

## Original Article

# Visual Impairment Registry of Patients from North Kolkata, Eastern India: A Hospital-based Study

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### Abstract

**Purpose:** To study the demographic profile, severity and causes of visual impairment among registered patients in a tertiary care hospital in north Kolkata, eastern India, and to assess the magnitude of under-registration in that population.

**Methods:** This is a retrospective analytical study. A review of all visually impaired patients registered at our tertiary care hospital during a ten-year period from January 2005 to December 2014, which is entitled for certification of people of north Kolkata, eastern India (with a population denominator of 1.1 million), was performed. Overall, 2472 eyes of 1236 patients were analyzed in terms of demographic characteristics, cause of visual impairment, and percentage of visual disability as per the guidelines established by the government of India.

**Results:** Male patients (844, 68.28%; 95% confidence interval [CI], 65.69-70.87) registered more often than female patients (392; 31.72%,  $P = 0.0004$ ). The registration rate for visual impairment was 11.24 per 100,000 per annum; this is not the true incidence rate, as both new patients and those visiting for renewal of certification were included in the study. Optic atrophy was the most common cause of visual impairment (384 eyes, 15.53%; 95% CI, 14.1-16.96).

**Conclusion:** Commonest cause of visual impairment was optic atrophy followed by microphthalmos. Under-registration is a prevalent problem as the registration system is voluntary rather than mandatory, and female patients are more likely to be unregistered in this area.

**Keywords:** Blindness; Disability; Optic Atrophy; Registration; Visual Impairment

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## INTRODUCTION

It has been recently estimated by the World Health Organization (WHO) that there are 285 million visually impaired people worldwide, among whom 39 million are blind.<sup>[1]</sup> In India, 62 million people are estimated to be visually impaired, 8 million of them being blind.<sup>[1]</sup>

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Visual impairment is currently defined as a presenting visual acuity of less than or equal to 6/18 in the better eye, whereas blindness is defined as a presenting visual acuity of less than or equal to 3/60 in the better eye.<sup>[2]</sup> Disability is an umbrella term for impairments, activity limitations, and participation restrictions.<sup>[2]</sup> The registration of blindness or visual impairment entails a certification of the disabled individuals based on which social services are coordinated. It also provides contemporary data regarding the incidence and causes of visual impairment for analysis and to set up priorities for their prevention. Registration of blindness is voluntary in India and the certificate is issued by a duly constituted medical board of experts, which includes an ophthalmologist. All individuals with visual disability of 40% or higher are entitled to various concessions and job benefits according to guidelines issued by the Ministry of Social Justice and Empowerment of the Government of India.<sup>[3]</sup> According to the 58<sup>th</sup> round data from the National Sample Survey Organization (NSSO) in India, blindness and visual impairment were found to account for 10.88% and 15.27%, respectively, of all categories of disabilities.<sup>[4]</sup> Various studies have been undertaken worldwide to evaluate blindness and visual impairment registries of the respective countries to detect the incidence and causes of blindness and visual impairment and ascertain the possible lacunae of under registration;<sup>[5-8]</sup> however, a thorough MEDLINE search retrieved only one such previous study report from eastern India.<sup>[9]</sup>

Our study aimed to analyze the data on registered visually impaired individuals in terms of demographic characteristics and severity and causes of blindness and visual impairment.

## METHODS

The procedure for certification and calculation of percentage of visual disability or impairment has been guided by the Government of India guidelines [Table 1].<sup>[3]</sup> Individuals with a visual disability of 40% or more (which corresponds to the visual impairment category as defined by WHO, i.e. visual acuity less than or equal to 6/18 in the better eye) as registered in the visual impairment registry in our tertiary care hospital in North Kolkata during a ten-year period from January 2005 through December 2014 were included in this study. As the certificate requires renewal every ten years, the ten-year study period should cover all the registered persons in that area. Both new patients and patients coming for renewal of registration were included in the study and the statistics were not obtained separately. Thus, it only reflects the number of cases registered per year and not the number of new cases of blindness/visual impairment per year, which would be the true incidence rate. The study followed the tenets of the declaration of Helsinki

