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Prevalence of Lameness and its Associated Risk Factors in Abergelle Fattening Farm of Alamata, South Tigray, Ethiopia

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Abstract: Purposive samplings were used from November, 2011 to April, 2012 in Alamata woredas to assess the major skeletal disorders. 1600 cattle were examined, of which 3.8% (60/1600) were affected. The rate of lameness, punctured and lacerated wound and fracture were 2.7% (43/1600), 0.2% (4/1600), 0.4% (7/1600) and 0.4% (6/1600) respectively. In related to the age, the rate of lameness was 2.3% (37/1600 and 0.4 %(6/1600) in both adult and old animals respectively,with statistical significance between these age groups ($p<0.05$). The rate of lameness was 2.7 % (43/1600) in local breeds as compared to the cross breeds with the rate of 0 % (0/100) but there is no statistical significance between these two breeds ($p>0.05$). In addition, the rate of lameness, lacerated, puncture wound and fracture in these animals originated from Raya were 1.8 %(28/1600), 0.3%(5/1600), 0.2 %(3/1600) and 0% (0/1600) respectively where as the animals originated from Wollo were 0.9%(15/1600), 0.1%(2/1600), 0.1%(1/1600) and 0.4 %(6/1600) respectively. This result showed there is statistical significance difference of fracture in these animals originated from Ro. naya and Wollo ($P<0.05$). In conclusion, skeletal disorder were the main constraint of the fattening animals in the study site therefore proper housing, design and size of the truck, appropriate feed of cattle should be implemented for reduction of the major skeletal disorders.

Key words: Cattle · Fracture · Lacerated Wound · Lameness · Punctured Wound

INTRODUCTION

Ethiopia is a country known for its livestock population which stands first in Africa and tenth in world with an estimated population of country comprises about 49.3 million cattle, 25.3 million sheep, 27.88 million goat, 7 million equine, 1.2 millions camels, 53 million poultry and immense been and fisheries. However production efficiency of cattle is low in Ethiopia despite their large population [1].

According to TBOABR [2], Tigray has an estimated cattle population of 3040, 1709 and the live stock population in Alamata is 108,519 cattle, 595514 sheep, 38,397 goats, 7,341 ovine's 7,341 camels and 132,153 poultry [3].

The statistics in support of livestock are impressive, nearly 2 billion people, one third of the world population, derive at least some of their livelihood farm animals nearly one person in every eight individuals depends almost entirely on livestock. Domestic animals meet more than 30% to the people foods and agriculture needs [4].

In sub Saharan Africa livestock plays a crucial role in economic development of the countries and living standard of rural communities by serving as a source of income and food export of live animals and animal products make substance contribution to the foreign exchange earnings of many countries [4]. As in many other countries, livestock plays multiple roles in Ethiopia being natural source of food, industrial raw material, export earnings and form an integral part of the agriculture production system. However, their productivity is low due

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to various constrains such as diseases, poor nutrition, poor management practices and low reproductive performance of the indigenous breed [5].

Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the agricultural productive system in Ethiopia [6].

Animal rearing plays a significant role in the economy of Tigray region. They are living banks for farmers of the region as they provide flexible binomial reserves for period of economic stress and better against crop failure they are source of income, enabling farmers to purchase inputs, foods and other needs. Livestock plays a particular critical role in the agricultural intensification process by providing draft power, meat and milk for food and manures for the fuel and fertilizer [2]. Even though, livestock provide such benefits to human beings they were facing a lot of challenges due to different diseases among which bone diseases and skeletal disorders are the once affecting both the dairy and beef animals.

Bone is specialized connective tissue with mineralized collaginouse fame work providing support to the body. Bone constantly under goes molding and remolding process. Most long bones are made up of hollow tube of cortical bone, the shaft or diaphysis and to extremities, the epiphysis. Shaft encircles acenteraly located cavity, the medullar cavity which consist bone marrow.The entire of long bone except at the ends at which articular cartilage is present, covered by periosteum. The outer fibrous layer of perioseum acts a protective and limiting merman where as the osteogenic layer (cambium) contains osteoblasts are responsible for osteogenic activities of bone [7].

