Epidemiological Study of Lameness in Male Working Horses In and Around Mekelle Town, Tigray Region, Northern Ethiopia.

[1] Mubarek Kider[*2] Haile Worku and [*2] Birhanu Eticha

[1] Benishngul Gumuz Regional State, Homosha Woreda Agriculture office, Homosha, Ethiopia
[*2] Benishngul Gumuz Regional State, Livestock and Fisheries Resource Development Agency, P.O. Box: 30 Assosa, Ethiopia Email: workuhaile29@mail.com and brihanueticha12@gmail.com

Abstract: This study was conducted from November 2011 to April 2012 in three selected sites in and around Mekelle twon (Mekelle, Quiha and Adigudom) of Tgray Region, Northern Ethiopia. The study employed was clinical and Questionnaire surveys to determine the prevalence of lameness in male working horses. A total of 360 working horses were randomly selected from the study areas and the overall prevalence of lameness was (10.83%). The prevalence rate of lameness was found to be 33/300(11%), 4/35(11.43%) and 2/25(8%) in Mekelle, Quiha and Adigudom study sites respectively and it was not found statistically significant (X^2=0.246, P=0.884). Higher prevalence 22/112 (19.64 %) was registered in working horses with poor body condition when compared to horses with medium 8/84(9.52%) and good 9/164(5.49%) body condition and the association was found statistically significant (x2=13.574, p=0.01). Prevalence of lameness was found to be affected by management condition and it was higher in horses with bad management condition (17.65%) when compared to horses with fair (8.92%) and good (6.66%) management condition and it was found statistically significant (X^2=8.578, P=0.014). In case of grade types, higher prevalence of lameness (41%) was registered in grade 2 type horses followed by grade 1(25.64) and grade 3 (23.07%) the least prevalence lameness (10.255) was recorded in horses with grade 4 type. In conclusion, the result of the current study showed that lameness is a major health problem of working horses in the study areas so that comprehensive horses health care and welfare promotion program is very important to alleviate the problem. [Mubarek K, Haile W and Birhanu E. **Epidemiological Study of Lameness in Horses in and Around Mekelle Town, Northern Ethiopia.** *Rep Opinion* 2017;9(5):41-46]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). http://www.sciencepub.net/report. 6. doi:10.7537/marsroj090517.06.

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1. Introduction

Ethiopia possesses approximately half of African equine population with 37%, 58% and 46% of all African donkeys, horses and mules respectively (FAO, 1996). Equine are important animals to the resource poor communities in rural and urban area of Ethiopia, providing traction power and transport services at low cost. The use of Equines in door to door transport service also provides urban dwellers with the opportunity of income generation (Wilson, 1991).

The number of equines in Africa is in the range of 17.6 million, comprising 11.6 million donkeys, 2.3 million mules and 3.7 million horses (Strake, 1993). According to (CSA, 2011) the total population of horses, donkeys and mules in Tigray region were 5557, 436,862 and 10384 respectively. Of these number Mekelle twon possesses about 1,200 horses, 1,792 donkeys and 223 mules which are mainly used for cart (CSA, 2011).

In Ethiopia equines are important animals in providing traction power and transport service because of the ragged topography characteristic inaccessible for modern road (Willson, 1991). Transportation facilities as well as the absence of well developed modern transport networks and the provision of high economic status of the equines should be of crucial importance to Ethiopians (Mengistu, 2003).

Despite their invaluable contributions, equines in Ethiopia are the most neglected animals and accorded low social status, particularly the male working equines. Horses involving in pooling carts often work continuously for 6 to 7 hours per day carrying 3 to 4 persons (195 to 260 kg) in a single trip. They are provided with grasses during the night and allowed to graze on pasture in the town fringe during the day (Hassen, 2000).

Because of neglecting in terms of feeding, health and management care, a variety of disease conditions hinder the optimum utilization of horses, among which lameness contribute a significant impact. Lameness is an indication of structural or functional disorder in one or more limbs that is manifested during progression or in standing position. Lameness can be caused by trauma, congenital or acquired anomalies, infection, metabolic disturbances, circulatory and nervous disorder and any combination of these (Stashak, 1996).

