4 (0.2)	3 (0.5)	7 (0.3)
Amblyopia	2 (0.1)	1 (0.1)	3(0.1)
Posterior capsule opacification	5 (0.3)	5 (0.8)	10 (0.4)
Other/undetermined	39 (2.4)	23 (3.5)	62 (2.7)
Total	1642 (100.0)	659 (100.0)	2301 (100.0)

TABLE 4 Presenting cataract blindness and cataract surgery prevalence by age, gender and literacy

	Number examined	Never operated cataract blind		Cataract operated				Cataract blindness burden		Percent surgical coverage
				All operated		Presumed blind*				
		No.	Prevalence†	No.	Prevalence†	No.	Prevalence†	No.	Prevalence†	
Age (yrs)										
50–59	2355	163	6.9	132	5.6	116	4.9	279	11.9	41.6
60–69	1519	265	17.5	172	11.3	151	9.9	416	27.4	36.3
>=70	843	273	32.4	159	18.9	150	17.8	423	50.2	35.5
Gender										
Male	2,158	295	13.7	209	9.7	191	8.9	486	22.5	39.3
Female	2,559	406	15.9	254	9.9	226	8.8	632	24.7	35.8
Literacy										
Literate	322	22	6.8	26	8.1	21	6.5	43	13.4	48.8
Illiterate	4392	677	15.4	437	10	396	9.0	1073	24.4	36.9
All	4717	699	14.9	463	9.8	417	8.8	1118	23.7	37.3

* Includes all bilaterally operated persons and unilaterally operated persons with a blind fellow eye.
† Crude prevalence per 100 examined subjects

TABLE 5 Presenting and best corrected visual acuity outcomes in aphakic and pseudophakic eyes*

		Best corrected visual acuity				
		≥6/18	<6/18 to ≥6/60	<6/60 to ≥3/60	<3/60	All
Presenting visual acuity	≥6/18	36 (100.0)				36 (23.7)
		243 (100.0)				243 (56.6)
	<6/18 to ≥6/60	30 (69.8)	13 (30.2)			43 (28.3)
		114 (79.7)	29 (20.3)			143 (33.3)
	<6/60 to ≥3/60	3 (33.3)	4 (44.5)	2 (22.2)		9 (5.9)
		5 (26.3)	4 (21.1)	10 (52.6)		19 (4.4)
	<3/60	24 (37.5)	9 (14.1)	1 (1.7)	30 (46.9)	64 (42.1)
		2 (8.3)	0	0	22 (91.7)	24 (5.6)
	All	93 (61.2)	26 (17.1)	3 (2.0)	30 (19.7)	152 (100.0)
		363 (84.6)	34 (7.9)	10 (2.3)	22 (5.1)	429 (100.0)

*Data are given as number (%) of eyes. Data for aphakic eyes are given above that for pseudophakic eyes.

subjects, visual outcomes in males were better, OR 1.7 (95% CI 1.1–2.6), $P < 0.05$; while the elderly population tended to have worse visual outcomes, OR 2.9 (95% CI 1.7–4.8), $P < 0.05$.

Refractive error was the main cause of visual impairment and blindness in cataract operated eyes (Table 7). The uncorrected or not properly corrected aphakia was the major cause of visual impairment in aphakics. Retinal detachment was seen in both type of cataract surgeries, but more often in aphakia, OR 3.4 (95% CI 1.4–8.5), $P < 0.05$.

DISCUSSION

The prevalence of blindness and cataract surgical burden in the study area was very high compared to other regional surveys that have been conducted in Nepal,[3,4] neighboring countries, and elsewhere[5–16] (Table 8). The high incidence of cataracts, especially in the Terai area, in Nepal has also been described in the National Blindness Survey.[2] That the present survey was conducted among a typical Terai population could be a reason for such a high prevalence of blindness being found in this study.[2] It was noticed that the majority (93.1%) of the study population were illiterate. Illiteracy in the study population was very high compared to the national average, 21.4% (among rural population), for those aged 50 and over. The questionnaires on barriers to uptake cataract surgery revealed that the main reasons for not seeking service was the cost followed by ignorance about the curability of condition thinking that it has come up with age. The illiteracy leading to poverty and lack of knowledge seem to have major implication for not seeking services and resulting in high prevalence of blindness in the area.

Besides the high prevalence of blindness and cataract surgical burden, the surgical coverage in the study population was very low. Even though the Gaur Eye Hospital has been in operation for 9 years, and has had an extensive community outreach program, the surgical coverage achieved is just 37.3%, a very low

TABLE 6 Presenting and BCVA in operated on eyes according to gender, literacy, location of surgery and age

	Aphakia			Pseudophakia			
	Eyes	%PVA≥6/18	%BCVA≥6/18	Eyes	%PVA≥6/18	%BCVA≥6/18	All eyes
Gender							
Male	59	18.7	52.5	201	63.7	89.0	260 (44.8)
Female	93	26.9	66.7	228	50.4	80.7	321 (55.2)
Literacy							
Literate	5	0	40.0	25	52.0	76.0	30 (5.2)
Illiterate	147	24.5	61.9	404	56.9	85.15	551 (94.8)
Location							
Hospital	87	26.4	65.5	411	57.4	85.2	498 (85.7)
Eye Camp	65	20.0	55.4	18	38.9	72.2	83 (14.3)
Age							
50–59 yrs	30	23.3	70.0	135	70.37	92.6	165 (28.4)
60–69 yrs	54	31.5	63.0	159	62.3	84.91	213 (36.7)
+ 70 yrs	68	17.7	55.9	135	36.3	76.3	203 (34.9)

