

# Ocular Morbidity among Earthquake Survivors in a Community Based Hospital in Nepal

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## ABSTRACT

### Background

Nepal suffered a massive loss of lives and property following devastating earthquake on Saturday 25 April, 2015 and 12 May, 2015. Though Nepal is prone to natural disasters and ocular trauma being important cause of visual morbidity, the impact of ocular trauma in disaster setting has rarely been studied.

### Objective

The aim of this study was to report the spectrum of ocular morbidities among the earthquake survivors who presented to a tertiary care Hospital which lies close to major earthquake hit districts of Nepal.

### Method

This is a hospital based retrospective study where details of all the cases with ocular injury or ocular diseases during first three weeks of earthquake were extracted from the record books of Ophthalmology and Emergency department. Detail ophthalmic examination findings and treatment received by the patients were also noted from the records, tabulated and analyzed.

### Result

There were total 3679 earthquake survivors, majority from Kavrepalanchowk district, visiting our Hospital during first three weeks of earthquake among which 92 patients had ocular problems. Among the 117 affected eyes, 75% had unilateral involvement. Males and females were equally affected. Children and adolescents of age group 11-20 years was the most commonly affected age group. Spectrum of ocular injuries ranged from lid lacerations, conjunctival inflammation to sixth nerve palsy and traumatic optic neuropathy.

### Conclusion

Ocular morbidity either in the form of ocular injuries or diseases were common in polytrauma cases among the earthquake survivors. Though most of them had eyelid injuries and conjunctival inflammations, vision threatening conditions were also observed which needed expert opinion and meticulous treatment.

## KEY WORDS

*Earthquake, ocular trauma, ocular morbidity*

## INTRODUCTION

Nepal is the 11<sup>th</sup> most earthquake-prone country in the world and has experienced a major earthquake every few generations.<sup>1</sup> The devastating earthquake of 7.8 richter scale on 25<sup>th</sup> April and 6.8 richter scale on May 12<sup>th</sup> 2015 caused widespread death, destruction and displacement of people. This terrible calamity killed over 8,790 people and injured more than 22,300. Among the highly affected fourteen districts, about five major earthquake stricken districts lie close to our hospital.<sup>2</sup>

In most earthquakes, the clinical spectrum ranges from crush injuries to ocular injuries varying from lid lacerations to vision impairing traumatic optic neuropathies or eyeball perforations. Likewise, huge amount of dust generated due to collapsed buildings may cause eye infections as well as other ocular morbidities.<sup>3</sup> Ocular morbidity is defined as the spectrum of eye diseases which includes both visually impairing and non-visual impairing conditions, experienced by population which may be due to trauma or ocular inflammations, infections etc.<sup>4</sup>

Ocular trauma is an important public health problem worldwide and can lead to significant visual impairment and loss of vision. Annually more than 2.4 million cases of ocular trauma with more than 40,000 patients sustain significant visual impairment permanently due to ocular trauma and is the second leading cause of unilateral blindness in Nepal accounting for 13.6% of total blindness.<sup>5,6</sup>

Despite its importance, there are no data and studies carried out which estimates the burden and impact of ocular morbidity due to natural disasters like earthquake in our local context inspite of Nepal lying in the earthquake prone zone. So, this study aims to analyze the pattern of ocular morbidity among the earthquake survivors in a community based Hospital of Nepal which lies close to the major earthquake hit districts of Nepal.

## METHODS

This was a hospital based retrospective study conducted in department of Ophthalmology in Dhulikhel Hospital, Kathmandu University Hospital. Informed consent was not necessary for this study as it was a retrospective study which included the pre-existing data. The Institutional review committee of Kathmandu University approved this study. We retrospectively reviewed the records book of Ophthalmology out patient department and emergency department including the patients of any age group, with earthquake related ocular problems or injuries, who presented during first three weeks of the disaster period from 25<sup>th</sup> April to 15<sup>th</sup> May 2015. The detailed information including age, gender, address, date of examination, best corrected visual acuity (BCVA), diagnosis and type of ocular injury were retrieved from the record. Details of the treatment received by the patients with investigations reports like x-ray orbit, CT Scan and MRI whenever done

were also retrieved from the record book. Ocular injuries were further classified as open globe injuries or closed globe injuries according to Ocular Trauma Classification Group by Kuhn and associates.<sup>7</sup> Statistical analyses were performed using descriptive methods and SPSS version 15.0 (Statistical package for social sciences, Inc., Chicago, IL, USA). Categorical variables are presented as frequencies and percentages, and continuous variables as mean, standard deviation (SD) or median values.

