Post Gorkha Earthquake Renal disaster: An experience at Nepal Medical College Teaching Hospital

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ABSTRACT

Renal disaster is the second most common cause of death following a natural disaster like earthquake, secondary to crush injury. Most of the patients with crush injury develop acute kidney injury (AKI) following rhabdomyolysis. AKI due to rhabdomyolysis is preventable in the majority of cases if managed properly. Following the Gorkha earthquake, we received 5 out of 45 patients who needed renal replacement therapy (RRT) in the Kathmandu valley. Here we present our experience in managing those cases. There were four females. Average time under the rubble was 4.9 hrs. Indications for RRT were hyperkalemia, oliguria, metabolic acidosis and uremic encephalopathy. One patient had sepsis in addition to the crush injury. All underwent hemodialysis as a mode of RRT. Initiation of HD on an average was on the 7th day of the index date, April 25, 2015. Average number of HD sessions were seven. Four patients received NSAIDS for pain management before presenting to us. All patients recovered well. Although the number of victims receiving HD at our center following the earthquake was small, we found that patients of renal disaster can be salvaged with appropriate treatment.

Keywords: Gorkha Earthquake, Renal Disaster, Hemodialysis, Nepal Medical College.

INTRODUCTION

On April 25, 2015 at 11:56:26 am Nepal Standard Time, Nepal experienced a major natural disaster, the Gorkha Earthquake.[1] This 7.8 Richter scale magnitudes earthquake was felt in neighboring countries like India, China and Bangladesh.[1] It took 8857 lives and left 21952 injured.[2] Disasters are always followed by suffering, both physical and mental. Crush injury following disaster is an important cause of death, being the second major cause of death following trauma itself.[3] Crush injury leads to acute kidney injury (AKI) aptly termed renal disaster as it is a disaster following a disaster.[4] If proper measures are not taken during and following extrication, they may die of AKI following rhabdomyolysis. AKI due to rhabdomyolysis is preventable in most cases. Renal function recovery and survival of the patients in AKI due to crush injury are better than for AKI due to other causes. [5,6] In this study we present our experience in managing AKI following the Gorkha Earthquake.

MATERIALS AND METHODS

This is a retrospective study done at Nepal Medical College Teaching Hospital (NMCTH). We analyzed the case sheets of patients admitted for the care of trauma following the earthquake and had undergone renal replacement therapy (RRT). Hemodialysis (HD) was the mode of RRT in all the patients. We looked at various variables including duration under the rubble, whether patient was resuscitated with fluid or not, indications of HD, no. of sessions of HD and outcome. We also looked at the blood parameters. Statistical analysis in the form of means and standard deviation was done.

RESULT

There were total of 45 patients who required RRT due to AKI following the earthquake in the Kathmandu valley. We treated 5 out of them who attended NMCTH for the care. The cases were referred to us from different centers within and outside the valley. There were four females and one male patient. Average age of the patients was 20.4± 2.88 yrs. Average time under rubble was 4.9 hrs. Average day of initiation of HD was around 7th day of the index date i.e. April 25, 2015. All patients received fluid resuscitation during and after the extrication. Out of five, four were oliguric. Average no. of HD session was seven. Three patients recovered after 2 to 3 sessions of HD while two had 12 and 15 sessions. In one patient, we had to start RRT with Slow & Low Efficient Dialysis (SLED) because of hemodynamic instability. Later she was transferred to regular HD as her vitals recovered. Two patients who needed multiple sessions had to be dialyzed daily for first few days and

later, on alternate days. Three patients had hyperkalemia, one had metabolic acidosis. All patients had increased LDH while only four had raised CPK-total. Indications for HD were hyperkalemia, pulmonary edema, oliguria and uremic encephalopathy.

One patient also had sepsis along with the crush injury. Four patients had received NSAIDS for the pain management prior to presenting to us. All patients recovered well and were discharged with mild degree of footdrop in all the patients. Average urea and creatinine at the time of admission and discharge were 220.6 (±118.04) vs. 53.92 (±36.55) and 8.08 (±4.24) vs. 0.76 (±0.37) respectively (Table 2). The clinical and biochemical parameters of the patients are given in the tables below. (Table 1 & 2)

Table 1. Clinical parameters of patients who underwent HD

Patient	Age in Year	Sex	Hours under rumble	No. of days after index date to start HD	Hospital stay (days)	Use of nephrotoxic drugs	BP at presentation (mmHg)		Urine output in 24 hrs at admission (ml)	No. of session of HD
							SBP	DBP		
A	21	Female	1	4	33	Yes	110	70	0	12
B	16	Female	3.5	8	13	No	130	80	10	3
C	24	Male	4	11	7	Yes	160	100	700	2
D	21	Female	7	12	21	Yes	90	60	40	3
E	20	Female	9	3	36	No	120	80	300	15
Average (±SD)	20.4 (2.88)	NA	4.9 (3.13)	7.6 (4.03)	22 (12.48)	NA	122 (25.9)	78 (14.8)	210 (300.5)	7 (6.04)

