



# Domestic Animal-Related Injuries: Experiences from Elnohud Teaching Hospital in Western Kordufan State-Sudan

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## Abstract

**Background:** Domestic animal-related injuries are significant source of morbidity and mortality worldwide especially in rural community.

**Materials and Methods:** In a cross sectional study, victims of domestic animal-related injuries in Elnohud teaching hospital and two private dispensaries in 2017 were evaluated. The objective was to determine pattern, complications, management and outcome of domestic animal related injuries. The data collected included patient's demographics, animal species-specific mechanism of injuries, in addition to complications, management and outcome after period of follow up. Data were analyzed and expressed in tables using SPSS version 22.

**Results:** A total of 210 patients were included in this study, accounting for 7.3% of all trauma patients. The mean age  $\pm$  SD was (28.6  $\pm$  7.3) years. Male were more affected than female (ratio 2.3:1), majority of the patients from rural areas 198 (94.3%). Field workers represented (53.8%) and students (23.8%). Donkeys were the main contributor to injuries (60%) followed by horses (17.1%). Fall and bite were the most frequent mechanism of injury (59%). Concerning pattern of injuries, isolated injuries was found in majority 192 (91.4%); about 160 (77.3%) patients have soft tissue injuries while 50 (23.7%) have fractures. Extremities were the most common injured anatomical sites (40.9%). Regarding treatment, surgery was the main treatment in 159 (71%); wound debridement besides fracture management representing the most frequent surgical procedures 80 (38.1%), 33 (15.7%) respectively. Complications occurred in 4 (22.8%) patients: 2 (54.1%) wound infection and residual disfiguring scars, and 10 (20.8%) traumatic amputations. Mortality was found to reach (1.9%).

**Conclusion:** Donkeys which are the widely used domestic animals are the major inflictor of injuries and falls represents the majority of mechanism of injury beside bites. Extremities were the most affected parts and surgical treatment is the most practiced modality. Wound infection and scaring were the main complication and mortality is higher among pediatrics age.

**Recommendations:** Effort should be made to raise the awareness about importance of proper using of safety measures when dealing with domestic animals. Prehospital care and effective transfer to hospitals should be promoted.

**Keywords:** Domestic; Animals; Injury

## Background

Domestic animal-related injuries are significant source of morbidity and mortality worldwide especially in rural community [1]. Livestock and domesticated dogs and cats usually inflict human injuries through various mechanisms; including bite, fall, kick, tread, scratch and butting causing variable pattern of injuries.

Domestic animals related trauma has received much attention recent years due to its burden on population at risk. In the USA, where statistical information associated with animal-related injuries is best documented, about 1.3 million of such injuries are reported annually [2]. Langley RL et al., [3] reported approximately 11% of occupational fatalities and studies from developing country like Iran and Turkey revealed incidence of 0.2% of total trauma and 1.9% in New Zealand [4]. Further recent studies from different countries stated that, about 10% of farmers subjected to animal related

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**Table 1:** Showed distribution of animal related injuries according to sociodemographic factors (N=210).

	Number	%
<b>Age</b>		
<20	91	43.3
20-39	61	29
40-50	44	21
>60	14	6.7
<b>Sex</b>		
Male	147	70
Female	63	30
<b>Residence</b>		
Rural	198	94.3
Urban	12	5.7
<b>Occupation</b>		
Unemployed	52	14.8
Field worker	92	53.8
Student	50	23.8
Manual workers	11	5.2
Employer	5	2.3
<b>Education</b>		
Un educated	103	49
Basic education	97	46.2
secondary education	3	1.4
Graduated	7	3.3
<b>Medical insurance</b>		
Yes	189	90
No	21	10

injury in the past year [5,6]. Also a report from Poland showed 1,807 people suffered from animal-related injuries in 2013 [7].

It is known that this type of injuries is common among people living in agricultural areas [8]. Similarly, West Kordufan region in Sudan is a known agricultural area, moreover, it is an important natural pastures, therefore, being in close contact to these animals, the people in these areas are frequently subjected to trauma related to these animals and contribution of domestic animals related injuries in the study region is not known due to poor documentation and lack of reporting as numerous victims were treated at home by traditional healers or medical assistants in remote rural clinics. The present paper, presents determination and analysis of data concerning pattern, complications, management and outcome of domestic animal related injuries.