Most lameness are found in the fore limb and of these 95% are in the knee or below the knee. Three lameness's are seen in the fore limb for every lameness in the hind limb. However, hind limb

lameness involved approximately 40% of the lameness diagnosis. This is the result of balanced gait. The greater number of lameness occurs in the fore limbs because they carry 60 to 65% of the weight and this is subjected to much greater contusion than the hind. One must remember that the animal may be lame in more than one limb or may have more than one pathological condition in the limb showing lameness (Stashak, 2002).

Lameness can be classified in to weight bearing (supporting) and non weight bearing (swinging) disorder. Supporting leg lameness is seen when the animal reduces the extent or duration of the weight bearing by taking a shorter step and elevating the body during the support phase of the stride. These occur particularly with the injury of the feet, bones, tendons, ligaments and motor nerves. Swinging leg lameness is seen during the swing phase of the stride cycle, when the limb is brought forward and supporting leg lameness is a lesion in one limb to cause secondary soreness, or lameness in another area of the lame limb or in any of the other three limbs from the effort to protect original injury. Another situation that can occur referred to as complementary lameness which involves developing in one of the opposite limbs (Aiello and Mays, 1998).

Although lameness has been reported as one of the health problems of working horses, affecting their health and welfare, little attempt has been made to characterize the nature of lameness in male working horses in Ethiopia in general and in the study area in particular. Therefore, the present study was designed to determine the prevalence of lameness in male working horses of the study area, to identify risk factors and quantify their degree of association with lameness in working horses.

2. Materials and Methods

2.1 Study area

The study was conducted from November 2011 to April 2012 in and around Mekelle twon (Mekelle, Quiha and Adigudom) to determine the prevalence of lameness in working horses and to identify risk factors of lameness in working horses. Mekelle is the capital city of Tigray region found at a distance of about 783 km away from Addis Ababa. It is located in the Northern extreme of Ethiopia extending from 33º 25″ to 39º 38″ north latitude and from 36º 27″ to 40º 18″ east longitude at an average altitude of 2000 - 2200 meter above sea level. The mean annual rain fall ranges from 450-500mm and the temperature varies from 12ºc (in November and December) to 27ºc (in January and March). Mekelle enjoys humid and hot climate (NMSA, 2011) and Quiha and Adigudom are found at a distance of about 10km and 35km away from Mekelle twon respectively and have more or less similar climatic condition to Mekelle twon(MOUA, 2011).

2.2. Study Population

A cross-sectional study was conducted on 360 male working horses to determine the prevalence of lameness. The survey was specifically designed to relic information on different parameters which were associated with lameness problem.

2.3. Sampling Methods and Sample size Determination

All male working horses obtained during the study period were sampled purposively to establish the prevalence and risk factors of lameness in the study area. The desired sample size was determined using the formula given by (Thrusfeild, 2007).

$$n = \frac{1.96^2 Pexp\ (1-Pexp)}{d^2}$$

where: n = require sample size

p_{exp} = expected prevalence

d = desire absolute precision

1.96^2 = z-value for the 95% confidence level

Therefore, based on the above formula, taking 95% confidence level, 5% absolute precision and 50% expected prevalence, the required sample size become 384. However, during the study period only 360 male working horses were obtained in the study sites and because of this the sample size was taken to be 360.

2.4 Study design

The study design was observational study of cross-sectional type, which involves selection of animals that were presented to study district from the total population of animals of the locality and then determination of each individual for simultaneous presence or absence of disease in order to guess significance of risk factors. The study was carried on 360 male working horses and the explanatory variables considered were body condition, management condition, site and degree of lameness. A structured questionnaire survey and physical examination techniques were used to study risk factors of lameness in male working horses.

2.5 Study Methodology

2.5.1 Questionnaire survey

A structural questionnaire was designed to collect data on information related to lameness, management practices and associated risk factors including animal identification (age, sex, weight, etc) in the horses from Mekelle, Quiha and Adigudom areas.

For the sake of clarity, the severity of lameness was classified as grade1, grade 2, grade 3 and grade 4 according to (Stashak, 2002), grade1lameness was considered when there is no lameness evidence at walk, but a short sited pain is noticed at trot; Grade 2 lameness was noticed when there is stilted gait and foot can be lifted off the ground without difficulty;

Grade 3 and grade 4 lamenesses are considered when the horses move very reluctantly and vigorously resists attempts to have a foot lifted and when the horses refuse to move and will not do unless forced respectively.

