Academic Journal of Animal Diseases 4(2): 52-59, 2015
ISSN 2079-200X

DOI: 10.5829/idosi.ajad.2015.4.2.935

Epidemiology of Lameness among Cart Pulling Donkeys in Hawassa City Administration, Southern Ethiopia

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Abstract: A cross sectional study was conducted from November 2013 to April 2014 at Hawassa city, Southern Nations and Nationalities Regional State of Ethiopia to determine the prevalence of lameness and identify factors associated with it in cart pulling donkeys. A structured data collection format was used to register findings of the lameness examinations in 422 donkeys. In addition, interviewer-administered structured questionnaire was used to interview 422owners/users. The overall prevalence of lameness in cart pulling donkey was found to be 40.2% originated from the hoof cavity, knee area, shoulder, knee joint, elbow, generalized system elbow and knee area with the respective prevalence of 18.3%,7.2%,7%,4.3%,1.9%,1.2% and 0.2%respectively. High frequency of lameness observed in the front legs than in the hind limb; 14.7%, 11.1%, 8%,3.6%,1.2%,0.2%,1% and 0.7%.lameness cases occurred in left front, right front, right hind, left hind, all four limbs affected, right front and right hind respectively. The chi square analysis of the risk factors of lameness in cart pulling donkeys indicated significant association between the occurrence of lameness and body condition score (p=0.000), number of working days per week (p=0.000),owner ship status (p=0.000)and number of working hours per day (p=0.004). But there was no statistical association (p>0.05) in the occurrence of lameness and age of the donkey, age of the owner, educational status of the user, work experience and family donkey owning experience. Analysis of the interview with owners/ users revealed that the floors of the house of 99.8% donkeys were mud with no drainage and only 0.2% donkeys had shelters with concrete floor. Only 0.2% respondents practiced hoof trimming, washing with warm salty water; visiting veterinary clinics, balancing work load with energy intake, provision of adequate rest and improving body condition of the donkey are recommended.

Key words: Cart Pulling Donkeys · Lameness · Prevalence · Risk Factors · Hawassa

INTRODUCTION

Animal power is an economical form of energy for traction, cultivation and transportation. It helps to minimize the flow of foreign currency involved in the import of tractor, spare parts and fuels [1].More than half of the human population is dependent on the power provided by draft animals, 90 million of which are equines [2].Unlike motorized traction power which relies heavily on fossil fuels, equine traction is supported by 60% renewable resource, such as locally grown crops, compared with only 9% for tractor [3]. Thus equine traction has a lower environmental impact, is more sustainable and is comparatively in expensive [4].

According to CSA [5], Ethiopia has 5.42 million donkeys, 1.78 million horses, 373,519 mules. In Ethiopia the use of donkeys as pack animal or for pulling cart has enabled small scale farmers to participate in the market economy. Donkeys are used for fetching water, for household shifting, for carrying the sick to hospital, for carrying sick calves, for transportation, hoping and for pulling materials needed for construction [6]. Despite their remarkable contributions, donkeys in Ethiopia are the most neglected animals accorded low social status [7]. This can be due to age-old erroneous concept that when donkeys do get sick they are quick to die and probably because they are no provider of meat and milk [8]. In countries like Ethiopia they are subjected to a variety of

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health disorder including multi-parasitism, back sore and other wounds due to different causes, hoof problems, colic, various infectious diseases such as strangles, tetanus and others [9]. Probably one of the most important limitations is the general lack of information on the proper management and welfare problems of donkeys, which leads them to receive minimum care [10]. The donkey has spent hundreds of years being used by man but, despite of this little attempt has been made to study any aspect of this animal until recently particularly in countries where they are most important [10].

As any other animals, donkeys are vulnerable to a variety of disease of biological origin, nutritional diseases and other miscellaneous cause that leads them to ill health, suffering, considerable loss of work output and reduced longtivity [11].Problems involving musculoskeletal system are among the reason for veterinary attention to equines [12].The major and common clinical manifestations of disease which affect organs of support are lameness, failure of support, insufficiency of movement and deformity [13].