**Table 1. Categories of visual disability as guide lined by the government of India**

Best corrected visual acuity in the better eye	Best corrected visual acuity in the worse eye	Percentage of impairment
6/18-6/36	6/60 to nil	40
6/60-4/60 or field of vision 10°-20°	3/60 to nil	75
3/60-1/60 or field of vision 10°	finger count at 1 ft to nil	100
Finger count at 1 ft to nil or field of vision 10°	Finger count at 1 ft to nil or field of vision 10°	100

ft, foot

for research involving humans and was approved by the Institutional Ethics Committee. Our certification system is based upon the best-corrected visual acuity rather than presenting visual acuity so patients with refractive errors were not registered. Furthermore, only those cases of visual impairment which were permanent in nature were registered so, un-operated cataract patients were also excluded. According to the 2011 census, there are 4.4 million people residing in the city of Kolkata, situated in eastern India.<sup>[10]</sup> Our referral center in North Kolkata caters to almost one-fourth of the total population of Kolkata (people residing in 36 out of the total 141 wards) for visual disability certification, which has been estimated to be around 1.1 million.

This was a retrospective review of the certificates in terms of age, sex, percentage of disability, and cause of the visual impairment. In the presence of multiple causes, the major cause as registered in the certificate was taken into account. The statistical software Epi-info version 6 (Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA 30329-4027, USA) was used for the calculation of results by summarizing the data in terms of mean, median, mode, and proportion. To determine the significance of differences in proportions, the Chi-square test was performed.

## RESULTS

Overall, 2472 eyes of 1236 patients from the visual impairment registry were analyzed. Among the patients, 844 (68.28%; 95% CI, 65.69-70.87) were male and 392 (31.72%; 95% CI, 29.13-34.31) were female depicting a male sex bias ( $P = 0.0004$ ). The male to female ratio was 2.15:1. The registration rate of visual impairment was 11.24 per 100,000 per annum (with a population denominator of 1.1 million). A total of 902 patients (72.98%; 95% CI, 70.5-75.46) were 100% disabled, 103 patients (8.33%; 95% CI, 6.79-9.87) were 75% disabled, and 231 patients (18.69%; 95% CI, 16.52-20.86) were 40% disabled [Table 2]. Among the different age

**Table 2. Distribution of visually impaired persons according to age, sex and disability percentage**

Age in years	100%		75%		40%		Total cases (n=1236)
	M	F	M	F	M	F	
0-4	6	2	0	0	0	0	8 (0.65%)
5-14	49	17	7	8	0	0	81 (6.55%)
15-19	32	11	9	3	16	6	77 (6.23%)
20-29	125	58	10	9	70	41	313 (25.32%)
30-39	73	25	19	5	16	9	147 (11.89%)
40-49	106	65	8	15	5	16	215 (17.39%)
50-59	115	51	0	0	18	0	184 (14.89%)
60-69	81	18	10	0	0	7	116 (9.39%)
70 & above	51	17	0	0	18	9	95 (7.69%)
Total	638 (51.62%)	264 (21.36%)	63 (5.1%)	40 (3.23%)	143 (11.57%)	88 (7.12%)	1236 (100%)
	902 (72.98%)		103 (8.33%)		231 (18.69%)		

groups the people in the 20-29 years age group are registered for certification most often (313 patients, 25.32%; 95% CI, 22.9-27.74,  $P = 0.0013$ ); people in the 20-59-year age group constituted 69.5% of the total registrations. Optic atrophy was identified as the most common cause of visual disability (384 eyes, 15.53%; 95% CI, 14.1-16.96), followed by microphthalmos (303 eyes, 12.25%; 95% CI, 10.96-13.54), retinitis pigmentosa (256 eyes, 10.36%; 95% CI, 9.16-11.56), and phthisis bulbi (255 eyes, 10.32%; 95% CI, 9.12-11.52) [Table 3]. Age-related macular degeneration (ARMD: 90 eyes, 3.64%; 95% CI, 2.9-4.38) and diabetic retinopathy (80 eyes, 3.24%; 95% CI, 2.54-3.94) were reported uncommonly. The youngest person registered was a one and half year- old boy with bilateral retinal detachment following retinopathy of prematurity. Congenital or developmental defects (microphthalmos, coloboma, anophthalmos, congenital glaucoma, and congenital cataract) were detected in 377 eyes (15.25%). Patients with microphthalmos and myopic degeneration mostly came to be registered at 20-29 years of age (126 and 114 eyes, respectively) [Table 4]. Retinitis pigmentosa patients were observed in the 20-59 years age group. Glaucoma (101 eyes) was the most common cause of visual impairment in the 50-59 years category. Diabetic retinopathy showed a bimodal presentation in the 20-29 years of age (18 eyes) and 40-59 years of age (62 eyes) as complications of Type I and Type II diabetes mellitus, respectively.

