Ocular Trauma in a Rural South Indian Population

The Aravind Comprehensive Eye Survey

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Purpose: To determine the rate of ocular trauma in a rural population of southern India and its impact on vision impairment and blindness.

Methods: A population-based cross-sectional study of 5150 persons 40 years or older in a randomly chosen rural population of 3 districts of southern India. Prospective information on trauma, type and agent of injury, setting of injury, and details of treatment sought for the last episode was recorded with questionnaires after face-to-face interviews. All interviewed subjects underwent a comprehensive ocular examination, including vision estimations, slit-lamp biomicroscopy examinations, and dilated posterior segment examinations.

Results: We elicited a history of ocular trauma in either eye from 229 (4.5%) persons, including 21 (0.4%) persons with bilateral ocular trauma. Blunt injuries (n = 124; 54.9%) were the major cause for trauma reported in this population. The most common setting where the ocular trauma occurred was during agricultural labor (n = 107; 46.9%). Nearly three quarters (n = 170; 74.2%) of those reporting ocular trauma sought treatment from an eye specialist (n = 104; 57.8%) and one fifth (n = 37; 20.6%) from a traditional healer. The age-adjusted (adjusted to the population estimates for India for the year 2000) prevalence for blindness in any eye caused by trauma was 0.8% (95% confidence interval [CI], 0.4–1.1). The odds ratios (OR) for trauma were higher for males (OR, 2.2; 95% CI, 1.6–3.0) and laborers (OR, 1.7; 95% CI, 1.2–2.4) and lower for literates (OR, 0.7; 95% CI, 0.5–0.9). Seeking treatment from a traditional eye healer for trauma was not associated with vision impairment (OR, 1.0; 95% CI, 0.3–3.2) or with blindness (OR, 3.4; 95% CI, 0.2–56.5).

Conclusions: Eye care programs may need to consider ocular trauma as a priority in this population, because the lifetime prevalence of ocular trauma is higher than that reported for glaucoma, age-related macular degeneration, or diabetic retinopathy from this population. Simple measures such as education regarding the use of protective eyewear could possibly significantly decrease this preventable cause of visual disability.

impairment caused by trauma in a rural population of southern India.

Materials and Methods

The Aravind Comprehensive Eye Survey is a population-based study of blindness and vision impairment among persons aged 40 years or older in 3 districts of southern India. Details of the method of this study have been published previously. To summarize, subjects for the study were chosen from villages in the 3 districts through a random cluster sampling approach. Trained social workers identified and enumerated subjects aged 40 years and older within the selected clusters. We offered comprehensive ocular examinations, including vision examinations with Early Treatment of Diabetic Retinopathy Study charts, refraction, anterior segment examinations with slit-lamp biomicroscopy, intraocular pressure measurements with applanation tonometry, dilated posterior segment examinations with direct and indirect ophthalmoscopy, and automated visual field examinations (Humphrey 650 visual field analyzer, Carl Zeiss Ophthalmic Systems, Inc., Dublin, CA). All comprehensive ocular examinations were carried out at the base hospital after obtaining necessary informed consent. We collected demographic, medical, and surgical history details from each participating subject before the ocular examinations. We obtained a history of ocular trauma in any eye from subjects participating in the study using the question “Have you ever suffered from any eye injury in the past?” to elicit this information. We recorded details of the most recent event of trauma as recalled by the subject, including the type of injury, the age at trauma, the setting of injury, and place where treatment was sought for the trauma, if any. The ophthalmologist rechecked for a history of ocular trauma if signs of ocular trauma were evident on clinical examination but a history was not available on patient interviews. The ophthalmologist determined whether trauma was an underlying cause for decrease in visual acuity for subjects with visual acuity worse than 6/18 in any eye.

We defined vision impairment as best-corrected visual acuity between 6/18 and 3/60 in the better eye, and blindness as best-corrected visual acuity worse than 3/60 in the better eye. We estimated the age-adjusted (adjusting to population estimates for India for the year 2000) prevalence with 95% confidence intervals (CI) for blindness caused by trauma. Confidence intervals for prevalence estimates and odds ratios (OR) from the regression analyses were calculated, taking into account design effects (deff) associated with cluster sampling using the generalized estimation equation. We used the chi-square and Fisher exact test to look for significance between categorical variables as appropriate. We used the youngest age at trauma to determine the mean age at trauma and for analysis involving age at trauma for subjects with trauma in both eyes. We estimated the OR (95% CI) for factors associated with trauma and with blindness from trauma in a multiple logistic regression model that included gender, education, and occupation as variables. Mantel-Haenszel ORs were estimated to determine whether the type of trauma, education of subjects, or occupation determined the use of services from an eye specialist or a traditional healer. We considered P values <0.05 significant.