BCVA PVA

TABLE 7 Principal cause of Impaired Vision/Blindness in operated eyes

	Presenting visual acuity						
	<6/18 to 6/60		<6/60 to 3/60		<3/60		
Cause of low vision	Aphakia	Pseudophakia	Aphakia	Pseudophakia	Aphakia	Pseudophakia	Total
Refractive error	30 (69.8)	114 (79.7)	3 (33.3)	5 (26.3)	26 (40.6)	3 (12.5)	181 (59.9)
Globe disorder	0	0	0	0	3 (4.7)	1 (4.2)	4 (1.3)
Glaucoma	0	0	1 (11.1)	0	0	1 (4.2)	2 (0.7)
Corneal opacity	2 (4.6)	20 (14.0)	0	11 (57.9)	4 (6.2)	7 (29.2)	44 (14.6)
Optic atrophy	0	0	0	0	4 (6.2)	0	4 (1.3)
Amblyopia	0	0	1 (11.1)	2 (10.5)	0	0	3 (1.0)
Posterior capsule opacification	1 (2.3)	1 (0.7)	0	0	0	0	2 (0.7)
Retinal detachment	6 (13.9)	7 (4.9)	2 (22.2)	0	9 (14.1)	2 (8.4)	26 (8.6)
Other/ undetermined	4 (9.3)	1 (0.7)	2 (22.2)	1 (5.3)	18 (28.1)	10 (41.7)	36 (11.9)
Total	43 (100)	143 (100)	9 (100)	19 (100)	64 (100)	24 (100)	302 (100)

TABLE 8 Studies using the similar protocol have been conducted in neighboring countries and elsewhere

Year	Authors	Study location	Sample size (Age in yrs)	Prevalence of blindness presenting VA<6/60	Visual-outcome cataract surgery ≥6/18	Cataract surgical coverage
1994	GP Pokharel et al[3]	Bheri Lumbini, Nepal	5112 (≥45)	5.3	n/a	42.0%
2002	YD Sapkota et al[4]	Gandaki, Nepal	5863 (≥45)	2.6	n/a	59.5%
2001	GVS Murthy et al[5,6]	Rajasthan I and II, India	4284 (≥50)	11.9	8.2%	65.7%
2002	PK Nirmalan et al[7]	Tirunevelli, India	5411 (≥50)	11.0	31.7%	56.5%
2002	RD Thulasiraj et al[8,9]	Sivaganga I and II, India	4642 (≥50)	6.0	25.2%	14.7%
1998	J Zhao et al[10,11]	Shuiny CountyI and II, China	5084 (≥50)	2.8	12.0%	47.8%
1999	M He et al[12]	Doumen County, China	5342 (≥50)	n/a	n/a	8.3%
2005	KM Anjum et al[13]	Tribal Area, Pakistan	1549 (≥50)	5.9	5.5%	46.0%
2007	R Bourne et al[14]	Pakistan National Blindness Survey and Outcome	16507 (≥30)	n/a	29.5%	n/a
2007	H-A Shahriari[15]	Sistan-va-Baluchestan, Iran	5446 (≥10)	0.79%*	n/a	n/a
2007	R J Casson[16]	Myanmar	2076 (≥40)	8.1	n/a	n/a

*Visual Acuity (VA) Cut off <3/60

level. The Bheri Lumbini survey conducted in 1994 found surgical coverage was 42%. In 2002, the Gandaki survey found surgical coverage was 59.5%. Another recently conducted survey in the adjacent zone of Lumbini (data unpublished) found surgical coverage was 63.5%. This highlights that the impact of surgical services in the study area was inadequate. The crude prevalence of never operated cataract blind was 14.9%, while in the 70 and over age group it was 32.4%. This is very high, especially for an area where surgical service has been available for the past 9 years. The hospital, which is located near the Nepal-India border, operates on a large number of people with cataract blindness who come from India; thus it seems it has not been able to provide an adequate service for sufficient Nepali sufferers. The Maoist insurgency that lasted for more than one decade in the country was coincided with establishment and functioning period of Gaur eye hospital. This unrest situation had restricted the movement of people all over the country especially to remote areas. This might have restricted the travelling of cataract blind as well for seeking the surgical services in this area. Whatsoever, it is noticeable that the accessibility for this hospital's surgical services appears to be difficult for those residing in the study area and who have cataract blindness.

The visual outcome of cataract surgery was also found to be unsatisfactory. Less than one quarter of aphakic and only 56.6% of pseudophakic subjects had VA 6/18 or better in their operated eyes. This poor result could also have impacted the low cataract surgical coverage in the area. Among those who were unilaterally blind, 30% had bilateral aphakia, and 55.4% unilateral aphakia; all of the latter had aphakia in one eye and pseudophakia in the other. This shows that uncorrected aphakia remains a major problem. The data show that only 20% of aphakia and 38.9% of pseudophakia surgeries done in the eye camps had presenting VA 6/18 or better. Aphakia operated in the hospital also showed a very poor visual outcome; only 26.4% could achieve presenting VA 6/18 or better. Even the best corrected visual acuity in aphakic eyes was not very encouraging. Approximately 60% after best correction could achieve a VA of 6/18 or better. More than 95% of cataract surgeries in the GEH were performed with an IOL.

These findings clearly suggest that the surgical coverage needs to be improved. For this purpose, extensive community outreach programs including health education and other awareness creating activities need implementing. Similarly, cataract surgical services need to be more accessible for cataract blind persons residing in the area. At the same time the quality of the surgery must also be improved through appropriate individual IOLs, standardized surgical procedures and post operative follow-up. Furthermore, accurate refraction and the provision of appropriate glasses are also needed to improve the outcomes of cataract surgery and to reduce the prevalence of blindness and the cataract surgical burden in this area.

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