Original Article

Injury Epidemiology after 7.8 Richter Gorkha Earthquake in Nepal: A Retrospective Study of Injuries Treated at Tribhuvan University Teaching Hospital

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Abstract

Introduction: Earthquakes are one of the most catastrophic natural disasters that occur without prewarning, Nepal experienced a massive earthquake of 7.8 Richter scale on 25th April 2015.It claimed 8,962 lives across several districts in Nepal with 22,302 injuries. After the earthquake, hospitals are confronted with large number of disaster trauma victims making it challenging for management of such mass casualty. Despite such crisis Tribhuvan University Teaching Hospital (TUTH) provided all possible services round the clock to all disaster victims brought to hospital from very first hour after the earthquake.

Methods: This is a retrospective analysis of management of the injured patients admitted in TUTH after the Gorkha earthquake. Patient's details including demographic data, injuries sustained and treatment carried out was retrieved from medical record section of the hospital. Injury pattern were categorized broadly into orthopedics related and non-orthopedics injure. Frequency distribution of these data's was calculated using Microsoft excel.

Results: Out of 1812 earthquake related injuries treated in hospital, 493 injured cases required admission. Their mean age was 35.84±21.84 years. Of them 153(31.6%) cases were from Kathmandu and 133 (27.0%) from Sindhupalchowk and Ramechhap.364 cases had single injury and 129 cases had multiple injuries, 81% of the injuries were orthopedic related and 19 % were non-orthopedic injury. Out of them 361(73.2%) cases required surgery, 119 (24.1%) were managed conservatively, 13(2.6%) died.

Conclusion: Earthquake is the most unpredictable catastrophic natural disaster. Limb fractures and soft tissue injuries are most common among the injury survivors. Knowing the nature and epidemiology of the injuries will help in effective management of available resources for benefit of maximum number of victims.

Keywords: Earthquake, Orthopedics, Tribhuvan University Teaching Hospital (TUTH)

Introduction

Nepal experienced a massive earthquake of 7.8 Richter scale on 25th April 2015, with epicenter at Barpak, Gorkha, 80 km northwest of Kathmandu. There were few major and uncountable minor aftershocks.[1] Earthquakes are one of the most catastrophic natural disasters that occur suddenly with little or no warning hence they are more devastating with a dramatic number of casualties.[2] As reported by the government, gorkha earthquake claimed 8,962 lives across several districts in Nepal with 22,302 injuries.[3]

After the earthquake, health management and treatment centers are confronted with a large number of trauma patients and this causes sudden and serious crisis.[2] Though this was Nepal's first experience in responding to a major disaster in eight decades but disaster preparedness of the health sector appeared worthwhile.[3] Disaster victims started to flood from

nearby location into Tribhuvan University Teaching Hospital (TUTH) within half an hour of earthquake. As there was negligible damage to the hospital building, so all services (Emergency, Operation Theater, Wards and Administration) were provided round the clock to the injured.

TUTH provided service to 1812 disaster victim during one month period after earthquake, most of them had minor injuries and were discharged after primary care from emergency while 493 injured patients were admitted for treatment in hospital.Lack of precise data of injuries managed at hospital after disaster is seen as a remarkable weak point in earthquake epidemiology, which is paramount to planning an effective response. This study will try to mitigate this issue.

Methods

This is a retrospective analysis of management of the injured patients admitted in TUTH after the gorkha earthquake. All data's including demographic profile (age, sex, address) length of hospital stay, types of injuries and surgeries performed were retrieved from the medical record section of TUTH,these information were found to be recorded in specially designed excel chart (only for the disaster victims).Frequency distribution of these data were calculated using Microsoft excel.

Results

Demography: Out of 493 injured patients admitted in TUTH, mean age of the patients was 35.84±21.84 years (2 month-90 years) (Fig.1). Of them 240 were male and 253 were female (M:F 0.94) .Location wise 153(31.6%) cases were from Kathmandu followed by 133 (27.0%) from Sindhupalchowk and Ramechhap (Fig.2).

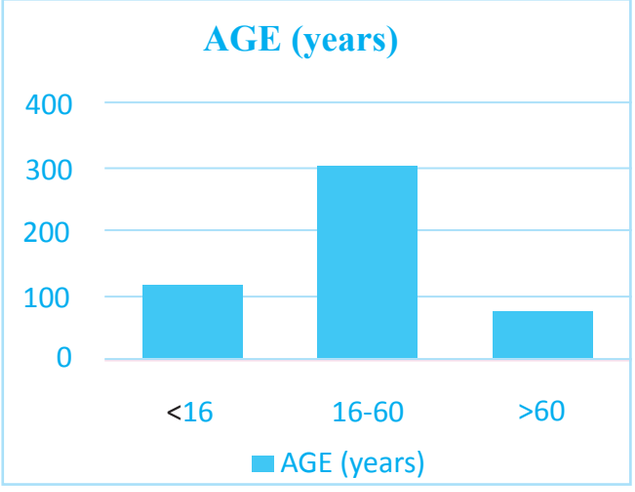
Mode of injury: Though exact data regarding mode of injury of individual patient was missing but out of 173 recorded , most common mode of injury was trapped in rubble and trauma due to falling objects(126 cases) followed by jumping out of buildings/fall from height(30).

