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Epidemiology of ocular trauma cases presenting to a tertiary care hospital in a rural area in West Bengal, India over a period of 2 years

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Abstract: *Ocular trauma occurs frequently in India and constitutes a major health problem. The present study was conducted to estimate the burden and epidemiological co-relates of ocular injuries in a tertiary care hospital. A retrospective record based study of ocular trauma cases attending the outpatient and emergency departments of Ophthalmology, North Bengal Medical College and Hospital, (NBMC & H) between 2013 and 2014 was performed. A total of 510 patients were included in the study of which 83.7% were male and 90.6% were literate. Adults, children and elderly comprised 79%, 17.6% and 3.3% of the study population. Closed globe injuries were the commonest (72.2%). More than 40% of the patients with eye injuries suffered these injuries at the workplace including agricultural activities. Preliminary treatment was sought at the NBMC & H in 57.1% of the cases while 8.1% of the patients preferred self-medication before attending the NBMC & H. Almost all (95.3%) patients attended the NBMC & H within the first 3 days following injury. More than 90% of the patients with OGI had clinical blindness (VA < 3/60) at presentation. Following treatment the proportion of patients with persistent blindness in the OGI group was 74.6%. This analysis provides an epidemiological study of patients who attended the outpatient and emergency department of the NBMC & H, Darjeeling.*

Keywords: *Ocular injuries, Tertiary care, West Bengal*

I. Introduction

Although eyes represent only 0.1% of the total body surface and only 0.27% of the anterior body surface, their significance to individuals and society is disproportionately higher. Those affected from ocular injuries often have to face loss of career opportunities, major life style changes and occasionally permanent disfigurement. In addition to physical and psychological costs of eye injuries to the individual, the direct and indirect cost of eye injuries to the society is enormous. Trauma has become the most common reason for extended hospitalisations of ophthalmic patients in industrialised nations. There are almost 2.5 million incident cases of eye injuries each year in the United States alone. [1] The number of people with trauma related visual impairment was close to 1 million in 1977 with 40,000 to 60,000 incident cases of trauma related visual impairment annually.[1] The annual incidence of hospitalisation for eye injuries is 8.1, 12.6, 13.2 and 15.2 in Scotland[2], Singapore[3], United States[4] and Sweden[5] respectively. One epidemiological study of ocular trauma in rural Nepal showed the incidence is 0.65 per 1000 males per year and 0.38 per 1000 female per year.

There have been differences in the findings of studies on ocular injuries from different parts of the world. While most studies have found increased incidence of injuries in young males,[6,7,8] others have found a bimodal distribution.[9] The most frequent causes of injuries were outdoor activities related, work related or sports related in men and home related and outdoor activities related in women.[10] In children the highest proportion of injuries occurred at home followed by streets and roads.[11] Differences have also been reported in the frequency of closed and open globe injuries presenting to the outpatient and emergency departments of tertiary care hospitals.[12,13,14,15]

Ocular trauma occurs frequently in India and constitutes a major health problem like in other developing countries.[16] The nature and patterns of injuries differ from country to country and from region to region based on occupation and other socio-demographic factors. Developing preventive protocols and proper planning of healthcare resources to tackle the problem demands epidemiological data specific to the region. The present study was conducted at the North Bengal Medical College and Hospital (NBMC & H), Darjeeling to determine the patterns of injuries attending the institute.

II. Materials and methods

Study setting

The NBMC & H is a tertiary care institute located in the district of Darjeeling in a rural area in West Bengal, India.

Study duration

The study was conducted between January 2013 and December 2014.

Study population

All patients attending the outpatient department of Ophthalmology and the Emergency at the NBMC & H with ocular injuries were included in the present study.

Study methodology

Clinical details of all cases were recorded on predesigned and pretested schedules. Patients requiring surgical intervention were admitted to the ophthalmology ward. Admitted patients were followed up till discharge in the indoors. Patients not requiring admission and discharged patients were asked to follow at the ophthalmology outpatient department where records were regularly updated by the researcher.

Definitions

Operational definitions were according to the World Health Organisation (WHO) and Birmingham eye trauma terminology system (BETTS)

- **Blindness:** visual acuity <3/60
- **Eye wall:** cornea and sclera
- **Closed globe injury:** no full thickness wound of the eye wall
    - **Contusions:** no full thickness wound, direct energy delivery (e.g. choroidal rupture) or due to change in shape of the globe (e.g. Angle recession)
    - **Lamellar laceration:** partial thickness wound of the eye wall
- **Open globe injury:** full thickness wound of the eye wall
    - **Laceration:** full thickness wound at the impact site of a sharp object by outside–in mechanism
    - **Penetrating:** entrance wound only
    - **Perforating:** entrance plus exit wound
    - **Intra-ocular foreign body:** technically a penetrating injury, but grouped separately because of different clinical implications
    - **Rupture:** full thickness wound by blunt object by inside-out mechanism due to increased intra-ocular pressure
    - **Adnexal injuries:** eyelid and/or conjunctiva injuries
- A person was deemed as literate if he or she can read or write with understanding in any language. A person who could merely read but couldn't write was not considered literate. [17]
- **Lost to follow-up:** the patients that did not attend the institute after the initial visit were described as lost to follow-up.