## DISCUSSION

According to the current estimation (2010) of the WHO, there are 285 million visually impaired people worldwide, among whom 39 million are blind.<sup>[1]</sup> In India the corresponding figures are 62 million and 8 million, respectively. The current estimates depend on the presenting visual acuity rather than the best-corrected visual acuity. The worldwide prevalence of blindness and visual impairment were found to be 0.57% and

**Table 3. Causes of blindness and visual impairment**

Cause	Both eyes	One eye	Total eyes
Optic atrophy	326	58	384 (15.53%)
Microphthalmos	268	35	303 (12.25%)
Retinitis Pigmentosa	256	0	256 (10.36%)
Phthisis bulbi	140	115	255 (10.32%)
Myopic degeneration	148	55	203 (8.21%)
Glaucoma	168	19	187 (7.56%)
Macular dystrophy	182	0	182 (7.36%)
Central leucoma	86	95	181 (7.32%)
ARMD*	90	0	90 (3.64%)
Diabetic retinopathy	80	0	80 (3.24%)
Retinal detachment	38	32	70 (2.83%)
Coloboma	32	29	61 (2.47%)
Amblyopia	32	11	43 (1.74%)
Occlusio pupillae	18	25	43 (1.74%)
Central choroiditis	28	11	39 (1.58%)
Absent globe	2	27	29 (1.17%)
(Enucleated/Eviscerated)			
Anterior staphyloma	16	10	26 (1.05%)
Corneal dystrophy	22	0	22 (0.89%)
Anophthalmos	4	5	9 (0.36%)
Retinoblastoma	2	5	7 (0.28%)
Congenital cataract	2	0	2 (0.08%)
Total	1940	532	2472 (100%)

\*ARMD, age related macular degeneration

4.14%, respectively, on the basis of the presenting visual acuity.<sup>[1]</sup> Causes of visual impairment included uncorrected refractive error (42%), cataract (33%), glaucoma (2%), ARMD (1%), corneal opacity (1%), trachoma (1%), diabetic retinopathy (1%), childhood blindness (1%), and undetermined causes (18%).<sup>[1]</sup> The current study is hospital-based, using the visual impairment registry of a tertiary care center. The population entitled to certification in this particular hospital is clearly defined and has been estimated to be 1.1 million according to the last census in 2011.

Table 4. Age distribution of main causes of blindness and visual impairment (Total eyes)

Age	Optic atrophy	Microphthalmos	Retinitis Pigmentosa	Phthisis bulbi	Myopic degeneration	Glaucoma	Macular dystrophy	Central leucoma	Age related macular degeneration	Diabetic retinopathy
0-4	0	5	0	0	0	2	0	0	0	0
5-14	28	57	0	55	0	0	8	0	0	0
15-19	36	49	0	16	9	0	26	0	0	0
20-29	66	126	98	41	114	18	30	27	0	18
30-39	74	39	42	31	0	0	44	22	0	0
40-49	48	18	82	54	25	0	52	24	0	34
50-59	18	9	34	33	9	101	22	42	40	28
60-69	60	0	0	16	10	42	0	34	32	0
≥70	54	0	0	9	36	24	0	32	18	0
Total	384	303	256	255	203	187	182	181	90	80