Bone disease are generally congenital or hereditary, nutritional or traumatic bone defects which are primarily caused by imbalance or deficiencies of minerals, particularly the trace minerals such as copper, zinc, magnesium, calcium and phosphorus concentration which must be present on the correct ratio as osteomalacia represents the classic example imbalance in calcium and phosphorus ratio. Either deficiency or excess intake of certain vitamins, particularly vitamin A and D, may influence growth and development of bone. Traumatic causes of bone disorders include fractures, fissures, peritoneal reaction as a result of trauma, sequestrum formation [8].

Disease of the skeletal support including bones and joints have much in common in that the major clinical manifestation of the disease which affects them, failure of support insufficiency of movements affects all voluntary muscles including those responsible for respiratory movements and mastication but failure to support are manifestation of involvements of the limb [9].

The gap of the study was improper housing that is slippery nature of floors with containing moisture, which is responsible for moistening of the hooves of the animals hence different infectious agents might penetrate and entered into the system. The other reason may be due to its slippery nature, animals may fall into the ground which may be responsible for fracture of the animals. The animal population in the house were too crowded which leads to fighting, confinement and feeding inside the house without tight leads also for fighting each other. Animal exposed to major skeletal disorder due to insufficient space of the animals inside the vehicle and tied of their horns on the side of the vehicle. Animals affected here due to bad road and driving conditions. The truck was not designed for animal transport, animals could be jump and be damaged. Inside the vehicle the driver used straw or wood chips to minimize chance of falling on the truck due to its slippery floorTherefore, the objective of the study is assessment of major skeletal disorder of fattening cattle in Ethiopia.

MATERIALS AND METHODS

Study Area: The study was conducted from October 2011 to April 2012 in abergele international livestock development plc Alamata branch. Alamata was located southern of Tigray near boarder of Amhara region. It is 180km far from Mekelle and 600km from the capital city of Ethiopia (Addis Ababa). It is found at latitude of 12.31°, longitude of 39.41°, the average elevation of Alamata is 1580 meters above sea level. The mean annual rainfall is 727mm. There is bimodal, rain fall in which the longest and the heaviest rainfall received falls from June to August, while the shortest rain fall is from March to April. The annual average temp is 27°C [3].

Study Design and Sample Size Determination: Purposive sampling methodology was employed to assess the major skeletal disorders in the fattening farm. For this purpose all animals purchased from different markets and transported to the farm were examined. The sample size was calculated using the formula where the total cattle population of cattle in the study site were 108, 519. [3]

Hence using the 50% prevalence and absolute precision of 5% the total sample size was calculated. Hence, the total sample size was 384 but to increase the precision of the result fourfold of the calculated sample were examined.

$$N=\frac{1.96^2*pexpe\ (1\text{-}pexpe)}{d^2}$$

Where N= the total sample size

P_{expe} = expected prevalence

d = absolute precision and to calculate the sample size the 95 level of confidence was utilized accordingly the total sample size was 384 but to increase the precision of the result fourfold of the calculated sample was used.

Study Animals and Methods of Examinations: The study animal comprises cross and local breeds of cattle stationed in Abergele international livestock development plc site Alamata branch which were originated from different parts of Raya and its boarder Wollo.

For identification of the major skeletal disorders, the fattening farm animals were examined by inspection and palpation of the affected part of the skeleton. Following clinical examination and palpation of the affected body parts of the animals,the data were recorded in the formats which were prepared for each particular disorder.

Data Analysis: Following collecting the relevant data from the examined animals were recorded into the Microsoft excels spreadsheet and properly coded. For data analysis, SPSS version 16 was used to determine the prevalence and chi-square was used to determine the relationship between the risk factors with the occurrence of the skeletal disorders.

RESULTS

In this study, the overall prevalence of major skeletal disorder was 3.8% (60 /1600) as indicated in table 1. In addition the prevalence of lameness in animals originated from Wollo and Raya 2.7 %(43/1600) of lamented, 0.4 % (6/1600) fractured, 0.2% (4/1600) of punctured and 0.4 %(7/600) were lacerated.