III. Results

A total of 510 patients were included in the study of which 427 (83.7%) were male and 462 (90.6%) were literate. Adults, children and elderly comprised 403 (79%), 90 (17.6%) and 17 (3.3%) of the study population.

Closed globe injuries were the commonest (368, 72.2%) type of injuries of which contusions, abrasions, superficial lacerations of external ocular surface and lamellar lacerations were the most frequent. Among open globe injuries (142, 27.8%), rupture of the globes was the most common. (Table 1)

More than 40% of the patients with eye injuries (209, 41.1%) suffered injuries at the workplace including agricultural activities. The other common injuries were sustained at home (142, 27.8%), road traffic accidents (16, 11.2%), assault (46, 9.0%). The lowest number of reported cases was injuries sustained at the school (11, 2.2%). (Table 2)

Preliminary treatment was sought at the NBMC & H in 291 (57.1%) patients while 41 (8.1%) patients preferred self-medication before attending the NBMC & H. (table 3). Almost all (486, 95.3%) patients attended the NBMC & H within the first 3 days following injury, 18 (3.5%) attended between 4 and 7 days while 6 (1.2%) attended the institute more than a week after the injury.

More than 90% (132) of the patients with OGI had clinical blindness (VA < 3/60) at presentation compared to only 8.1% (30) of patients with closed globe injuries. Following treatment the proportion of patients with persistent blindness in the OGI group was 75.4% (107) (including patients lost to follow up) while in the CGI group was 7.8% (29). (Table 4)

IV. Discussion

Although ocular injury is an important cause of preventable loss of vision, particularly in developing countries, until recently there has been only limited progress towards understanding the epidemiology and prevention of eye trauma. The prerequisite of any prevention programme for a disease is an understanding of the magnitude of the problem and the distribution and determinants of the disease. Only a thorough knowledge of the same will enable the institution to arrange appropriate and reliable preventive measures and plan resources at the treatment levels.

Socio-demography of eye injury

Increased involvement in occupations, sports and a risky and adventure seeking behaviour increases the chances of injury among younger men to eye injuries.[18] This phenomenon seems to be common throughout the world, as evidenced by the predominance of males in younger age groups reporting eye injuries in india[12,13] as well as other countries in the developing and developed worlds. [19,20,21,22,23]

Children are at risk of ocular trauma because of their tendency to experiment with new objects and to imitate adult behaviours without being aware of the risk. Most of these hazards occur from careless and unsupervised games. [24] In their study from china, ciao et al reported a relatively high percentage of children less than 14 years of age among patients hospitalised with eye injuries that could be attributed to the local toy industries.[19] The reasons for the high percentage of children among patients with eye injuries in the present study had not been investigated further.

Among patients with eye injuries males constitute 80-85% of the total number attending the outpatient and emergency department of the hospitals in this geographical region. [25,26] Although it is tempting to assign the reason for this towards a differential use of the health care system, community based survey reports from developed countries show a similar increased male predominance of eye injuries. [27,28] This again can be attributed to the increased outdoor, occupational and sports and recreational activities with higher risk of injuries in men.

According to Liggett[29] and Glynn[30], less educated and less wealthy persons are prone to partake in risk taking activities and thus to be injured. In a door to door survey in rural Nepal, Khatry reported 50.9% literate males and 31.2% of literate females, among all ocular injury patients.[31] In their study from a south India community, Nirmalan et al reported lower odds ratios (OR) for literates for eye trauma.[32] However, studies from an urban slum population in Delhi, India did not corroborate the reported decreased risk of ocular trauma in literates. [33]

Place of occurrence of eye injuries

Work place injuries were the commonest cause of injury, similar to studies from India and other countries.[23, 33,32, 34]almost half of these were sustained during agricultural activities, probably due to the fact that large sections of the population attending the NBMC & H belong to the farming community from the nearby areas. One study estimated the incidence of eye injuries in agriculture to be lower than construction but higher than industrial works.[35]

India has a very high road traffic accident rate (1,047.7 persons injured per 10000 kms of roads). In West Bengal 394.5 persons are injured in road traffic accidents per 100000 kms. [36] This high rate of accidental injuries may be the reason for the higher number of eye injuries in the present settings than those reported in other studies.[26,37,38,39]

Initial treatment and presentation delays

Awareness of services delivered at a centre may contribute to early presentation.[18] the NBMC & H is regarded as a centre for excellence in the treatment of ocular conditions in this part of the state and apprehension of loss of sight following injury may be responsible for an increased utilisation of services at the NBMC & H. The main reason for the section of patients not attending the NBMC & H as first choice or presenting late to the institute were distance, financial disability, ignorance, relatively minor amount of injury, late referral or sheer reluctance. There are contradicting reports regarding the presentation of injuries for treatment when compared to the present study. Most studies from developing countries including India show significant delays in most patients in seeking medical care. [40,41,42] Even among developed countries delays in seeking treatment has been reported. [43]

Correlation between initial and final visual outcome

Post traumatic blindness (VA < 3/60 in the best eye) was seen in only 10% of patients with closed globe injury while more than 90% of patients with open globe injuries presented with clinical blindness in the present study. Prognosis following trauma has been attributable to several factors, VA at presentation being the

most important one. [19,44,45, 46, 47] Despite advancements in microsurgical techniques in many cases the eyes cannot be salvaged,[48]hence the importance of prevention of eye injuries.