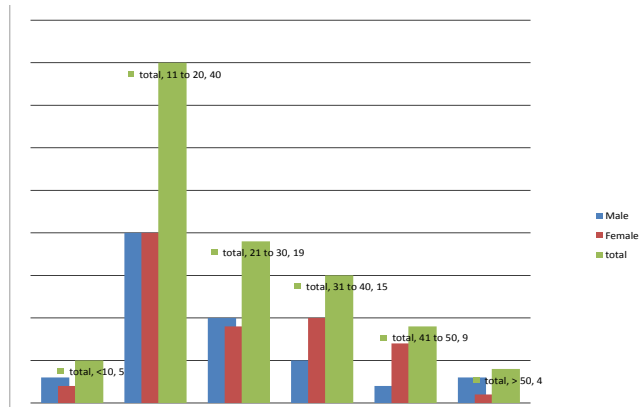


Figure 1. Age and Sex Distribution of Earthquake Survivors

## RESULTS

According to the hospital records, total 3679 earthquake affected patients were managed in Dhulikhel Hospital, majority of which consisted of orthopedic related injuries, during first three weeks of earthquake. The record at Ophthalmology department and Emergency department showed that 92 patients had some form of ocular injuries and diseases, which accounted for about 2.5% of total earthquake victims who visited Dhulikhel Hospital at the time of disaster. One hundred seventeen eyes were affected among which 69 cases had unilateral ocular involvement whereas 23 cases had bilateral eyes involved. The average age of the patients presenting with ocular injury or diseases was  $25.8 \pm 14.5$  years. Males and females were equally affected, however young adolescents of age group from 11- 20 years was the most commonly affected age group (fig. 1). Majority of the patients (81.5%) were from Kavre District (Table 1). Lid lacerations were the most common injuries encountered, isolated injury being in 20 eyes and in association with surrounding tissues injuries in further 22 eyes (fig. 2). Thirty four patients presented with conjunctivitis but very few patients had corneal pathologies. Sixth nerve was the most commonly affected cranial nerve with three patients presenting with esotropia and diplopia.(fig. 3) (Table 2)

Two patients had low vision (BCVA< 6/18) in their affected eyes but the unaffected eyes were generally unimpaired. One patient had severe visual impairment (BCVA<6/60) in his right eye due to traumatic optic neuropathy and blindness in his left eye (BCVA<3/60) due to pre-existing age related cataract. Overall, all the disaster stricken cases were closed globe injuries.

**Table 1. District wise distribution of Earthquake Survivors**

District	N	%
Kavre	75	81.50
Sindhupalchowk	16	17.40
Ramechhap	1	1.10



**Figure 2 Eyelid with eyebrow and forehead laceration**



**Figure 3. Left eye esotropia**

## DISCUSSION

In the aftermath of natural disasters like earthquake, survivors often sustain ocular injuries that reduce normal ocular functioning. Ocular trauma is one of the important and unrecognized cause of visual impairment and blindness in developing countries like Nepal. There are many literatures available which describes the epidemiology of ocular injuries in hospital setting and studies have been conducted in larger population in different regions of Nepal stating the prevalence of ocular injuries which ranges from 1.6%- 4.9%.<sup>8-10</sup> Likewise, a population based study on epidemiology of ocular trauma in rural Nepal, by Khatri et al. showed the incidence of 0.65 per 1000 male populations per year and that of 0.38 per 1000 females population per year.<sup>11</sup> However, there have been very few studies regarding the prevalence of ocular injuries or morbidities in a natural disaster conditions like earthquake in Nepal or worldwide, although Nepal lies in the earthquake prone belt. This study reveals that among the total earthquake affected patients presenting to our hospital, 2.5% had ocular morbidities, either in the form of ocular trauma or ocular diseases pertaining to earthquake which is higher than the study conducted in Rawalpindi General Hospital and Holy

**Table 2. Spectrum of Ocular Morbidities Among Earthquake Survivors**

Structures involved	Number
<b>Peri-orbital areas</b>	
Eye brow laceration	1
<b>Eyelids</b>	
Lid lacerations	20
Ectropion	1
Pre-septal cellulitis	1
<b>Episclera</b>	
Episcleritis	17
<b>Conjunctiva</b>	
Sub-conjunctival hemorrhage	4
Inflammation	34
Laceration	1
<b>Cornea</b>	
Abrasion	1
Foreign body	6
Ulcer	5
<b>Optic nerve</b>	
Traumatic optic neuropathy	1
<b>Cranial nerve</b>	
Lateral rectus palsy	3
<b>Multiple Injuries</b>	
Peri-orbital lacerations with lid lacerations	4
Lid lacerations with sub-conjunctival hemorrhage	12
Eyebrow with eye lid lacerations	4
Lid laceration with forehead laceration	1
Lid laceration with facial wound	1

family Hospital in Rawalpindi which had 0.19 % of ocular injuries among the total patients received at the Hospital during the Pakistan earthquake of October 2005.<sup>12</sup> Their low prevalence than ours may be due to their exclusion of mild to moderate ocular injuries. This is the only literature available for reference as ocular trauma related to natural disasters has not been studied compared to the extensive studies done in ocular trauma in general setting.