Lameness is one of the most prevalent health problems in the donkeys. It can be caused by a wide range of conditions and both the severity of the disease and prognosis for return to previous function can vary markedly [14].It is one of the most important causes of loss of performance in horse [15].Currently, there is limited information on the prevalence and risk factors of lameness. Therefore the objective of the study was to determine the prevalence and predisposing factors of lameness in cart pulling donkeys in Hawassa City.

MATERIALS AND METHODS

Study Area: The study was conducted in Hawassa town from November 2013 to April 2014. Hawssa is capital city of Southern Nation Nationalities and Regional State of Ethiopia, found at 270 km south of Addis Ababa. It is geographically located between 4°27' and 8°30' latitude. It lies in plain which allows the use of carts. The annual rain fall range of town is 800-1000mm.The maximum annual temperature does not exceed 30°c and minimum temperature range between 11.2°c-19.2°c. The total population of donkeys for Hawassa town are 3969 [5].

Study Design: Cross-sectional study carried out to determine the prevalence of lameness and factors associated with it among cart pulling donkeys in Hawassa city.

Study Population: All cart pulling donkeys and their owners/users residing in all sub-cities of Hawassa (from different sites where cart donkeys are located in mass like market places, construction sites and veterinary clinics of Hawassa).

Sample Size Determination and Sampling Technique: Systematic random sampling was employed to select donkeys and their owners to be sampled. The sample size was determined using the formula for single population proportion and the following assumptions were made. A confidence interval of 95% is considered and level of significance was taken at $\alpha = 0.05$. Margin of error of 5 percent and prevalence of 50% was considered as there is no previous study conducted on the issue.
Accordingly:

$$n = \frac{Z^2 (1 - \alpha/2)\, p\, (1-p)}{d^2} = 11$$

Where
n= sample size
Z (1- α /2) = confidence level corresponding to 95% CI = 1.96
p = 50% prevalence considered = 0.5
d= is the margin of the sampling error to be tolerated 0.05

Therefore,

$$n = \frac{1.96^2 \; x \; (0.5))\; (1 - 0.5)}{(0.05)^2} = 384$$

A non-response rate of 10% was taken in to account and a total sample size of 422 donkeys and their owners were sampled from study area.

Study Variables
Dependent Variable: Lameness in Donkeys

Independent Variables:

- Body condition score
- Age of the donkey
- Age of the user/owner
- Ownership status
- Educational level of the user/owner
- Family donkey owning experience
- Work experience of the user/owner
- Number of Working days per week
- Number of working hours per day

Data Collection Instruments: A structured data collection format was used to register findings of the lameness examinations. In addition, interviewer-administered structured questionnaire was used to interview owners/users.

Data Collection Techniques: Structured questionnaire was used to interview donkey owners /drivers and the questionnaire prepared in English was translated into Amharic language. Donkey cart owners/drivers were interviewed and their response was recorded in questionnaire format. The questionnaire was aimed to collect information related to owner/driver experience with donkey and experience with lameness. Physical clinical examination was conducted to detect the presence of lameness and identify the possible origin of lameness. The study animals were examined when they are in motion for detection of any kind of abnormality in locomotion and donkeys that move with clear abduction, adduction, showed clearly impaired movement with uneven length and timing and that were reluctant to bear weight on one or more limb were considered as lame donkey. The examination was performed initially by visualizing the donkey at the side, in front and behind both at rest and movement followed by friendly approach to the animal [12].The skeleton and joint of each donkey was subjectively assessed by visual observation and palpation. Limb palpation was performed from distal to proximal, noting pain responses, swelling and wounds. Physical clinical examination was conducted to identify the possible origin of lameness. Special attention was given to the hooves, joints and long bones of limb. A grading system of lameness, 1-5 was applied. For sake of simplicity the examined donkeys were categorized in to5 age groups. Similarly, the body condition score was categorized in 5 groups.

Data Management and Analysis: Data were entered, cleaned and analyzed using SPSS Version 16 statistical package. Proportions, percentages and central tendencies were used to describe the study population. Chi-square analysis was used to determine association of lameness with different predisposing factors where significance was taken at 5%.

