Prevalence and causes of low vision and blindness in northern KwaZulu

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Abstract **A survey of the prevalence of blindness and low vision was conducted in the Ingwavuma district of KwaZulu to assess the effectiveness of existing eye care facilities in the prevention and treatment of impaired vision and blindness. One hundred subjects from each of 60 randomly selected clusters (N = 6 090) were screened. Of these, 293 were identified and referred to an ophthalmologist for examination. Of the 268 (91,5%) examined, 241 were found to have visual impairment. Sixty-one of these people were blind, 85 had low vision, 61 were blind in one eye but had normal vision in the other, and 34 had low vision in one eye but normal vision in the other. The prevalence of blindness was 1,0% (95% confidence interval 0,7 - 1,2%), and the prevalence of impaired vision was 1,4% (95% confidence interval 1,1 - 1,7%). Age-related cataract (59,0%) and chronic glaucoma (22,9%) were the two main causes of blindness. Age-related cataract (75,3%), refractive error (10,0%) and chronic glaucoma (4,7%) were the main causes of impaired vision. Existing eye care services for the region have reduced the prevalence of blindness by only 7,0%. The training of ophthalmic nurses and the establishment of a sight-saver clinic in the area are necessary to reduce the prevalence of low vision and blindness.**

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The Mosvold Hospital health ward is situated in northern Zululand. This rural area is sparsely populated, with an estimated population of 54 833, 61% of whom are less than 20 years old.[1] People live in scattered, isolated homesteads and the economy is maintained by subsistence farmers who grow maize and keep cattle and goats.

Health services for the area are provided at Mosvold Hospital, a 150-bed rural community hospital with 5 doctors, and at 4 residential clinics and 13 mobile clinic points scattered through the area. Specialist services for eye care are available at King Edward VIII Hospital, which is 440 km away in Durban. In addition the South African Bureau for the Prevention of Blindness provides 5 week-long sight-saver clinics each year at Ngwelezana Hospital in Empangeni, 270 km from Mosvold Hospital.

No data on blindness and low vision in KwaZulu are currently available, and in the planning of eye care services in the region, it has been necessary to extrapolate data from studies done elsewhere in South Africa[2] and Africa.[3-11]

This study was undertaken to determine the prevalence and aetiology of blindness and low vision in the population of the Mosvold Hospital health ward, and to assess the impact of the distant eye care facilities in Durban and Empangeni on the prevention and treatment thereof in the area. The survey was part of the planning and evaluation process for the establishment of a sight-saver clinic at Mosvold Hospital.

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Method

The sampling frame included all people living in the Mosvold health ward. The sample comprised 60 clusters of 100 persons each selected by means of a random cluster sampling technique.[12,13] The number of clusters in each subsection was selected according to a probability proportional to population size procedure. The first homestead in each cluster was randomly selected and adjacent homesteads were then visited until 100 people per cluster were found. Everyone in the homestead containing the 100th person was included in the sample.

Each of the 12 field teams comprised one trained ophthalmic assistant and one student ophthalmic nurse. Each team surveyed a single cluster per day. The age and sex of each person in the homestead at the time of the survey were recorded. Visual acuity was tested by means of a standardised technique, the Snellen 'E' chart. The study group comprised all those who were unable to read the 6/18 line with one or both eyes, young children or infants whose mothers or guardians said they had an eye problem, people who wore glasses for distance vision and those who reported having had an eye operation. Subjects in this group were referred to the ophthalmologist for examination on the same day that they were screened.

The ophthalmologist's examination comprised an accurate measurement of the visual acuity in each eye with and without spectacle correction, examination of the anterior segment with a torch light, and examination of the optic disc and macula with a direct ophthalmoscope. Where indicated, it also included a subjective refraction and Schiotz tonometric assessment.

The severity and causes of visual impairment were classified according to the World Health Organisation classification.[14,15] An assessment was made as to whether low vision or blindness had been prevented or cured, or whether, under 'ideal' eye care conditions, either condition could have been prevented or cured. It was not possible to plot visual fields; eyes with glaucoma that were classified into visual acuity impairment category 1 or 2 but which had a cup/disc ratio of 0,8 were presumed to have a visual field restricted to less than 10° but more than 5° around central fixation; these were placed in category 3. Similarly, eyes with a cup/disc ratio of 0,9 or greater were presumed to have a visual field restricted to less than 5° around central fixation, and were placed in category 4.

With regard to confidence intervals (CIs), no adjustment was made to allow for the random cluster sampling design. The reported intervals are therefore approximate and may be too narrow.

Results

A total of 1 044 homesteads were visited, and 6 090 people were screened (5,8 people per homestead). This

sample was 11,1% of the total census population of the region. The age and sex distribution of those included in the sample corresponded very closely to the structure of the 1985 population census in Ingwavuma.