2.4.2 Clinical Survey

Within the same animal in the questionnaire survey further examination was conducted clinically to identify the major types of lameness. Physical and clinical examination and diagnosis of musculoskeletal abnormalities were undertaken according to (Stashak, 1997). Anamnesis, visual examination by manipulation and palpation were applied in the diagnosis of lameness. Study animals were those male working horses presented to the study sites.

Taking History: History of lameness was taken for each horse by asking the owners to obtain facts required for the diagnosis. The questions included how long had the horse been lame? Has the lameness worsened, stay the same or improved? What caused the lameness? And other questions suited to the particular case.

Examination of the animal at rest: careful examination was done at distance, close visualization of the animal from front, sides and behind to assess symmetry of lameness, conformation, the condition and alteration in posture, weight shifting and pointing. At close observation each limb was observed and compared to its opposite. **Examination the animal at exercise:** This was done to identify the limb involved and the degree of lameness and in-coordination at movement. Each selected horse was examined while it was walking and trotting. The degree of lameness was categorized in to four as grade 1, grade 2, grade 3 and grade 4.

Following observation of the animals from a distance, close examination of limbs by palpation and manipulation was performed and the following body parts are involved in the examination:

Foot: The foot was evaluated for growth and wearing patterns, inspected for signs of cracks, discharge and poor conformation and palpated for signs of increased heat around the coronary band. Hoof tester, hoof nipper and hoof knife were used during examination of the foot.

Pastern and fetlock: Palpation of pastern and fetlock joint was undertaken to detect swelling, pain, thickening of the joint capsule and increase in temperature if any.

Metacarpus: The extensor tendons on the dorsal surface of the cannon bone were palpated for the presence of swelling and pain.

Carpus: The carpus was visualized for swelling on dorsal and palmer surfaces and carpal injuries show some degree of distension of the joint capsule of the inter carpal and ante brachia carpal joint.

The upper forelimb: This area of the leg were palpated, flexed, abducted and extended to determine if any localizing sign can be found.

Tarsus: It was visualized and palpated for tarsocrural joint distension, thickening of fibrous joint capsule, bone proliferation of the distal tarsal joints and distension of the tarsal sheath.

Stifle Joint: This was examined carefully for the presence of fixing of the patella and for joints **Femur and hip**: The muscles surrounding the femur and hip was examined for inflammation, symmetry and muscle atrophy in any.

2.5. Data Analysis

Prevalence of lameness and related specific risk factors were determined as a proportion of the lamed horses out of the total examined horses. Results of collected questionnaires and examined data were entered in to computer using excel software and the data was analyzed by using descriptive statistics. The statistical analysis of risk factors associated with lameness was performed by using SPSS version 16.0.

3. Results

Out of the total animals examined (n=360), 39/360(10.83%) prevalence of lameness was recorded (table 1). This study revealed that traumatic injury, infection, arthritis, nail piercing, over growth of hoof were the main causes of lameness in the horses in the study area.

Table 1: The prevalence of lameness in horses in the study area.

Total number of horses examined	360
No. of horses positive for lameness	39
Prevalence	10.83%

Table 2: Prevalence of lameness versus study sites.

Study sites	**No. examined**	**No. positive**	**Prevalence (%)**	$\chi 2$	P- value
Mekelle	300	33	11	0.246	0.884
Quiha	35	4	11.43		
Adigudom	25	2	8		
Total	**360**	**39**	**10.83**		

Lameness was recorded across the study sites with the highest 4/35(11.43%) and lowest 2/25 (8%) prevalence was registered Quiha and Adigudom respectively and prevalence of lamenesss was not statically significant (χ2=0.246, P=0.884) across the study sites (table 2).

The highest prevalence of lameness was recorded in horses having poor body condition (19.64%) followed by medium (9.52%) and good (5.4%) body condition respectively it was found and statistically significant (x^2 =13.574, P=0.001) (Table 3).