Ethical Considerations: All the study participants were informed about the purpose of the study; their right to refuse and assurance of confidentiality and informed verbal consent were obtained from every respondent. Donkeys were handled as per the ethical standards of The Donkey Sanctuary.

RESULTS

Out of the total of 422 donkey owners 415 fully responded to all the questions in the questionnaire yielding a response rate of 98.34 %. Equal numbers of donkeys were therefore examined.

Among 415 cart pulling donkeys examined 167(40.2%) donkeys were lame. Regarding the origin of lameness, hoof cavity 76(18.3%), knee area 30 (7.2%), knee joint18 (4.3%), elbow 8(1.9%), generalized system 5(1.2%), elbow and knee area 1(0.2%) were the origin of lameness. High frequency of lameness observed in the front legs than in the hind limb; left front 61(14.7%), right front 46(11.1%), right hind 33(8%),left hind15(3.6),all four limbs affected 5(1.2), right front and left hind 1(0.2%),right front and right hind 4(1%), left front and right hind 3(0.7%). Out of 167 lame donkeys 69(16.6%) had lameness grade 2,84(20,2%) scored lameness grade 3 and 14(3.4%) had lameness grade4.30.85% had lameness grade 2.

Out of the hypothesized risk factors for lameness in donkeys body condition score (x^2=48.4,, p=0.000), working days per week (x^2=29.0,p=0.000), working hours per day (x^2=17.1,p=0.004) and ownership status (x^2=24.4,p=0.000) were found to be statistically significantly associated. Whereas age of the donkey (x^2=1.3, p=0.86), owner/rider age (x^2=0.5, p =0.9), educational level of the owner/rider (x^2=3.4, p=0.1), work experience of rider (x^2=1.86,p=0.3) and family donkey owning experience(x^2=0.69,p=0.4) had no statistically significant association in the occurrence of lameness in chi-square.

From a total of 415donkey owners interviewed, 104 (25.1%), were illiterate, 286(68.9%) had some elementary level education and 25(6%) had some secondary level education. Forty seven (11.32%) respondents were in age of 8-11,323(77.83%), were 16-30 and 45(10.8) were >31age. All respondents provide feed and water for their donkeys after work. But only 1(0.2%) person took care for the foot of his donkey through washing and picking foreign bodies from in the hoof after work. The rest 414(99.8%) persons had not taken any care for their donkey's foot. They used to check the foot when there was a problem in the foot. Cart pulling donkeys play a greater role in the livelihood of the community 272(65.5%) respondents had daily income 10-50 birr, 135(32.5%) had 60-120 birr

Table 1: Occurance of lameness in cart pulling donkeys at Hawassa city by origin

Origin of lameness	Frequency	Percentage
Shoulder	29	7%
Elbow	8	1.90%
Knee area	30	7.20%
Knee joint	18	4.30%
Hoof cavity	76	18.30%
Generalized system	5	1.20%
Elbow and knee area	1	0.20%
Total	167	40.20%

Table 2: Occurrence of lameness in cart pulling donkeys at Hawassa city by affected limb

Affected limb	Frequency	Percentage
Left front	61	14.70%
Right front	46	11.10%
Right hind	33	8%
Left hind	15	3.60%
All limbs affected	5	1.20%
Right front and right hind	4	1%
Left front and right front	3	0.70%
Total	167	40.20%

Table 3: Result of chi square analysis

Risk factors	Number examined	Number of lame donkeys	Percentage of lame donkeys	Calculated X^2	P-value	95% CI of X^2
BCS				48.4	0	0.000-0.007
Moderate	60	52	68.40%			
Ideal	259	104	40.20%			
Fat	80	11	13.80%			
Age				1.3	0.89	0.81-0.88
<3 years	29	14	48.30%			
3-6years	108	43	39.80%			
7-10years	128	48	37.50%			
11-15years	103	42	40.80%			
>15 years	47	20	42.60%			
Ownership				24.4	0	0.000-0.007
Owner	230	68	29.60%			
Rented	177	95	53.70%			
Commission	8	4	50%			
Family experience of donkey owning				0.69	0.4	
Yes	224	86	34.40%			
No	191	81	42.40%			
Experience of working with donkeys				1.86	0.3	0.34-0.44
1-5years	339	140	41.30%			
6-10 years	66	22	33.30%			
11-17years	10	5	50%			

