

# Domestic animal-related neuro-trauma: An account, from a tertiary institute

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## ABSTRACT

**Context:** Experience of animal-related neurotrauma at an apex institute, National Institute of Mental Health and Neurosciences, Bangalore, India. **Aims:** The aim of this study is to review epidemiology, clinical findings, and outcome of animal-related traumatic brain injury (TBI) evaluated and treated at our institute. **Settings and Design:** A retrospective study consisting of demographic data, clinical findings, radiological details, and outcomes. **Materials and Methods:** The clinical and imaging records of 30 patients treated for animal-related TBI at the emergency services, from January to July 2010. Outcome was assessed by Glasgow outcome scale (GOS). **Statistical Analysis Used:** SPSS 15.0 version, descriptive statistics. **Results:** A total of 6190 neurotrauma cases were evaluated and treated during the study period. Among them, 30 (0.48%) were animal-inflicted injuries. Of these cases, animal-vehicle collision and directly animal-inflicted injuries were 15 (50%) each. The mean age of patients were 39.46 (6-71 years). Twenty-nine (96.66%) cases were from rural areas. Twenty-three (76.6%) had mild, 6 (20%) had moderate, and 1 (3.3%) had severe head injury (Glasgow coma scale). Four (13.3%) patients had abnormal pupillary reaction. Associated injuries were found in 25 (83.3%) patients. CT scan was abnormal in 50% (15/30), common finding was contusion in 8 (26.6%) patients, followed by edema in 6 (20%). There were 3 (10%) spine injuries, 1 (3.3%) internal carotid artery (ICA) dissection, and 2 (6.6%) brachial plexuses injuries. Three (10%) required surgery, and 1 (3.3%) patient expired. As per the GOS, good recovery was seen in 8 (80%) patients, moderate disability in 1 (10%), and vegetative state in 1 (10%) patient.

**Key words:** Animal-related injuries, animal-inflicted, animal-vehicle collision, neuro-trauma, outcome

## Introduction

Domestic animals are generally human-friendly, but occasionally can attack, with or without provocation, which can be either direct infliction or with vehicle collision causing injuries ranging from innocuous to life-threatening injuries.<sup>[1]</sup> The humans sustain injury when trying to avoid a dog or cattle either let loose or straying into the roads. Some of the injuries may also be due to inadvertent attack by the animal. In urban setting, traffic may contribute the confusion, whereas in a rural setting, narrow road or mud path, especially uneven paths, are additional hazards. A large number of

rural Indian populations depend on animal husbandry; injuries sustained directly or indirectly from them are not usually reported and are not given sufficient attention. The literature on animal-related TBI is scarce. Hence, this study was undertaken to explore the main descriptive epidemiology of domestic animal-related injuries seen in emergency service at a tertiary neurotrauma center, Bangalore, India.

## Materials and Methods

### Study type

This is a retrospective descriptive review gathered from the trauma registry books and medical records of tertiary neurotrauma center, Bangalore, India. It summarizes animal-related injuries that presented to emergency services from 1 January to 31 July 2010 (six months).

### Study site and subjects

The subjects were patients living in Bangalore city center and its rural districts, who have suffered from

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animal-related injuries and were presented to the emergency services, Bangalore in India.

### Data collection and management

The data was collected from trauma register and patient files by residents and was cross-checked by neurosurgeons. The data was filled on a structured patient chart, which consisted of patients' gender, age, source of injury (dog, bull, cow, goat, etc.), month, interval to seek medical services, symptoms, Glasgow coma scale, CT scan findings, and prognosis (GOS). The data presented in this study deals with injuries caused directly or indirectly by animals e.g. road accidents. Details of outcome (GOS) were obtained over phone for 10 patients. Rest of the patients' outcome details could not be collected, may be due to either non-availability of phone numbers or were non-reachable.

### Statistics

The statistics of the data were obtained by SPSS 15.0 version. The descriptive statistics such as frequency and percentage for categorical variables, and mean, standard deviation for continuous variables was used.

