Original article

Agriculture related corneal injuries

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Abstract

Introduction: Agricultural workers are predisposed to corneal injuries, which, if neglected, can lead to corneal blindness. **Objective:** To study the prevalence and mode of agriculture-related corneal injuries in the village of Badkali, MuzaffarNagar, Western Uttar Pradesh, India in 2005 – 2006. **Subjects and methods:** Adult population of village Badkali, MuzaffarNagar, Uttar Pradesh. A door-to-door survey was carried out by paramedical ophthalmic assistants in October and November 2007. The main outcome measure was occurrence of corneal trauma in the fields from January 2005 until December 2006, its mode of injury, symptoms, treatment taken and outcome. **Results:** The study area comprised of 718 people, of whom 584 were engaged in agricultural activities and 481 were male. While working on the fields, 221 persons sustained corneal injuries and out of them four were injured more than once. The number of injuries caused due to sugarcane leaves, wheat , cattle tail/ ear, 'cheri leaves' and others were 83(36.7 %), 24(10.6 %), 60(25.5 %), 31(13.7 %)and 28(12.4 %) respectively. All were closed globe injuries except for two. Out of the 221 injured, 117 (51.7 %) took treatment and 95(42.2 %) had a best corrected visual acuity < 6/18. **Conclusion:** The majority of the population in Badkali were employed in farming. Logistic regression shows that the occurrence of injuries was more in those engaged in farming and related activities as compared to other occupations (OR = 0.012, p = 0.000, 95 % CI = 0.02, 0.09) and the maximum number of injuries being caused by sugar cane leaves followed by cattle tails.

Key-words: agriculture, farming, corneal injury, corneal blindness, prevention

Introduction

Corneal blindness is a major public health problem worldwide and infectious keratitis is one of the predominant causes (Chirambo, 1976; Chirambo1986; Rapoza, 1991; Brilliant, 1985; Khan, 1985; Gilbert, 1995). Fungal keratitis is challenging both in terms of diagnosis and treatment; and is very common in South India (Liesegang,1980; Hagan,1995). Agricultural workers seem to be at greatest risk of developing fungal keratitis and the inciting agent is usually a minor trauma with a vegetable foreign body. This pilot study was undertaken to find the causes of corneal injury in agricultural workers.

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Subjects and methods

A pilot study was undertaken in October and November 2007 in the village of Badkali, Muzaffarnagar, Uttar Pradesh, India. In Uttar Pradesh, sugarcane, wheat and 'cheri' are cultivated throughout the year. A questionnaire was prepared for a door to door survey. The inclusioncriteria were age more than or equal to 18 years and history of corneal injury due to farming. Ten experienced paramedical ophthalmic assistants (PMOA) were recruited to conduct the study. They were explained about corneal ulcer and its sequel by lectures and videos by the authors. They were also trained to gather the required information, fill up the forms and impart the knowledge on preventive aspects.

These PMOAs went to each house to collect the information from the study population. They filled up a form which included details of the number of family members, gender, occupation, any episode of corneal trauma in the field (in 2005 and 2006), mode of injury, symptoms, treatment taken and outcome.

They educated the villagers using handouts about the consequences of corneal injuries, the necessity of immediate treatment and the need to wear protective goggles/head gear while working on the fields. The head gear was indigenously prepared by a local worker on the author's instructions using a metallic net available in the local market for putting on windows for protection against mosquitoes. The metallic net was cut in a rectangular shape and a cotton piping was sewn all around. It could be tied around the head (Figure 1). The head gear was more acceptable to the farmers because it gave a wider field of view, comfort, durability and had an indigenous nature.

The survey was conducted from 1st October 2007 to 31st October 2007. Snellen's charts were also placed in the courtyard of 15 houses and people were taught to check their vision of one eye at a time, at 6 meters distance. Goggles/head gears were made available at a nominal rate at the local shop. The corneal injury data obtained from the questionnaires was compiled and evaluated. **Statistical analysis**: Logistic regression was applied, considering predictor variables like sex, occupation and, among the injured persons, for assessment of the risk of vision loss with treatment taken. For the purpose of logistic regression, the cases with multiple injuries were merged with the other categories. All the applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the research.

Results

The study population comprised of 718 persons out of which 481 were males (Figure 2). Farming and its related activities were pursued by 584 people. From 1st January 2005 to 31st December 2006, 221 persons sustained corneal injuries. Eighty-one injuries were caused by sugarcane leaves, twenty two by wheat, fifty seven by cattle tail / ear and twenty nine by 'cheri leaves'. Four persons were injured more than once, one with sugarcane and wheat, the second with wheat leaf and cattle tail, the third with cattle tail and cheri leaf and the fourth with sugarcane leaf, cattle tail and cheri leaf. Other causes like fall of dust, insect, acid, iron dust and trauma with mango/ shesham tree bark constituted 28 (12.4%) cases. There were only two open globe injuries while the rest were all closed globe injuries. Out of the total 221 injured, 117 participants (52.9%) took treatment which lasted for less than two weeks in 60 persons (27.1%) and more than or equal to two weeks in 57 persons (25.8%). The final best corrected visual acuity was $\geq$6/18 in 116, < 6/18$\geq$6/60 in 23, <6/60 $\geq$ 1/60 in 70 and <1/60 in 12 persons.