Table 2. Biochemical parameters of patients who underwent HD

Patient	Urea Admission (mg/dL)	Urea Discharge (mg/dL)	Creatinine Admission (mg/dL)	Creatinine Discharged (mg/dL)	Sodium Admission (mmol/L)	Sodium Discharge (mmol/L)	Potassium Admission (mmol/L)	Potassium Discharge (mmol/L)	Total CK (mg/dL)	LDH (mg/dL)
A	160	110	8.5	1.2	128	133.1	6.5	3.49	60	2700
B	378	23.1	11.9	0.6	122	140	5.9	3.7	1743	7671
C	186.8	71.7	2.5	0.6	129.9	129	3.26	3.21	2206	1917
D	299	30.3	12.3	0.3	153	136	5.4	4.3	1364	2250
E	79.2	34.5	5.2	1.1	132.5	139.5	3.6	3.2	3010	9680
Average (±SD)	220.6 (118.04)	53.92 (36.55)	8.08 (4.24)	0.76 (0.37)	133.1 (11.79)	135.5 (4.59)	4.93 (1.43)	3.58 (0.45)	1677 (1092)	4844 (3580)

DISCUSSION

Earthquake is a global problem and Nepal is the eleventh most earthquake prone country in the world. Earthquake is one of the major causes for crush syndrome. Crush syndrome can lead to AKI which is often fatal if untreated. Incidence of crush syndrome is about 2–5% in disaster victims.[7] Incidence of renal disaster depends on intensity of disaster, population density, structural characteristics of building and the timing of occurrence of the disaster. The good thing about the complication of crush syndrome is: it is preventable and reversible if appropriate treatment like fluid resuscitation and/or dialysis is applied judiciously.[8] However, rescue workers, medical team including nephrologists are not fully aware of this condition.[8]

Our center is a 700 bedded teaching hospital with facilities for RRT. Our center was also affected by the earthquake and the unit had to be shift to a different place on the ground floor for the safety of the patients and the staff. We had to cut down the operating no. of machines from 12 to seven and had responsibility to continue to support chronic HD patients as well. As we had limited space and limited no. of HD machines and were expecting large no. of AKI patients following the massive earthquake, the nephrology service in the Kathmandu valley was channelized to different centers by coordinating with each other and through Nepal Society of Nephrology (NSN).

In the Kathmandu valley, only around 50% of existing machines were operational during the initial period post

disaster. There were 45 patients of AKI due to crush injury in the valley that needed RRT of which nine died (personal communications). We received around 10% (5 out of 45) from different places of earthquake struck areas and started treating them. In our center all patients were treated with HD. In some centers peritoneal dialysis was performed. Due to lesser no. of cases at our center we were not able to draw conclusion on mode of treatment.

As expected in crush injury, potassium, LDH and CK total were raised and metabolic acidosis was present in our patients.[9,10,11] However, the factor that predict the need of RRT in AKI due to rhabdomyolysis is raised urea and creatinine rather than other biochemical and clinical parameters.[12] In an observational study by Esmael El-Abdellat *et al* showed that elevation of serum myoglobulin was assoiated with the development of AKI with odds ratios of 7.87.[13] In our study we did not measure serum myoglobulin level. Four out of five patients received nephrotoxic drugs which may have aggravated in developing AKI.

The Gorkha earthquake had 8857 morality and left 21952 injured. In this earthquake, the mortality amongst patients who underwent HD in Kathmandu valley was 20% which is comparable to other major earthquakes like Kashmir (21%) and Marmara (15%) earthquake.[8] Forty five patients (0.5%) underwent HD in the Kathmandu valley. In Marmara earthquake, 477 patients underwent HD and had 17480 deaths (2.72%). Likewise, Kashmir earthquake had 73000 deaths but had only 55 cases that underwent HD (0.07%). In a recent Haiti earthquake (2010) there were 220,000 deaths with 92 cases of crush syndrome and 62 patients undergoing dialysis.[14] Scenario was different when earthquake struck Spitak, Armenia in 1988. There were 25000 deaths with 600 cases of crush syndrome and around 225 to 385 patients had to be taken for dialysis.[14]

The no. of AKI in the Gorkha earthquake was lesser than expected. It may be because of the nature of collapsed building. Crush induced rhabdomyolysis is common if the earthquake hits urban areas with multistoried concrete buildings rather than one story and wooden frame buildings.[15] Another reason for this may have been due to ineffectiveness of extrication of the victims leading to death.

Disaster is always followed by sufferings and chaos amongst the people and relief workers leading to mismanagement in relief distribution and medical management including dialysis service. Proper and channelized management is necessary to alleviate the post disaster mismanagements.[4] Thus, in a disaster prone area like Nepal, there should be a national committee which can act during the disaster period and should have a good communication with international organization like Renal Disaster Relief Task Force/International Society of Nephrology (RDRTF/ISN). RDRTF was created by ISN in 1990 and had offered assistance to different renal disasters including Marmara and Kashmir earthquakes.[16] In the Gorkha earthquake, RDRTF had communicated with NSN and had offered assistance of any kind for the management of renal disaster.[17,18]

Though the number of victims receiving HD in our center after the earthquake was small, we found that patients of renal disaster can be salvaged with appropriate treatment.

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