

Prevalence of Blindness and Cataract Surgical Outcomes in Takeo Province, Cambodia

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Purpose: To estimate the prevalence of blindness and cataract surgical outcomes in persons 50 years or older above in Takeo Province, Cambodia.

Design: A population based survey.

Methods: A total of 93 villages were selected through probability proportionate to size using the Rapid Assessment of Avoidable Blindness methodology. Households from 93 villages were selected using compact segment sampling. Visual acuity (VA) of 4650 people 50 years or older was tested and lens status and cause of visual impairment were assessed.

Results: The response rate was 96.2%. The age- and sex-adjusted prevalence of bilateral blindness [presenting visual acuity (PVA) <3/60 in the better eye] was 3.4% (95% confidence interval, 2.8%–4.0%), resulting in an estimated 4187 people blind in Takeo Province. The age- and sex-adjusted prevalence of low vision (PVA <6/18 to 3/60) was 21.1%, an estimated 25,900 people. Cataract surgical coverage in the bilaterally blind was 64.7% (female 59.5%, male 78.1%). Cataract surgical outcome was poor (best-corrected visual acuity <6/60) in only 7.7% and good in 88.7% (best-corrected visual acuity ≥6/18) of eyes operated in the last 5 years before the survey.

Conclusions: The cataract surgical coverage for women is less than that for men. The increased life expectancy in Cambodia and the fact that women constitute 60.6% of the population (aged ≥50 years) at Takeo Province could have had an impact on cataract workload and high prevalence of blindness. A repeated survey using the same methodology after 8–12 years might be helpful in proving genuine change over time.

Key Words: cataract surgical outcomes, RAAB, prevalence, Cambodia

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Generating evidence of valid indicators is crucial to evaluate the effectiveness of elimination of avoidable blindness.¹ Although VISION 2020 recommends reassessments of prevalence and causes of blindness every 5 to 10 years, only a few countries have performed population-based surveys over time.² An example of where multiple studies have been undertaken is in Adilabad district in the state of Andhra Pradesh, a rural district of India where the prevalence of blindness [presenting visual acuity (PVA) <6/60 in the better eye] in people 50 years or older was reduced from 11.0% to 8.0% ($P = 0.03$) between the

years 1996 and 2006.³ Another example is Oman, where the prevalence of blindness [best-corrected visual acuity (BCVA) <3/60 in the better eye] for people 40 years or older decreased significantly from 9.8% [95% confidence interval (95% CI), 8.3%–11.3%] in 1997 to 6.9% (95% CI, 5.9%–7.9%) in 2005.⁴

Considering its history, Cambodia has achieved remarkable improvements in its health system in the last 2 decades. It was for instance 1 of the top 10 high-mortality countries that had a great reduction in the annual rate of mortality in children younger than 5 years (1990: 117 deaths per 1000 live births; 2011: 43 deaths per 1000 live births).⁵ Because of a markedly improved measles immunization program, there were no reported measles cases in the year 2012.⁶ Also, the human immunodeficiency virus infection rate decreased from 2.1% (1997) to 0.7% (2010).⁷ Because of an increased life expectancy (from 1990–1995: male = 54, female = 57 years; from 2005–2010: male = 60, female = 63 years), the old-age dependency ratio (ratio of the population aged ≥65 years to the population aged 20–64 years) increased from 6.3 dependents per 100 persons of working age in 1980 to 7.3 in 2010 and is projected to be 8.8 in 2020.^{8,9} Although its Human Development Index (HDI) is still below the regional average (0.671), between the years 2000 and 2011 the HDI increased from 0.438 to 0.523.¹⁰ As the HDI is positively correlated with blindness parameters, an increased HDI could result into a higher prevalence of blindness and an increased cataract backlog.¹¹

Population-based surveys to estimate the prevalence of blindness and monitor cataract surgical outcomes have been performed in several provinces in Cambodia since 1996. The first survey was performed in 1996 in Kandal province. Results showed a prevalence of bilateral blindness [visual acuity (VA) <3/60] of 6.9% (95% CI, 5.4–8.7) in people older than 45 years; however, blindness was only loosely defined as “vision worse than 3/60,” and age- and sex-adjusted results were not available.¹²

