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Original Article

Management of Orthopaedic Injuries following 2015 Gorkha Earthquake: Our Experience in Public Health Concern Trust Nepal

Shikshya Prakash Shrestha[1], Umesh Bahadur Bogatee[*1], Roshan Lal Shrestha[1], Ganesh Dangal[2] Anil Shakya[1], Niraj Shrestha[1], Anuj Raj Bijuchhe[1], Ojash Dangal[3]

Author Info:

[1]Department Of orthopaedics and Trauma, Kathmandu Model Hospital /Phect-NEPAL

[2]Department of Obstetrics and Gynaecology and Earthquake Relief coordinator Kathmandu Model Hospital/Phect-NEPAL

[3]KIST Medical college, Nepal

***Corresponding Author:**

Dr. Umesh Bahadur Bogatee; Email/Contact:

bdrumesh985@gmail.com

+977-9841278416

ABSTRACT

Background: On April 25 2015, a magnitude of 7.8 earthquake struck in central Nepal, causing a huge physical and social disturbances. Physical impacts comprised casualties with deaths and injuries and damage to infrastructure, cultural heritage and natural environment while social impacts are demographic, psychological and economic consequences. We report our experience in treating victims who were brought at our centre via different means.

Objectives: to provide an overview the caseload and provide analysis of earthquake victims for improving the future strategies in similar scenarios.

Methods: A retrospective study of the clinical characteristics and patterns of hospitalised patient after the 2015 earthquake was conducted. Demographic evaluation, surgical procedures and morbidities were reviewed. The patients were followed up for an average of 24 months, detail records were kept on their recovery and function.

Results: A total of 85 patients were treated with subsequent follow-up. The proportion of males admitted was similar to that of females (49.4% and 50.5% respectively). The highest number of admitted age group ranges (17- 45) was about 37.64%. Most injured site was lower limbs (68.23%) where fracture tibia and fibula had the highest incidence (56.89%). Out of all, 14.11% of cases were open fractures. Trauma severity was assessed with injury severity score and most of them categorized as mild one (95.29%). The most common procedure performed was closed reduction and pinning (n=28), followed by open reduction and fixation (n=24). Overall, mortality rate was 2.35% (2 of 85). Total 25 implants were removed within three years of period and 28.6% of patients were not returned to date.

Conclusions: The injury epidemiology reported in this study showed quite congruence with most other earthquake related studies. Analysis profiles of injuries and clinical features of earthquake victims will definitely impact rescue efforts and treatment of fracture injuries in possible future natural calamities.

Keywords: Earthquake; Musculoskeletal injury; Nepal; Treatment

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INTRODUCTION

Nepal is lying in one of the most seismically active regions in the world where the Indian tectonic plate moves under the Eurasian plate at an average rate of 4cm annually, lifting up the Himalayas in the process.[1] On Saturday Noon, April 25, 2015, a 7.9 magnitude earthquake struck with its epicentre at Barpak village in Gorkha district killing nearly 9000 lives and leaving thousands injured and, turned settlements into rubble.[2] After this calamity, hospitals were confronted with large numbers of trauma victims. Two large aftershocks shook the region and several aftershocks occurred during succeeding days. Relief efforts were being hampered by a collapse in communication, landslides and bad weather. In Nepal, the disaster amplified catastrophic dimensions because of the poor pre-existing buildings and medical infrastructure and perceived constraints in government emergency response and evacuation policy.

A series of studies have discussed injury profiles after earthquakes around the world and most of them concluded that fracture injuries were the most common earthquake related injuries.[3-6] In this study, We aimed to find the incidence and distribution of fractures which further can lend us to a better preparedness and implementation of surgical management and reliefs in an earthquake and other natural calamities.

MATERIALS AND METHODS

This is a retrospective study of the clinical characteristic manifestation of hospitalized patients after 2015 earthquake This study was conducted after the approval from Institutional Review Committee of the Phect-NEPAL, (033-2017). A total of 85 medical records of patients with earthquake-related injuries from April 2015 to June 2015 were accessed from Kirtipur Hospital, Phect-NEPAL in preliminary study. In addition, we reviewed follow up records in subsequent years (2016-2019). We recorded total number of cases, patient demographic data, diagnosis, injury profiles, anatomical side of injury, morbidity, mortality and orthopaedic procedures performed on victims. All patients sustaining any sort of fracture or dislocation were included in this study that even comprised the cases managed together by orthopaedic with Plastic & Reconstructive department. But all soft tissue injuries and cases which solely performed by the plastic and reconstructive department and to those patients whose primary orthopaedic surgery was done in another centre were excluded. Initially, all casualties were received at the hospital triage centre then allocated according to their triage priority. The severity of injuries was determined using the Injury Severity Score (ISS) mild (ISS≤8), moderate (9≤ISS≤14) and severe (ISS≥15). The score is the sum of the Squared Abbreviated Injury Scores for the 3 most injured body regions.7 The management plan was decided jointly by an orthopaedist and anaesthetists. All casualties that required surgical intervention underwent baseline preoperative laboratory and radiological investigation. Compound and crush injuries were given priority over closed injuries. Post-operative care was given. Long-term follow up was done until fracture healing. The incidence of hardware removal was determined with fracture union and functional outcomes.