## Materials and Methods

This is a cross sectional hospital-based study which was carried out during the year 2017 in Elnohud teaching hospital and tow private dispensaries in Elnohud city which is located in West Kordufan state in Sudan. The objective of this study is to determine mechanism of injuries, pattern, treatment, complications and outcome of domestic animal related injuries.

About 210 patients with domestic animal related injuries were treated according to local guidelines of trauma management. The

subjects of this study include all patients of all age group and gender that presented to Elnohud teaching hospital and the dispensaries with domestic animal related injuries during the study period. Some of the patients received only ambulatory treatment and others were admitted to the ward of them, few were transferred to tertiary hospital. Every patient was management after proper clinical assessment and performing a needed investigation. The data were collected using administered standardized questionnaire designed to obtain prospective information through direct interview. The collected data included: personal data like age, occupation, education, residence, medical insurance. It also included pattern, site, management, complications and outcome in addition to animal species causing injury. The obtained data was entered and analyzed using Statistical Package for Social Scientist (SPSS) version 22. Data summary was presented in tables. Concerning ethical issues, approval was obtained from the ethical committee, faculty of medicine, west Kordufan University and a written informed consent was obtained from each participant after explaining the research objectives and procedures.

## Results

A total of 210 patients participated in this study, their ages range between (1 year to 70 years) with mean age (28.6) SD (7.3 years) and the majority 91 (43.3%) were below 20 years (Table 1). Most of the victims were male 147 (70%) with male to female ratio about 2.3:1. Vast majority were living in rural areas 198 (94.3%) which located a considerable distance from Elnohud city. About 92 (53.8%) of the patients were field workers and 103 (49%) were uneducated. Also, majority 189 (90%) of the patients have no medical insurance.

With regards to distribution of animal species inflicting trauma and mechanism of injuries, donkeys were the major contributor to injuries, representing about 126 (60%). The remaining were horse 36 (17.1%), dogs 10 (4.7%), cows 12 (5.7%), camel 18 (8.6%), sheep 6 (2.9%) and cats 2 (0.9%). The most common mechanism of injury was falling 78 (37.1%) followed by biting in 46 (21.9%), kicking 24 (11.4%), stepping 8 (3.8%), butting 10 (2.8%), shopping cart related 20 (9.5%) and Others 28 (13.3%) (Table 2).

## Characters of injuries

Concerning the site of trauma, in this study approximately all body regions have encountered injuries, 192 (91.4%) had isolated injuries and 18 (8.6%) had multiple injuries.

The most frequently injured sites were the extremities 86 (40.9%) followed by trunk, and head and neck (Table 3). The study has also shown that soft tissue injuries represented 120 (57.1%) and this included; open wounds injuries like cut wounds, lacerations, abrasions and contusions represented near half of the cases 96 (45.7). Visceral injuries which were a consequence of penetrating or blunt abdominal and chest wall trauma occurred in 10 (4.8%). Also, in this study, head trauma was in 12 (5.7%) with scalp lacerations representing the majority. Urogenital trauma which was common among pediatrics patients in this study, were seen in 8 (3.8%) (Table 4). Fractures was about in 66 (23.7%), the most common type of fractures in this study, were fractures extremities 38 (76%).

## Patterns of admission and treatment

This study showed that, 136 (64.8%) patients were treated within 6 h from trauma onset and presentation more than 6 h was reported in 74 (35.2%). In this study, only 63 (30%) received prehospital management. Regarding modalities of treatment, 160 (76.2%) of the

**Table 2:** Showed distribution of animal related injuries according to animal species and mechanism of injuries.

Animal	Mechanism of trauma							Total 210 (100%)
	Fall (37.1%)	Bite (21.9%)	Kicking (11.4%)	Stepping (3.8%)	Butting (2.8%)	Cart related (9.5%)	Others (13.3%)	
Cat	0	2	0	0	0	0	0	2 (0.9%)
Dog	0	10	0	0	0	0	0	10 (4.7%)
Donkey	61	25	7	2	0	15	16	126 (60%)
Horse	9	3	15	0	0	5	4	36 (17.1%)
Sheep	0	0	0	0	6	0	0	6 (2.9%)
Goat	0	0	0	0	0	0	0	0.00%
Cow	0	0	2	6	0	0	4	12 (5.7%)
Camel	8	6	0	0	0	0	4	18 (8.6%)
Total	78	46	24	8	10	20	28	210 (100%)