In 2001, a Rapid Assessment of Cataract Surgical Services (RACSS) was performed in 3 rural provinces and confirmed a high age- and sex-adjusted prevalence of blindness (BCVA <3/60 in the better eye) between 4.3% and 6.0% for people 50 years or older. Prevalence of cataract blindness (bilateral cataract, BCVA <3/60 in the better eye) was between 3.1% and 4.5%. Cataract surgical outcome was below the World Health Organization (WHO) recommendations [good outcome (BCVA 6/6–6/18): between 35.5% and 61.9% (WHO: >90%); poor outcome (BCVA <6/60): between 17% and 30.6% (WHO: <5%)].^{13,14}

A nationwide Rapid Assessment of Avoidable Blindness (RAAB) in 2007 suggested an age- and sex-adjusted prevalence of blindness (PVA <3/60 in the better eye) of 3.3%. Cataract surgical outcome was good in 75.5% and poor in 15.2%. Prevalence of cataract blindness (bilateral cataract, BCVA <3/60) was 1.9%.¹⁵

The CARITAS Takeo Eye Hospital (CTEH) in collaboration with the Ministry of Health is one of the main teaching hospitals for eye care staff in Cambodia. Eye care services have been delivered since 1997. Hospital-based monitoring of cataract surgical services demonstrated an increase in the number of cataract surgeries of 75% from the year 2007 (1241 surgeries)

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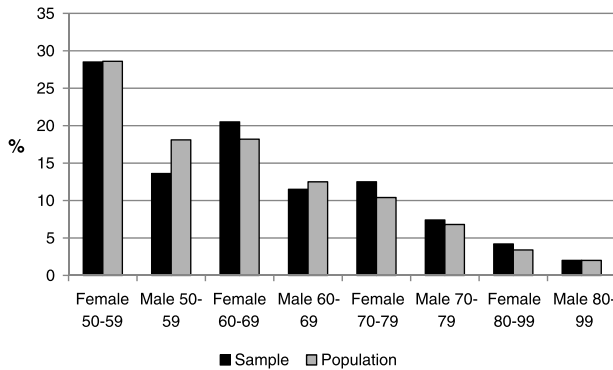


FIGURE 1. Age and sex distribution of the respondents (n = 4471) and population (aged ≥50 years) of Takeo Province (n = 122,808).

to the year 2011 (2181 surgeries). A total of 5282 cataract surgeries (64.3%) from all 8211 surgeries were performed on female patients. A majority of the patients were older than 60 years (6339 = 77.2%), and 38.2% of all cataract surgeries were done on residents from provinces outside Takeo Province. From 2007 to 2011, cataract surgical quality improved with an increase in patients with good outcome (from 41.7% to 50.1%) and a decrease of patients with poor outcome at discharge (from 12.6% to 8.5%).¹⁶ A provincial population-based survey of the prevalence of blindness has never been performed in Takeo Province. The objective of the 2012 RAAB was to establish baseline information about blindness parameters in terms of prevalence and cataract surgical outcome in Takeo Province.

MATERIALS AND METHODS

The standard procedures of the RAAB were followed.¹⁷ A sample size of 4650 people 50 years or older across all 10 districts in Takeo Province was determined using RAAB version 4.02 (International Center for Eye Health, London). This assumed a variation of 20%, a prevalence of blindness in people 50 years or older of 2.9% (based on the results of the RAAB 2007), a required 95% CI, a nonresponse rate of 5%, and a design effect of 1.5. A total of 93 villages from all districts in Takeo Province were selected through probability proportionate to size sampling, using data from the 2008 census as the sampling frame [population aged ≥50 years in Takeo = 122,808 people (13.3%); male = 48,362, female = 74,446].¹⁸ Households within the villages were selected by the compact segment sampling method and consecutively visited until a cluster of 50 people 50 years or older was examined.¹⁹ If the segment did not include enough individuals, a backup segment was visited. If an eligible person was absent, the survey teams returned at least once in an attempt to examine the individual.

Visual acuity was measured in daylight using a Snellen tumbling E-chart (symbol size equivalent to 6/18 on one side and 6/60 on the other) with available correction. If presenting VA was less than 6/18 in either eye, pinhole vision was measured. Lens status in each eye was assessed by an ophthalmologist in a dark room using a direct ophthalmoscope. If VA was less than 6/18, pupils were dilated and examined with a direct ophthalmoscope. The principle disorder responsible for visual loss in each eye as well as in the individual (better eye) after considering disorders in either eye, which was most amenable to treatment or prevention, was marked.