The prevalence of lameness in different local and cross breed shown that it was 2.7 % (43/1600) and 0 % (0/1600) respectively (Table 2)

Table 1: Over all prevalence of major skeletal disorder.

Major skeletal disorder	Prevalence (%)
Lameness	2.7% (43/1600)
Fracture	0.4% (6/1600)
Punctured Wound	0.2%(4/1600)
Lacerated Wound	0.4% (7/1600)
Total	3.8 (60/1600) %

Table 2: Prevalence of lameness according to breed.

Breed	No of animals examined	Affected animals	P value
Local	1596	2.7%(43/1600)	.739
Cross	4	0%(0/1600)	
Total	1600	2.70% (43/1600)	

Table 3: Prevalence of lameness by age

Age	No of animals examined	Affected animals	P value
Adult	1566	2.3% (37/1600)	.000
Old	34	0.4%(6/1600)	
Total	1600	2.7% (43/1600)	

Table 4: Prevalence of lameness in animals based on origin.

Origin	No of animals examined	Affected animals	P value
Wollo	419	0.9%(15/1600)	.189
Raya	1181	1.8%(28/1600)	
Total	1600	2.7% (43/1600)	

Table 5: Prevalence of fracture of fattening animal by breed.

Breed	No of animals examined	Affected animals	P value
Local	1596	0.4% (6/1600)	.902
Cross	4	0%(0/1600)	
Total	1600	0.4% (6/1600)	

Table 6: Prevalence of fracture in the fattening animal based on age.

Age	No of animals examined	Affected animals	P value
Adult	1566	o.4% (6/1600)	.718
Old	34	0% (0/1600)	
Total	1600	0.4% (6/1600)	

Table 7: Prevalence of fracture based on origin.

Origin	No of animals examined	Affected animals	P value
Wollo	419	0.4% (6/1600)	.000
Raya	1181	0% (0/1600)	
Total	1600	0.4% (6/1600)	

Moreover, the prevalence of lameness in different age group was 2.3% (37/1600) in adults and 0.4 % (6/1600) inold animals (Table 3).

The fattening animals were originated from Wollo and Raya with population of 419 and 1181 respectively. The prevalence of lameness of Rayan breeds were 1.8 % (28/1600) and Wollos breed were 0.9 % (15/1600).

Most of the animals examined in the study area were local 1596 where 0.4% (6/1600) were affected by fracture but the cross breed were not affected.

Table 8: Proportion of wound based on breed

	No of animals examined		Affected animals			
Types of wound	Local	Cross	local	Cross	Total	p value
Punctured	1596	4	0.2% (4/1600)	0% (0/1600)	0.2%(4/1600)	.920
Lacerated	1596	4	0.4% (7/1600)	0%(0/1600)	0.4%(7/1600)	.894

Table 9: Prevalence of wound based on age

	No of animals examined		Affected animals			
Types of wound	Adult	Old	Adult	Old	Total	P value
Punctured	1566	34	0.2% (4/1600)	0% (0/1600)	0.2%(4/1600)	.768
Lacerated	1566	34	0.4% (7/1600)	0% (0/1600)	0.4%(7/1600)	.695

Table 10: Prevalence of wound based on origin

	No of animal examined		Animal affected			
Types of wound	Wollo	Raya	Wollo	Raya	Total	P value
Punctured	419	1181	(0.1%) 1/1600	0.2% (3/1600)	0.2%(4/1600)	.957
Lacerated	419	1181	0.1% (2/1600)	5/1600(0.3%)	0.4%(7/1600)	.886

The total numbers of adult animals were 1566 and 34 old animals with prevalence of fracture of o.4% (6/1600) and 0% (0/1600) respectively (Table 6).

Similarly, prevalence of fracture from Wollo was 0.4%(6/1600 and 0%(0/1600) from Raya (Table 7).