Our certification system is based on best corrected visual acuity rather than presenting visual acuity. Furthermore, certificates are given to patients with permanent visual impairment or blindness, so temporary causes of visual impairment, such as uncomplicated non-operated senile cataract, are excluded. The WHO (2010) estimates on visual impairment and blindness are based on presenting visual acuity rather than best corrected visual acuity. In contrast, the definition of visual impairment according to the *International statistical classification of diseases, injuries and causes of death, 10<sup>th</sup> revision (ICD-10)*, H54, was based on “best-corrected” vision, i.e. visual acuity obtained with the best possible refractive correction. The blindness registry studies performed before 2010 mentioned in this article mostly complied with the “best-corrected” vision standards, which have been followed by our study as well.<sup>[5-9,11]</sup>

Optic atrophy (15.53%), microphthalmos (12.25%), retinitis pigmentosa (10.36%), phthisis bulbi (10.32%), myopic degeneration (8.21%), and glaucoma (7.56%) were the leading causes of visual impairment in our analysis, which corroborated with the previous study reported from West Bengal, eastern India and the study from Oman.<sup>[8,9]</sup> ARMD (47%), glaucoma (13%), and diabetes (7%) were major causes in a study in Avon in the UK.<sup>[5]</sup> Similar observations were reported from Denmark (ARMD, 71.4%; diabetes, 8.4%; glaucoma, 5%) and Israel.<sup>[6,7]</sup> In our study, ARMD (3.64%) and diabetes (3.24%) were rather uncommon causes, comparable to other reports from developing countries.<sup>[8,9]</sup>

Under-registration is a global problem and has been noted by various investigators.<sup>[8,11-14]</sup> In a study conducted in the Western Eye Hospital and Moorfields Eye Hospital, UK, 51% of patients diagnosed as eligible for visual impairment certification remained unregistered.<sup>[11]</sup> In another study from the UK, 45% of patients eligible for registration did not have the certificate.<sup>[12]</sup> A similar study from Oman showed that 3525 registered cases

represented only around 20% of the 17,000 projected bilaterally blind people in that country.<sup>[8]</sup>

The registration rate calculated in our study is 11.24 per 100,000 per annum, which is also less than that in the study in Avon, UK (30 per 100,000 per annum).<sup>[5]</sup> As both new patients and patients visiting for renewal of certification were included in the study, this rate reflects the number of cases registered per year and not the true incidence rate. In the 58<sup>th</sup> round of the NSSO survey, India, 54% of the visually impaired persons were females but in our study females constituted only 31.72% of all registered individuals.<sup>[4]</sup> Socio-economic obstacles preventing women from reaching the certifying institutions could contribute to such low registration rate in females. People in the 20-59 years age group were the most interested in registering their visual disabilities. They constitute the main working population of the community and the certificate could help them in getting government jobs.

The percentage of irreversible blindness as observed by different investigators varied from 20 to 40% in various blindness surveys. In the Oman Eye Study (OES), 25% of the cases of blindness were permanent in nature.<sup>[15]</sup> A similar study from Tibet showed that 36% of cases had irreversible blindness.<sup>[16]</sup> A comprehensive field study in our defined population could provide data on the percentage of permanently blind people in our region.

One limitation of our study is that it is a hospital-based study and the data regarding different causes of blindness cannot be directly compared to the data from field surveys. However, the major causes of visual impairment in various age groups can provide useful information regarding the emphasis required in treatment of important blinding diseases in those age groups. Another limitation is that many of the patients are expected to be unregistered as the registration system is voluntary but not mandatory.

Further research to determine the reason for non-registration, especially among female individuals,



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despite the benefits of registration is warranted. A future community based comprehensive study to detect the causes of visual impairment and blindness as well as the reasons for non-registration can provide us with useful information to solve the problem of under-registration.

In conclusion, optic atrophy was the most common cause of visual impairment, followed by microphthalmos, and the registered population mostly comprised young adults. A community-based survey along with a review of the registry records and interviews of all visually impaired individuals, irrespective of inclusion in the registry, can be worthwhile. At present, an intense awareness program through electronic and print media on the benefits of certification and the organization of outreach camps can achieve the goal of extending social justice and equality to visually disabled individuals living in our society.

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## Conflicts of Interest

There are no conflicts of interest.

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