Descriptive statistics were used. All the data was entered in Microsoft Excel (Ver.2016) and statistical analysis was performed using software IBM SPSS statistics 16. The continuous variables were analysed as means ±standard deviation (SD) and categorical variables were mentioned as numbers and percentages.

RESULTS

The demographic distribution of 85 patients who were admitted and treated under our department is depicted in Table 1. The proportion of males admitted was similar to that of females (49.4% and 50.5% respectively). The mean age of victims was 41.54 (Range: 6-84years). The highest number of admitted age group ranges (17- 45) was about 37.64%. More patients (60.2%) were brought to the hospital from outside Kathmandu valley via road and even airlifted. Among them, most are from the Sindhupalchok district and the surrounding Kirtipur area. None were admitted on same day of an earthquake but eventually brought after the following day. Out of a total 57(67.07%) were admitted after 25th April, the remaining 28 patients were admitted after major aftershock. The longest hospital stayed was 58 days (ranging 3-58 days) while the mean hospital stayed was 11.27±9.627. A large number of patients belongs to the Newar community (34.93%). Two foreign nationals from China and Bangladesh were also treated After their arrival to the hospital, trauma severity was assessed with injury severity score and most of them categorized as mild one (95.29%).

Table 2 shows the anatomical distributions of fracture. Most injured site was lower limbs (68.23%)

Table1: Demographic distribution of the Earthquake victims (n=85)

Variable	Number of patients
Gender male/female, No. (%)	42 (49.4)/43 (50.5)
Age (mean ±SD)	41.54±21.37
Age (Range of patients)	0-99
0-16 17-45 46-70 71-99	13 (15.29) 32 (37.64) 23 (27.05) 10 (11.76)
Foreign nationals	2 (2.35)
Hospital stay (mean± SD)	11.27±9.627
Local (Kathmandu Valley)	33 (39.75)
Outside valley	50 (60.24)
Ethnicity (%) Khas/Arya Newar Tamang Others	 21 (25.30) 29 (34.93) 16 (19.27) 17 (20.48)
The Severity of injuries (ISS scores%) Mild Moderate Severe	 81 (95.29) 4 (4.70) 0
Admitted after the first earthquake (25th April)	57 (67.07)
Admitted after a major aftershock (12th May)	28 (32.90)

Table 2: Distribution of fractures based on anatomical site

Localization	Frequency (n=85)	Percent (%)
Upper limb fractures	25	29.41
Humerus Radius* Metacarpal and carpals Phalanges*	10 11 2 2	40.0 44.0 8.0
Lower limb fractures	58	68.23
Femur		
Tibia/fibula/ malleolus*	10 33	17.24 56.89
Calcaneus*	8	
Patella	2	3.44
Metatarsal / phalanges*	5	
Dislocation*	10	11.76
Hip Knee Shoulder Ankle	3 2 2 3	
Scapula*	2	
Pelvis*	1	
Clavicle/Ribs*	3	
Open fracture	12	14.11

Table 3. Post-operative complications

Wound infection	5	5.882%
Pulmonary embolism	1	1.17%
Mortality	2	2.35%
Revision surgery	0	0

Table 4: Removal of Implants

	N	Percent
Removal of Implants (n=35)	25	71.4%
Ilizarov Ring (n=10)	9	90%
IM Nail (n=1)	1	100%
Plates/screws (n=24)	14	58.3%

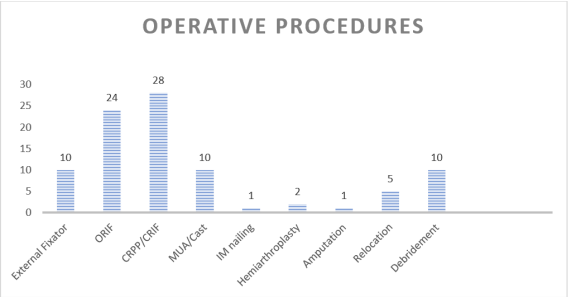

Figure 1: Orthopaedic Procedures

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where fracture tibia and fibula had the highest incidence (56.89%). Femur fracture included midshaft, intertrochanteric and neck regions. Some fractures were even associated with dislocation which accounts for 11.76%. Few patients presented with multiple traumas in both upper and lower limbs including chest and pelvis. Out of all, 14.11% of cases were open fractures.

Figure1 summarizes the operative procedures performed at our setup. Twenty-eight patients underwent closed reduction and pinning while 24 victims were treated with open reduction and internal fixation. Ten patients were treated with an external fixator and hybrid Ilizarov is our choice of the fixator. Series of debridement was performed in 10 patients. We have done only one intramedullary nailing. Postoperatively we lost one patient with pulmonary embolism and another one after 4 weeks of discharge. Five patients accompanied wound infection which was managed with antibiotics and a series of debridement and grafts (Table 4). Most patients didn't come for regular follow-up visits. Total 25 implants were removed within three years of period and 28.6% of patients were not returned to date.

