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Research article

Comparative pattern of fracture in different animals

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ABSTRACT

Incidence of bone fracture is very common in both medical and veterinary profession. There is lots of fracture management techniques applied for bone fracture. A total of 6163 clinical cases were recorded from May, 2017 to April, 2018 at the Sahidul Alam Quadery Teaching Veterinary Hospital (SAQTVH), CVASU. The objectives of the study were to find out the incidence of fracture in dogs, cats, goats and cattle and parameters were also studied for fracture occurrence in breed, age, sex and different nature and causes of fractures. A total of 6163 cases were recorded out of which 829 were surgical cases and 85 were fracture cases (dog-20, cat-19, goat-36 and cattle-10). The overall incidence of fracture was recorded as1.38% for all four species (dogs, cats, goat and cattle) of animals and 10.25% for all surgical cases of animals. Goat was the most common (42.35%) species to have a fracture among four species. Local breeds were more susceptible for fracture in dog, cat and cattle but jamunapari breeds were common in goats. Overall males were more prone for fracture and age less than six months old were also more vulnerable for fracture among four species. Closed unilateral hind limb fractures were more in all cases. Among different bones, femur fracture was the most common in dogs and cats but metacarpal bone was more common in goat and tibial bone in cattle and most of the fractures were oblique in nature. Falling from height (34.11%) was the major cause of fracture comparison to other causes but according to four species, automobile accident was common cause of fracture in dogs.

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1. INTRODUCTION

Orthopaedic affections, specially bone fractures constitute a major problem among dogs and cats (Senna, 2001, Harari, 2002 and Ben Ali, 2013) as well as cattle, sheep and goat (Singh et al., 1983, Aithal et al., 1998; Bilgili et al., 2008). The most common types of fractured long bone in dogs and cats is the femur and tibia representing 45% ((128/282), 26% respectively (Harasen, 2003). Metacarpal and metatarsal fractures incidence is high in small ruminants (Newman and Anderson, 2006) as well as in calves accounts for 50% of fractures (Auer et al, 1993). The most common fractures in food animals, such as cattle, include those of the metacarpus and metatarsus (approximately 50%), tibia (approximately 12%), radius and ulna (approximately 7%), and humerus (<5%). Fractures of the femur and pelvis also occur, but are uncommon. Fractures of the

phalanges are rare (Ferguson, 1982). Most fractures occur in goats between 1 to 3 years of age and are observed in femur, tibia, metacarpus or metatarsus, phalanx, humerus, radius and ulna in decreasing order of frequency (Singh et al., 1983 and Awatif et al., 2006). In dogs, non-descriptive (42.10%) male (72.68%) age between 12-36 months (78.95%) are more prone for long bone multiple fractures (Singh et al., 2015). Understanding the different types of fracture and their incidence will be helpful to develop improved techniques of fracture fixation in animals (Aithal et al., 1999). This study was undertaken to analyze the occurrence of limb fractures pattern in different animals.

2. MATERIALS AND METHODS

A survey study was conducted on clinical cases presented to Sahidul Alam Quadery Teaching Veterinary Hospital (SAQTVH), Chattogram Veterinary and Animal Sciences University (CVASU), Chattogram during the period from May 2017 to April 2018. 85 fractures cases were subjected to thorough relevant history and clinical examination included inspection, gait evaluation, neurologic and radiographic examination. Radiographic examination in two orthogonal views of the affected limb was conducted using a digital X-ray .machine (Shimadzu, Kyoto, Japan) with standard exposure factors. Sedation of affected animals with diazepam/ xylazine was performed when needed. The breed, age, sex and different nature of fractures were recorded to infer significance of the study. The history of trauma was also recorded to ascertain the etiology of the fracture. All data were organized in the Microsoft excel spreadsheet and analyzed by using software STATA 11.

3. RESULTS

A total number of 6163 clinical cases were recorded at SAQTVH within 1 year during the period from May 2017 to April 2018. Among 6163 clinical cases, surgical cases were recorded 829 and fractures were 85 cases. Overall incidence of fracture cases was 1.38% and in relation to surgical cases, incidence of fracture was 10.25%. The occurrence of fracture among the different species was shown in Table 1. The results revealed that highest incidence of fracture found in goats –36 (42.35%) followed by dogs -20 cases (23.52%), cats -19 cases (22.35%) and cattle -10 cases (11.76%).

Table 1: Incidence of fracture according to species

Species	Total number	Proportionate incidence (%)
Dog	20	23.52
Cat	19	22.35
Goat	36	42.35
Cattle	10	11.76
Total	**85**	**100%**

The incidence of fracture in different breeds of different animals was presented in Table 2. The results showed that occurrence of fracture was more in local (Non-descriptive) breed in dog, cat and cattle but in goat, higher occurrence was recorded in Jamunapari goat.