Most of the literatures show that ocular injuries are more frequent in males.<sup>8-10,13</sup> In contrast, study done in Rawalpindi, Pakistan, females were involved in 68% cases which can be due to the effect of social and cultural habits in Pakistan, where females are mostly indoors and in earthquakes, people who are indoors are affected more than who are outdoors.<sup>12,14</sup> But this study has revealed unusual pattern of equal involvement of males and females which is obvious because both the genders are equally exposed to ocular injuries since the earthquake occurred on the day of holiday and most of the people were at their homes.

Increased incidence of ocular findings among the young children and adolescents of 11-20 years age group in this

study can be explained by the fact that children are the vulnerable group, lack coordination and are not able to escape from danger like adults so ocular injuries resulted in the process of running outdoors and seeking shelter in order to escape their poorly built houses in rural areas. Smaller children and toddlers were taken care and evacuated by their parents so they were less affected. In contrast to these findings, majority of the studies where general ocular trauma was studied, most affected age group was 21-30 years.<sup>8,9,13</sup> But there are few studies also which found that one-third of the ocular injuries occurred in those less than age of 20 years which is similar to our finding.<sup>15</sup> Likewise, Niiranen and Raivio et al also found that children with ocular trauma represented 34.5% of all eye injuries.<sup>16</sup>

As for the nature of ocular injuries, all cases in this study were closed globe injuries which is consistent with findings of other studies done in other hospitals in Nepal.<sup>9,13,17</sup> This finding indeed highlights the protective function of orbital bones and eyelids which protects the inner ocular vulnerable structures.

Most frequent ocular finding documented in this study was eyelid lacerations with or without surrounding structure damage followed by conjunctival inflammations. There were 17 cases of episcleral inflammations also which may be due to allergy to dust and dander released from collapsed houses as allergy has been associated with occurrence of episcleritis in other studies also.<sup>18</sup> There were three cases of lateral rectus palsy with patients presenting with esotropia and diplopia which can be explained by the fact that most of the injuries were due to collapsed houses and involved associated head and neck injuries. Another general ocular trauma study done previously in our Hospital also revealed ocular contusion injury with lid oedema, ecchymosis and sub-conjunctival hemorrhage as the most frequent finding.<sup>13</sup> But in contrast to our finding, in a study done in Rawalpindi Hospital after the Pakistan Earthquake of 2005, orbital fractures and cranial nerve palsies were the most common findings encountered.<sup>12</sup>

Penetrating injuries or globe ruptures were not encountered in this study because patients with grave ocular injuries

may have been referred to tertiary eye centers by volunteer doctors or health personnel working in fields or such patients may have sustained severe crush injuries and did not live long enough. And since the transportation was also blocked for the rural areas due to landslides, all the patients with ocular injuries could not sought medical treatment by the eye specialists immediately. Since none of the cases were open globe injury and few cases with corneal lesions and optic neuropathy, visual impairment was encountered in only countable cases.

Nepal is used to having natural disasters like earthquakes, landslides, flood, etc. so general education about preventive measures and primary management of ocular trauma would aid in the decrease of trauma related visual morbidity. Ocular injuries are usually not given priority if they are accompanied with multi-organ injuries. After management of life threatening major organ injury, ocular injuries should be given preference as visual morbidity could lead to socioeconomic and financial burden to the patient and his family. This study retrospectively analyzed patients files registered in Emergency and Ophthalmology department so few patients may have been missed due to chaos, confusion and numerous aftershocks occurring repeatedly which could have lead to some bias. But it may be the only possible way to perform study in an emergency situation. Nevertheless, this study provides invaluable data of earthquake related ocular morbidity which may be useful for future population based prospective studies.

## CONCLUSION

Ocular morbidity either in the form of ocular injuries or diseases were common among the earthquake survivors. Earthquakes will continue to affect human populations and cannot be predicted. Thus, there is a critical need for population based data to plan preparedness protocols. Information gathered following a particular earthquake can help save lives during subsequent occurrences. This study would serve as a reference and aid in determining and planning the type of intervention needed for effective management of ocular injuries and also for future earthquake disaster response.

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