Table 3: prevalence of lameness on the basis of body condition

Body condition	No. examined	No. positive	Prevalence (%)	x^2	P- value
Good	164	9	5.49	13.574	0.01
Medium	84	8	9.52		
Poor	112	22	19.64		
Total	**306**	**39**	**10.83**		

During the study lamenesses were graded as grade 1, grade 2, grade 3 and grade 4 and the highest prevalence 16/39 (25.64%) was registered in horses with grade 2 lameness and the lowest prevalence was recorded 4/39 (10.25%) in horses with grade 4 lameness (table 4).

Table 4: Prevalence of lameness with regard to grade of lameness

No. of horses with lameness	Grade of lameness	No. positive	Prevalence (%)
39	1	10	25.64
	2	16	41
	3	9	23.07
	4	4	10.25
Total		**39**	**100**

4. Discussion

The present study revealed an overall 39/360 (10.83%) prevalence of lameness caused mainly by traumatic injury, infection, arthritis, nail piercing, over growth of hoof in the study area. In addition to these attention of the owner towards their working horses is poor. This finding was in agreement with the previous report of (Pearson et al., 2000) in central Ethiopia where over loading contributes to high causes of back sore and lameness.

Among the study sites, the highest and the lowest prevalence of lameness were recorded inn Quiha 4/35 (11.43%) and Adigudom 2/25(8%) respectively. However, study sites and prevalence of lameness was not found statistically significant (P< 0.05). Among the three study sites, a large number (300) of male working horses were obtained from Mekelle indicating prevalence of lameness to be 33/300(11%). This finding showed that in and around Mekelle the livelihood of the community depends on working cart horses.

Higher prevalence of lameness was observed 22/112(19.64%) in horses with poor body condition when compared with horses with medium 8/84 (9.52%) and good 9/164 (5.49%) body condition and the association was found to be statistically significant (p <0.05) and this finding revealed that horses with poor body condition were highly exposed to lameness causing agents due to the exposure of their skeleton to the external environment that increases its probability to be rubbed by friction with harnessing material and being injured. A report made by (Shimeles, 2008) in Adigrat supported the present finding in that high prevalence of external injury was seen in horses with poor body condition when compared with horses with medium and good body condition.

From management point of view, high prevalence of lameness was recorded in badly managed horses (18.65%) than horses managed fairly and in good way. This is due to lack of awareness of owners on the health and management of working horses. Owners do not give attention to their housing, feeding and health care (Mohammed and Takatel, 1992), they were kept under traditional husbandry condition. The horses fed on naturally grown grasses that did not keep its normal grazing time. In almost all cases, horses are left to on forage by themselves when they were not working (Feseha and Aweke, 1995).

Occasionally horses are given post harvest of cereal crop residues such as teff straw, wheat bran and other feeds such as hay and grains of maize, wheat and barley, but since it has no continuity it did not contribute much for them. On top of overloading by owners the comfort of horses were not kept during transportation by cart riders and this contributes its best for the occurrence of lameness. (Starkey, 1993) reported that horses that pull two wheel carts were highly injured when compared to those horses that pull four wheel carts. This is because of the excessive pressure that is exerted on the animal, which results in injury and lameness. The injury caused by the cart might be predisposing factor for transmission of lameness causing infectious agents such as epizootic lymphangitis, which was highly prevalent at the study areas, especially in and around Mekelle.

Other factors that were considered to be the cause of lameness were, the surface on which they work that could be too soft, too hard, slippery or rocky which aggravate conformational imperfections and results in lameness. Muscle fatigue was also one of the most important pre disposing factors of lameness as stated by (Stashak, 1997).

Out of the total lameness recorded, higher prevalence occurs in the forelimbs, because they carry 60 to 65% of the weight and this is subjected to much greater contusion than the hind limbs. The horses may be lame in more than one limb or may have more than one pathological condition in the limb showing lameness (Stashak, 1997).

When severity of lameness was examined on walking and trotting, grade 2 type of lameness was highly prevalent (41%) when compared with grade 1(25.64%), grade 3(23.07%) and grade 4(10.25%). This might be due to other cases (injury and epizootic lymphangitis) that make the owners to bring their horses to the clinic which might result in grade 2 type of lameness.