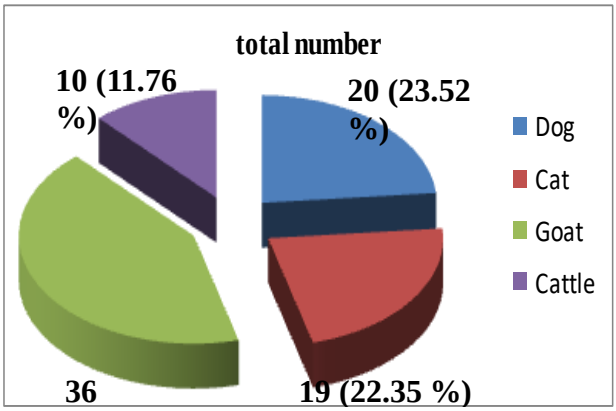

Fig. 1: Incidence of fractures among the different species

Table 2: Incidence of fracture according to breeds

Breeds	No.	Percentage (%)
Dog		
• Local (ND)	10	11.76
• Spitz	8	9.41
• German shepherd	2	2.35
Cat		
• Local (ND)	17	20.00
• Persian	2	2.35
Goat		
• Cross (BB x JP)	14	16.47
• Black Bengal	6	7.05
• Jamunapari	16	18.82
Cattle		
• Local	7	8.23
• Cross (Local x HF)	3	3.52
Total	**85**	**100**

ND-Non descriptive, BB-Black Bengal. JP-Jamunapari, HF- Holstein Fresian

Table-3: Incidence of fracture according to sex

Species	Sex		No.
	Male (%)	Female (%)	
Dog	13 (15.29)	7 (8.24)	20
Cat	9 (10.58)	10 (11.75)	19
Goat	19 (22.24)	17 (20.00)	36
Cattle	6 (7.05)	4 (4.71)	10
Total	**47 (55.29)**	**38 (44.71)**	**85**

Table-4: Incidence of fracture according to age in different species

Species	Age (month)	No	Percentage
Dog	< 6 months	12	14.12
	6-12 months	6	7.05
	More than 12 months	2	2.35
Cat	< 6 months	14	18.82
	6-12 months	5	3.33
	More than 12 months	0	0
Goat	< 6 months	27	31.76
	6-12 months	8	9.41
	More than 12 months	1	1.17
Cattle	< 6 months	7	8.23
	6-12 months	3	3.53
	More than 12 months	0	0
Total		**85**	**100**

Incidence of fracture according to sex was shown in Table-3. Most of the fractures occurred in male than the female among four species. Male contributes about 55.29% (47 cases) and female about 44.71% (38 cases). Incidence of fracture according to age in different species was presented in Table 4.Most of the fractures found less than 6 months of age among each species of animals. Incidence of fracture was more in goat 27 cases (31.76%) at less than 6 months of age comparison to dog, cat and cattle.

Table 5: Occurrence of fractures based on open and closed

Criteria	Involved species				Total (%)
	Dog	Cat	Goat	Cattle	
Closed fracture	19	19	36	8	82(96.47)
Open fracture	1	-	-	2	3(3.52)
Total	**20**	**19**	**36**	**10**	**85 (100)**

The highest incidence of fractures was found to be the closed fracture which was about 96.47% as against the open fracture which was about 3.52% (Table 5) and 6 unilateral fractures occurred at a higher rate (91.76%) than the bilateral fractures (8.23%) among all four species (Table 6).

Table 6: Occurrence of fracture based on unilateral and bilateral limb affected

Criteria	Involved species				Total (%)
	Dog	Cat	Goat	Cattle	
Unilateral fracture	18	17	35	8	78(91.76)
Bilateral fracture	2	2	1	2	7(8.23)
Total	**20**	**19**	**36**	**10**	**85 (100)**

Table 7: Incidence of fracture based on involvement of affected bone

Fracture location	Dog			Cat			Goat			Cattle			Total (%)
	Ep	Met	Dia	Ep	Met	Dia	Ep	Met	Dia	Ep	Met	Dia	
Fore limb													
Scapula	-	-	-	-	-	-	1	-	-	-	-	-	1 (1.18)
Humerus	-	-	-	-	1	2	1	-	2	-	1	-	7(8.24)
Radius/Ulna		2	4										7 (8.24)
Metacarpal	-	-	-	1	-	1	2	6	1	-	-	2	13(15.29)
Digit	-	-	-	-	-	-	-	-	-	-	-	-	0
Hind limb													
Femur	2	1	5	1	4	4	1	1	2	-	1	1	23(27.05)
Tibia/Fibula	1	1	4		1	2	1	1	5	-	2	1	19(22.35)
Metatarsal	-	-	-	-	1	-	-	2	6	-	2	-	11(12.94)
Digit	-	-	-	-	-	-	1	2	-	-	-	-	3 (3.52)
Pelvis	-			1			-			-			1 (1.18)
Total	**20**			**19**			**36**			**10**			**85 (100)**