The survey was carried out by 4 teams in December 2011 and January 2012. Each team consisted of 3 people: 1 team leader and 2 ophthalmic nurses. Data entry clerks were responsible for double entry of data. All staff received 1-week formal training at the CTEH. Interobserver variation for assessment of VA, pinhole vision, lens status, and cause of visual impairment was assessed between teams and was of good standard ($\kappa \geq 0.61$) for all 4 teams.

After review of all forms, the survey data were entered and validation checks completed in the RAAB software. The data were analyzed (RAAB version 4.02) for predefined reports relating to both sample and age- and sex-adjusted [to the population of Takeo Province aged ≥50 years (122,808 people)] results.

Ethics approval was granted by the National Ethics Committee for Health Research, Cambodia, and the Royal Victorian Eye and Ear Hospital, Human Research and Ethics Committee, Melbourne, Australia. All participants provided informed consent (by thumb print) for the examination.

RESULTS

Of the 4650 persons sampled, there were 179 nonrespondents (3.8%). Of the nonrespondents (56.0% male, 44.0% female), 157 were not available, 8 refused participation, and 14 were unable to communicate. For the 4471 respondents, 1538 (34.4%) were male, and 2933 (65.6%) were female. The age and gender distribution of the sample was largely similar to the structure of the population of Takeo Province; only the 50- to 59-year age group for males was slightly underrepresented in the sample (Fig. 1).

Among the examined population, 3.8% (170 participants) were blind (PVA <3/60 in the better eye). Women were more likely to be affected by blindness [women: 129 (4.4%); men: 41 (2.7%)] (Table 1). The prevalence of blindness increased significantly with age (Fig. 2).

The age- and sex-adjusted prevalence of blindness of those 50 years or older in Takeo Province with a PVA of less than 3/60 in the better eye was 3.4% (95% CI, 2.8%–4.0%), an estimated 4187 people (Table 2).

The age- and sex-adjusted prevalence of blindness due to bilateral cataract was 1.9% (95% CI, 1.5%–2.3%), an estimated 2313 people. There was a significant difference in the prevalence

TABLE 1. Prevalence of Bilateral Blindness, Severe Visual Impairment (SVI), and Visual Impairment (VI), by Gender

VA	Male %; 95% CI (n)	Female %; 95% CI (n)	Total %; 95% CI (n)
Blindness: PVA <3/60 in the better eye, with available correction	2.7; 1.8–3.5* (41)	4.4; 3.6–5.2* (129)	3.8; 3.2–4.4 (170)
Blindness: BCVA <3/60 in the better eye, with best correction or pinhole	2.0; 1.3–2.7* (30)	3.7; 3.0–4.3* (107)	3.1; 2.6–3.6 (137)
SVI: PVA <6/60-3/60 in the better eye, with available correction	3.4; 2.5–4.3 (52)	5.1; 4.3–6.0 (150)	4.5; 3.8–5.2 (202)
VI: PVA <6/18-6/60 in the better eye, with available correction	18.9; 16.6–21.1 (290)	17.4; 15.8–19.0 (510)	17.9; 16.3–19.4 (800)

*CI significantly different (P value as default setting not available in RAAB version 4.02).

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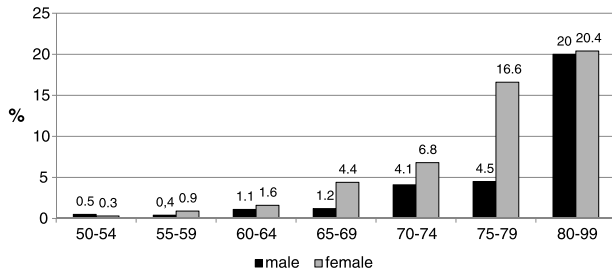


FIGURE 2. Prevalence of 170 people with bilateral blindness (PVA <3/60 in the better eye).

of blindness due to bilateral cataract, with women having a higher rate than males [female: 2.6% (95% CI, 2.0%–3.2%), an estimated 1914 people; male: 0.8% (95% CI, 0.4%–1.3%), an estimated 399 people]. Combining bilateral and unilateral blind eyes, there were 11,791 eyes blind due to cataract (prevalence, 4.8%; 95% CI, 4.2–5.4): 8695 in females (5.8%) and 3096 in males (3.2%). Lowering the threshold to visual impairment (BCVA <6/18) all together, 47,622 blind or visually impaired eyes due to cataract were identified.