5. Conclusion

The finding of the present study revealed the importance of lameness and its contribution to hampering the productivity, work performance and general health status of male working horses in the study area. Lameness was exacerbated by overloading, improper health care and malnutrition. In the study area, because of bad management, horses were easily exposed to lameness causing agents such as injury, hoof overgrowth, arthritis, infection and others. Significant association was not observed within study sites ($P > 0.05$) while there was statistically significant association among body condition scores and the occurrence of lameness ($P < 0.05$). These all revealed that lameness is very common in the sites indicating that community awareness should be strengthened with regard to management of working horses, about the importance of health care of working horses, the way that they supply good nutrition and give adequate rest period after work and further epidemiological investigation should be done on major causes of lameness in horses in the country in general and in the study sites in particular.

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Corresponding author:
Dr. Haile Worku. and Dr. Birhanu Eticha
Benishngul -Gumuz Regional State, Livestock and Fisheries Resource Development Agency, Assosa, Ethiopia
Email: workuhaile29@mail.com and brihanueticha12@gmail.com

References

1. Aiello S.E., and Mays, A., (1998): Veterinary Manual 8th ed, USA, White House Station, Merck and Co. Inc. Pp.56-111.
2. Central Statistical Authority, (2011): Agricultural Sample Survey, Statistical Bulletin, Ethiopia, Addis Ababa, pp. 41-52.
3. FAO, (1996): Food and Agricultural Organization Production year book. FAO: Rome. Italy, 158.
4. Feseha G., and Aweke T., (1995): Donkey in North Gonder, socio economic importance and 4. management and health constraints. Final year paper, Faculty of Veterinary Medicine, Addis Ababa University, Ethiopia, Pp. 33.
5. Hassen K., (2000): A preliminary study on the socio economic importance, health problems and other management constraints of horses in mid and high land areas of North Gonder. DVM thesis, FVM, AAU, Debrezeit, Ethiopia.
6. Mengistu A., (2003): The genetic resources of equines in Ethiopia and their contribution to rural livelihoods society proceeding of the 11th annual conference of the Ethiopia of animals production (ESAP). Addis Ababa, Ethiopia, Pp. 14-15.
7. Mohammed A., and Taketel F., (1992): Preliminary study on the status of the donkeys in Awasa woreda. Pp.92-98 in: Proceeding the Cairo international meeting on working animals, held 13-16 April 1992, Cairo Egypt. World association for transport, animal welfare, Hardwick court

farm, Hardwick lane, chertsey. UK, KT 160 AD. Pp.200.
8. Pearson R.A., Mengistu A., Agajia T., Eleanor F.A., David G.S., and Mesfin A., (2000): Use and Management of donkeys in peri-urban areas of Ethiopia. Center for tropical veterinary medicine: University of Edinburgh, Scotland; Drought animal power technical reports.
9. Shimeles A., (2008): Prevalence of external injuries in working equines in and around Adigrat, Tigray region. DVM Thesis, College of veterinary medicine, Mekelle, Ethiopia. Pp.13-14.
10. Starkey P., (1993): Animal traction networking in south Africa Summary of a visit from 1-7 May 1993. South Africa network of animal traction (SANTAT). News latte 1: 4-5, University of Hare Alice, South Africa.
11. Stashak T.S., (1997): Adam's lameness in horses 4th ed, Lea and Febiger Philadelphia, USA. 68-712.
12. Stashak T.S., (2002): Examination for lameness. In Adama's lameness in horses, 5th ed. Lippincott, Wiliam's and wilkines. USA, Philadelphia, 113-183.
13. Stashak T.S., (1996): Horse honors guide to lameness in horses 1st ed. C.C can, S. Huns berger, P.J. Calle, R. D.Magae, (Ed), USA, Lea and Febiger Philadelphia, USA, 85-120.
14. Thrusfield M., (2007): Veterinary Epidimology. 3rd ed. UK, Blackwell Science, Ltd, Pp: 233- 250.
15. Wilson R.T., (1991): Equine in Ethiopia in: Donkeys, Mules and horses in tropical Agriculture Development (Eds. Fileding, Dad Pearson, R.A). UK, Edinburgh, Center for tropical veterinary medicine, 83.

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