Both local and cross breed was examined in our study and of them none of the cross breeds were affected where as wound and 4 local breed were affected with that rate of 0.2 % (4/1600) in punctured wound and 0.4% (7/1600) were affected by lacerated wound (Table 8).

The prevalence of punctured wounded animals in the fattening farms were also assessed and the rates in the different age groups were 0.2% (4/1600) and 0% (0/1600) respectively in both adult and old animals and the prevalence of the lacerated wound in adult and old with their respective prevalence 0.4% (7/1600) and 0% (0/1600) (Table 9).

The proportions of punctured wound animals were also determined based on their origin and it was 0.2% (3/1600) and (0.1%) 1/1600 respectively in animals originated from Raya and Rollo and the rate of lacerated wound were 5/1600 (0.3%) and 0.1% (2/1600) of Raya and Rollo respectively. Even though, the rate was different there is no statistical significance difference between age groups were observed (P>0.05) (Table, 10).

DISCUSSION

The current study revealed that the overall prevalence of the major skeletal disorder in fattening animals in the study area was 3.8% (60/1600). And most of the animals were affected by lameness, lacerated wound, punctured wound and fracture. Similarly, Marta *et al.* [10] stated that locomotors system disorders are highly relevant for most farm animals. Moreover, the prevalence of lameness was 2.7 % (43/1600) of the animals in study area were shown to suffer from lameness. At the same time the rate of lameness in different age group shown that it was 2.3% (37/1600) and 0.4% (6/1600) in both adult and old animals respectively with highest rate in adult. This showed there is statistical significance between these age groups ($p<0.05$). compared to the report of [10] the present finding is less prevalence of 3.5%. This may be due to managemental system, duration stay on the site, study season, breed and age of the animals where very young and very old animal were not brought to the site. Only male animals were purchasing and fattened, no female animal were purchased and fattened.

At the same time, the current finding revealed that the prevalence of lameness in the different breed was 2.7% (43/1600) in the local breeds as compared to the cross breeds having the prevalence of 0% (0/1600). The rate of lameness didn't show any statistical significance differences (P>0.05).This prevalence is lower compared with Ambers [7], which stated prevalence of 1.6% in cross breed and 3.8% in local breed. The variation may be due to purchasing animals from local markets and due to the absence of cross breeds in the local market during purchasing of animals as most of the time only the local breeds are available in the different markets of the study site.

The prevalence of lameness according to origin was 0.9% (15/1600) and 1.8% (28/1600) for animal originated from Wollo and Raya respectively. The rate of lameness didn't show any statistical significance differences (P>0.05). This may be due movement of animals on foot for long distances. It was stated that excessive walking can lead to over wearing of the sole which becomes soft and easily bruised thus predispose to lameness. The most common feed in the study site were molasses, fagullo, straw and hay. Similarly, feeding of energy ration deficient in adequate quality of fiber causes ruminal acidosis which in turn releases bacteria endotoxins [11] which leads to lameness due to trauma and wear of hoof [12].

In the fattening farm housing design and housing system is the main cause for lameness. The population animal in the house were too crowded which leads to fighting. Confinement and feeding inside the house without tight leads to fighting each other. Similarly, accumulation of waste product inside the house is responsible for softening of hoofs. These all things lead to the occurrence lameness. At the same time, design of the housing system must consider factor like breed size, topography of the ground, condition of floor surface and the size of the herd which predispose them to lameness as it was stated in Radostits *et al.* [9].

The rates of fracture in male animals, local and cross breeds were 0.4%, (6/1600) and 0/1600 (0%) respectively. However, adult and old cattle were also affected with rates of 6/1600 (0.4%) and 0% (0/100) respectively. It indicates that fractures are more common in adult animals as compared to old and the male cattle were also the most victims as compared to the female animals. The rate of fracture didn't show any statistical significance differences (P>0.05). Aiello [8], stated that bone fracture occurs in cattle of all age, but they are most common in those <1 year old. Fractures of the distal and proximal part are common in adult cattle.