The main cause of blindness in persons (PVA <3/60) in Takeo Province was unoperated cataract (81.8%). Disorders of the posterior segment, including glaucoma, were the second main cause (Table 3).

The age- and sex-adjusted prevalence of low vision (PVA <6/18 to 3/60) due to all causes was 21.1%, an estimated 25,900 people: 9950 males (20.6%) and 15,950 females (21.4%). The sample prevalence of low vision (BCVA <6/18) not due to unoperated cataract, refractive error, or uncorrected aphakia was 0.7% (n = 29) and was proportionately higher in men (1.0%, n = 15).

Cataract surgery had been performed in 372 eyes. Age at the time of surgery was older than 70 years in 50.0% (n = 55) of males and 39.7% (n = 104) of women; 85.2% (n = 317) of operations had been carried out at the CTEH. Intraocular lens (IOL) implantation rate was 92.7% for all eyes and 98.4% for eyes that had been operated less than 5 years ago. Overall, the visual outcome was good (PVA ≥6/18) in 69.9% (n = 260) of eyes, and this improved to 82.5% (n = 307) with pinhole. The outcome was poor (PVA <6/60) in 13.2% (n = 49) and improved to 11.0% (n = 41) with pinhole. The results of those eyes that had been operated less than 5 years before the survey are shown in Table 4.

The reasons for poor outcome in those eyes that had been operated with IOL implantation less than 3 years (default setting of cutoff for causes of poor outcome is 3 years according to RAAB version 4.02) before the survey were as follows: uncorrected refractive error (n = 1; 6.3%), selection of eyes with co-existing pathology (n = 10; 62.5%), and surgical complications

(n = 2; 12.5%). Although considerable achievement could be achieved with adequate postoperative optical correction, spectacles have been used by only 26 (7.0%) of all cases.

The population results of cataract surgical coverage (CSC) for persons are shown in Table 5.

The main barriers to cataract surgery in survey participants who were bilaterally blind due to cataract (BCVA <3/60) were “cost of the operation” (n = 49; 34.8%), “old age, no need” (n = 26; 18.4%), “no company” (n = 24; 17.0%), and “fear of operation” (n = 18; 12.8%). Four participants (2.8%) indicated unawareness of treatment as barrier (results for PVA are not available as BCVA is the default setting for barriers according to RAAB version 4.02).

DISCUSSION

This is the first published report of a provincial population-based survey with the standard RAAB methodology in Cambodia.

Cataract was identified as the main cause for blindness and severe visual impairment as well as uncorrected refractive error for visual impairment. The workload in coming years for Takeo Province is mainly determined by the cataract backlog and reducing uncorrected refractive error. Altogether, 11,791 eyes blind due to cataract were identified (8695 for females, 3096 for males); 47,622 eyes were visual impaired because of cataract.

Although the CSC increased in recent years, the result of the RAAB within Takeo Province suggests a stagnant prevalence of blindness, probably due to changing age structure of the population. In the year 2007, overall 11.1% of the population in Cambodia was 50 years or older; in Takeo Province, it was 13.3% in the year 2012. The strong impact of the age structure was also suggested by the results of 2 recent surveys with the RAAB methodology in Tanzania and Rwanda. Although the CSC for blind persons was with 69.8% in Tanzania much higher than in Rwanda with only 47.2%, the age- and sex-adjusted prevalence of blindness was higher in Tanzania (2.4% vs 1.6%). One of the main differences was a higher percentage of the population 50 years or older in Tanzania (13.4% vs 8.2%).²⁰

Table 6 provides an overview about the population-based surveys performed between 1996 and 2012 in Cambodia. The comparison between the results of the surveys is limited by the fact that different methodologies and inconsistent definitions were used. Rutzen et al¹² performed a survey in Kandal Province of all people in the sample regardless of age. Blindness was not specifically defined as vision worse than 3/60 and reported for people 45 years or older. The RACSS in 2001 was performed using the random-walk method (with possible biased selection of households), whereas in the RAAB in 2007 and 2012 compact segment sampling method was used. There were also differences regarding the methodology of eye examinations with possible underestimation or overestimation of eye diseases: a