**Table 3:** Showed distribution of animal related injuries according to site of the injury and diagnosis (N=210).

Site	Diagnosis	Number	%
<b>Head and neck injuries</b>		<b>46</b>	<b>21.9%</b>
- Head	Bruise, contusions	27	12.8
- Neck	Strain, open wounds, expanding haematoma	9	4.3
- Face and mouth	Lacerations, teeth loss, tongue injury	10	4.8
<b>Trunk</b>		<b>48</b>	<b>22.8%</b>
- Chest	Fracture ribs, Heamopnumothorax	20	9.5
- Abdomen	Bruise, Visceral abdominal injuries	16	7.6
- Buttocks	Open wounds	4	1.9
- Back and spine	Strain, bruise, fractures	8	3.8
<b>Extremities</b>		<b>86</b>	<b>40.9%</b>
- Upper limp	Strain, Bruise, contusions, fractures, amputation	28	13.3
- Hand	strain, tendon injury, wounds, fractures, digit amputation	18	8.6
- Lower limp	Strain, Bruise, contusions, fractures	33	15.7
- Foot	Strain, open wounds, fracture	3	1.4
- Hip and Groin	Open wounds, Hip fractures, pelvic fracture	4	2
<b>Genitalia</b>	<b>Open scrotum, bruise, urethral and penile injury</b>	<b>12</b>	<b>5.7</b>
<b>Multiple sites injuries and diagnosis (N=210)</b>	<b>Face, neck, chest, extremities</b>	<b>18</b>	<b>8.6</b>

patients were admitted hours to days in to hospital, nine of them required blood transfusion as an initial supportive treatment.

Third of the victims 61 (29%), were received conservative treatment with discharged after short period. The rest of management modalities was surgical intervention including: fractures management in 33 (15.7%), tendon repair 2 (1.0%), wound exploration under anesthesia in 6 (2.9%), limb or digit amputation 10 (4.8%), tracheostomy 1 (0.4%) and minor wound debridement in 80 (38.1%) (Table 5). There were only 5 (2.4%) referred to tertiary hospitals.

### Outcome complications

Out of 210 patients, 206 (98.1%) were alive and the remaining four patients died because of head and chest trauma giving a mortality rate of 1.9%. Of the survivors, 149 (70.9%) patients were discharged well and 9 (4.2%) lost to follow up. The remaining 48 (22.8%) patients developed variable complications.

The encountered complications were wound infection 12 (19.1), Joint stiffness 7 (11.6), limb or digit loss 10 (16.3), neurological deficit 4 (6.5%), loss of function 2 (3.2%), disfiguring scar 12 (19.1%) and expanding neck haematoma casing upper airway obstruction

necessitated tracheostomy in 1 (1.6%).

## Discussion

Despite poor registry and categorization of trauma patients, we observed that, domestic animals related injuries represent a great burden on the medical staff and hospital in our setting. In this study area where populations are farmers and nomads in majority, injuries are regularly encountered in different places including houses, farms, pastures and local markets. In this review, domestic animal related injuries occurred in 7.3% of all trauma admissions, a figure which is similar to Gilyoma JM et al., [9] and significantly higher than that reported by Moini et al., [10] in Iran and Nogalski et al., [8] in Poland. Deficient reporting is a recognized problem for the researchers in many resource limited settings in under developed countries [9]. In our setting, prevalence is considered to be underestimated. The reasons behind that are poor registries at hospitals; no reporting in death certificates for those died before reaching the hospitals and many victims receives treatment elsewhere other than hospitals. A comprehensive reporting need firstly revising competency of registry in hospitals and collecting data from remote rural clinics and even a police records. Beyond doubt, accurate data could support useful

**Table 4:** Showed distribution of animal related injuries according to tissue affected (N=210).

Pattern of injuries	Number	%
<b>Visceral injury</b>	<b>10</b>	<b>4.8%</b>
- Haemopnumothorax	6	60
- Haemoperitonium- splenectomy	4	40
<b>Fractures</b>	<b>66</b>	<b>31.4%</b>
- Fractures extremities	38	57.6
- Fracture ribs	4	6
- Fractures with digit or limb amputation	8	12
- Fracture pelvis	2	3
- Spinal cord injury	8	12
- With multiple injured patients	6	9
<b>Intra cranial injuries</b>	<b>12</b>	<b>5.7</b>
<b>Other soft tissue injuries</b>	<b>120</b>	<b>57.1%</b>
- Tendon	4	3.3
- ligament and muscle strain	18	15
- open wounds in the skin	96	80
- tongue and teeth injury	2	1.7
<b>Urogenital trauma</b>	<b>8</b>	<b>3.8%</b>

policy guidance and help in minimizing occurrence of such injuries and their related morbidity and mortality.