Table 4: Result of chi square analysis

Risk factors	Number examined	Number of lame donkeys	Percentage of lame donkeys	Calculated X^2	P-value	95% CI of X^2
Working days per week					29	0 0.000-0.007
2	16	1	6.20%			
3	15	2	13.30%			
4	23	7	30.40%			
5	63	14	22.20%			
6	221	106	48.00%			
7	77	37	48.10%			
Hours per 3hrs Day						
	7	2	28.60%	17.1	0.004	0.000-0.011
4hrs	52	10	19.20%			
5hrs	31	14	45.20%			
6hrs	52	15	28.80%			
7hrs	52	23	44.20%			
8hrs	221	103	46.60%			
Educational Level				0.5	0.9	0.16-0.24
Illitrate	104	46	44.2			
Elementary	286	115	40.2			
High school	25	6	24%			
Age of Rider				0.5	0.9	0.85-0.91
8-15years	47	17	36.2			
16-30years	323	131	40.60%			
31-45years	39	16	41%			
46-70years	6	3	50%			

Table 5: Result of questioner survey

Study variable	Frequency	Percentage (%)
Educational level		
Illiterate	104	25.10%
Some elementary	286	68.90%
Some high school	25	6%
Age of users		
8-15years	47	11.30%
16-30years	323	77.80%
>31years	45	10.50%
4		
Management of donkey after work		
Provide feed and water	414	99.80%
Provide feed, water and Hoof care	1	0.20%
Income per day		
10-50 birr	272	65.50%
60-100 birr	132	32.50%
130-150 birr	8	1.90%
Floor of shelter		
Concerte	1	0,2%
Mud with no drainage	414	99.8
Family donkey owning experience		
Yes	224	54%
No	191	46%
Work experience		
1-5years	339	81.70%
6-10years	66	15.90%
11-17years	10	2.40%
Management of lameness		
Government clinic	91	21.9%
Private clinic	14	3.4%
Injection by owner	11	2.7%
March 16, 2015Foreign body		
remove, hoof trimmed wash with salt	87	20.9%
Nothing done	38	9.2%

income per day and 8(1.9%) had 130-150 birr income per day. Of 415 donkeys, only 1(0.2%) donkey's shelter floor is made of concrete while the rest shelter floor is made of mud with no drainage. The prevalence of lameness obtained from the questionnaire data was higher 241(58.1) than the prevalence obtained from physical examination. According to the respondents 21.9% and 3.4% respondents took their lame donkey to government and private veterinary clinic respectively. While 2.7% treated their donkey by hoof trimming, removing foreign material from foot and washing with salt and warm water and 9.2% do nothing for their lame donkey.

DISCUSSION

The overall prevalence of lameness in cart pulling donkeys in Hawassa was 40.2%and it was found to be associated with the body condition score, ownership status, number of working days per week and number of working hours per day.This prevalence report is higher than earlier reports of Morgan [16] who reported 3.1% prevalence of lameness in working donkeys in and around DebreZeit including Addis Ababa. This variation can be explained by the fact that this study was carried out on donkeys that are exclusively used for cart pulling purpose, whereas donkeys in and round Debrezeit are primarily used for pack purpose. It may also because donkeys in Hawassa work for longer hours in a day and more days in a week compared to donkeys in and around Debrezeit.

However, the current report is lower than the work of Broster *et al.* [17] who reported a prevalence of 98% in donkeys in Pakistan and India; and Reix *et al.* [18] who reported prevalence of 98% in donkeys in Pakistan. This difference may be due to difference in donkey work type and work load, difference in working environment which includes topography. It may be also be explained by the differences in care for donkeys.