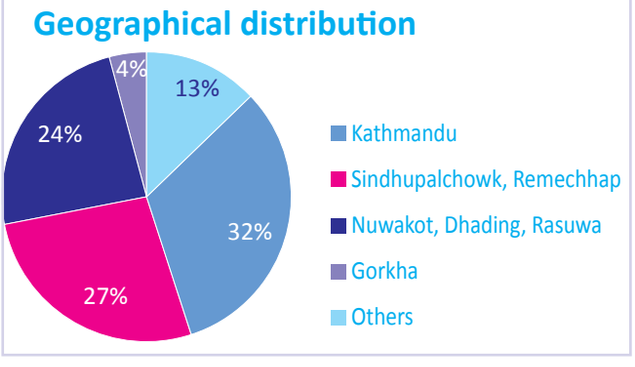
Duration of hospital stay: Mean length of hospital stay was 12.35±11.91 days (range 1-77 days).

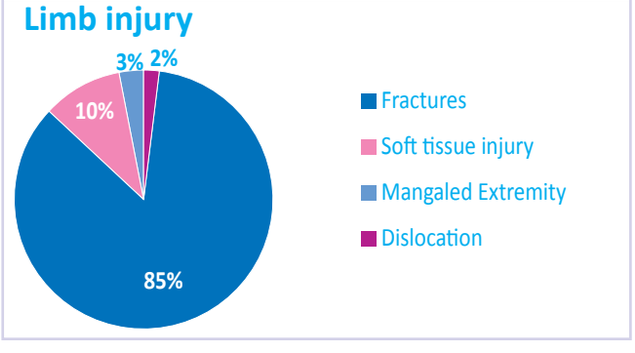
Types of injury: Out of 493 patients, 364 cases had single injury and 129 cases had multiple injuries. 340(67.34%) cases had extremity injuries (Fig.3),Spine injury in 59(11.9%) cases , Head injury in 35(7%) cases, Abdominal trauma 30 (6%) cases, burn 4 cases and miscellaneous (Opthamlo/gyne/ENT related injury) 45 cases(Fig.4).

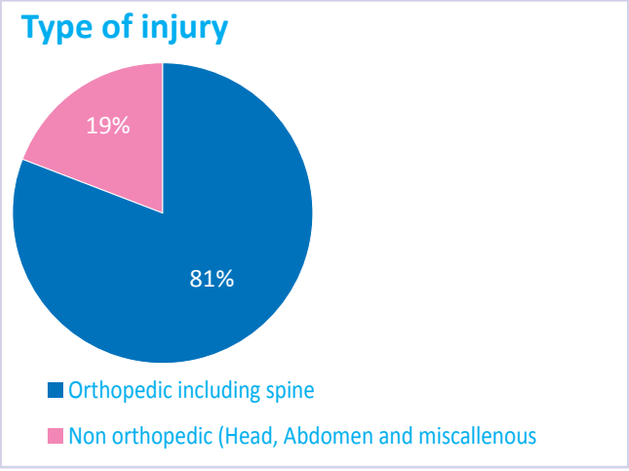
Management: Out of them 361(73.2%) cases required surgery, 119 (24.1%) were managed conservatively, 13(2.6%) died .296 Cases were managed by single stage surgery while 65 cases required multiple stage surgery.

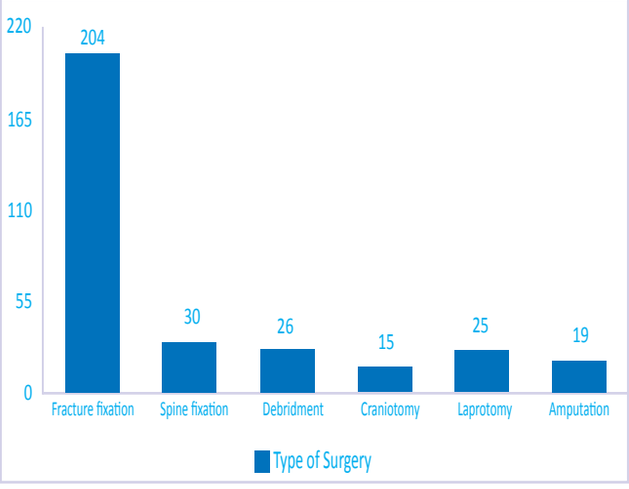
Fracture fixation by External fixation /internal fixation was done for 204 fractures (47 upper limbs and 157 lower limbs) out of 290 total fracture cases. Other surgeries performed were Spine fixation, Debridement, Craniotomy, Laprotomy, Plastic surgery, Amputation and Miscellaneous (Fig. 5)