The logistic regression showed that the occurrence of injuries was more in those engaged in farming and related activities as compared to other occupations (OR=0.012 , p=0.000, 95% CI = 0.02 - 0.09). However sex does not show any relationship with occurrence of injuries (OR=1.3, p=0.12, 95%CI=0.93-1.8). Among the injured persons, logistic analysis showed that the risk of vision loss up to <1/60 was more as compared to

those with ≥ 6/18 (OR=0.20, p= 0.041, 95%CI= .04-.96). Rest of the categories with vision loss <6/ 18 to ≥ 1/60 are not significant when compared to those with ≥ 6/18.

Figure 1: Indigenously prepared head gear

Characteristics	Frequency (n)	Percentage (%)
Age Group		
<=20	96	13.4
21-30	152	21.2
31-40	171	23.8
41-50	137	19.1
>=50	162	22.6
Total	718	100.00
Sex		
Male	481	67.0
Female	237	33.0
Total	718	100.0
Occupation		
Agriculture	584	81.3
Others	134	18.7
Total	718	100.0
Injury		
Occurred	221	30.8
Did not occur	497	69.2
Total	718	100.0
Mode of injury		
Sugarcane (1)	81	36.7
Wheat(2)	22	10.0
Cattle Tail (3)	57	25.8
Cheri leaves (4)	29	13.1
Others (5)	28	12.7
1,2	1	.5
3,2	1	.5
3,4	1	.5
1,3,4	1	.5
Total	221	100.0
Whether treatment taken		
Yes	117	52.9
No	104	47.1
Total	221	100.0
Duration of treatment		
Treatment not taken	104	47.1
Treatment taken for <2 weeks	60	27.1
Treatment taken for ≥2 weeks	57	25.8
Total	221	100.0
Type of Injury		
Close Globe	219	99.1
Open globe	2	.9
Total	221	100.0
Final Best corrected visual acuity(BCVA)	116	52.5
≥6/18	23	10.4
<6/18≥6/60	70	31.7
<6/60≥1/60	12	5.4
<1/60	221	100.0
Total		

Figure 2: Characteristics of study population

Discussion

Corneal trauma, even if trivial, is a predisposing factor for development of corneal ulcer. In a review of 1353 cases of fungal keratitis in Southern India, preceding history of trauma typically agricultural was noted in 54.4% cases (Gopinathan, 2002). Farmers are at risk for work related eye injuries, some of which can be very serious (Sprince, 2008). We found no difference in the risk of corneal trauma amongst the two sexes in those engaged in the farming. An increased occurrence of injuries in males has also been reported from South India (Srinivasan, 2006). Sugarcane leaves accounted for the maximum number of injuries in our study. Sugar cane is a major crop grown throughout the year in Western Uttar Pradesh. The sugar cane leaves have sharp edges. Ocular injuries are likely to occur when the farmers tie the stems together while harvesting. The second common source of injury was the cattle tail/ear. Injuries occurred while milking and bathing them. While milking, the to and fro movement of the tail occurs due to the irritation caused by house flies and may accidentally hit the eye of the farmer. Leaves of wheat and 'cheri' crops, fall of dust, insect, acid, iron dust, mango/ sheesham tree bark were the other causes of corneal trauma in our study. Paddy, tree branch, dust, vegetable matter (hay, sugar cane, grass, corn, stalks, wood, onions, ground nut, palm leaf), animal matter, metallic foreign body, miscellaneous objects, finger nail and unknown accounted for 25.40 %, 18.70 %, 18.0%, 15.10 %, 5.60 %, 4.90 %, 4.90 %, 4.20 and 3.20 % of total cases of corneal injury respectively in a study conducted at Madurai, Southern India (Srinivasan, 1997). Cow tail/dung caused only 5.60 % of injuries in their study in comparison to 26.60 % in ours.

In our study population, only 52.9 % of the total number of persons injured took treatment. This could be due to lack of awareness and non-accessibility to eye care services.

Ignorance about the consequences of these injuries results in lack of prompt institution of adequate therapy leading to even a greater morbidity. In our study, the treatment lasted for more than or equal to two weeks in 43 % cases. The eye was lost in both the cases of open globe injury. The risk of BCVA < 1/60 as compared to those with ≥ 6/18 indicates that the vision loss could be prevented if timely treatment is taken. A larger sample size is required to validate these findings.

The epidemiological pattern and causative agents for suppurative corneal ulcer varies significantly from country to country, and even from region to region within the same country. It is thus important to determine the "regional" aetiology within a given region for a comprehensive strategy for the diagnosis and treatment of corneal ulcer (Leck, 2002). Administration of prophylactic 1 % chloramphenicol and 1 % clotrimazole by paid village health workers to patients with corneal abrasion who reported within 48 hours resulted in healing without complications in 98.5 % patients (Srinivasan, 2006). The "regional" information is important with regard to empirical management, as most of the eye clinics in the locality do not have microbiology facilities. However the cost factor, the non-availability of committed health care workers and effective antimicrobial agents are a major constraint in drug prophylaxis. Prevention of injury itself, using protective goggles/head gear in the population at risk is a cheaper and more feasible option.

The study limitations were the recall bias, small sample size, non-availability of vision record prior to injury and the exact nature of the treatment taken.

Conclusion

The farmers are at risk for corneal injuries during their diverse activities while working in the fields. Sugar cane and cattle are a major source of corneal trauma in the farmers of Muzaffarnagar, Northern India. Educational campaigns through television, radio and newspapers are required to increase awareness amongst the villagers regarding the use of protective glasses/head gear and to seek prompt treatment in the event of ocular injury.

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