

Prevalence of Work Related Wound and Associated Risk Factors in Cart Mules of Adet Town, North-Western Ethiopia

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Abstract: Across-sectional study was conducted from in Adet town, Northwestern Ethiopia to estimate the prevalence of work related wound and associated risk factors in cart pulling mules. The study animals were selected randomly. The risk factors sex, age, body condition scores, condition of saddle, load weight, length of trip and rest within week were assessed through questionnaire survey and physical clinical examination of animals. The 387 cart pulling mules were examined for the presence of work related wound and an overall prevalence of 55.6% (n = 215) was found. Predominant distribution of wound was seen in back and breast area 44.7% and 20.2%, respectively. And Prevalence of wound was significantly higher in older mules (>15 years) than younger and adult age groups. Likewise, Wound prevalence was found to be strongly associated with BCS groups, where mules with BCS less than 3 (with poor body condition) were three times more likely at a greater risk (OR = 3.44, 95% CI = (2.09-5.68)) of having wound than those mules with better body condition (BCS > 3). In addition, there was significant association between beating and prevalence of wound. Furthermore, prevalence of back sore was significantly associated with saddle frame or proper padding. Those mules which were used without any saddle frame were almost four times at greater risk of having back sore (OR=3.86, 95% CI= (1.03-14.9)) than those used with saddle frame or proper padding. However, factors like sex, load weight, length of trip and rest within week were not significantly associated with work related wound in the study area. In conclusion the finding shows that wound is major problem in cart pulling mules in Adet town and its surroundings. Hence, implementing a comprehensive mule health and welfare improvement program should be a priority for concerned stakeholder.

Key words: Wound • Risk Factor • Yilmana Densa District • Prevalence • Working Donkeys

INTRODUCTION

Equidae is the mammalian family comprising the single genus *Equus* consisting of domestic and feral horse, donkey, mule and zebra [1]. Mule is a hybrid, the offspring of different species the dam being mare and the sire a jack or stallion donkey. The mule combines the donkey's longevity toughness and level headedness with the horses size and superior in intelligence, almost equal to the horse, which is an advantage in certain circumstances such as work in back, cart-drawing and ploughing [2].

The numbers of equines in Africa account 17.6 million from these 11.6 million are donkeys, 2.3million are mules and 3.7million are horses [3]. There are about 2 million horses, 6.2million donkeys and 0.38 million mules in Ethiopia. Around 20, 907 mules in Ethiopia are used for only draught purpose [4]. Specific to Amhara National Regional State there are 2 million donkeys, 124 thousand mules and 300 thousand horses [5].

Cart mules play an important role in rural communities providing power and transport at low cost. They can be used for various agricultural operations such as ploughing, transport for activities such as carrying water,

building material, agricultural products and people. The efficient use of working animals depends on how they are connected to the implement they are pulling or the materials they are carrying and how well they have been trained and are managed [6]. In Ethiopia, the use of equines for transportation will continue for the coming many years because of the rugged terrain characteristics inaccessible for modern road transportation facilities as well as the absence of well-developed modern transport networks. Hence farmers use alternative means like drought animals especially donkeys and mules to overcome transportation problems [7]. Therefore, the health and welfare of equines should be crucial importance to Ethiopia [8].

Despite their significant use, the husbandry practices of working equine are poor, working donkeys and mules are predisposed to many welfare problems like external injuries. Wounds are amongst one of the commonest health concerns to afflict working donkeys and mules in many countries [9-12].

The most common cause of wounds in working equine are over loading, improper position of load predisposing to falling, beating of mules, hyena bites, mule bites and injuries inflicted by horned bovine [13]. Some hobbling methods, inappropriate harnesses or yokes that may be heavy and ragged, long working hours may cause discomfort and inflict wounds [8]. According to Sells *et al.* [12] loading of donkeys without padding and over loading in long distance causes in external injury on donkeys and mules. Poorly designed harnesses have an effect on the animals' health and safety [14].

Though this is the real case scenario, there is limited work available concerning the epidemiology of wound and its associated risk factors on cart pulling mules in Adet town and surrounding kebeles where these animals are being used extensively and are contributing their behalf in the transportation sector. Therefore, the objectives this study were,

- To determine the prevalence of wound on cart pulling mules in Yilmana-Densa district and to assess associated risk factor with wound in cart pulling mules.