Regarding the predisposing factors, donkeys with poor body condition was found to be more likely to be lame compared to those with good body condition. A similar finding has been reported by Meseret *et al.* [19] in mules in Northwestern Ethiopia. [18] also reported association between lameness and poor body condition. This may possibly be due to increased energy expenditure on locomotion and loss of appetite due to pain. Moreover, overworking coupled with under nutrition could lower body condition and increase lameness simultaneously [13,20].

Lameness was also found to be associated with number working days in a week and working hours in a day. This might be due to the fact that all of the donkey owners depend heavily on their donkeys for income generation: hence they use their donkeys without rest which might predispose them to lose their body condition and possibly to become lame. A report by Maranhão *et al.* [21] has indicated that overworking donkeys resulted in prevalence of multiple joint and tendon swellings and reduced joint flexion, which are clinical signs of lameness.

Ownership status was also associated with the occurrence of lameness. A number of reasons can be mentioned here which include lesser care, longer working hours and larger working days among rented donkey users compared to owners.

Other independent variables which were not significantly associated with lameness in donkeys in this study include age of donkeys, age of the owner/rider, educational status of the cart donkey owners/drivers, work experience of the user/owner and family donkey owning experience.

According to the report of Morgan[16] in and around DebreZeit including Addis Ababa, most lameness (61%) is found in the forelimb. This is in agreement with the current study in which most lameness cases occur in the fore limb (14.7%) in the left front, 11.1 in the right front and 3.8% combined with hind limb). The reason for this is that the forelimb carries 60-65% of weight and thus subjected to much greater stress than hind limbs [17]. In the current study most (36.8%) lameness were labeled as grade 2 and grade3 lameness grade, showing gait abnormality during walking according to Dyson [22].

In the current study 18.3% lameness cases originated from hoof cavity. Penetrating wounds of the foot are common causes of lameness. In most equine population, the high prevalence is expected during wet seasons they walk on the gravel road where their hoof softens and a lot of stone and debris packed into their hooves [23].

In this study 100% respondents said that they provide feed and water after work. However, only 1(0.2%) of respondent practiced daily hoof care. This finding probably was a good indicator about the level of awareness of donkey cart owners/riders, where less attention was given to the foot of donkey. In the current study only 91 (21.9%) and 14(3.4% of respondents took their lame donkeys to nearby government and private veterinary clinics. Respectively, while 11 (2.7%) respondents treated their lame donkey by themselves using medication purchased from localmarkets (usually injections) whereas 87 (20.9%) treated lameness by removing foreign material from the hoof, hoof trimming, washing with salt and warm water. Only 38 (9.2%) did nothing for their lame donkeys. Even those taken to veterinary clinics were those which are already severely lame and no longer able to work. Similar situations were reported by Helima *et al.*[24], where 38.3% of wounded horses were treated using traditional medicines and 36.2% of wounded horses had no chance to go to veterinary clinics or 17.7% due to financial constraints. This also agrees with the work of Nirag *et al*.[25], where 31.6% of the diseased donkeys were taken to the nearby veterinary clinics, 10.5 % were treated traditionally, 57.9% did not get any help from their owner and forced to work regardless of the disease.

CONCLUSION

The result of this study showed that lameness is one of the most important causes of loss of performance in cart pulling donkeys. The overall prevalence of lameness in cart pulling donkeys was 40.2%.The study indicated that the foot of the donkey is the origin of most lameness cases. It was also observed in this study that body condition score, ownership status, number of working days per week and number of working hours per day were found to be the important risk factors for the occurrence of lameness. Hence, it is important and timely to take steps to improve the situation and make sure that

donkeys are used more efficiently and their welfare improved in the future by solving the associated problems.

Recommendations: Provision of adequate feed so that donkeys will have good body condition that provides some resistance against lameness and owners should regularly deworm their donkeys. Awareness creation and training to donkey owners on hoof care, provision of adequate feed and regular checkup of the foot of donkeys. Donkeys should get adequate rest and work load should be balanced. The efforts of charity organizations like the donkey sanctuary project, both in awareness creation and provision of veterinary services needs to be supported and encouraged by the concerned bodies.

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