## Results

The summary of animal-related injuries is listed in Table 1.

Of 6190 subjects 30 cases (0.48%), animal-vehicle collision were 15 (50%) and 15 (50%) were animal-inflicted injuries. There were 21 males and 9 females with a mean age of

39.46 ± 16.8 (range 6-71 years). Three (10%) were elderly (>60 yrs); of them, 2 were male injured by bull gore from rural region, presented with LOC and associated injuries with mild head injury. Four (13.3%) were pediatric (<18 yrs); of them, 3 were male presented with LOC; 2 patients had moderate head injury with associated injuries. The injuries were higher in villages with 29 (96.6%) cases. Mean interval from injury to presentation to the emergency room was 7.58 ± 7.14 (Mean ± SD) hours. Neurotrauma patients were assessed by Glasgow coma scale (GCS), 23 (76.6%) had mild, 6 (20%) had moderate, and 1 (3.3%) with severe injury. Four (13.3%) patients had abnormal pupil reaction.

All patients underwent computed tomography scan. Fifteen (50%) patients had abnormal findings on CT imaging. Most common presentation was contusion 8 (26.6%), followed by edema 6 (20%), skull fracture 4 (13.3%), diffuse axonal injury 2 (6.6%), SDH 2 (6.6%), and SAH 2 (6.6%).

Twenty-seven (90%) patients had symptoms listed in Table 2. Twenty-five (83.3%) patients had associated injuries; 27 (77.1%) had scalp and facial injuries; there were 5 (14.2%) upper and 3 (8.5%) lower extremities. There were 3 (10%) spine injuries, 1 patient (3.3%) had internal carotid artery (ICA) dissection, and 2 (6.6%) patients had brachial plexuses injuries.

Majority of patients were managed medically, 3 (10%) required surgery for hematoma evacuation. One (3.3%) patient of bull gore expired. Ten patients were available for follow-up interview over telephone, GOS was

**Table 1: Summary of animal-related injuries**

Animal-related injuries	n	%	Glasgow coma scale (GCS)			Abnormal pupils	CT abnormal findings	Associated injuries	Death	Glasgow outcome score (GOS)			
			Mild	Moderate	Severe					Good	Moderate	Severe	Vegetative
Animal-vehicle collision													
Cow	4	13.3	3	1	0	0	1	2	0	0	0	0	
								Brachial plexus injury-1					
Dog	7	23.3	6	1	0	1	2	7	4	0	0	0	
Buffalo	2	6.6	1	1	0	0	2	0	2	0	0	0	
Goat	2	6.6	1	0	1	1	1	0	1	0	0	0	
Animal inflicted													
Bull gore	10	33.3	9	1	0	1	5	8	1	1	1	0	1
								Spine-2 Hemiparesis-1					
Cow	3	10	2	1	0	1	2	3	0	0	0	0	
								Spine-1 Brachial plexus injury-1					
Dog	1	3.3	0	1	0	0	1	1	0	0	0	0	
Pig	1	3.3	1	0	0	0	1	0	0	0	0	0	
Total	30		23	6	1	4	15	21	1	8	1	0	1

CT-Computed tomography

assessed in them. Good recovery was seen in 8 (80%) patients, moderate disability in 1 (10%), and vegetative state in 1 (10%) patient.

Table 3 depicts the comparison of frequencies of multiple variables of different mode of injuries like animal-related injury, road traffic accident (RTA), assault, and falls.

## Discussion

The animal-related neuro-trauma is not commonly studied. We categorized these injuries as direct animal-infliction or animal-vehicle collision. Horned animals like sheep, goat, and cattle may occasionally attack a person and cause head and neck injuries. Neck injuries may cause carotid dissection or spinal trauma.

