# Monitoring of body weight, body condition and observation of wound on working equines in HuletEjuEnese district, East Gojjam, Amhara National Regional State, Ethiopia

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## Abstract

A study was conducted in urban and rural areas of HuletEjuEnese district to describe body weight, body condition, causes and location of wounds on different body parts of donkeys and mules. A total of 150 donkey and mule owners were selected and interviewed on equine wound management, injury occurrence and the fate of wounded equines. Visual observation and measurement was made on body condition and location of injury on 300 equines. Data was analyzed using the descriptive statistics and general linear model. The major causes of external injury of equines were improper harness (63.4%), over working and over loading (58.9%) and multi factorial causes (32.2%). Observed causes of external injuries were not significantly different ($p>0.05$) between mules and donkeys. The mean body weight of donkeys in age group 5-15 years (107.2 ± 32.6) was significantly higher ($p<0.05$) than those below 5 (92.7 ± 19.3kg) and above 15 years (93.7 ± 23.5 kg. Donkeys providing cart pulling had lower mean body weight (98.2 ± 27.9 kg) compared to those involved in pack services (107.3 ± 33.5 kg). The body condition of equines did not vary significantly ($p>0.05$) with age and sex but significant differences ($p<0.05$) were observed with work type, working hour and feeding condition. In general, in the study district the body condition of donkeys and mules were poor. Therefore, proper management like optimizing working hours and load, proper harness, and health management are crucial for increasing the performance of working equines. Awareness creation on equine welfare and management is required to alleviate discomfort, pain, occurrence of injuries and other related welfare problems of working equines.

**Keywords**: Body condition; Body weight; External injury; Equine; HuletEjuEnese

## Introduction

Ethiopia is believed to have the largest livestock population in Africa (CSA, 2016/17). The varied and extensive agro-ecological zones and the importance of livestock in livelihood strategies make Ethiopia home to large numbers of livestock. Indeed, Ethiopia has the largest livestock inventory in Africa, 59,486,667 cattle, 30,697,942 sheep and 30, 200, 226 goats, 8,439, 220 donkeys, 409, 877 mules, 2,158, 176 horses and 59,495, 026 chickens (CSA, 2016/17). Ethiopia possesses approximately half of Africa's equine population with 37%, 58%, and 46% of all African donkeys, horses, and mules, respectively (Biffa and Woldemeskel, 2006). In Ethiopia the contribution of equines is extremely diverse. They carry heavy loads, pulling carts and provide a transportation service; consequently, they contribute significantly to the national economy (Gebreab, 1993). Although in many developing countries including Ethiopia, equines are kept mostly for transportation; people in most peri-urban area hire horses, mules and donkeys for commercial purposes such as carting goods and people and for fetching water. However, Mohammed (1991) reported that in Ethiopia the daily hire charge is the same irrespective of the load carried or the distance traveled.

The husbandry practices of working equines are poor. Some methods of hobbling to restrain equines cause discomfort and inflict wounds (Alujia and Lopez, 1991; Mohammed, 1991) and poorly designed harnesses or yokes that may be heavy and ragged have an adverse effects on the animals health and safety. This misuse, mistreatment and lack of veterinary care for equines have contributed enormously to early death, resulting in shortening working life expectancy of 4 to 6 years. However, in countries where animal welfare is in practice, the life expectancy of equine reaches up to 30 years (Svendsen 1981; Fred and Pascal, 2006).

In HuletEjuEnese district equines are kept for different purposes like cart service, pack service, traction and renting out service. But long working hours and difficult conditions are experienced by working donkeys and mules in the district (WAO, 2011, unpublished). Animals are often forced to work for long hours, and when get free; they are left to graze on natural pasture. These would have a negative impact on their welfare and quality of life of equines

in the district. Therefore, the objectives of this paper were to describe body weight, body condition and the causes and location of wound on different body parts of equines in HuletEjuEnese district.

## Materials and methods

### Description of the study area

The study was conducted in HuletEjuEnesie district which is found in East Gojjam zone, Amhara National Regional State, Ethiopia. It is located 370 km northwest of Addis Ababa, capital of Ethiopia. The district is geographically located at 10˚ 45' 00" -11˚ 10' 00" N latitude and 37˚ 45' 69" - 38˚ 10' 00" E longitude. The district has an altitude range of 1290-4036 m a.s.l. (WAO, 2011, unpublished). The land use pattern of the district is classified into five categories; 66.7% cultivated, 13% grazing, 7.2% bushes and forest land around homestead, 12.96% land not useful ("Kola") and 0.14% settlement areas (WAO, 2011, unpublished).

Agroecologically, the district is classified as 52%, 18%, 30% mid-land ("Weinadega"), high land ("Dega") and lowland ("Kola"), respectively. The mean annual rainfall is 1100 mm and the minimum and maximum rainfall ranging from 997 mm to 1203 mm. The rain fall is bimodal with major rain being in"Kiremt" (June-September) and short rain in April and May ("Belge"). The mean annual temperature is 18.5°C and the range is from mean minimum of 10°C to mean maximum 27°C (WAO, 2011).

