

Increase in mortality associated with blindness in rural Africa

H.R. Taylor,^{1,2} S. Katala,³ B. Muñoz,¹ & V. Turner¹

Forty-seven persons were identified with visual impairment (visual acuity of 6/60 or less in their better eye) during a population-based survey in 1986 of eye disease in three villages in central Tanzania. Four years later, 41 (87%) of them and 70 (82%) of 84 age-, sex-, and village-matched controls with normal functional vision (visual acuity 6/18 or better in the better eye) were traced, and those who were still alive were re-examined. The remainder were reported to be alive but had moved to other villages. Deaths among those aged 40–79 years amounted to 10 among the 37 visually impaired and 7 among the 70 sighted controls. This gave an excess mortality rate (odds ratio) of 3.33 times (1.03–11.04, 95% CI) among the visually impaired compared to their age-matched controls. The excess mortality rate for visually impaired women was 4.11 (0.72–25.5) and 2.71 (0.50–15.2) for visually impaired men. Nine out of 25 with vision of less than 3/60 in their better eye had died. The higher mortality rate among the visually impaired suggests that, in this environment, blindness is not only associated with considerable disability but is also associated with a shortened life expectancy, especially for women.

Introduction

Blindness is one of the most feared disabilities, a survey in the USA placing it second after cancer (1). Often considered as an inevitable sign of old age or an outcome of fate that one must accept, blindness has over the last two decades come to be regarded as a worldwide condition that is largely preventable or curable. WHO has estimated that 80% of the world's blindness is avoidable (2).

The onset of blindness clearly limits one's ability to function normally. The hardship, however, is often greater in rural areas where, for example, the meagre resources of subsistence farmers are already fully stretched and further resources cannot be mobilized. Blindness is associated with a marked loss of economic dependence and social standing, together with marginalization of the blind person in family decision-making (3). Surgical reversal of blindness due to cataract, for example, has led to a remarkable change in the socioeconomic well-being of these patients.

Blind persons for whom cataract surgery is neither available nor an appropriate treatment must

live the rest of their lives in the isolated world of the blind. Little is known of their life expectancy. We are aware of only one study which reported four times excess mortality (compared with non-blind persons) among 600 blind people (vision less than 3/60 in the better eye) in a population-based sample of 11 000 aged over 30 who lived in the onchocerciasis-endemic areas of West Africa (4). After controlling for endemicity levels, the authors concluded that the excess mortality was due to the visual disability itself rather than a direct effect of infection with *Onchocerca volvulus*.

The present study reports a four-year follow-up of blind and sighted controls to determine the mortality rate of blind people in a trachoma-endemic area.

Methods

In 1986, we conducted a cross-sectional prevalence survey in the Kongwa subdistrict of the Dodoma region in central Tanzania, where we examined a sample of 2510 persons of all ages drawn from three villages (5, 6). The three villages and, within each village, the clusters of households were selected randomly. A house-by-house census of the selected households was undertaken and the members of these households were examined. Age was determined from a calendar of important local events with assistance from relatives, when needed.

All persons over the age of 7 years had the visual acuity of each eye tested with an E chart at a distance of 6 metres, the acuity being recorded following WHO recommendations (2). Those with

¹ Dana Center for Preventive Ophthalmology, The Wilmer Institute, Johns Hopkins University, Baltimore, MD, USA.

² Department of Ophthalmology, University of Melbourne, Victoria, Australia. Requests for reprints should be sent to Professor H.R. Taylor, The Royal Victorian Eye and Ear Hospital, 32 Gisborne Street, East Melbourne, Victoria 3002, Australia.

³ Kongwa Primary Eye Care Project, Kongwa, United Republic of Tanzania.

Reprint No. 5180

poor vision had a detailed ophthalmic examination to establish the most likely cause of their visual impairment (6).

Forty-two months later, in 1990, we attempted to re-examine all who had been identified in 1986 as being visually impaired (6/60 or less in their better eye) as well as controls who had normal vision (6/18 or better vision in their better eye). Two controls, matched by age (within one year), sex, and village, were selected for each impaired case. Because of the high prevalence of visual impairment among the elderly, we could not find enough controls for the oldest; missing as controls, therefore, were two males aged 60–69 years, two males aged 70–79 years, and two males and four females of over 80 years. The visual acuity was remeasured on all who could be traced; relatives and neighbours were questioned about those not present. If the person had died, the date of death and events surrounding the death were investigated by a nurse-practitioner using the local language. A likely cause of death was established and, where possible, existing health records were checked to confirm this. For those who had moved to another village, attempts were made to locate and examine them, or at least establish that they were still alive.