Occasionally, animals may be found on the roads. Rider or pillion of a two-wheeler may be injured when trying to avoid the animal. Fall from the vehicle; injury to neck from improperly secured helmet may be additional

mechanisms of neurotrauma. Generally, two-wheeler users are at risk in the animal-vehicle collision, seen in our series.

Animal-related head injury accounted for 0.48% of total neurotrauma admittances. Fifty percent had animal-vehicle collision, and other half had animal-inflicted injuries. Twenty-nine (96.6%) patients were from rural areas. Nearly one-fourth sustained moderate to severe head injury (GCS score). Fifty percent of patients had abnormal CT findings, of which one-fourth had contusion. Twenty-five (83.33%) patients had associated injuries. Spine injuries were in 3 (10%) patients, brachial plexuses and internal carotid artery (ICA) dissection were seen in 2 (6.6%) and 1 (3.3%), respectively. Three (10%) patients required surgery, and 1 (3.3%) patient expired. Outcome was good in majority 8 (80%), 1 patient was moderately disabled, and 1 patient was in a vegetative state as assessed by GOS out of 10 patients.

Nearly 70% of India lives in rural areas where the majority of them depend on animal husbandry for their livelihood and they form a significant role in rural development. Most commonly reared domestic animals are cattle, sheep, goat, poultry, pigs, and dogs for guarding fields and houses.<sup>[2]</sup> The benefits from domestic animal as pets, source of food, transport, and farm are well-known. Most animal-related injuries caused may be due to fear of humans (real or perceived), animals are forced to do something they would rather not do, protecting a violation of their territory or are acting to protect their young (especially if human is

**Table 2: Symptoms manifesting both due to animal-vehicle collision and animal-inflicted (27/30, 90%)**

Symptoms	n	Percentage
LOC	19	63.3
Vomiting	12	40
ENT bleed	11	36.7
Weakness	4	13.4
Bladder disturbances	2	6.7
Seizures	1	3.3

LOC – Loss Of Consciousness, ENT – Ear, Nose & Throat

**Table 3: Comparison of animal related injuries with other mode of injuries like RTA, assault, falls in same institution at same time**

Variables	Animal injury n=30	RTA n=1029	Assault n=138	Fall n=420
Age (M±SD)	39.46±16.82	33.90±15.49	34.81±13.88	33.05±21.63
Range (yrs)	(6-71)	(2-84)	(1-79)	(1-95)
Female (%)	30.0	16.4	18.8	22.4
Duration to reach hospital (M±SD, hr: min)	7:58±7:14	11:59±50:30	15:26±33:53	37:36±128:34
GCS (M)	13.23	12.32	13.63	12.63
Motor (M)	5.7	5.52	5.84	5.54
Symptoms present (%)	90.0	84.2	80.4	80.7
LOC (%)	63.3	55.9	62.3	45.7
Associate injuries present	83.3	88.0	90.0	70.0
CT				
Abnormal (%)	50.0	65.6	42.0	60.7
Contusion (%)	29.9	29.8	12.3	22.6
Extra-axial* (%)	10.0	24.0	17.4	25.5
Edema (%)	20.0	22.4	8.7	17.1
Fracture (%)	10.0	28.6	23.2	21.9
Surgery (%)	10.0	9.0	7.2	13.8
Death (%)	3.3	1.8	0.0	2.4

\*EDH-Extra dural hematoma, SDH-Sub dural hematoma; RTA-Road traffic accident; M-Mean, SD-Standard deviation, GCS-Glasgow coma scale, LOC-Loss of consciousness, CT-Computer tomography

between a newborn and a mother).<sup>[3]</sup> Animal-vehicle collision relates to improper surrounding landscape or land use categories, topography in rural areas, and sudden obstruction of speeding vehicle (especially two wheelers) by street dogs and domestic animals like cow or buffalo.<sup>[4]</sup> The majority of injuries from these animals are substantial, with potential risk of mortality and morbidity.<sup>[5]</sup>

The proportion of animal-related injuries to total emergency admittance varies: Among developed countries, it ranges from 1% to 2.7% and in developing nations, it accounts for 0.2%.<sup>[6,7]</sup> In the present study, mainly focusing on animal-related neurotrauma, it accounts for 0.48%. Persons with animal-related poly-trauma might be treated in respective specialty hospitals. The proportion of animal-vehicle collision was 11.4%,<sup>[8]</sup> and proportions of direct inflicted injuries are 2.6% in Poland,<sup>[9]</sup> and 0.2% in Turkey,<sup>[7]</sup> the present study has 0.4% and 0.4%, respectively (total RTA cases during this period was 3377).