Three levels of informed consent were used in this study: community, household, and individual. Meetings were held with community leaders and all health-related personnel in the area to explain the purpose of the study. Once approval was obtained at these meetings, the study was fully explained to all adults in the household to address any concerns and to secure consent for the household to participate. Before both screening and definitive examinations, the study was explained in detail to all potential participants, and their voluntary consent was solicited. All informed consent was obtained verbally, because a significant proportion of this population is illiterate. The study and this method of obtaining informed consent were approved by the Committee on Human Research at the Johns Hopkins Bloomberg School of Public Health and by the Ethical Review Committee of the Aravind Eye and Children’s Hospitals. The investigators followed the tenets of the Treaty of Helsinki.

Results

We collected data on ocular trauma from 5150 (96.5%) of 5337 enumerated persons aged 40 years and older in the 3 study districts. We elicited a history of ocular trauma in either eye from 229 (4.5%) persons, including 21 (0.4%) persons with bilateral ocular trauma. The mean current age of persons reporting a history of ocular trauma was 52.6±4.5 years (median, 45.0 years; range, 40–85 years), and 141 (61.6%) were males. One hundred thirty-four (39.0%) subjects who reported ocular trauma were literate. Most (n = 153, 66.8%) of those who reported ocular trauma were agricultural laborers (Table 1). Forty-five (19.6%) of the 229 persons with a history of ocular trauma did not remember the age at trauma. The mean age at trauma for the remaining 184 persons was 42.3±15.5 years (median, 45.0 years; range, 5–75 years). The age at trauma did not differ significantly between genders (P = 0.5).

Blunt injuries (n = 124; 54.9%) were the major cause of trauma reported in this population (Table 2). We found that the most common setting of ocular trauma was agricultural labor (n = 107; 46.9%). More than one fourth (n = 61; 26.7%) of all ocular trauma occurred in a domestic setting. Nearly three quarters (n = 170; 74.2%) of those reporting ocular trauma sought treatment for their injury primarily from an eye specialist (n = 104; 57.8%). Nearly one fifth (n = 37; 20.6%) of those with trauma sought treatment from a traditional or local healer. Education of the subject was not associated with seeking treatment from an eye specialist (OR, 0.9; 95% CI, 0.5–1.6) or a traditional healer (OR, 0.8; 95% CI, 0.4–1.6). After adjusting for age and gender, being engaged as a laborer was not associated with seeking treatment from either an eye specialist (OR, 0.3; 95% CI, 0.1–1.2) or a traditional healer (OR, 1.7; 95% CI, 0.4–7.6). After adjusting for age and gender, the type of trauma, either blunt or penetrating injury, was not associated with utilization of service from an eye specialist (reference category blunt injury, penetrating injury [OR, 1.2; 95% CI, 0.4–2.4],
Table 2. Characteristics of Trauma and Use of Services by Gender

<table>
<thead>
<tr>
<th>Type of trauma</th>
<th>Female (n = 88)</th>
<th>Male (n = 141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blunt</td>
<td>49 (55.7%)</td>
<td>75 (53.2%)</td>
</tr>
<tr>
<td>Penetrating, large</td>
<td>10 (11.4%)</td>
<td>11 (7.8%)</td>
</tr>
<tr>
<td>Penetrating, small</td>
<td>6 (6.8%)</td>
<td>18 (12.8%)</td>
</tr>
<tr>
<td>Chemical</td>
<td>2 (2.3%)</td>
<td>3 (2.1%)</td>
</tr>
<tr>
<td>Foreign body</td>
<td>19 (21.6%)</td>
<td>22 (15.6%)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>2 (2.3%)</td>
<td>12 (8.5%)</td>
</tr>
<tr>
<td>Sought treatment</td>
<td>67 (76.1%)</td>
<td>103 (73.1%)</td>
</tr>
<tr>
<td>Treatment sought from eye specialist</td>
<td>42 (47.7%)</td>
<td>63 (44.7%)</td>
</tr>
<tr>
<td>General practitioner</td>
<td>3 (3.4%)</td>
<td>9 (6.4%)</td>
</tr>
<tr>
<td>Traditional healer</td>
<td>18 (20.5%)</td>
<td>19 (13.5%)</td>
</tr>
<tr>
<td>Optician</td>
<td>2 (0.3%)</td>
<td>2 (1.4%)</td>
</tr>
<tr>
<td>Nonallopathic practices</td>
<td>4 (4.6%)</td>
<td>10 (7.1%)</td>
</tr>
<tr>
<td>No treatment sought</td>
<td>21 (23.9%)</td>
<td>38 (26.9%)</td>
</tr>
</tbody>
</table>

Data presented as number of subjects with percentage in parentheses.

foreign body [OR, 0.7; 95% CI, 0.3–1.6], chemical injury [OR, 1.1; 95% CI, 0.2–6.3] or from a traditional healer (reference category blunt injury, penetrating injury [OR, 3.2; 95% CI, 0.7–15.3], foreign body [OR, 1.8; 95% CI, 0.7–4.4]).