Results

Of the 47 visually impaired and 84 normally sighted controls who were selected (Table 1), 41 impaired (87%) and 70 controls (82%) were either re-examined or had died (as confirmed by relatives or neighbours). The remainder, who had moved away, were reported to be alive and well by reliable informants. Although all the sighted controls had

Table 1: Baseline distribution, by age and sex, of 47 visually impaired and 84 controls with normal sight

Age (years)	Impaired		Controls	
	Male	Female	Male	Female
<10	0	1	0	2
10–19	2	2	4	4
20–29	0	1	0	2
30–39	0	1	0	2
40–49	3	2	6	4
50–59	4	6	8	12
60–69	7	10	12*	20
70–79	3	2	4*	4
≥80	1	2	0*	0*
Total	20	27	34	50

* Age- and sex-matched controls with good vision could not be found in sufficient numbers in these older age groups.

functionally normal vision of 6/18 or better in their better eye, 30 had at least some degree of visual impairment (acuity of 6/60 to 1/60, hand movements, or perception or no perception of light) in their other eye.

Twelve of the visually impaired and 7 sighted controls had died (Table 2). The excess of deaths among the impaired seemed to have occurred predominantly in the year preceding the re-examination in 1990 (Fig. 1), although we have no way of determining what ascertainment bias may have occurred at the time of data collection.

No deaths occurred in either the visually impaired or the sighted controls aged less than 40 years. As no controls over the age of 80 years were found with normal vision, the rates for this age group cannot be compared. In this oldest age group, the one blind male and one of the two blind females had died. The numbers of deaths, by age and sex, for those aged 40–79 years are shown in Table 3. Over the forty-two months, 10 of the 37 visually impaired had died compared to 7 of the 70 sighted controls. The excess mortality rate (odds ratio) among the impaired was 3.33 (1.03–11.04, 95% CI). The excess in mortality rate was higher for females (4.11 (0.72–25.5)) than for males (2.71 (0.50–15.2)), although the difference between the two was not significant.

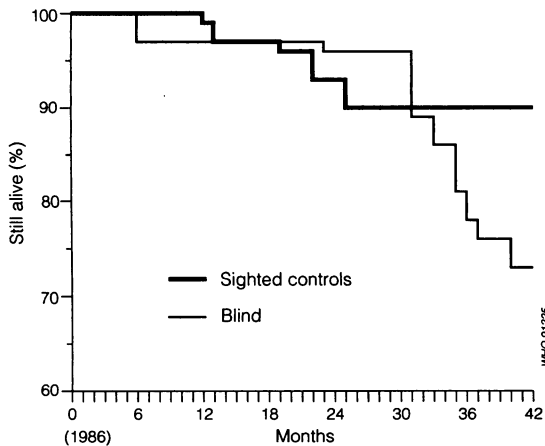
Seven out of 16 (44%) with visual loss due to cataract had died, as had the two persons with macular degeneration. Only two out of 21 (10%) with corneal disease and one out of 8 (13%) with other causes for their visual loss had died. Overall, those who were blind from cataract were older (mean age, 64 years) than those blind from corneal disease (mean age, 48 years); those with cataract who died were older (mean age, 69 years) than those with cataract who did not die (mean age, 60 years).

There was a progressive increase in the mortality rate with increasing visual impairment. The

Table 2: Reported causes of death among the 47 visually impaired and 84 controls with normal sight (of all ages)

Cause of death	Impaired	Controls
Dysentery	4	3
Cerebral malaria	2	1
Tuberculosis	1	1
Liver failure	1	0
Cardiac failure	3	0
Malnutrition	1	0
Fever	0	1
Suicide	0	1
Total	12	7

Fig. 1. Mortality among the 37 blind and 70 sighted controls aged between 40 and 79 years, as indicated by the percentage survival during the 42 months after 1986.



deaths included four (7.4%) of the 54 controls with vision of 6/18 or better in each eye, three (10%) of the 30 controls with 6/18 or better in one eye and vision of less than 6/18 in the other, three (14%) of 22 with impaired vision of 6/60 in their better eye, and nine (36%) of 25 with impaired vision of 3/60 or less in their better eye. This analysis was not age-adjusted as the numbers are small. When followed up, four of the control subjects had become visually impaired; three of them had 1/60 vision in their better eye and one had 3/60.

Discussion

This study has shown that individuals over the age of 40 who are visually impaired (visual acuity of 6/60 or less in each eye) had 3.33 times the risk of dying

compared to their normally sighted peers (visual acuity 6/18 or better in their better eye).

The study has several limitations. The number of blind were relatively small and mortality rates could not be established for persons <40 years or >80 years old. It is generally believed that blind children have a higher mortality rate than their sighted peers, but our study does not provide information on that matter. The time and cause of death were established retrospectively and in the absence of medical records. By our best assessment, there were no overall differences in the causes of death between the visually impaired and their sighted controls. Given the higher death rate among the impaired, it would be of considerable interest to establish the actual causes of death. Further studies will be needed to address this issue. Similarly, we have no way of telling whether any of the controls may have become blind before they died; certainly four of the surviving controls had lost functional vision when re-examined.