The prevalence of fracture based on origin was 0.4% (6/1600) from Wollo and 0% (0/100) from Raya. This result shown there is statistical significance difference of fracture in these animals originated from Raya and Wollo (P<0.05). The reason why fracture can be seen in the fattening site may be due to over loaded of the vehicle more than the expected capacity, the design and size of the vehicle, tight of the animal on the truck, rugged road which makes transportation of animals' difficult. Similarly, Denny [13], stated that direct injury in road accident, direct force transmitted through bone or muscle to vulnerable area of bone which leads to fracture of the tibial tuberosiy, olecranon or latral condyle of the humerus.

The other reason why it is common may be also due to improper housing that is slippery nature of floors with containing moisture, which is responsible for moistening of the hooves of the animals hence different infectious agents might penetrate and entered into the system. The other reason may be due to its slippery nature, animals may fall in to the ground which may be responsible for fracture of the animals. But Frank [14], stated that it is difficult to predict the type of fracture caused by direct trauma as the amount and direction of force is not known. However, Leonard [15] explained that running, jumping or falling of animals during transportation are the predisposing factors for the occurrence of fracture. Similarly, animal exposed to major skeletal disorder due to insufficient space of the animals inside the vehicle and tied of their horns on the side of the vehicle. Animals affected here due to bad road and driving conditions. The truck was not designed for animal transport animals could be jump and be damaged. Inside the vehicle the driver used straw or wood chips to minimize chance of falling on the truck due to its slippery floor, similar report were written in Fufa [16].

The rate of wound in the current study was 0.7% (11/1600) where the majority of the defects were lacerative type of wound with the rates of 0.4% (7/1600) as compared to the punctured wound having the prevalence of 0.2% (4/1600). Similarly, the rate of the puncture types of wound in adult and old animals were 4/1600 (0.2%) and 0/1600 (0%) respectively and lacerative wound types of wound with rate of 0.4% (7/1600) and 0 (0% (0/1600) where as the rate of punctured wound in the local and cross breeds were 4/1600(0.2%) and 0/1600(0%) respectively and lacerated wound with the prevalence of 7/1600(0.4%) and 0% (0/1600). At the same time the rates in animals originated from Wollo and Raya were 0.1% (1/1600) and 0.2% (3/1600) of punctured wound respectively and lacerated wound having different origin of Wollo and Raya with their respective rate of 0.1% (2/1600) and 0.3% (5/1600) respectively. The rate of, lacerated and punctured wound didn't show any statistical significance differences (P>0.05).

From these findings we can assure that skeletal disorders were common in the site due to mixing of animals having different age, body weight, origin and horned and polled animals. At the same time, housing design and size, feeding and watering systems and fencing problems might predispose the animals to different skeletal disorders. At the same time, the compound of the site which was fenced by wire which might predisposed the cattle to different types of injury as mostly distortion of the different locomotors organ

was occurred while the animal passes through the fence accordingly punctured and lacerated wounds were created based on the degrees of the damage. Similarly, sharp objects like nails, glass shards, bullets, other foreign bodies are common in the area and these might be potentially causes of punctured wounds. These wounds might be contaminated by different infectious agents if they stay for long period of time. And also hair and bacteria with substantial infection is common problem associated with punctured wound [17].

CONCLUSION

The current study revealed that skeletal disorder was commonly found in the study site with the major disorders of lameness, lacerative, punctured wound and fracture. The most commonly occurred skeletal disorders were lameness. This might be associated with poor management of the farm particularly housing design, poor hygiene, improper design and size of the vehicle for cattle transport and lack of management during feeding where animals were fed high energy diet source, distortion of the fence that damaged the animals. Similarly the fence of the fattening farm was constructed with wire so that while the animals try to cross it the barbed wire might penetrate the skin of the animals which predisposes them to punctured and lacerative types of wounds. Hence, based on the above finding the following points will be recommended

- The house should be properly design, cleaned every day and it should haveenough space for easily movement of animals and resting of the animals.
- A vehicle properly designed for animals transport should be used.
- Further treatment of the skeletally disordered animal should be encouraged.
- The area where animals are kept should be fenced properly.
- Reducing feeding of energy beyond the required level.

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