TABLE 2. Age- and Sex-Adjusted Prevalence of Bilateral Blindness, Severe Visual Impairment (SVI), and Visual Impairment (VI), by Gender

VA	Male %; 95% CI (n)	Female %; 95% CI (n)	Total %; 95% CI (n)
Blindness: PVA <3/60 in the better eye, with available correction	2.3; 1.5–3.2* (1123)	4.1; 3.3–5.0* (3064)	3.4; 2.8–4.0 (4187)
Blindness: BCVA <3/60 in the better eye, with best correction or pinhole	1.7; 1.0–2.4* (835)	3.4; 2.8–4.1* (2539)	2.8; 2.2–3.3 (3374)
SVI: PVA <6/60-3/60 in the better eye, with available correction	3.2; 2.3–4.1 (1529)	4.8; 4.0–5.7 (3600)	4.2; 3.5–4.9 (5129)
VI: PVA <6/18-6/60 in the better eye, with available correction	17.4; 15.2–19.7 (8420)	16.6; 15.0–18.2 (12,349)	16.9; 15.4–18.5 (20,769)

*CI significant different (P-value as default setting not available in RAAB version 4.02).

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TABLE 3. Main Causes of Blindness, Severe Visual Impairment (SVI), and Visual Impairment (VI) in Persons (PVA)

Main Cause	Blind PVA	SVI PVA	VI PVA
	<3/60, n (%)	<6/60-3/60, n (%)	<6/18-6/60, n (%)
Refractive error	0 (0.0)	5 (2.5)	521 (65.1)
Cataract, untreated	139 (81.8)	190 (94.1)	263 (32.9)
Aphakia, uncorrected	3 (1.8)	1 (0.5)	0 (0.0)
Total curable	142 (83.5)	196 (97.0)	784 (98)
Surgical complications	2 (1.2)	0 (0.0)	3 (0.4)
Trachoma	1 (0.6)	0 (0.0)	0 (0)
Phthisis	4 (2.4)	0 (0.0)	0 (0)
Other corneal scar	6 (3.5)	1 (0.5)	1 (0.1)
Total preventable	13 (7.6)	1 (0.5)	4 (0.5)
Total avoidable	155 (91.2)	197 (97.5)	788 (98.5)
Glaucoma	4 (2.4)	2 (1.0)	0 (0.0)
Diabetic retinopathy	0 (0.0)	0 (0.0)	1 (0.1)
Potentially preventable	4 (2.4)	2 (1.0)	1 (0.1)
Globe abnormality	1 (0.6)	0 (0.0)	2 (0.3)
Other posterior segment	10 (5.9)	3 (1.5)	9 (1.1)
Total posterior segment	15 (8.8)	5 (2.5)	12 (1.5)
Total, n (%)	170 (100)	202 (100)	800 (100)

tonometry to measure intraocular pressure was, for instance, performed only in 1996; pupil dilation for posterior segment diseases was not performed in the survey with RACSS methodology.

All surveys on a province level were performed in different provinces, and only 400 residents from Takeo Province were included in the nationwide RAAB 2007. Uneven distribution of eye care services, human resources, and available technology contribute to the issue that direct comparison of the RAAB results in Takeo Province with results from survey performed in other provinces is not possible. Even the political situation has changed considerably; for instance, the survey in the year 1996 was impaired by security risks due to the ongoing civil war.

As the CTEH is one of the major teaching hospitals in Cambodia, the program would benefit from a repeated RAAB after 8–12 years. It would be possible to demonstrate if there was genuine improvement over time. In addition, considerable efforts to upscale refraction services (training of refractive nurses, implementation of a vision center in the remote Kiri Vong District Hospital of Takeo Province in the year 2011, as well as a fully equipped optical shop at the CTEH) have been undertaken during the last 4 years. To make informed decisions if such investment has an impact on, for instance, spectacle use, evidence from population-based surveys is needed.