Limitations

Since this was a retrospective record based study only data recorded in the register could be used. Detailed socio-demographic records were not kept at the institute records and hence not included in the study. No active follow-up of the patients were undertaken and hence the long term outcome of the patients were not available. There being a large number of alternate service providers in the study area, a part of the population especially from the higher socio-economic strata is likely to attend these paid private providers. Again, the figures in the present study are underestimates since patients with minor eye injuries would not have attended the NBMC & H or any other service provider.

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Conflict of interest

The authors do not have any conflict of interest to declare.

Table 1: types of injuries (n=510)

Injury type		Frequency	Percentage
Closed globe injuries (n=368)	Contusions, abrasions, superficial lacerations of external ocular surface, lamella lacerations	226	44.3
	Superficial foreign body	100	19.6
	Fire cracker injury	19	3.7
	Chemical injury	22	4.3
	Thermal/ miscellaneous injuries	1	0.2
Open globe injuries (n=142)	Rupture	67	13.1
	Penetrating injury	53	10.4
	Perforating injury	2	0.4
	Intra-ocular foreign body	5	1.0
	Fire cracker causing open globe injury	11	2.2
	Blast injury	4	0.8

Table 2: distribution of injuries based on place of occurrence

Place	Number	Percentage
Work place including agriculture	209	41.06
Home	142	27.84
Road traffic accident	57	11.17
Assault	46	9.01
Sports	17	3.23
At school	11	2.15
Bomb blast and fire cracker	28	5.49
Total	510	100

Table 3: place where treatment first sought

Treatment where preliminary treatment was sought	Number	Percentage
North Bengal Medical College and Hospital	291	57.1
Any nearby health centre	76	14.9
Nearby doctor	59	11.6
Paramedical staff	43	8.3
Self or neighbour	41	8.1
Total	510	100

Table 4: Visual outcome at presentation and last follow-up

Type of injury (N)	Initial Vision (N, %*)	6/6 – 6/12 N (%#)	6/18 – 6/36 N (%#)	6/60 – 3/60 N (%#)	2/60 – PL + PR accurate N (%#)	PL+ PR defective – no PL N (%#)	Fixation CSM N (%#)	Failed F/U N (%#)
Closed globe injuries (368)	6/6 – 6/12 (242, 65.8)	237 (97.9)	0	1(0.4)	0	0	0	4(1.6)
	6/18 – 6/36 (72, 19.6)	44 (61.1)	24 (33.3)	0	1(1.4)	0	0	3(4.2)
	6/60 – 3/60 (24, 6.5)	2 (8.3)	10 (41.7)	12 (50)	0	0	0	0
	2/60 – PL + PR accurate (13, 3.5)	1(7.7)	0	8 (61.5)	3(23.1)	0	1(7.7)	0
	PL+ PR defective – no PL (3, 0.8)	0	0	0	0	3(100)	0	0
	Could not be determined (14, 3.8)	0	0	0	0	0	12 (85.7)	2 (14.3)
Type of injury (N)	**Initial Vision (N, %**)**	**6/6 – 6/12 N (%##)**	**6/18 – 6/36 N (%##)**	**6/60 – 3/60 N (%##)**	**2/60 – PL + PR accurate N (%##)**	**PL+ PR defective – no PL N (%##)**	**Fixation CSM N (%##)**	**Failed F/U N (%##)**
Open globe injuries (142)	6/6 – 6/12 (n= 3, 2.1)	3 (100)	0	0	0	0	0	0
	6/18 – 6/36 (n= 3, 2.1)	0	2 (66.7)	1(33.3)	0	0	0	0
	6/60 – 3/60 (n= 4, 2.8)	0	0	3 (75)	0	0	0	1(25)
	2/60 – PL + PR accurate (n= 62, 43.7)	0	0	26 (41.9)	33 (53.2)	3(4.8)	0	0
	PL+ PR defective – no PL (n= 54, 38)	0	0	0	10 (18.1)	40 (74.1)	0	4 (7.4)
	Could not be determined (n= 16, 11.3)	0	0	0	1(6.3)	0	12 (75)	3(18.7)

* percentage of closed globe injuries
**percentage of open globe injuries
#percentage of number of cases in the initial visual acuity group
##percentage of number of cases in the initial visual acuity group

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