Apart from those who were re-examined, we had to rely on verbal reports whether those who were absent were still alive. Any resulting misclassification bias should have affected both groups equally and, with similar follow-up rates for each group, it seems unlikely that the difference in mortality between the two groups could be due to this bias.

Our results indicate that blindness is not only a major disability in its own right but that it also leads to a significant increase in mortality. In areas such as this blindness is a killing disorder. These findings, which are in agreement with those from the onchocerciasis endemic areas of West Africa (4), may reflect the situation in other areas where blindness rates are high among underserved rural communities.

Table 3: Number of deaths, by age group and sex, among 37 visually impaired and 70 sighted controls

Age group (years)*	Impaired		Controls	
	Male	Female	Male	Female
40-49	1/3 ^b	0/2	0/6	0/4
50-59	0/4	1/6	0/8	0/12
60-69	3/7	2/10	2/12	3/20
70-79	1/3	2/2	2/4	0/4
Total	5/17	5/20	4/30	3/40

* Age in 1986.

^b No. of dead/total.

Acknowledgements

This study was supported by a Research to Prevent Blindness William and Mary Greve International Research Scholar grant awarded to Hugh R. Taylor and a grant from the Edna McConnell Clark Foundation awarded to Virginia Turner.

The study was conducted under the auspices of the Central Health Foundation, Dodoma, Tanzania, and the National Prevention of Blindness Committee of Tanzania. The authors thank Dr J.M. Temba, Assistant Chief Medical Officer and Director of Preventive Services, Ministry of Health, Tanzania; Dr G.L. Upunda, Regional Medical Officer, Dodoma, Tanzania; Dr B.B.O. Mmbaga, Zonal Eye Health Educator, Dodoma, Tanzania; and Mr Matt Lynch and Ms Lynn Hutt, The Johns Hopkins University, Baltimore, MD, USA, for their assistance.

Résumé

Augmentation de mortalité associée à la cécité en Afrique rurale

Lors d'une enquête sur les maladies oculaires portant sur l'ensemble de la population de trois villages de Tanzanie centrale, réalisée en 1986, 47 personnes ont été classées comme amblyopes (acuité visuelle ne dépassant pas 6/60 pour le meilleur œil). Quatre ans plus tard, 41 (87%) de ces sujets et 70 (82%) de 84 sujets témoins appariés pour l'âge, le sexe et le village et ayant une vision normale (acuité visuelle au moins égale à 6/18 pour le meilleur œil) ont été retrouvés, et ceux qui étaient encore en vie ont été réexaminés. D'autres sujets étaient encore en vie mais avaient quitté le village. Parmi les sujets âgés de 40 à 79 ans, il y a eu 10 décès chez les 37 amblyopes et 7 décès parmi les 70 témoins ayant une vue normale. La mortalité (odds ratio) est donc 3,33 fois plus élevée chez les sujets amblyopes par rapport aux témoins appariés selon l'âge (intervalle de confiance à 95%: 1,3–11,04). La surmortalité chez les femmes amblyopes était de 4,11 (0,72–25,5) et chez les hommes de 2,71 (0,50–15,2). Parmi les 25 sujets ayant une acuité visuelle inférieure à 3/60 pour leur meilleur œil, 9

étaient décédés. La surmortalité chez les sujets amblyopes laisse à penser que, dans cet environnement, la cécité est non seulement associée à un handicap considérable mais également à un raccourcissement de l'espérance de vie, en particulier chez les femmes.

References

1. **The National Advisory Eye Council.** *Vision research, a national plan 1983–1987; 1987 evaluation and update.* Bethesda, National Institutes of Health, 1987 (NIH Publication No. 87–2755).
2. **World Health Organization.** *Guidelines for programmes for the prevention of blindness.* Geneva, 1979, pp. 9–47.
3. **Javitt, J. et al.** The economic and social impact of restoring sight, In: Henkind, P., ed. *ACTA: XXIV International Congress of Ophthalmology.* Philadelphia, J.B. Lippincott, 1983, pp. 1308–1312.
4. **Prost, A. & Vaugelade, J.** La surmortalité des aveugles en zone de savane Ouest-Africaine. *Bulletin of the World Health Organization*, **59**: 733–776 (1981).
5. **Taylor, H.R. et al.** Hygiene factors and increased risk of trachoma in central Tanzania. *Archives of ophthalmology*, **107**: 1821–1825 (1989).
6. **Rapoza, P.A. et al.** Prevalence and causes of vision loss in Central Tanzania. *International ophthalmology*, **15**: 123–129 (1991).