Discussion

The Gorkha earthquake claimed 8,962 lives across several districts in Nepal with 22,302 injuries, thus injury to death ratio accounted 2.5:1.[3]The number of injured far exceeds those dead and the average injury to mortality ratio in earthquakes stands at around 3:1.[4-5]Hospitals are confronted with a large number of trauma patients and this causes sudden and serious crisis. Primary failure of the health care facilities in the district due to structural damage delayed much required early response; but our hospital stand out with negligible damage thus was able to provide care to large number of injured people from the very first hour. Steinman et al. [6] calls for a "shift in paradigm" during times of disaster from investing unlimited resources into benefits of individual patients to spreading limited resources for care of the largest number of patients. Triage allows patients with limb threatening injuries or infections to be treated as top priority. We followed the same principal during disaster management in our hospital. Medical teams headed by Hospital preparedness for Emergencies (HOPE) team with consultants, residents, medical students, paramedical staff and volunteers provided emergency care to the injured patients by implementing triage system

The type and number of injuries caused by an earthquake vary according to human/individual factors, seismic/geologic factors and the built environment.[7]Most of the injuries are orthopedics in nature; thus orthopedic surgeons play a key role in providing care to earthquake survivors.[8]

In our study majority of the patient (61%) were 16-16 years age group, (24%) were <16 yrs and (15%) were >60 yrs .Similar age distribution (77.9% adults and 22.1% pediatric) among earthquake victims was reported by disaster relief team from Singapore during their humanitarian assistance in 2015 Nepal earthquake. [9]Another study from Dhulikhel hospital on earthquake victims also reported 74% of patients were in age group 15-65 yrs.[10]

In our study 81% of the injuries were orthopedic related and 19 % were non-orthopedic (7% head injury, 6% abdominal injury and others 6%). In rehabilitation cluster report of health ministry of Nepal on may 2015 (as cited by Sheppard PS et al [11]), among estimated 18, 500 injured people approximately 6% suffered spinal cord injuries (SCI), 2% had amputations, 4% sustained traumatic brain injuries (TBI), and the vast majority (approximately 70%) of the injuries were fracture. Similar earthquake related injury pattern (87% orthopedics and 13% were nonorthopaedic (5.4% head, 4.4% thoracic, and 3.4% abdominal) was reported by 6 different article on 1549 earthquake related injuries.[12-17]Thus to manage earthquake related injuries orthopedic surgeons along with team of general surgeons, neurosurgeon and plastic surgeon should make a co-ordianted team.

In our study injury to limbs accounted for 67.34% of patients requiring hospital admission. EL Ganjouei KA et al. and Salim J et al reported between 40% and 67% of patients wiht limb injuries needed admission.[18, 19] Out of 290 fractures , 204 fractures required surgery .Of them majority ,157(77%) were lower limb fracture and 47 (23%) were upper limb fracture. In study on 8 major earthquakes reporting 3988 fractures, 2372 (59%) involved lower extremity.[20] As most of the injuries are suffered by trapping of extremities on collapse of building or due to jumping out of the buildings lower

limb fracture is far more common then upper limb fracture.

Majority of the extremities fractures were managed by external fixation with debridement (for open fracture and mangled extremity when salvage was possible). Internal fixation for fractures was done only in closed isolated fractures and external fixation was preferred in polytauma cases. Literature also suggests that in such crisis damage control orthopedics (DCO) in form of external fixation is the approach of choice. The focus should be on hemorrhage management, wound debridement, infection control, and soft tissue stabilization. External fixation is key to proper management of fractures and soft tissue stabilization, yielding favorable results in earthquake disaster scenarios.[21-23]Thus external fixation devices for both lower and upper limb fractures should be available in abundance during management of earthquake related injuries (EQIs).

In our study overall mortality rate among hospitalized patient was 2.6 %(13/493).In similar study in Dhulikhel hospital the 90 days mortality among EQIs was as low as 2%.[10]However the overall mortality rate among such victims can be as high as 8 %(50/645) as seen in university hospital study after 1999 Marmara Turkey earthquake.[24] Mortality rates depend upon injury severity and the availability of resources to manage cases during such crisis.

Conclusion

Earthquake is the most unpredictable catastrophic natural disaster. Thus pre-preparedness with public awareness campaign, anti-seismic building, early rescue, and effective first aid can reduce health impact. Majority of injury are orthopedics related, knowing the nature and epidemiology of the injuries will help to develop guidelines for delivering effective healthcare with allocation of available medical resources efficiently.

Conflicts of Interest: None Declare

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