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Excess mortality associated with blindness in leprosy patients in Korea

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Summary Vision loss and blindness are potential complications of leprosy. There is little data available to indicate the impact of eye complications on life expectancy and quality of life. We sought to determine the relative risk of death in blind leprosy patients compared to nonblind leprosy patients.

A population-based ocular survey of 510 mycobacteriologically negative leprosy patients in rural South Korea, conducted in 1988, formed the study population. After a 7-year period patients were traced to determine their status (alive, dead, lost to follow up).

Blind patients showed a 4·8-fold risk of death, even after adjusting for other factors, compared to nonblind patients. Young blind leprosy patients had the highest relative risk of death. Excess mortality was not associated with any specific cause of blindness, ocular pathology, or type of disease.

Findings from our study suggest that all leprosy patients with ocular disabilities (including those released from antileprosy treatment) should be targeted to receive eye care to prevent vision loss. Particular emphasis should be placed on young patients.

Background

Evidence was accumulated over 40 years ago demonstrating that leprosy patients, particularly lepromatous patients, have higher age-standardized mortality rates compared to the general, non-leprosy population.[1] Long-term effects of some of the complications of leprosy, e.g. tropic ulcers, can reduce life span through repeated infection and exposure to economic hardship and malnutrition. Since then, a number of studies have demonstrated 1·5 to 2 fold higher mortality rates among multibacillary patients compared to paucibacillary patients[2,3] suggesting that leprosy-related reactions and increased frequency of intercurrent diseases, such as tuberculosis predict a higher mortality rate. This may be particularly true where

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medical care is limited. Researchers from the Philippines have also suggested that leprosy patients with an early age at onset of disease (less than 18 years of age) have a higher mortality rate than patients whose onset was when they were older.[4]

Recent evidence in the ophthalmologic literature has suggested that in the general population in developing countries blind people have standardized mortality rates three to four times higher than in the non-blind population.[5–7] The mechanism by which mortality is increased in blind people has not been adequately explored although it is likely that blindness leads to decreased socioeconomic status, malnutrition, and infections secondary to injury.

Finally, more recently, three population-based surveys have shown that people with cataract (controlling for vision loss) have standardized mortality rates 1·5 to 2 times higher than patients without cataract.[8–10] Changes in the lens protein are hypothesized to reflect similar system changes that lead to more rapid aging and early mortality.

There is no published information on the relative contribution of disease type, age at leprosy onset, blindness or cataract to mortality in leprosy patients. Thus, our study goal was to determine if the age standardized mortality rate among blind leprosy patients was significantly higher than among nonblind leprosy patients. We also sought to assess the contribution of gender, cataract, type of leprosy, and age at onset of leprosy to increased mortality.

Methods

In 1988, 593 leprosy patients, resident in 7 resettlement villages in South Korea were encouraged to receive an eye examination. Our study methods have been described previously.[11] Briefly, in each village best corrected vision was measured followed by a slit lamp examination. A standardized examination form was used to record information on cause of vision loss or blindness and the presence of lid, conjunctival, corneal, uveal, or lens abnormalities. Although all of these patients were mycobacteriologically negative it has been a common practice in Korea to maintain antileprosy therapy and up-to-date records are kept on all patients. Five hundred and ten patients underwent an ophthalmologic examination.

In October 1995, all patient records were reviewed to determine current status (alive and living in the village, died, or moved from the village), regardless of whether they received an eye exam in 1988 or not. Patients no longer living in the village were traced by phone to their new residence. Death certificates are not routinely kept in the leprosy record files and were not available for review.

Age was stratified into three groups and age-adjusted relative risk and confidence limits were calculated. Age at onset of leprosy was divided into those with an onset age of <18 and those 18 and over. Stepwise logistic regression modelling was used to determine the risk of death while controlling for the possible confounding effects of other variables. Survival curves based on Kaplan-Meier cumulative probabilities were also calculated; these provide a graphic illustration of the mortality experiences of the two groups.

Results

At the 7-year follow-up 49 (9·6%) of the 510 patients had died. We were unable to locate nine patients. Baseline information on this population in 1988 is given in Table 1. Although only

Table 1. Study population ($n = 510$) in 1988

Median age	53 years
Gender	49·0% male 51·0% female
Median age at onset of leprosy	19 years
Median duration of leprosy	34 years
Disease type	77·4% multibacillary 22·6% paucibacillary
Clinical information	
Best corrected vision	
Blind (<3/60)	21 (4·2%)
Visually disabled (6/18–3/60)	23 (4·6%)
Not visually disabled (>6/18)	454 (91·2%)
Ocular conditions	
Lagophthalmos	144 (28·9%)
Corneal disease	67 (13·6%)
Corneal disease and/or decreased corneal sensation	102 (20·7%)
Chronic uveitis	141 (30·3%)
Leprosy-related eye disease†	240 (51·6%)
Cataract or aphakia	76 (15·6%)
Any eye disease‡	270 (53·0%)

*The numbers do not always total to 510; clinical information could not be recorded for patients with phthisis bulbi. Also excluded were cases where corneal disease did not permit examination of the iris and lens.

†Leprosy related eye disease is defined as presence of lagophthalmos, lagophthalmos-related corneal disease, decreased corneal sensation, or chronic uveitis.

‡Any eye disease is defined as leprosy-related eye disease or cataract.

4·2% of the study population were blind (< 3/60 in the better eye), 52% of those examined had leprosy-related potentially blinding ocular pathology.

Blind patients had an unadjusted risk of death 4·53 times higher (95% CI 2·72–7·54) than nonblind patients. The relative risk of death in multibacillary and paucibacillary patients was the same. As expected, increasing age and gender (= males) were both associated with higher mortality. The risk of death of patients with a young age at onset of leprosy was 1·29 times (95% CI 0·91, 1·81) the risk of death of patients with an older age at onset.