As expected, majority of injuries 29 (96.6%) occurred in rural parts, only one case from urban region was due to avoiding dog on road. Males appear to be common victims, as seen both in our study (70%) and in other studies 73.2%<sup>[6]</sup> and 62%.<sup>[9]</sup> The mean interval to reach emergency services in present study, i.e.,  $7.58 \pm 7.14$  hours (Mean  $\pm$  SD), is earlier as compared to study from Iran,<sup>[4]</sup> which is  $13.04 \pm 25.12$  hours.

GCS is one of the standard criteria to assess the severity of head injury. Majid Moini *et al.*,<sup>[4]</sup> reported 2/40 (5%) of moderate head injury, whereas the present study has higher percent 7/30 (23.3%) of moderate to severe head injury, of which two third is due to animal-vehicle collision and rest is animal-inflicted. Possible reason might be the person riding two wheeler vehicles not taking proper precaution (not wearing helmet), braking of high speed vehicles and loss of control due to sudden obstruction by street dogs/cow/buffalo, or bad condition of surrounding landscapes.

All patients underwent CT imaging, of which fifty percent (50%) had abnormal findings; 60% were animal-inflicted, and 40% had vehicle-collision. Among them, the most common finding was contusion 8 (26.6%), followed by edema 6 (20%), and skull fracture 4 (13.3%); 2 (6.6%) patients had diffuse axonal injury, 2 (6.6%) patients had SDH, and 2 (6.6%) patients had SAH.

As the present study is focusing only on neurotrauma, and other injuries like, spine, chest, abdomen, and extremity injuries were considered as associated injuries,

seen in 25 (83.3%). Extra-cranial internal carotid artery (ICA) dissection was seen in 1 patient who manifested as hemiparesis. Two patients had the brachial plexus injury, and 3 cases had spinal injuries.

Effective management requires rapid medical evaluation and may necessitate surgical intervention and prophylactic antibiotic and anti-epileptic therapy. The animal-vehicle collision and large animal-inflicted injuries to the head and neck can cause serious impact on brain. Nogalski *et al.* reported<sup>[9]</sup> 7.8% of total patients required a craniotomy; 10% of the patients in our study required surgical intervention for emergency evacuation of hematoma. The only mortality (3.3%) in the series was 60-years-old woman who reached hospital in altered sensorium since bull gore injury with moderate GCS score and sluggishly reacting pupils. She had brain parenchymal contusion on imaging, underwent evacuation of contusion, the post-op GCS deteriorated and she expired during hospital-stay. Nogalski *et al.*<sup>[9]</sup> reported death rate was 5.88% of animal-related poly trauma injuries.

Interestingly, we found that frequency of neuro-trauma and mortality among women is slightly higher due to animal-related injuries, whereas lower in RTA, assault, and falls. This is probably because all are from rural background. Four women were directly injured by bull while handling them at home; 5 were pillion rider injured by colliding with animal on road (trying to avoid them on the way).

In the present study, the GOS was used to assess long-term outcome. Follow-up was available for only one third (33.3%) of patients with the range of 12 to 18 months; it was done with telephonic interviews. The good recovery was seen in 8 (80%) patients, moderate disability, and vegetative state were seen in 1 (10%) each.

## Conclusion

Both, animal vehicle-collision and animal-inflicted injuries can cause potential risk to public or vehicle users.

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