MATERIALS AND METHODS

Study Area: The study was conducted from October 2013 to April 2014 on randomly selected cart mules in Adet

town of Yilmana-Densa district, Amhara National Regional State. The area is located in the North-Western part of Ethiopia at a distance of about 565kms from Addis Ababa.

Yilmana-Densa is one of the districts in MirabGojjam Zone, sharing border on the south with Kuarit, on the southwest with Sekela, on the west with Mecha, on the north with Bahir Dar Zuria, on the east by with Abay River which separates it from the Debub Gondar Zone and on the southeast with MisraqGojjam Zone. Adet is administrative town of Yilmana-Densa district.

According to Yilmana-Densa District Agricultural Office [15] report the livestock population of the area is estimated to be of 121, 064bovine, 74, 564 ovine, 14, 339caprine, 22, 487 equine(19, 552 donkeys, 2, 148 mules and 787 horses) and 77, 198 poultry.

Study Animals: The study animals were mules, kept mainly for cart pulling purposes which are common source of transportation of goods, construction materials, farm product and others.

Study Design and Methodology: Across-sectional study was conducted on 387cart pulling mules of Adet town and the surrounding kebeles to investigate the prevalence of work related wound and predisposing risk factors.

Sample Size Determination and Sampling Method: A total of 387 cart pulling mules have been sampled randomly for physical examination from Adet town especially those which are present at the towns' main market and grind mill houses and some purposively selected Kebeles around the town in Yilmana Densa district. The sample size has been determined according to the formula given by Thrusfield [16].

$$N = 1.962 P_{exp} (- P_{exp}) / d^2$$

where, N= required sample size, P_{exp} = expected prevalence (50%), d= desired precision (5%),

Z = 1.96 for 95% confidence interval.

Physical Examination: Each randomly selected mule was physically examined for any external injury (Wound), its nature and extent and the finding was recorded on a structured body map format. Age and body condition score estimation were made according to Svendsen [17].

Questionnaire Survey: Semi-structured interview (SSI) was made with each randomly selected cart mule owner (n=387) in addition to the direct physical clinical examination to extrapolate information regarding owner's general information, mule management practice (Harnessing, feeding, housing), working nature (Duration of work, weight carried, travel) and mule-owner relationship.

Data Analysis and Presentation: Data generated from direct physical examination and SSI were properly coded and entered into Microsoft Excel-2007 spread sheet. The data was filtered for any invalid entry and then transferred to SPSS 16.0 version for windows package (2007) for statistical analysis. Descriptive statistics was made and differences in the prevalence of wound within each risk factor were tested for significance through Pearson's Chi-square and logistics regression analysis at a probability level of 0.05. Where test result considered to be significant when p-value is less than 0.05 and chi-square value greater than 3.84.

RESULTS

Descriptive Statics for Cart Mules and Cart Mule Owners: The descriptive statistics for age, sex and BCS of sampled mules and demographic data for cart mule owners was summarized in Table 1 and 2, respectively

Prevalence and Distribution of Wound: Out of the total 387 examined cart mules, 55.6% (n=215) were found wounded. With regard to wound distribution on the body of examined mules, greater proportion (44.7%) was observed in the back sore followed by breast sore (20.2%).

Wound Score: As illustrated in Figure 2 below, greater proportion of injured mules (34.3%) were with either back (Wither) or breast sore (Score 3), while 15.5% were with score 2 having a back or breast sore together with minor sores in other parts of their body. Approximately 2% of the wounded mules were abandoned due to excessive wound (Score 1) and the remaining 3.9% were with minor sore (Score 4).

Prevalence of Wound among Age, Sex and Body Condition: As summarized in Table 3 above, wound prevalence was strongly associated with age; where

higher proportion of mules aged greater than 15 years (Old) were with wound compared to other age groups ($\chi^2= 10.293$, $p<0.05$). There was no any significant difference in the prevalence wound among sex groups.

Wound prevalence was found to strongly associated with BCS groups ($\chi^2=24.701$, $p<0.05$), where mules with BCS less than 3 (Less than moderate body condition) were approximately three times at a greater risk (62.4%, OR = 3.44, CI = 2.09-5.68) of having wound than those mules with better body condition (BCS > 3) (32.6%) as shown in Table 4.

Severity of Wound among Body Condition: Figure 3 indicates that, moderate and severe cases of wound are significantly common ($F = 9.08$, $p< 0.05$) in mules with body condition score less than 3 than those with better body condition.

