Corneal disease in rural Transkei

J. C. HILL, R. MASKE, S. VAN DER WALT, P. COETZER

Summary

A survey of external eye diseases was undertaken in Transkei; a total of 1519 people were examined. A high incidence of climatic droplet keratopathy was found in the population, and this was a common cause of blindness in elderly men. Only 7 people had pterygia - all women. Both climatic droplet keratopathy and pterygia are believed to result from actinic damage, therefore the discrepancy noted in the prevalence of these two degenerative disorders was unexpected. Keratomalacia was observed in 5 children, all of whom had mild forms of vitamin A deficiency eye disease. Although the number of children with overt vitamin A deficiency was small (0.58% of children aged less than 15 years), the importance of this finding lies in the possible pool of children without clinical disease but with low levels of vitamin A and therefore more likely to develop and to succumb to infections of the respiratory and alimentary systems. A further 20 people had corneal changes similar to those found in xerophthalmia; but since associated conjunctival signs were absent it is improbable that these changes were secondary to vitamin A deficiency.

Corneal diseases are common in developing countries especially in rural areas. The type and pattern of disease varies according to the environmental and climatic conditions. A recent survey in Calvinia, 1 in the Karoo, revealed a high prevalence of diseases resulting from actinic damage, such as pterygium and climatic droplet keratopathy (CDK). With increasing longevity, the incidence of these degenerative conditions would be expected to increase and become a significant cause of blindness in the older population, especially among those who have worked out-of-doors for most of their lives. The ultraviolet (UV) portion of the sun's radiation has been implicated in the aetiology of both these diseases. 2,4 Recent evidence that the ozone layer of the stratosphere is becoming thinner, allowing more UV radiation to reach the earth's surface, gives serious cause for concern. 3 Similarly an increase in both pterygium and CDK can be expected, with a corresponding increase in people who are visually disabled.

In many parts of Africa and other developing countries of the world vitamin A deficiency is a major cause of corneal disease. This may result in blinding corneal ulceration especially when associated with measles. It has been calculated that 10 million children develop clinical signs and symptoms and another 250,000 children become blind from this disease every year. 5 There has been renewed interest in the prevalence of vitamin A deficiency eye disease since studies linked this disorder to high infant mortality rates. 6,7 The associated epithelial changes of the pulmonary and alimentary passages predispose children to infections of these organs from which they may eventually succumb. 5 Little work has been done on the prevalence of vitamin A deficiency eye diseases in southern Africa. Kuming and Politzer 8 reported a 9.7% incidence of xerophthalmia among children admitted to Baragwanath Hospital for malnutrition, but no recent information is available about the prevalence of xerophthalmia in the community.

Further information about vitamin A deficiency and other external eye diseases in southern Africa is needed. Many of these conditions are easily preventable by simple measures.

The findings of a preliminary survey undertaken in rural Transkei are presented. The aim of the survey was to establish the prevalence of external eye diseases in this part of southern Africa.

In our opinion, the most plausible explanation for the difference in blood levels between the three groups is the variation in atmospheric lead exposure. A more formal study, with serial lead estimations over time, might resolve the question of direct lead absorption more completely.

We record our gratitude to Mr F. Moerat for his expert advice and assistance in locating and working with the juveniles; Dr R. Coogan, the Medical Officer of Health of the City of Cape Town at the time; and Dr L. Tibbit, Medical Officer of Health, Cape Regional Services Council, for their co-operation; and to the South African Medical Research Council for financial support. We are grateful to Dr P. Strebel for his helpful suggestions.

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Subjects and methods

The survey was undertaken during the last 2 weeks of September 1987 in the Kentani and Willowvale districts of Transkei. Permission to carry out the survey was obtained from the Government of Transkei and local chiefs. The survey population was picked from three separate areas by random cluster sampling.13 Before the arrival of the survey team, a census of the survey population was performed. The names, sex and ages of each member of the selected households were obtained. During the survey an eye clinic was set up in a local clinic, school or community hall. People included in the survey population were asked to attend the clinic, people who attended but were not in the census were examined but the findings were not recorded. An external eye examination, including biomicroscopy with a Haag-Streit slit-lamp, was performed on all patients in a darkened room, except young apprehensive children who were examined with the aid of a torch. When corneal disease was noted a full eye examination was carried out, including measurement of visual acuity, tear film assessment and Schirmer's test.

Results

A total of 1 519 people were examined (Fig. 1). A preponderance of females was found in the survey: 946 females were examined compared with 573 males. There was also a large number of children in the survey population: 867 (57.1%) were aged ≤ 15 years.

The most common disease encountered was CDK, and this was graded as shown in Table I: an example of grade 4 disease is shown in Fig. 2. The percentage of patients in each age group with this condition, together with those who had significant visual loss because of grade 3 or 4 disease, is shown in Fig. 3. In total, 178 people were affected by CDK (Table II), this figure represents 11.7% of the total population. However, CDK only rarely affects children; if the adult population aged ≥ 21 years was considered, it was found that 24% of women and 74.1% of men were affected by this disorder.

TABLE I. SYSTEM OF GRADING CDK

<table>
<thead>
<tr>
<th>Grade</th>
<th>Area affected/symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limbal areas of cornea affected only</td>
</tr>
<tr>
<td>2</td>
<td>Whole of palpebral cornea affected: vision normal</td>
</tr>
<tr>
<td>3</td>
<td>As for grade 2 but vision significantly reduced (6/18 or less)</td>
</tr>
<tr>
<td>4</td>
<td>As for grade 3, but raised nodules present</td>
</tr>
</tbody>
</table>

Other diseases found were pterygium, corneal scarring from a variety of causes, conjunctival xerosis, superficial punctate keratopathy (SPK) and leucoma adherens. Table II shows the number, together with the sex and mean ages, of people affected by these diseases.