Gender disparities were also observed in Takeo Province, as shown in some other population-based surveys. Although

TABLE 5. Population-Weighted CSC (Persons), by Gender

VA	Male, %	Female, %	Total, %
PVA <3/60	78.1	59.5	64.7
PVA <6/60	52.2	46.6	48.3
PVA <6/18	22.5	22.9	22.8

Cataract surgical coverage: $\frac{x+y}{x+y+z} \times 100$ [x = persons with unilateral (pseudo)aphakia and operable cataract in the other eye; y = persons with bilateral (pseudo)aphakia; z = persons with bilateral operable cataract].

there is an overall improvement of the CSC, it is similar to the results of the national 2007 RAAB, which were lower for women than for men with a difference of almost 20%. It seems that the increased efforts for an extensive community outreach program in Takeo Province have still been insufficient in improving equitable access especially to cataract surgical services. The higher life expectancy for women compared with men and the imbalanced gender structure in people 50 years or older (60.6% female) in the survey area might be reasons for the significant gender differences. Results from a literature review of blindness surveys in Africa identified 3 main strategies to overcome gender inequity in prevention of blindness: transport needs should be addressed; counseling of patients and their family members as well as an affordable pricing should be implemented.²¹ In Takeo Province, women participating in an Eye Health Knowledge, Attitude and Practice survey were significantly more likely to report that they were not able to travel to the eye hospital on their own and that they needed a caretaker (74% vs 58%, $P < 0.001$).²² It might be worthwhile to evaluate the existing outreach service and counseling system at the CTEH to identify gaps in regard to accessibility and affordability especially for women. Ideally, gender equity would be addressed, and strategies should be included in a national action plan together with the Ministry of Health, Cambodia.

There might be several reasons for the comparatively good cataract surgical outcome. Only 3% of all patients reported that their cataract surgery had been performed in an eye camp (nationwide RAAB 2007: 9.7% of all surgeries had been performed in a camp). Compared with other Cambodian provinces, surgical eye camps by visiting foreign teams are less frequently done at Takeo Province. Patients who are identified for cataract surgery during the community outreach program of the CTEH are always referred to the hospital for surgery. A significant decrease in surgeries being done in a camp was also observed in Andhra Pradesh, India (from 38.3% in the year 1996 to 0.5% in the year 2006). In the same time, there was a huge reduction in patients presenting with aphakia (from 74.5% to 16.5%).³ The fact that 85.2% of all surgeries at Takeo Province had been performed at the well-equipped CTEH together with the high IOL implantation rate could have contributed to the good outcome as well. Results from

TABLE 4. VA With Available and Best Correction in Eyes Operated Less Than 5 Years Ago (n = 248)

VA	IOL Eyes (%) PVA	IOL Eyes (%) BCVA	Non-IOL Eyes (%) BCVA	Total Eyes (%) BCVA	WHO Recommendation ¹⁴
Can see 6/18 (good)	185 (75.8)	218 (89.3)	2 (50.0)	220 (88.7)	PVA: >80%; BCVA: >90%
Cannot see 6/18, can see 6/60 (borderline)	41 (16.8)	9 (3.7)	0 (0.0)	9 (3.6)	
Cannot see 6/60 (poor)	18 (7.4)	17 (7.0)	2 (50.0)	19 (7.7)	PVA/BCVA: <5%
Total	244 (100.0)	244 (100.0)	4 (100.0)	248 (100.0)	

TABLE 6. Main Results of Population-Based Blindness Surveys in Cambodia From 1996 to 2012

