



# Prevalence of Visual Impairment and Blindness and Survey of Barriers to Eye Care in a South Indian Population

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## Background

- About 314 million people worldwide live with visual impairment, of whom 45 million are blind and 87% live in developing countries.<sup>1</sup>
- 1/3 of the world's blindness caused by cataract occurs in India.<sup>2</sup>
- Each year about 3.8 million in India are blinded by cataract.<sup>3</sup>
- The present lack of updated population-based data on visual status and barriers to eye care may hinder designing effective treatment and prevention programs and assessing progress in reducing visual impairment.<sup>4</sup>

## Purpose

To determine the prevalence of blindness and visual impairment, and identify barriers to eye care in Chennai, India.

## Methods

- A cross-sectional study of vision status of 2558 subjects aged 5 years and older was conducted in May and June 2009.
- Single-stage cluster random sampling: routine eye camps in 19 randomly selected rural villages and urban slum areas.
- All camp participants underwent a vision acuity screening with a Snellen E chart and a near vision chart and a basic eye exam.



- 244 subjects aged 15 years and older responded to a quantitative survey prior to eye examinations.
- Two-stage cluster random sampling: a simple random sample of participants proportional to camp size at all 19 camps.
- The survey included demographic background, awareness of visual status, acceptance of and prior access to eye care services.
- An interpreter translated by reading verbatim a standard interview script written in Tamil.
- Statistical analyses were performed using MINITAB 15.



Table 1. Prevalence of Blindness and Visual Impairment by Age and Gender

Gender	Age Groups (Years)	N	Blindness (US)			Blindness (Indian)			Blindness (WHO)			Visual Impairment		
			n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI
Male	5-29	250	2	0.80	(0.10, 2.86)	0	0.00	(0, 1.19)	0	0.00	(0, 1.19)	3	1.20	(0.25, 3.47)
	30-39	109	2	1.83	(0.22, 6.47)	0	0.00	(0, 2.71)	0	0.00	(0, 2.71)	6	5.50	(2.05, 11.60)
	40-49	215	6	2.79	(1.03, 5.98)	4	1.86	(0.51, 4.69)	0	0.00	(0, 1.38)	11	5.12	(2.58, 8.97)
	50-59	142	22	15.49	(9.97, 22.51)	8	5.63	(2.47, 10.80)	1	0.70	(0.02, 3.86)	33	23.24	(16.57, 31.06)
	60-69	85	19	22.35	(14.03, 32.69)	5	5.88	(1.94, 13.20)	2	2.35	(0.28, 8.24)	30	35.29	(25.25, 46.41)
	70+	26	12	46.15	(26.59, 66.63)	4	15.38	(4.36, 34.87)	2	7.69	(0.95, 25.13)	12	46.15	(26.59, 66.63)
	Total*	827	63	7.62	(5.90, 9.64)	21	2.54	(1.58, 3.86)	5	0.60	(0.20, 1.41)	95	11.49	(9.39, 13.86)
Female	5-29	267	6	2.25	(0.83, 4.83)	0	0.00	(0, 1.12)	0	0.00	(0, 1.12)	10	3.75	(1.81, 6.78)
	30-39	354	5	1.41	(0.46, 3.27)	1	0.28	(0.01, 1.56)	0	0.00	(0, 0.84)	8	2.26	(0.88, 4.40)
	40-49	528	21	3.98	(2.48, 6.02)	1	0.19	(0.005, 1.05)	0	0.00	(0, 0.57)	45	8.52	(6.28, 11.24)
	50-59	239	22	9.21	(5.86, 13.60)	9	3.77	(1.74, 7.03)	4	1.67	(0.46, 4.23)	38	15.90	(11.50, 21.16)
	60-69	150	59	39.88	(29.39, 44.85)	25	15.63	(10.37, 22.20)	6	3.75	(1.59, 7.96)	81	50.53	(42.62, 58.61)
	70+	38	17	44.74	(28.62, 61.70)	8	21.05	(9.55, 37.32)	3	7.89	(1.66, 21.38)	19	50.00	(33.36, 66.62)
	Total*	1604	132	8.23	(6.93, 9.68)	44	2.74	(2.00, 3.67)	13	0.81	(0.43, 1.38)	205	12.78	(11.18, 14.51)
Total	5-29	517	8	1.51	(0.65, 2.95)	0	0.00	(0, 0.56)	0	0.00	(0, 0.56)	14	2.64	(1.45, 4.38)
	30-39	476	7	1.47	(0.59, 3.01)	1	0.21	(0.005, 1.16)	0	0.00	(0, 0.63)	15	3.15	(1.77, 5.14)
	40-49	767	28	3.65	(2.44, 5.23)	5	0.65	(0.21, 1.51)	0	0.00	(0, 0.39)	59	7.69	(5.91, 9.81)
	50-59	392	45	11.48	(8.08, 0.15)	17	4.34	(0.03, 0.07)	5	1.28	(0.004, 0.03)	72	18.37	(0.15, 0.23)
	60-69	255	80	31.37	(25.73, 37.46)	31	12.16	(8.41, 16.81)	8	3.14	(1.36, 6.09)	116	45.49	(39.21, 51.82)
	70+	67	29	43.28	(31.22, 55.96)	12	17.91	(8.61, 29.19)	5	7.46	(2.47, 16.56)	31	46.27	(34.00, 58.88)
	Total*	2512	199	7.92	(6.90, 9.05)	66	2.63	(2.04, 3.33)	18	0.72	(0.43, 1.13)	311	12.38	(11.12, 13.73)

CI = Confidence Interval; \*Total includes patients with uncorrected age; another 46 patients with uncorrected gender were not included. Visual impairment: BCVA, best-corrected visual acuity (in the better eye) < 6/18 but ≥ 3/60. Blindness: WHO (BCVA < 3/60), Indian (BCVA < 6/60), and US (BCVA < 6/60) definitions.