Only 7 people were found to have pterygium, these were all women. Corneal scarring was found in 33 people, 3 of whom had bilateral disease, while the contralateral eyes in the other cases were all normal. Trauma was the cause in 20 cases. In 11 cases the scarring resulted from a metallic foreign body. The remaining 2 cases were secondary to infective keratitis.

Five children had clinical xerophthalmia with evidence of conjunctival keratinisation or Bitot's spots (Fig. 4), which, according to the World Health Organization, are graded as

XIA and XIB xerophthalmia respectively.14 This group included a pair of siblings. All the children with xerophthalmia were aged ≤ 15 years and represent 0.58% of this age group. SPK was seen bilaterally in 20 people while 1 person had unilateral disease only. Eleven of these cases had similar punctate lesions present in the conjunctiva as well as the
TABLE II. EXTERNAL EYE DISEASES FOUND IN SURVEY POPULATION (N = 1519)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Females (N = 946)</th>
<th>Males (N = 573)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>CDK Grades 1+2</td>
<td>97</td>
<td>10,3</td>
</tr>
<tr>
<td>Grades 3+4</td>
<td>1</td>
<td>0,1</td>
</tr>
<tr>
<td>Total</td>
<td>98</td>
<td>10,4</td>
</tr>
<tr>
<td>Corneal scarring</td>
<td>17</td>
<td>1,8</td>
</tr>
<tr>
<td>Pterygium</td>
<td>7</td>
<td>0,74</td>
</tr>
<tr>
<td>Xerophthalmia</td>
<td>4</td>
<td>0,43</td>
</tr>
<tr>
<td>SPK</td>
<td>9</td>
<td>0,95</td>
</tr>
<tr>
<td>Corneal melting</td>
<td>4</td>
<td>0,42</td>
</tr>
</tbody>
</table>

Fig. 3. Percentage of population affected by CDK according to age and sex.

Fig. 4. Bitot's spot (arrowed).

Fig. 5. Leucoma adherens. An episode of corneal melting has occurred in the past. The perforation was plugged by a knuckle of iris resulting in a corneal scar and a displaced pupil.

cornea. All the people with xerophthalmia or SPK had moist eyes with good marginal tear strips and normal Schirmer's tests.
Six people had leucoma adherens (Fig. 5) or significant thinning present in the lower half of the cornea in both eyes. There was no history of trauma or previous infection in any of these cases; many could not recall when the original problem had appeared, while the remainder remembered having had eye problems as children. The appearances were typical of old corneal melting disease that had occurred in childhood with the scarring persisting into adult life.

Discussion
There was a disproportionately large number of both children and women in the survey because of the absence of men who had migrated to urban areas to seek employment. These migrant workers were excluded from the census population since they were not permanently resident in the area. Inclusion in the survey would have been inappropriate because the majority of their lives were spent in a different environment and their diets were likely to be significantly different from their rural counterparts.

The most common disease encountered was CDK, a degenerative eye condition caused by chronic actinic damage. An increased prevalence in people who work outside (often men) and in the older age groups is therefore to be expected. The results of this survey follow this expected pattern. The disease was usually of a mild nature (grades 1 and 2). Grade 3 and 4 disease, causing significant visual loss (visual acuity of 6/18 or less), was found mainly in older individuals, especially elderly men, among whom there was a significant prevalence of visual morbidity from this disorder (Fig. 3). All the men over the age
of 70 years (N = 31) had CDK and in 28.8% significant loss of vision had occurred from grade 3 or 4 disease.

An unexpected finding was the low prevalence of pterygium, only 7 patients were found to have this degenerative disorder. In Calvinia a higher percentage of the adult population was found to have pterygium and the incidence increased with age — in the > 70-year age group over 30% were affected by this condition. Both pterygium and CDK are thought to result from actinic damage, more specifically the UV portion of solar radiation. It was therefore surprising to find such a discrepancy in the prevalence of these two degenerative disorders. Possibly the climate favours the development of CDK at the expense of pterygium or alternatively there may be a racial resistance to the development of pterygium. Corneal scarring resulted from a variety of causes including trauma, foreign bodies and old infective lesions. The scarring was unilateral in all but 3 cases and therefore was not a significant cause of blindness in the population.

Of particular interest was the incidence of epithelial xerosis, an early sign of vitamin A deficiency eye disease. Only 5 patients were found to have ocular evidence of vitamin A deficiency. This disease is usually found in childhood and many of its signs are subtle and can only be seen by slit-lamp examination, a procedure inappropriate for very young children. It is therefore possible that some cases in young children, who could only be examined with a torch, were missed. No child was blind from vitamin A deficiency. However, affected children are at risk of becoming blind from corneal melting when additional factors arise; for example, when food becomes scarce or during an outbreak of measles. In addition, even this mild degree of vitamin A deficiency may have an important impact on child mortality. A longitudinal observational study of approximately 4000 children in central Java showed a 2.7-fold excess mortality risk for children with night blindness, a 6.6-fold excess for children with Bitot's spots and an 8.6-fold excess mortality risk for children with night blindness, a 6.6-fold excess for children with Bitot's spots and an 8.6-fold excess mortality risk for children with vitamin A deficiency.

Inclusion of these disorders is difficult and expensive, whereas prophylaxis for advice and financial help in organising this survey.

We wish to thank the Bureau for the Prevention of Blindness for advice and financial help in organising this survey.

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