	1996	2001	2007	2012
Methodology	Cross-sectional, population based ⁶	RACSS, cross-sectional, population based ⁷	RAAB, cross-sectional, population based ⁸	RAAB, cross-sectional, population based
Location	Kandal Province	Battambang, Kampot, Kampong Cham province	All provinces in Cambodia	Takeo Province
Population survey sample	1 Million N = 6558 (all ages)	2.93 Million 7200 (≥50 y old)	14 Million N = 5902 (≥50 y old). 8 cluster (400 people) surveyed at Takeo Province	925,000 N = 4650 (≥50 y old)
Prevalence of blindness	1.1% (n = 66) bilateral blindness VA <3/60 of all ages, 95% CI, 0.9%–1.4%; 6.9% bilateral blindness VA <3/60 (≥45 y old); 95% CI, 5.4%–8.7% (age- and sex-adjusted population results as well as PVA/BCVA not available)	4.3%–6.0% (n = 2369–10,660) for age- and sex-adjusted BCVA <3/60	3.3% (n = 51,451) for age- and sex-adjusted PVA <3/60; 95% CI, 2.7%–3.9%	3.4% (n = 4187) for age- and sex-adjusted PVA <3/60; 95% CI, 2.8%–4.0%
Cataract surgical coverage (VA <3/60 in persons)	No data			
Main cause of blindness (PVA <3/60 in the better eye)	Cataract (67.4%) Phthisis and uncorrected refractive error (each 6.1%)	19.6%–25.0% (Female 17.2%–26.4%, male 17.4%–40.0%) Cataract (80.9%–85.6%) Trachomatous corneal scar (6.1%–8.1%)	54.9% (Female 49.8%, male 67.4%) Cataract (74.7%) Nontrachomatous corneal scar (8.0%)	64.7% (Female 59.5%, male 78.1%) Cataract (81.8%) Other posterior segment (5.9%)
Good cataract surgical outcome (BCVA ≥6/18)	No data	54.8%–75.5%	75.5%	Corneal scar (3.5%) 82.5%
Poor cataract surgical outcome (BCVA <6/60)	No data	17.0%–30.6%	15.2%	11.0%
IOL implantation rate	No data	42.6%–79.2%	88.7%	92.7%

an international study of preoperative VA among cataract surgery patients suggest that hospitals with low specialization scores (for instance, hospitals lacking specialized equipment like A or B scans for preoperative diagnosis) were significantly more likely to operate on patients with dense cataracts and performing surgeries more prone to complications.²³ Continuous hospital-based monitoring of cataract surgical outcome at CTEH has been implemented since 2006 and might have contributed to good surgical quality.¹⁶ In the year 2011, 12% of all cataract surgeries at the CTEH have been performed as extracapsular cataract extraction. Increased efforts to reduce, for instance, surgical-induced astigmatism might reduce the number of patients in need of post-operative spectacle correction.

Age at time of surgery is another important factor as increasing age is associated with an increased risk for poorer outcome and surgical complications (more advanced mature cataracts and higher prevalence of ocular comorbidity).^{24,25} In Takeo Province, 50% of operated men and 39.7% of operated women had been 70 years or older at time of their surgery. Despite this high percentage of old patients, surgical complications were in only 12.5% of all cases responsible for poor surgical outcome.

In the RAAB 2007, “unawareness of treatment” was identified as a barrier to cataract surgery for people bilaterally blind due to cataract (12.1%).¹⁵ In 2012, only 2.8% indicated lack of awareness as barrier. It should be noticed that an RAAB as a rapid procedure does not provide enough time for in-depth interviews; data on barriers can therefore be only regarded as indication if more qualitative research is needed. Results from the Eye Health Knowledge, Attitude and Practice in-depth interviews suggested that although 85% of respondents reported having some nonspecific knowledge of cataract, only 19% knew that surgery is the appropriate treatment.²² To improve awareness, there were increased efforts to bridge the gap between the CTEH and the communities (closer collaboration with community-based rehabilitation services, weekly airing of radio spots informing about the main important eye diseases and the services offered at CTEH). Since 2007, there was also a marked increase in visually impaired, but not blind patients presenting with immature cataracts at the CTEH (from 16.8% to 32.2%). It is possible that both improved knowledge and better quality of cataract surgical services encouraged patients to access service earlier.

In 1996, Thomson stated, “there seems little prospect of making substantial inroads into the backlog of avoidable blindness in the near future” in Cambodia, because of the fact that there was only 1 fully trained ophthalmologist and an estimated cataract surgical rate (CSR) of 250.²⁶ Jackson and Foster²⁷ estimated a CSR of 113 in 1994. Since that time, the establishment of an augmented service delivery network in most provinces might have contributed to the improvement of the reduced prevalence of cataract blindness as well as cataract surgical outcome.²⁸ Meanwhile, the National Program for Eye Health estimated the nationwide CSR as 1516 in 2010.²⁹ Because of the aging population and the overall improved general health indicators in Cambodia, which might have an impact on the prevalence of blindness, ongoing efforts including the commitment for continuous funding especially to reduce the cataract backlog are needed to reach the goal of VISION 2020.^{1,2}

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Perfection is not attainable, but if we chase perfection we can catch excellence.
— **Vince Lombardi**