We identified trauma as the underlying cause for vision impairment (vision between 6/18 and 3/60 after best correction for that eye) in 68 (27.2%) eyes, including 38 of these 68 (15.2%) eyes that were blind (vision worse than 3/60 after best correction for that eye). Among the 38 eyes that were blind with trauma identified as the underlying cause, 16 (42.1%) eyes were phthisical, 10 (26.3%) eyes had corneal scarring, 5 (13.2%) eyes had macular scarring, 3 (7.9%) eyes had retinal detachments, 2 (5.3%) eyes had optic atrophy, and 1 (2.6%) eye each had a macular hole and a total hyphema. We identified trauma as the underlying cause for vision impairment in 39 persons, of whom 32 (82.1%) persons were blind in 1 eye. Six of the 7 (17.9%) persons who were visually impaired had bilateral vision impairment with trauma as an underlying cause. Trauma was not attributed as an underlying cause for any person with bilateral blindness. The age-adjusted (adjusted to the population estimates for India for the year 2000) prevalence for blindness in any eye caused by trauma was 0.8% (95% CI, 0.4–1.1; defl = 1.7).

We found OR for trauma to be significantly higher for males (OR, 2.2; 95% CI, 1.6–3.0) and laborers (OR, 1.7; 95% CI, 1.2–2.4) and significantly lower among literates (OR, 0.7; 95% CI, 0.5–0.9) in a multiple logistic regression model. The multivariate model seems appropriate because we did not find correlation sufficient to produce collinearity between the variables concerned.

In a multiple logistic regression model that included gender, education, and occupation, the odds for blindness in any eye because of trauma were significantly associated only with male gender (OR, 3.8; 95% CI, 1.8–8.0). Seeking treatment from a traditional eye healer for trauma was not associated with vision impairment (OR, 1.0; 95% CI, 0.3–3.2).

Discussion

Data from our study suggest that ocular trauma is a major problem for this rural population, with the prevalence higher than that reported for glaucoma, diabetic retinopathy, or age-related macular degeneration. Much of the ocular trauma was, however, unilateral and did not lead to bilateral blindness. The prevalence of ocular injury in this rural population is similar to that reported earlier (age-gender adjusted rate of 4.0%; 95% CI, 2.5–5.4) from an urban population in Andhra Pradesh in south central India. The prevalence of blindness in any eye because of trauma is also similar to that reported from an urban population (0.6%; 95% CI, 0.2–1.0) in Andhra Pradesh. Consistent with that study, we found a higher prevalence of ocular injury among males and laborers. However, the setting of ocular injuries was different for both populations; many of the ocular injuries in the rural population occurred in an occupational setting (agriculture), whereas most of the injuries in the urban population occurred while playing.

Previous studies have consistently reported poor utilization rates for eye care services in rural populations of India, although these reports have primarily focused on chronic diseases like age-related cataract. Much of the poor utilization of eye care among rural populations has been attributed to the lack of available and affordable eye care services. It is interesting to note that nearly 75% of those with a history of ocular injuries sought treatment and primarily from an ophthalmologist (n = 104; 57.8%). It is possible that the acute nature and the associated symptoms may be driving people with ocular injuries to seek eye care. Our study was not, however, designed to further explore the reasons for an increased uptake of services. The lack of data on the duration between injury and seeking treatment is another limitation that prevents us from commenting further on this issue. We are also unable to comment on whether appropriate treatment at an appropriate time might have averted much of the blindness or vision impairment or influenced outcomes of injury in any manner.

Education, occupation, or type of injury was not associated with seeking treatment from a traditional healer; one fifth of those with ocular injuries in this population sought treatment from a traditional healer. It is possible that the proportion of people we report seeking care from a traditional healer is an underestimate. Our questionnaire was not designed to ascertain whether people sought care from more than 1 eye care provider, and we would not have data if people sought care from a traditional healer before seeking care from an ophthalmologist. The relatively large proportion of people seeking treatment from a traditional healer in this population suggests the potential to train and use traditional healers as primary care providers in rural populations. A previous study from Malawi has reported successful use of traditional healers for the management of corneal diseases.

The higher rates of trauma among males, laborers, and those with lower levels of education that we report are consistent with other studies worldwide. Our results are also consistent with a study on ocular trauma in a rural population in Nepal that reported higher rates of trauma among males and laborers, with literacy being a protective factor. The setting of injury in our study was also similar to that reported from rural Nepal, with domestic or agricultural injuries being the most common.

It is interesting to note that a high percentage of people...
reported seeking treatment for their most recent eye injury. This could be in part because of the study design, in which a question regarding eye trauma was asked. This could also be because more minor eye injuries were underreported.

Door-to-door enumeration and high response rates from subjects who were randomly selected is a major strength of our study. However, it is possible that the prevalence of trauma we report is actually an underestimate, because much of the information on trauma was collected by recall, and people may not have reported minor injuries or injuries sustained at younger ages, especially during childhood. If we extrapolate our results to the rural population of India, there may have been 8,692,332 persons with at least 1 episode of ocular trauma during their lifetime, and 1,580,424 of these persons may have monocular blindness related to trauma. Although these extrapolated numbers should be interpreted with caution because our study population may not be representative of the diverse rural population of India, they do suggest the magnitude of the problem ocular injuries pose in rural India. Eye care programs in India need to consider ocular trauma as a priority alongside other chronic diseases of the eye.

References