Concerning the affected age group, the study found most injured patients are below 20 years, 91 (43.3%) of them were children, and students represents near quarter 50 (23.8%) of the victims. This in contradiction to other studies which found injuries rate was high in the third decade of life [8-11]. Injury to children is usually attributed to a wide range of activities engaged in by this class of people especially that related to family activities necessitated using animals in the transport to work, to the field, to markets or even to schools, furthermore, working with shopping cart is also increases the risk of such type of injury, moreover, immaturity and imprudence beside lack of awareness about safety measures in dealing with these kinds of animals are also implicated. On the other hand and in agreement with other studies, males were predominantly more affected than females in this study [9,10,12,13]. This probably attributed to the greater exposure of males to various outdoor activities related to uses of domestic animals in their daily life.

About (94.3%) of the victims live in rural areas, it is axiomatic that people in rural areas have to be more affected as they are living in close contact to domestic animals most of the day. Being located a considerable distance from the hospital where they expected to be treated; therefore, people find difficulties in transporting an injured patient, and this mainly because of far distance, no ambulance and rugged roads. Similarly, Gilyoma JM et al., [9] reported rural dwellers to be the majority of his study group but Moini et al., [10] reported affection of both rural and urban dwellers in his study. The study found that, half of the victims were uneducated, and this has unfavorable implications on level of awareness concerning using safety measures when dealing with these animals, moreover, people expected to lack knowledge about proper handling and transferring of injured patients especially those who need special care during transport.

Tolerance of the cost of management is important determinant

**Table 5:** Showed distribution of modalities of treatment, outcome and complications of domestic animals related injuries (N=210).

Modalities of treatment	Number	%
Medications, Reassurance and observation	61	29
Wound debridement	80	38.1
Exploratory Laparotomy	4	1.9
Tube thoracotomy	8	3.8
Fractures management	33	15.7
Tendon repair	2	1
wound exploration under anesthesia	6	2.9
Limb or digit amputation	10	4.8
Tracheostomy	1	0.4
Referred	5	2.4
<b>Outcome</b>		
Complete healing	149	70.9
developed complications	48	22.8
Died	4	1.9
Lost to follow up	9	4.2
<b>Complications ( n=48)</b>		
Wound infection	14	29.1
Joint stiffness	7	14.7
Neurological deficit	4	8.3
Residual disfiguring scars	12	25
Amputation	10	20.8
Airway obstruction	1	2

in outcome; majority of patients has no medical insurance, for this reasons, many victims has no intention in seeking medical advice in far hospitals from them.

In contrast to other studies [8,9,14,15], donkeys contributed to about two thirds of the reported injuries in this study 126 (60%) followed by horses and camels but no reported injury caused by goats. This probably because of donkeys are the most widely used animals in daily life activities like transfer and loading, moreover, it is the animals capable of producing injuries through different mechanisms like making falls, kicking, biting and treading.

Dogs bite and cat scratches were usually considered non-lethal and frequently treated in rural clinics so it was not predominant injuries in our study. However, many studies found dog bites were the most common cause of injuries which commonly affect children more than adult [9,14]. On the other hand, Eid HO et al., [16] reported camel related injuries as the most common injuries followed by cow-related injuries and Lucas M et al., [17] documented cattle, horses, dogs as the main animals inflicting trauma among veterinarians. Different variations in causative animals in the above studies are probably attributed to diversity in animal species living in these areas besides frequency and accuracy of reporting trauma.

About (37.1%) of injuries were caused by falls. Falls usually occurs with large animals used for transports like donkeys, horses, camels and sometimes cattle or animals in relation to shopping carts, however, these animals can also produce injuries through other different mechanism like; biting, stepping and kicking. Biting related to these kinds of animals is because it possesses strong jaw and teeth.