Prevalence of Back (Wither) Sore among Conditions of Saddling: Prevalence of back sore was significantly associated with condition of saddling or padding ($\chi^2= 4.599$, $p< 0.05$). Those mules which were used without any saddle frame were almost four times at greater risk of having back sore (75%, OR=3.86, 95% CI=(1.03-14.9)) than those used with proper saddling (16.7%) as shown in Table 5.

Association of Wound with Working Nature: There was no any significant difference in the prevalence of wound ($P > 0.05$) among working conditions of mules (Table 6).

Owner's Communication with Mules and Prevalence of Wound: The current study has showed that there was significant association between beating and prevalence of wound ($\chi^2=7.735$, $p < 0.05$) as illustrate in Table 7.

Owners' Practice of Wound Management in Mules: The study has revealed that mule owners practice different approaches to manage wounds. Hence, greater proportion of the owners (45.05%) have abandoned their mules without any intervention, while 18.92%, 16.67% and 19.37% of the respondents seek for veterinary care, traditional healer and handle it by themselves, respectively (Figure 4). With respect to rest, majority of the owners (90.5%) did not believe wound as possible reason to rest a mule from working while only 9.5% of the owners believe rest is mandatory to reduce wound incidence (Table 8).

Table 1: The descriptive statics of sex, age and body condition from examined cart mules

Variable		Frequency (n)	Percentage (%)
Sex	Female	190	49.1
	Male	197	50.9
Age	< 5 years	3	0.78
	5 - 10 years	157	40.57
	10 - 15 years	169	43.67
	> 15 years	58	14.99
BCS	BCS < 3	298	77.0
	BCS >=3	89	23.0

Table 2: Summary of demographic data

Variable		Frequency(n)	Percentage (%)
Age	<=20 years	55	14.2
	20 -30years	184	47.7
	>30 years	147	38.1
Educational level	Illiterate	171	44.2
	Only read write	79	20.4
	Elementary	105	27.1
	High school complete	32	8.3
Work experience	<=1year	124	32.0
	1 -5year	238	61.5
	>=5year	25	6.5

Table 3: Prevalence of wound with age and sex of examined cart mule

Variable	Age(in years)	Examined mules (n)	Wounded (n)	Percentage (%)	χ^2	p value
Age	< 5 years	3	2	66.7	10.293	0.001
	5-10 years	157	80	51.0		
	10 – 15 years	169	90	53.3		
	> 15 years	58	43	74.1		
Sex	Female	190	111	58.4	1.241	0.265
	Male	197	104	52.8		

Table 4: Wound prevalence with body condition score

BCS	Examined mules (n)	Wounded (n)	Percentage (%)	χ^2	OR (95% CI)	p value
BCS < 3	298	186	62.4	24.701	3.44(2.09-5.68)	p = 0.000
BCS > 3	89	29	32.6			

Table 5: Association of back sore with condition of saddle frame use

Condition of saddle frame use	Examined mules (n)	Wounded (n)	Percentage (%)	χ^2	OR (95% CI)	p value
No saddle frame	12	9	75	4.59	3.86(1.03 – 14.9)	0.032
With saddle frame	375	169	43.7			

Table 6: Association of wound with working nature

Working nature		Examined mules (n)	Wounded mules (n)	Percentage (%)	p-value
Length of trip	Less than 8 Km.	10	7	70.00	p> 0.05
	More than 8 Km.	377	208	55.20	
Load weight	<=500 Kg.	185	99	53.50	p> 0.05
	500 - 1000 Kg.	198	115	58.10	
	> 1000 Kg.	4	1	25.00	
Rest within a week	With no free day	105	59	56.20	p> 0.05
	With free day	282	156	55.30	
Rest within a day	No rest	78	47	60.30	P > 0.05
	With rest	309	168	54.40	

Table 7: Owners' communication with their mule and wound prevalence

Communication with mule	Examined mules (n)	Wounded (n)	Percentage (%)	χ^2	p value
Beating	193	120	62.2	7.735	0.012
Shouting	193	95	49.2		
Feeding (as incentive)	1	0	0		

Table 8: Wound as reason to rest a mule

Provision of rest when wounded	Number of responses (n)	Percentage (%)
Do not provide rest	199	90.5
Rest is required	21	9.5
Total	220	100.0