Ep = Epiphyseal, Met = Metaphyseal and Dia = Diaphyseal

The incidence of fracture based on affected bone involvement was shown in Table 7. The study revealed that the overall incidence of fracture was more in hind limb 57 cases (67.05%) than forelimb 28 cases (34.12%). It also found that the overall higher incidence of fractures occurred in femur 23 cases (27.05%) followed by tibia/fibula 19 cases (22.35%), metacarpal 13 cases (15.29%), metatarsal 11 cases (12.94%), humerus 7 cases (8.23%), radius/ulna 7 cases (8.23%), digit 3 cases

(3.52%), scapula 1 case (1.18%) and pelvis 1 case (1.18%). According to species, femur fracture was more in dogs and cats but metacarpal fracture was more in goat and tibial fractures in cattle.

Table 8: Incidence of fracture based on nature of fractures

Fracture direction	Affected species				Total (%)
	Dog	Cat	Goat	Cattle	
Transverse	6	4	15	3	28 (32.94)
Oblique	14	15	19	6	54 (63.53)
Spiral	-	-	1	-	1 (1.18)
Comminuted	-	-	1	1	2 (2.35)
Total	**20**	**19**	**36**	**10**	**85 (100)**

The incidence of fracture based on nature of fracture was shown in Table 8. The overall highest incidence of fracture was found in obliquefractures 54 cases (63.53%) followed by transverse 28 cases (32.94%), comminuted 2 cases (2.35%) and spiral 1 (1.18%) fractures.

Table 9: Risk factors/ causes of fractures in different species

Criteria	Involved species				Total (%)
	Dog	Cat	Goat	Cattle	
Automobile accident	7	-	3	1	11(12.94)
Falling from height	5	8	11	5	29(34.11)
Trauma by fighting, beating etc.	2	4	8	4	18 (21.18)
Stuck in cot	-	-	10	-	10 (11.76)
Unknown	6	7	4	-	17(20.00)
Total	**20**	**19**	**36**	**10**	**85 (100)**

The risk factors/causes of fractures in different species were presented in Table 9. Many factors were responsible for the occurrence of fractures. The overall most common causes of fractures were found in falling from height -29 cases (34.11%) followed by trauma by fighting, beating etc. -18 cases (21.18%), unknown -17 cases (20.00%), automobile accident -11 cases (12.94%) and stuck in cot -10 cases (11.76%). The common risk factor of fracture by stuck in cot found only in goats.

4. DISCUSSION

In the present study, fractures represented about 1.38%. (85/6163) among all cases (goat, cattle, dog, cat) recorded in hospital and 10.25% (85/829) among all surgical cases. The overall incidence of fractures was very similar to finding (0.95%) reported by Singh et al. (2015) and in relation to the surgical affections, fracture incidence was not similar to the authors reported by Ben Ali (2013) and Senna et al. (2004) represented 17.8% in dogs and cats and 14.7% in feline, respectively.

In the present work, highest incidence of fracture was recorded in goat 42.35% (36/85) followed by dogs 23.52% (20/85), cats 22.35% (19/85) and cattle -11.76% (10/85) but Singh et al. (2015) who reported the fracture incidence in dog 61.80% (55cases), goat 24.72% (22 cases), cattle and buffalo 11.24% (10 cases) and others species 2.25% (2 cases). This variation between two reports could be due to overcrowded and increased car accident in India than in Bangladesh, in addition could be due to dog was easy to carry to the hospital and more awareness to treatment of pet animals. Fracture incidence was more in goat at Chattogram, Bangladesh because of more goat population comparison to