Although the site of injuries is unpredictable, however, certain body regions were found to be more vulnerable to injuries. In keeping with other studies, extremities were the most affected region in the body 86 (40.9%) followed by trunk, head and neck [9,18-20]. The explanation to this, as reported in some studies, is that animals may be at ease to attack moving body parts [18,21,22]. Furthermore, attempts at using foot and hand to avoid animal bites may be a possible reason for these parts being affected more, and in all situations, keeping distance far from animals is always the best preventive methods.

Multiple body region injuries occurred at a rate lower than reported by Norwood S et al., [13]. Generally, the type of wounds can range from minor bruises to more extensive injuries like punctured wounds, avulsions, fractures, amputations and damage viscera. In this setting, the majority of injuries were the soft tissue injuries which represented 120 (57.1%) a result similar to that reported by Gilyoma JM et al., [9] followed by fractures 50 (23.7%) while lethal injuries that caused mortality of this study were head and visceral injuries.

The reported limb amputation which is (3.8%) in the study was higher than what reported in two other studies by Gilyoma JM et al., [9] and Chalya et al., [11]. Though wild animals were included in both studies.

It is known that prehospital care of trauma patient has been reported to be the most important factor in determining the ultimate outcome after the injury [23]. The lack of advanced pre-hospital care in form of competent rescuer and effective ambulance system for transportation from site of injury to hospital is a major challenge in providing care for trauma patients in our locality. All injured patients there were brought by their relatives using their own vehicles or even animals, a situation similarly stated by Gilyoma JM et al., [9]. This unsupported prehospital care has been contributing significantly to poorness of the outcome of management for these patients.

The fundamental principles of animal related injuries includes; cleaning and debriding the wound, giving analgesia, prophylactic antibiotics, and tetanus vaccination followed by treatment of the developed complications [9,11,24].

In contrast, extensive injuries to skeleton or viscera may require admission and operative procedures including wounds debridement and primary or delayed primary closure. Moreover, major surgical procedures under anesthesia may be needed as thoracotomy, laparotomy and fractures management. In keeping with study by Gilyoma JM et al., [9] the most frequent treatment in our study was surgical treatment (71%) of which the most frequent modality is surgical wound debridement with either primary or delayed closure. Referring to tertiary hospital was amenable to 5 (2.4%), basically because of head and chest trauma. A feedback reports showed that, four of them died on the way or after arrival to the tertiary hospital.

Complications were expected to occur in animal related injuries and it is usually related to type of animal, mechanism and site of injury, moreover, time of presentation is a well determinant factor. In this study, wound infection and disfiguring residual scars were the most frequent complications. However, the most disabling complications were joint stiffness, paralysis, and limb or digit amputation. Most of the developed complications were related to late presentations which are because of poor transport and lack of pre hospital management.

In general, the overall outcome of the injuries was good as more than 149 (70.9%) of the patients (survivors) were discharged well.

Similar observation was reported previously by Gilyoma et al., [9]; however, complications here, were encountered in 48 (22.8%) where wound infection and residual disfiguring scars were the commonest complications 26 (54.1%) and traumatic amputations represented only 10 (20.8%).

Mortality in this study was (1.9%) which is less than that reported by Gilyoma et al., [9] and that is probably due to only domestic animals were included in our study. Mortality rate in our study was recorded in three infants with severe chest and abdominal injury beside one adult with head injury.

## Limitation

The basic limitation in this study was under reporting of minor injuries and self-discharges by patient against medical advice which is a recognized problem facing medical staff in our setting. Poor follow up after discharge from hospitals was also a limitation of concern. On the other hand, the causative animals in this study area, may not match a comparable other areas or studies. For all these reasons, the results may not be adequate for resembling situation and population in other areas, however, despite these limitations; the study has provided a valuable local data about mechanism of injuries, pattern, treatment, complications and outcome of domestic animal related injuries that can be utilized to optimize trauma care for the victims of animal related injuries. Similarly, the study has also provided a comparable data to the other parts of the world in this field.

## Conclusion

Children and young adults are the most affected age group. Donkeys which are the widely used domestic animals for different purposes are the major inflictor of domestic animal related injury and falls represents the majority of mechanism of injury beside bites. Majority of the patients received surgical treatment. Wound infection and scarring were the main complication. Mortality is higher among pediatrics age.

## Recommendations

This type of injuries mandates a more effective strategy to encourage use of protective measures besides efforts on promoting competency in early intervention and optimization of transporting injured patients to the hospital.

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