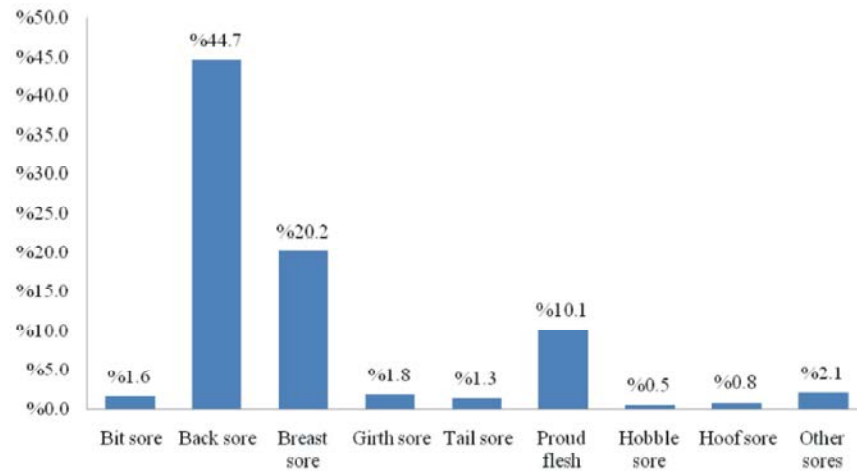


Fig. 1: Distribution of wound on different body parts of cart mules (n = 387)

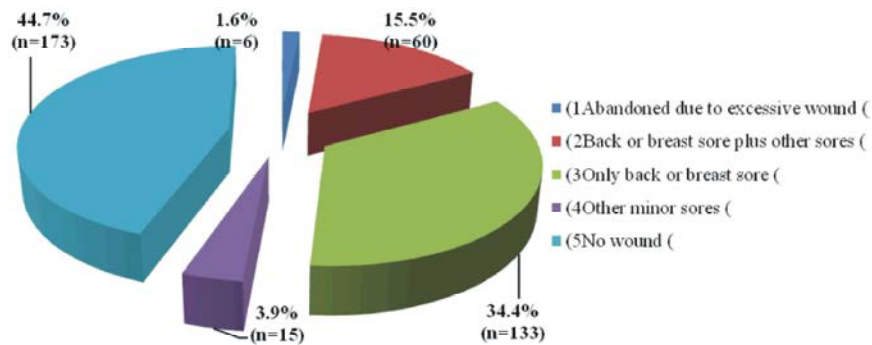


Fig. 2: Proportion of wound scores

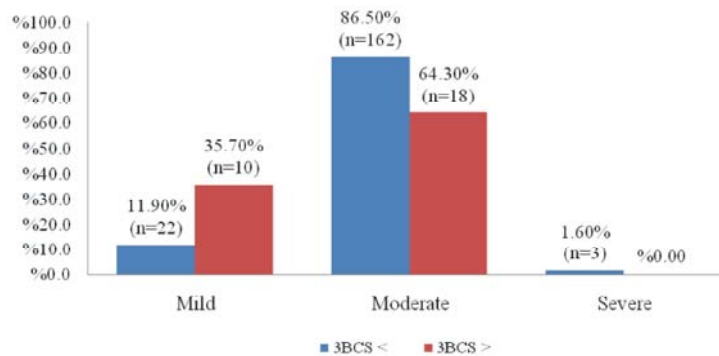


Fig. 3: Association of wound severity within BCS (n= 215, F=9.08, p=0.006)

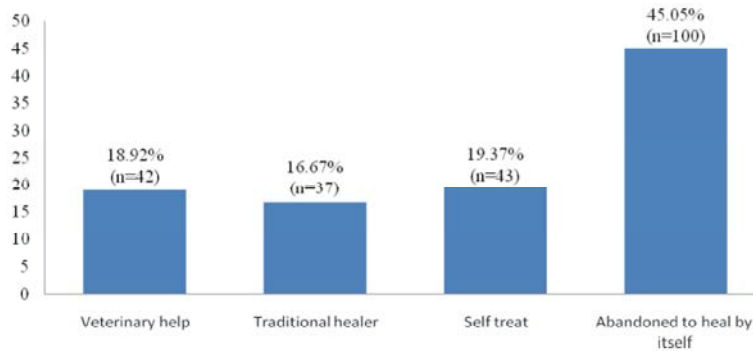


Fig. 4: Owners' measure when mules get wounded

DISCUSSION

The overall prevalence of wound in the current research was 55.6% which is in line with the previous report (54%) by Sells *et al.* [12] in Morocco but less than the finding by Biffa and Woldemeskel [10] (72.1%) in working equines in Hawassa. This is probably due to variation in husbandry and management practice by the farmers among different geographic area.