Of 293 people referred for further assessment, 268 (91,5%) were seen by one of the two ophthalmologists. The final study group that fulfilled the inclusion criteria comprised 241 people. Sixty-one (25,3%) of these were blind (categories of visual impairment 3 - 5 in both eyes), 85 (35,3%) had low vision (categories of visual impairment 1 or 2 in one eye and 1 - 5 in the other eye), 61 (25,3%) were blind (category 3 - 5) in one eye with normal vision in the other eye, and 34 (14,1%) had low vision in one eye (category 1 or 2) with normal vision in the other eye.

The overall prevalence of blindness was 1,0% (95% CI 0,7 - 1,2%) and the prevalence of low vision was 1,4% (95% CI 1,1 - 1,7%). Blindness in children under the age of 15 (reference indicator for the estimation of blindness among children) was 5/10 000. In those over the age of 50 years, the prevalence of impaired vision and blindness rose rapidly (Fig. 1). The crude and age-adjusted prevalences of blindness and impaired vision in men and women were not significantly different (Table I).

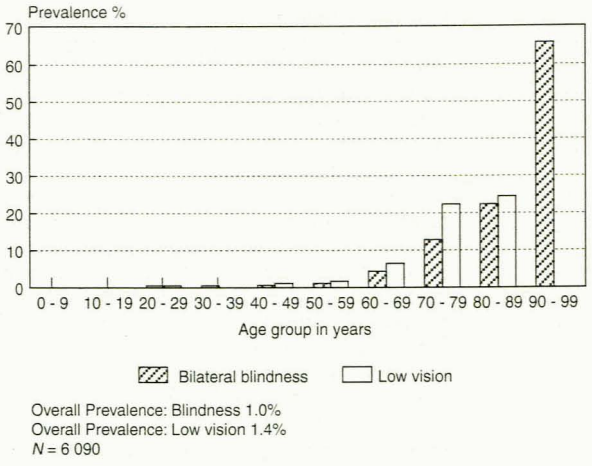

FIG. 1.
Prevalence (%) of bilateral and unilateral blindness and low vision by age.

TABLE I.
Prevalence (%) of bilateral and unilateral blindness and low vision

	Bilateral		Unilateral	
Sex	Blindness	Low vision	Blindness	Low vision
Female	1,02	1,55	1,00	0,53
Male	0,97	1,17	1,01	0,61
	P = NS	*P = NS*	*P = NS*	*P = NS*

Direct standardisation for age and the Mantel-Haenszel procedure did alter the result.

The aetiology of blindness in the study population is shown in Table II. Age-related cataract alone was responsible for 39,3% of blindness and age-related cataract together with another disease in one or both eyes was responsible for a further 19,7% of blindness. In 15 out of 61 (24,6%) blind persons, more than one aetiology was found in one or both eyes, or a different aetiology was found in each eye.

The aetiology of impaired vision was similar to the aetiology of blindness (Table III). Age-related cataract alone was responsible for 68,2% of impaired vision, and age-related cataract occurring with another condition in one or both eyes was responsible for a further 7,0% of impaired vision.

The prevalence of blindness in one eye was 1,0% (95% CI 0,7 - 1,2%), and the prevalence of low vision in one eye was 0,6% (95% CI 0,4 - 0,7%). The crude and age-adjusted prevalences of blindness and low vision in one eye in men and women were not significantly different (Table I), and there was a fairly even age distribution.

Table IV shows the aetiology of blindness in one eye and Table V that of low vision in one eye. Trauma was responsible for 42,6% of cases of blindness in one eye.

TABLE II.
Aetiology of blindness

WHO code, clinical entity	Males	Females	Total	Percentage of all blindness
Single aetiology in both eyes				
366.1 Age-related cataract	7	17	24	39,3
365.1 Chronic (open angle) glaucoma	7	7	14	22,9
Other causes*		8	8	13,1
More than one aetiology in each eye				
Other causes†		2	2	3,3
Different aetiologies in the two eyes				
360.4 and 360.9 — atrophy of globe secondary to trauma and eye excised following trauma	2		2	3,3
360.4 and 366.1 — atrophy of globe aetiology unknown and age-related cataract		2	2	3,3
366.1 and 365.1 — age-related cataract and chronic (open angle) glaucoma	1	1	2	3,3
365.5 and 366.1 — glaucoma secondary intumescent cataract and age-related cataract	1	1	2	3,3
Other causes‡	5		5	8,2
Total	23	38	61	100,0

* One each of: 360.4 — atrophy of globe secondary to inflammation; 362.7 — retinitis pigmentosa; 362.7 — inherited maculopathy; 363.3 — chorioretinal scarring secondary to inflammation; 365.4 — congenital glaucoma; 371.0 — corneal scarring cause undetermined; 377.1 — optic atrophy secondary to trauma; 744.0 — microphthalmia.