DISCUSSION

This earthquake occurred at noon on a weekend so most victims were injured while escaping falling debris rather than buried under rubbles. Most houses in the valley and surrounding suburbs were old and non-earthquake resistant which was unable to withstand shocks and aftershocks jolts. Several studies have manifested the role of timing in types of damage and the number of deaths resulting from an earthquake.[8,9] Due to difficult mountain topography, additional landslides impassable roads, damaged communications and, infrastructures and changeable weather posed substantial challenges to rescue efforts.[10] In Our study, there is no significant difference in victims, considering sex proportions. The mean age of our patients was 41.5 years and 37.6% of them were between 17 and 45 years. This is quite similar to the results of other studies on the victims of earthquakes in Yuesu, Bam, Sumatra and Azerbaijan.[11-14] It seems districts from then zones Bagmati and Gandaki had endured a lot from this earthquake. Since these districts are rich in terms of socio-cultural diversity with indigenous communities and other ethnic minorities, we tried to figure out the most affected population and our study shows the highest victims was Newar (34.93%). The majority of the study population (60.24%) was from outside Kathmandu valley. The earthquake casualties were transported by land while few were being airlifted. It is notable that the onset of Gorkha earthquake occurred on Saturday noon. It being a holiday, all schools, colleges, offices and many shops were closed. After earthquake, people were hurtling and jumbled down road and houses and injuries happened accordingly. We noticed trends of closed wounds rather than massive crush injuries. In our study, closed fractures accounted for 85.89%.

Likewise, Kang et al.[11] and Guner et al.[15] coupled with the statistics. Head, spine and chest injuries were comparatively low which may presume with late rescue response.[11-14] Our study showed that musculoskeletal injuries were higher than any other systems. The fracture distribution which we compiled is similar to distributions assembled by Peng et al.[14] Mulvey et al. [16] and Bulut et al.[17] For this study there was no presentation of compartment syndrome. Out of a total, 95.29% victims reported mild injuries (ISS≤15). Extremities injuries were the most common post-earthquake trauma.[18] In this study, fractures of lower extremities made a largest percentage of fractures (68.23%) and tibia and fibula comprised 56.8% of the total lower-limbs fractures. Similar trends were reported in, Wenchuan, Yushu earthquake and Bam earthquake by and Lu-Ping et al.[10] Kang et al.[11] Salimi et al.[13] respectively. In the initial period, following a disaster the most urgently required orthopaedic procedures are splinting, debridement and external fixators.[10-14] Our team tried in maintaining sterility and followed basic principles of managing open fractures before surgery. Early intervention could significantly decrease morbidity and mortality. We used external fixator in ten victims and hybrid Ilizarov Ring was our choice which has yielded satisfactory results. We chose this fixator in order to decrease revision surgeries. Lei Lu et al.[19] used Hoffman II Fixators in Wenchuan earthquake whereas Tilkeridis.k et al.[20] chose for Ilizarov in Pakistan earthquake.

Further study is needed to investigate the different treatments being used for various earthquakes. We did not encounter any urgent need for blood transfusion and postoperative mechanical ventilator support for our patients. We lost one post hip reduced patient due to pulmonary embolism. Regional and spinal anaesthesia were preferred. Our team was accompanied by few international faculties from India and England which resulted in skills handover and better aftercare. No deformity non-union and infection were noted in later follow ups. 74.4% of post-operative patients came for implant removal procedures and fracture union was confirmed

both clinically and radiologically. Victims had been counselled earlier in their follow up as implants can be left indefinity if they desired however patient request was also a relative indication for removal. 28.6% had never visited for further follow up and even no queries were made. No other earthquake studies reported such a long term follow up as in our study. Last but not least, this traumatized earthquake is also associated with increased prevalence in psychiatric symptomatology and the need for psychiatric care should be paid attention too.

This study had its few limitations and flaws but it was nonetheless important. For this study, the most epidemiologic data of earthquake patients rely on the medical records of hospital which could lacked the detail records and could be affected by chaotic earthquake and its aftermath.

The Earthquake will continue to strike and healthcare responders and hospitals must be prepared nationwide to overcome the situation by anticipating the consequences and planning accordingly.[15]

CONCLUSION

Orthopaedics remains a major subspeciality with utmost needed after an earthquake as most of the patient has musculoskeletal injuries with total 184 patients were treated in Phect-NEPAL. Out of all, 85 victims were solely treated with orthopaedics while remaining dealt with plastic team In Conclusion, the majority victims reported mild injuries, in accordance with ISS score and the bigger ratio of fractures involved the lower extremities. Upper extremities fracture, dislocations were a substantial proportion of all fractures. While closed fractures tended to predominate the injuries and correspondingly, many fractured were treated with open reduction and Internal fixation. Infection rate was lower in our study. Few patients never returned for follow up.

It is not possible to predict and prevent an earthquake or to estimate the time, location and severity of earthquake damage and injury. Meanwhile, meticulous and proper planning, timely intervention, maximum utilization of resources, surgical intervention by team of orthopaedic surgeons can make a drastic difference in morbidity of patients. A comprehensive disaster plan would have helped to manage these emergencies along with rapid response team, an efficient triage and availability of manpower and instrument to tackle such calamities in near future

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