Regarding wound distribution, back (Wither) sore (44.7%) and breast sore (20.2%) were identified with greater frequency. This probably coincide with poorly designed and ill fitted saddles and straps which is manufactured by unskilled artisans and girth sores might correlate with improper use of girth ropes by the cart owners. This finding was similar with previous report made by Pearson *et al.* [6] and Biffa and Woldemeskel [10].

In the present study greater proportion of wound cases were graded as moderate in contrast to Biffa and Woldemeskel [10] who have reported greater proportion of the case were severe in working equines of Hawassa. The difference might be due to difference in body condition of mules, topography of environment (Rugged landscapes), the type of harness material used (Natural or synthetic), the fit of the harness, working nature (Behavior of the owner, the frequency of work and the load) all contribute to the intensity or severity of wound.

From age categories the present finding has showed that 66.7% of wound in age group <5, 51% in age group 5-10, 53% in age group 10-15 and 74.1% in older (>15 years). This showed that a significantly higher prevalence of wound was recorded in older mules ($\chi^2=10.293, P < 0.05$). Similar scenarios were reported by Biffa and Woldemeskel [10]. This might be due to the fact that olds were involved in multiple activities, yet very little management was accorded to them. They were made to carry heavy loads over long distances and hours.

Low body condition score is an indicator of reduced body fat [18]. In the current study wound was found to be significantly associated with body condition, where mules with poor body condition were three times at risk of developing wound than good body condition score. Similarly, Mekuria *et al.* [8] and Solomon and Rahmato [19] indicated that, poor physical condition due to mainly malnutrition is the leading cause of sores in equines. The probable reason for such association is due to mules with a poor body condition may have less natural padding protecting them from pressure and friction caused by saddle. In contrary, Sells *et al.* [12] reported that, no any significant difference between wound prevalence and body condition score in Morocco.

According to Biffa and Woldemeskel [10] injuries in working equines have been caused by improper harness and saddle design. Similarly, the finding in the current study has shown that mules which have been used without saddle frame were with greater risk of developing wound back sore than those mules used with proper saddle frame. This is probably due to a properly designed, well-fitted and comfortable harness allows the working animal to pull the implement to the best of its ability without risk or injuries.

When considering communication of mule owners with their mules, the current study has showed a significantly high prevalence of wound (62.2%) in mules handled through beating. In Ethiopia some owners refer to wounds on their equines as 'accelerators' since the animals move faster when the wound is beaten [20].

Concerning wound management majority of mule owners (45.05%) abandoned their mules to heal by itself with 19.37% have tried to treat it by themselves. In addition, few owners (18.92%) managed their wounded mules differently by allowing them to have access to appropriate veterinary care and the remaining 16.67% seek for traditional healer. Similar situations have been reported by Biffa and Weldemeskel [10] in Hawassa and

Pearson *et al.* [21] that most of equine owners take their injured donkeys and mules to veterinary clinic after trying traditional methods. Only a few people look for veterinary advice on treatment of sores in mules.

In the current research, there was no any association in the prevalence of wound among sex groups and different working nature of mules. In contrast, Biffa and Woldemeskel [10] and Sells *et al.* [12] reported that wound prevalence is associated with different working nature. This difference might be due to difference in management practice, harnessing and nature of work (Duration of work, weighting load and road nature) in these different study area.

CONCLUSION

The current study has showed presence of wound as welfare problem in cart pulling mules in Adet town and surrounding kebeles. It has further explored and identified poor harnessing, low body condition, old age of mules and poor communication of cart mule owners with their mules as main predisposing factors for occurrence of wound. Poor practice of wound management, where most cart mule owners abandon their wounded mules rather than looking help to veterinary service. The study has shown also community less aware about resting time and the use of modern veterinary services. To alleviate the problems, Intervention plans targeting the development of knowledge and attitude of animal owners should be in place to improve use and management of cart mules and Stakeholders should be involved in improving the welfare of mules and use of improved harness are recommended.

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