Table 2. Association of Visual Burdens with Gender

Gender	Blindness (US)			Blindness (Indian)			Blindness (WHO)			Visual Impairment		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Female	1			1			1			1		
Male	0.91	(0.67, 1.25)	0.565	0.92	(0.54, 1.55)	0.747	0.74	(0.26, 2.08)	0.567	0.88	(0.68, 1.14)	0.327

Figure 2. Visual Burdens by Age

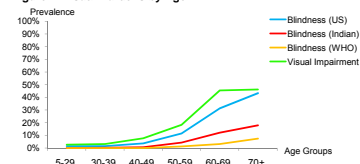


Table 5. Acceptance of Eye Care Services by Surveyed Factors

Age Groups	Willingness to use			
	Medicine	Glasses	Surgery	All
5-29	30 (61.2%)	38 (77.6%)	33 (67.3%)	19 (38.8%)
30-39	44 (53.0%)	68 (81.9%)	54 (65.1%)	30 (36.1%)
40-49	77 (52.4%)	133 (90.5%)	85 (57.8%)	52 (35.4%)
50-59	33 (47.1%)	64 (91.4%)	41 (58.6%)	18 (25.7%)
60-69	30 (54.5%)	49 (89.1%)	37 (67.3%)	24 (43.6%)
70+	14 (70.0%)	19 (95.0%)	10 (50.0%)	7 (35.0%)

Figure 1. Access to eye care

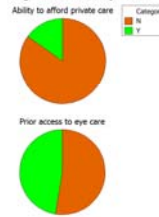


Table 3. Association of Visual Burdens with Age\*

Eye Conditions	OR	95% CI	P	Chi-Square
Blindness (US)	1.11	(1.05, 1.12)	0	155.146
Blindness (Indian)	1.11	(1.05, 1.14)	0	59.0541
Blindness (WHO)	1.13	(1.09, 1.18)	0	28.0961
Visual Impairment	1.09	(1.08, 1.11)	0	134.087

Table 4. Association of Visual Burdens with Cataract

Visual Status	Cataract %	95% CI	OR	P
Blindness (US)	79.9	(73.65, 85.23)	59.87	< 0.0001
Blindness (Indian)	89.39	(79.36, 95.63)	76.06	< 0.0001
Blindness (WHO)	94.44	(72.71, 99.86)	131.24	< 0.0001
Visual Impairment	85.92	(60.36, 71.17)	41.5	< 0.0001

Table 6. Logistic Analysis of Acceptance of Eye Care Services

Age Groups	Willingness to use					
	Medicine		Glasses		Surgery	
	OR	p	OR	p	OR	p
5-29	1		1		1	
30-39	0.68	0.402	1.77	0.322	1.1	0.838
40-49	0.64	0.33	3.49	0.036	1.1	0.765
50-59	0.57	0.273	4.37	0.037	1.05	0.916
60-69	0.68	0.488	3.17	0.11	1.42	0.526
70+	1.6	0.531	11.75	0.06	0.53	0.351

## Results

The prevalence of blindness was 0.72%, 2.63%, and 7.92% by the WHO, Indian, and US definitions respectively; the prevalence of visual impairment was 12.38% (Table 1). Blindness and visual impairment occurred more frequently in females (Table 2) and older ages (Figure 2 and Table 3). Cataract (12.12% [95% CI 10.88-13.45%]) was the leading cause of blindness and visual impairment (Table 4). Only 15.1% [95% CI 11.8-18.7%] of all surveyed could afford private eye care and 52.6% [95% CI 47.7-57.4%] had never received previous eye care services (Figure 1). The acceptance rates of medicine, eyeglasses, surgeries, and all three were 53.7% [95% CI 48.9-58.6%], 87.5% [95% CI 84.0-90.5%], 61.1% [95% CI 56.3-65.8%], and 35.4% [95% CI 30.8-40.1%] respectively, while 4.0% [95% CI 2.4-6.3%] were unwilling to use any if they had an eye disease. The acceptance rates for glasses was associated with age, education and access to eye care and for surgery was associated with visual burden (Table 5 and 6).

## Discussions and Conclusion

Cataract remains the leading cause of blindness and visual impairment in this region. Resources should be allocated to address the high prevalence of cataract. Perceptual barriers to eye care are consistent among most demographic groups, notably including education, employment, and financial status. Concerns for quality of local eye care services, financial barriers, and a general lack of eye care knowledge present major challenges for local eye care providers.

## References

1. World Health Organization. *Fact Sheet No. 282*. Available at: <http://www.who.int/mediacentre/factsheets/fs282/en/index.html>. Accessed March 21, 2010.
2. Thyfleurs B. A simplified methodology for the assessment of blindness and its main causes. *World Health Stat Q*. 1987; 40: 129-141.
3. Fletcher AE, Donoghue M, Devaram J, et al. Low uptake of eye services in rural India: a challenge for programmes of blindness prevention. *Arch Ophthalmol*. 1999; 117: 1393-1399.
4. Thulasiraj RD, Nirmalan PK, Ramakrishnan R, et al. Blindness and vision impairment in a rural south Indian population. *The Aravind Comprehensive Eye Survey. Ophthalmology*. 2003; 110: 1491-1498.

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