dog. Occurrence of fracture was more in local (Non-descriptive) breed in dog, cat and cattle but in goat, higher occurrence was recorded in Jamnapari goat that was found in present work. These results could be due to Jamnapari goat population more in Chattogram than non-descriptive breed of other species. On the other hand, in dog higher incidence was recorded in German Shepherd (17/88) and in cat, Siamese breed (Ben Ali, 2013) and similar finding was recorded by Senna et al. (2004) and Harasen (2003). According to age, present case study revealed maximum fractures occurred in less than six months of age in dog, cat, goat and cattle and highest incidence was recorded in goat (31.76%) compare to other species. Similar finding was reported by Singh et al. (2017) who recorded 60% fractures in goat less than nine month of age. In another study, young dogs below 6 months are most commonly affected (46.02%) and (36.25%) respectively reported by Simon et al. (2010, 2011). This is because young dog is very active, playful and learn to cope with the dangers of their environment through experience (Kolata et al. 1974). Young dogs get skeletal maturity between 5 months (toy breeds) and 18 months (giant breeds) through a very rapid biphasic growth rate. During the growing stage, structural and biochemical properties of immature bone are considerably different from those of adult bone and are characterized by lower strength and stiffness (Torzilli et al., 1981).
Regarding sex, overall male was more susceptible for fracture than female among four species but individually in dog, goat, cattle more fracture occurrence was found in male but reverse in cat in present study. However in individual report, male dog (73.68%) and goat (53.34%) are more susceptible than female recorded by Singh et al. (2015) and Singh et al. (2017).

The overall highest number of fracture was recorded as closed (96.47%), unilateral (91.76%) fractures compare to open, bilateral fractures. Among four species, maximum closed and unilateral fractures were found in 36 and 35 cases in goat out of total 85 cases. This finding was probably due to causes and location of fractures.

Overall pelvic limb fractures were found to be more (67.09%) than pectoral limb and highest number of fracture was recorded in femur (27.05%) than other bone among all four species and second highest number of fractures in tibia-fibula. Diaphyseal fractures were recorded more in different long bones compare to epiphysis and metaphysis. Individually femur fractures were found to be more in cat followed by dog, goat and cattle. In case of goat, metacarpal and metatarsal fractures were found to be first and second number compare to other bone. Singh et al. (2017) also reported the highest number of fractures was found in pelvic limb (63.34%) in goat. Similar findings were also reported by Ganesh et al. (1994) and Aithal et al. (1998) in goat. Singh et al. (2017) revealed more common fractures in tibia-fibula (36.66%) in goat but in present study, maximum fractures were found in metacarpal bone. Kumar (2016) also reported highest number of fracture in metacarpal followed by metatarsal in goats. Minar et al. (2013) also reported the hind limb (37.0%) as most common followed by forelimb (30.0%), pelvis (22.0%) and facial bones (11.0%) in dogs. Ben Ali (2013) who reported maximum fractures were found in femur dogs (20 cases) and 13 cases in tibia-fibula in cats.

In the present work, overall oblique type of fractures were found to be more (63.53%) compare to other types of fractures among dog, cat, goat and cattle. Maximum numbers of oblique fractures were found in goats followed by cat, dog and cattle. Similar findings were also reported by Singh et al. (2017), Arora (1996), Patel (2014) in goats. In addition to that Simon et al. (2011) reported the occurrence of oblique/transverse fractures were more (42.59%) than overriding (30.21%) and comminuted fractures (18.12%) in dogs. Higher incidence of oblique/transverse fracture indicates that the predominance of bending or compression forces as the cause of fracture (Smith, 1985).

The overall most common causes of fractures were falling from height (34.11%) compare to other causes among dog, cat, goat and cattle. According to species in goat, cat and cattle the most common cause of fracture was falling from height but in dog-automobile accident was the main cause of fracture. Similar findings were recorded by Gupta,2015 who recorded that falling

from a height (37.50%) followed by an automobile accident (25.0%) in goat but disagree the result by Kushwaha et al. (2001) who observed automobile accident (71.43%) as the main cause of fracture followed by falling from a height (28.57%). In dogs, similar findings were also recorded by Singh et al. (2015), Aithal et. al. (1999), Minar et al. (2013) who reported automobile accident 42.10%, 46.86% and 43.0%, respectively. In cat based on present work, similar results were found by Ben Ali (2013) who recorded 10 cases out of 28.

5. CONCLUSION

The overall incidence of fracture was recorded as1.38% for all four species (dogs, cats, goat and cattle) of animals and 10.25% for all surgical cases of animals. Goat was the most common (42.35%) species to have a fracture among four species. Local breeds were more susceptible for fracture in dog, cat and cattle but Jamnapari breed was common for fracture in goats. Overall males were more prone for fracture and age less than six months old were also more vulnerable for fracture among four species. Closed unilateral hind limb fractures were more in all cases. Among different bones, femur fracture was the most common in dogs and cats but metacarpal bone was more common in goat and tibial bone in cattle and most of the fractures were oblique in nature. Falling from height (34.11%) was the major cause of fracture comparison to other causes but according to four species, automobile accident was common cause of fracture in dogs.

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