† One each of: 366.1 and 365.1 — age-related cataract and chronic (open angle) glaucoma; 366.1 and 371.0 — age-related cataract and corneal scarring (cause undetermined).

‡ One each of: 360.4 and 366.1 — atrophy of globe secondary inflammation and age-related cataract; 363.3 and 367.1 — chorioretinal scarring secondary trauma and myopia; 365.5 and 366.1 — glaucoma secondary intumescent cataract and uncorrected aphakia; 366.1 and 371.4 — age-related cataract and climatic droplet keratopathy; 366.1 and 379.3 — age-related cataract and uncorrected aphakia.

Corneal scarring was responsible for 14,7% of cases of blindness in one eye, and 17,6% of cases of low vision in one eye.

Women had significantly more low vision due to cataract than men ($P < 0,05$), although there was no statistically significant difference with regard to blindness caused by cataract.

Six people in the study population had had previous cataract extractions, 2 men at King Edward VIII Hospital and 4 women at Manguzi Hospital, a neighbouring rural hospital where a sight-saver clinic had been held 3 years previously. The overall prevalence of cataract-related blindness (treated and untreated) was 0,69% (95% CI 0,49 - 0,89%).

None of the 22 people who had chronic glaucoma was on medication at the time of the survey. One person had had bilateral trabeculectomies at King Edward VIII Hospital 5 years previously, but both trabeculectomies had failed and he was blind. Only 2 of the 17 people (11,8%) found to have refractive errors had spectacle correction.

The estimated number of blind people in the area served by the hospital is 548, of whom 215 are blind due to age-related cataract alone. The impact of the existing eye services in the area has reduced the prevalence of blindness by a mere 7,0%. If all cases of blindness due to age-related cataract and chronic glaucoma had been successfuly managed, there would be only 99 blind people in the area and the blindness prevalence would be 0,2% (95% CI 0,1 - 0,3%).

Discussion

There is a marked migration of men away from the area to the mines and other employment possibilities in urban areas. It is unlikely that these people are blind, although they could well have low vision or blindness in one eye. The absence of this group from the study population could give a falsely high prevalence of bilateral blindness and low vision, although it is unlikely to affect the prevalence of unilateral eye disease.

While a prevalence of blindness of 1,0% compares with prevalences reported from other areas in sub-Saharan Africa, there is a complete absence of trachoma and onchocerciasis in KwaZulu, so the expected prevalence of blindness would be lower. The only other blindness prevalence survey reported from South Africa

TABLE III.
Aetiology of low vision

WHO code, clinical entity	Males	Females	Total	Percentage of all low vision
Single aetiology in both eyes				
366.1 Age-related cataract	15	43	58	68,2
367.1 Myopia	4	4	8	9,4
365.1 Chronic (open angle) glaucoma	4		4	4,7
363.7 Inherited maculopathy			2	2,3
Other causes*	2	4	6	7,1
More than one aetiology in each eye				
Other causes†	1	1	2	2,3
Different aetiologies in the two eyes				
365.5 and 366.1 — absolute glaucoma, secondary trauma and age-related cataract	1	1	2	2,3
Other causes‡	2	1	3	3,5
Total	29	54	85	100,0

* One each of: 362.0 — diabetic retinopathy; 367.2 — astigmatism; 371.0 — corneal scarring secondary trauma; 371.4 — climatic droplet keratopathy; 377.1 — optic atrophy cause undetermined; 379.3 — aphakia corrected.
† One each of: 366.1 and 365.1 — age-related cataract and chronic (open angle) glaucoma; 366.1 and 371.4 — age-related cataract and climatic droplet keratopathy.
‡ One each of: 360.4 and 366.1 — atrophy of globe secondary trauma and age-related cataract; 365.6 and 371.0 — absolute glaucoma secondary trauma and corneal scarring secondary trauma; 366.1 and 379.3 — age-related cataract and corrected aphakia.