Stepwise logistic regression analysis revealed that only age (odds ratio = 1·10, 95% CI 1·08, 1·12, $p < 0·001$) and blindness (odds ratio = 4·78, 95% CI 2·87, 7·96, $p = 0·002$) were independently associated with mortality. The graphical association between blindness and mortality, controlling for age, is shown in Figure 1.

Age-stratified analysis revealed that young blind leprosy patients had a mortality ratio 5·7 times higher than among the nonblind cohort (Table 2). There were only 35 patients under 40 years of age, none of whom were blind. Of those patients under 50 years of age ($n = 180$) only one patient was blind in 1988; he died 6 years after the baseline examination.

Excess mortality was not associated with cataract, lagophthalmos, chronic uveitis or any of the other specific ocular pathology findings. The risk of death of patients with visual impairment (6/24–3/60) was not different than those patients with adequate vision (≥ 6/18).

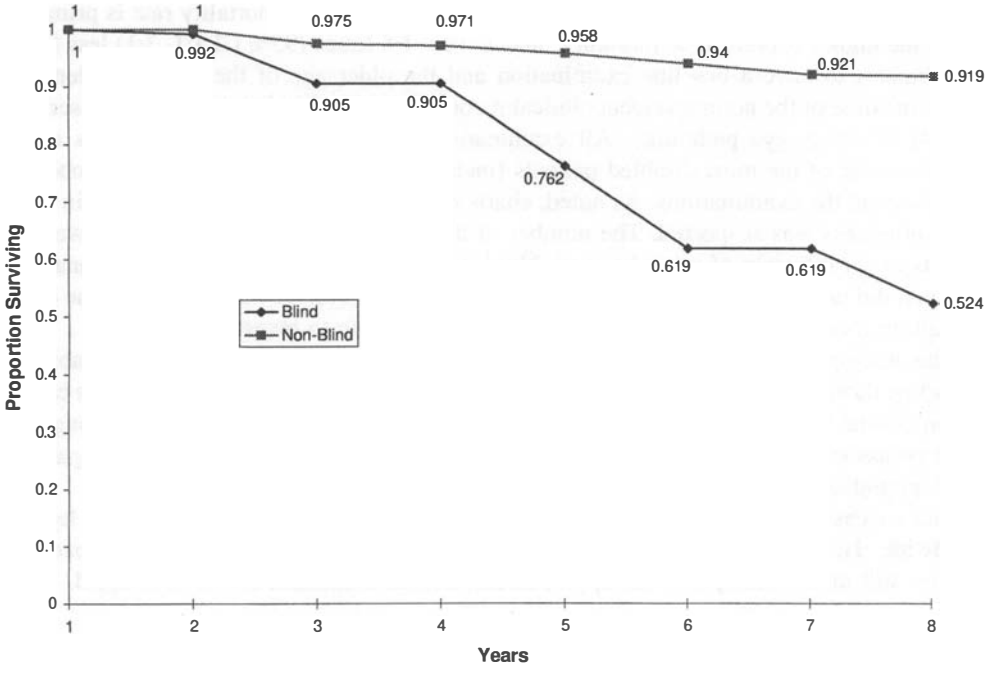

Figure 1. Cumulative survival of blind (<3/60 in better eye) and nonblind leprosy patients in Korea.

Discussion

Our study has shown that leprosy patients who are blind have a significantly higher age adjusted risk of death compared to normally-sighted patients. Young blind people have the highest mortality rates. This study has several limitations. Among the 1988 baseline study population, nonrespondents were more likely to be male (17·0%) than female (10·1%) ($p = 0{\cdot}01$). They were also slightly older (mean age = 54 years) compared to respondents (51 years). Mortality among respondents was 97·8/1000, significantly lower than the

Table 2. Age-stratified risk of death among the blind and non-blind

Age group	No.	Died	Death rate	Relative risk of death (95% Confidence interval)
<60 years				
Blind	7	2	28·7	5·6 (1·6, 19·5)
Not blind	350	18	5·1	
60–69 years				
Blind	9	4	44·4	3·3 (1·4, 8·1)
Not blind	97	13	13·4	
70+ years				
Blind	5	3	60·0	1·9 (0·8, 4·6)
Not blind	28	9	32·1	

192·3/1000 mortality rate among the nonrespondents. The higher mortality rate is primarily due to the higher overall male mortality; males were 1·8 times (95% CI 1·1, 3·1) less likely than females to have a baseline examination and the older age of the nonrespondents. A review of some of the nonrespondent clinical records in 1995 revealed that some had serious, possibly blinding, eye pathology. All examinations were done at centralized sites in the villages; some of the most disabled patients (including those with vision related problems) did not attend the examinations. As noted, charts of nonrespondents were reviewed; in some cases, blindness was suspected. The number of blind were relatively small. There were no patients under 40 years of age who were blind. Excluding these patients from the analysis, however, did not significantly change our findings. We do not have information on the cause of death in these patients and this would be a valuable topic to investigate.

The findings from this study suggest that all leprosy patients with ocular disabilities (including those released from antileprosy treatment) should be targeted to receive eye care to prevent vision loss. Particular emphasis should be placed on young patients. Although we found no association between specific ocular diseases and mortality it is likely that patients with lagophthalmos, chronic uveitis, and cataract have a reduced quality of life.

The success of antileprosy therapy has led to a reduction in the incidence of leprosy worldwide. However, it is important to ensure that the visual needs of leprosy patients, whether still under antileprosy therapy or released from treatment, are not neglected.

Acknowledgments

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