TABLE IV.
Aetiology of blindness in one eye

WHO code, clinical entity	Males	Females	Total	Percentage of all blindness in one eye
Single aetiology				
366.1 Age-related cataract	6	6	12	19,7
366.2 Traumatic cataract	5	3	8	13,1
360.4 Atrophy of globe — secondary trauma	1	4	5	8,2
371.0 Corneal scarring — secondary keratitis	3	2	5	8,2
360.8 Eye excised following trauma		4	4	6,6
368.0 Strabismic amblyopia	1	3	4	6,6
360.8 Eye excised — reason undetermined		3	3	4,9
371.0 Corneal scarring — secondary trauma	3		3	4,9
377.1 Optic atrophy — secondary trauma	1	2	3	4,9
360.4 Atrophy of globe secondary kerato-uveitis		2	2	3,3
Other causes*	4	5	9	14,8
More than one aetiology				
Other causes†	1	2	3	4,9
Total	25	36	61	100,0

* One each of: 360.4 — atrophy of globe secondary to endophthalmitis; 360.4 — atrophy of globe cause unknown; 363.3 — macular scarring secondary trauma; 363.3 — macular scarring secondary inflammation; 365.5 — glaucoma secondary intumescent cataract; 366.3 — cataract secondary uveitis; 368.0 — anisometropic amblyopia; 371.0 — corneal scarring cause undetermined; 379.3 — posterior dislocated lens.
† One each of: 366.2, 363.3 and 377.1 — cataract, macular scarring and optic atrophy secondary trauma; 366.2 and 371.0 — cataract and corneal scarring secondary trauma; 366.3 and 371.0 — cataract and corneal scarring secondary kerato-uveitis.

TABLE V.
Aetiology of low vision in one eye

WHO code, clinical entity	Males	Females	Total	Percentage of all low vision in one eye
Single aetiology				
366.1 Age-related cataract	4	11	15	44,1
367.1 Myopia	1	2	3	8,8
368.0 Strabismic amblyopia	2	1	3	8,8
363.3 Macular scarring secondary trauma	2		2	5,9
371.0 Corneal scarring secondary keratitis	1	1	2	5,9
371.0 Corneal scarring secondary trauma	1	1	2	5,9
371.0 Corneal scarring cause undetermined	1	1	2	5,9
Other causes*	3	2	5	14,7
Total	15	19	34	100,0

* One each of: 365.1 — chronic (open angle) glaucoma; 366.2 — traumatic cataract; 367.2 — astigmatism; 368.0 — anisometropic amblyopia; 371.4 — climatic droplet keratopathy.

is from Elim Hospital district in Gazankulu in the northern Transvaal, where a blindness prevalence of only 0,6% (95% CI 0,5 - 0,7%) was found, 10,0% of which was due to corneal scarring from chronic trachoma.[2] Elim Hospital has enjoyed a very good eye care service for many years, with a full-time ophthalmic surgery service and a training programme for ophthalmic nurses. The reduction of blindness by only 7,0% in the Mosvold Hospital health ward reflects the inadequacy of the eye care service for the region.

The prevalence of glaucoma in this study is higher than that reported from other areas in Africa.[2-11] This could be due to methodological misclassification as blind of those eyes with cup/disc ratios of 0,8 or more but with a visual acuity of 3/60 or better. There were 7 people in this group who, if reclassified, would have reduced the prevalence of blindness to 0,9% (95% CI 0,7 - 1,1%) with chronic glaucoma alone responsible for 12,9% of blindness. However, it is important to make this adjustment on the visual impairment classification on the basis of the disc appearance and inferred visual field constriction.

Age-related cataract and chronic glaucoma account for 91,9% of blindness and 80,0% of low vision in this area, and if the prevalence of blindness and low vision is to be reduced successfully, efforts should concentrate on tackling these two conditions. The establishment of a more accessible ophthalmic surgery service, albeit intermittently, with the establishment of a sight-saver clinic at Mosvold Hospital, should facilitate a reduction in the prevalence of age-related cataract. The training of ophthalmic nurses for the area, who will be able to facilitate and co-ordinate glaucoma case-finding in the clinics, as well as follow up and supervise patients on medical treatment, with referral to the sight-saver clinic for glaucoma surgery if this is indicated, should facilitate a reduction in the prevalence of blindness caused by chronic glaucoma.

Trauma was the most common cause of blindness in one eye. The severity of the injuries sustained, the delay in presentation, and the inadequacy of the surgical management of perforating injuries in the rural situation are all factors which contribute to the high prevalence of blindness in one eye due to trauma.[16] Refractive errors were an important cause of low vision, and the provision of an adequate service for the refraction and dispensing of spectacles needs to be incorporated into the sight-saver clinics for the area.

Whether the establishment of a more effective ophthalmic service in the area will reduce the prevalence of blindness to acceptable levels will need to be monitored closely. There is considerable resistance to medical intervention among elderly people in communities with low literacy levels. Many other cultural and social factors exist, such as a ready acceptance of physical disability, which could prevent people from seeking intervention. Subjects found to have age-related cataracts during this study were offered surgery at a local sight-saver clinic to be held the following week, but none presented for surgery at that clinic. A further study needs to be conducted to investigate these factors.

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