The livestock production is one of the major economic bases of the area. The total livestock population in the district is estimated to be 727,157 heads in which 88,112 (12.12%) cattle, 488,649 (67.2%) sheep, 19,579 (2.7%) goats, 17,183 (2.36%) equines and 113,634 (15.62%) poultry. The number of livestock per household is about 3.85, 21.37, 0.86, 0.75 and 4.97 heads for cattle, sheep, goat, equines and poultry, respectively (WAO, 2011, unpublished).

### Data collection

Multi-stage sampling techniques were employed where the first stage was district. The district was selected purposively based on equine population, potential cart service, and access of the road in the rural Kebeles of the district. The district was stratified into urban and rural kebeles based on infrastructure, management system and work type of equines. Accordingly, three rural ad-

ministrations and two urban kebeles were randomly selected from a total of 40 rural and 6 urban kebeles based on the proportion of equine abundance.

Thirty households were purposively selected and interviewed based on equine possession (one who has at least one donkey and one mule were selected) from each selected rural administrative and urban kebeles (a total of 150 interviews).

A total of 300 equines (150 mules and 150 donkeys) were used for data collection. One hundred twenty and 180 equines were selected from urban and rural kebeles respectively. Each equine owner having at least one donkey and one mule was selected purposively for the purpose of comparing the two species with work types, feeding conditions and preference of owners. Body weight measurements, body condition scoring and observation of wound were recorded. Data on body weight, body condition and observation of wound on different body parts were collected from 150 mules and 150 donkeys. For households with more than one mule and one donkey, the animals were selected randomly. Body condition score was assessed based on five scales (0-5) based on the criteria described by Carroll and Huntington (1988).

For body weight measurement, girth meter was used for measuring girth and length of equines. But, since the girth meter was not developed for equines reading the body weight from girth meter was not possible; therefore, regression equation for the mule was established as;-33+2.8*G+1.36*L; where G is girth and L is length (Kay, 2007). Whereas for the donkey regression equation was established as; $G^{2.12}X\ L^{0.688}/3801$ where G is girth and L is length (Pearson *et al*., 2000).

**Statistical analysis**

Depending on the type of information collected, different analysis methods were applied. The collected data were organized, summarized and analyzed using Statistical Package for Social Sciences version 16 (SPSS 16, 1996). Descriptive statistics and percentage were used to present the data. Chi-square ($\chi^2$) test was used to determine differences among categorical variables, for example, the fate of wounded equines, body condition scoring of animals and the major causes of external injury of equines. General Linear Model (GLM) procedures were used to analyze effect of explanatory variables on body weight of equines. For working donkeys and mules, the working hours, work type and

feed condition of the monitored working equines were considered as fixed effects.
The following model was fitted to analyze body weight of equines

$Y_{ijklm} = \mu + W_i + F_j + T_k + S_l + A_m + \varepsilon_{ijklm}$

Where;

$Y_{ijklm}$ = body weight on the $n^{th}$working equines of the $i^{th}$ work type and the $j^{th}$ feed type in the $k^{th}$ working hours, $l^{th}$sex type and $m^{th}$ age group.

$\mu$ = the overall mean common to all animals in the study

$W_i$ = fixed effects of the $i^{th}$ work type (1=pulling cart, 2=riding, 3=pack service, 4=traction, 5=renting out)

$F_j$ = fixed effects of the $j^{th}$ feed type (1=supplemented or 2=not supplemented)

$T_k$ = fixed effects of the $k^{th}$ working hours (1= less than 6 hrs, 2=6- 9 hrs, 3= >9 hrs)

$S_{l=}$ fixed effects of the $l^{th}$ sex type (1= female and 2= male)

$A_{m=}$ fixed effects of the $m^{th}$ age group (1= less than 5 years, 2= 5-15 years and 3= greater than 15 years)

$\varepsilon_{ijklm=}$ is the random error

## Results

### Major causes of external injury of equines

The study demonstrated that the major causes for the occurrence of external injuries of mules and donkeys in the study area were 66.7%, 53.3% and 33.3% improper harness, over loading and over working and multi factorial causes, respectively (Table 1). Improper harnesses were found to cause more external injury of mules ($p<0.05$) than donkeys. Over working and over loading factors for the cause of external injury were more observed in donkeys($p<0.05$) than mules. Unknown causes for the occurrences of external injury were significantly higher in mules ($p<0.01$) than donkeys.

**Table 1. Causes for the occurrence of external injuries of equines in the study district**

| Causes | Donkey N=150 | Mule N=150 | Total N=300 | Chi square | *p*-value |
|---|---|---|---|---|---|
| | N (%) | N (%) | N (%) | | |
| Improper harness | 91 (60.7) | 109(72.7) | 200 (66.7) | 4.9 | * |
| Over loading and over working | 91(60.7) | 69 (46.0) | 160 (53.3) | 7.8 | * |
| Biting | 11 (7.3) | 8 (5.3) | 19 (6.3) | 0.5 | ns |
| Infectious disease | 30 (20.0) | 29 (19.3) | 59 (19.7) | 0.02 | ns |
| Nail piercing | 5 (3.33) | 9 (6.0) | 14 (4.7) | 1.2 | ns |
| Cauterization | 9 (6.0) | 8 (5.3) | 17 (5.7) | 0.06 | ns |
| Unknown | 22 (14.7) | 48 (32.0) | 70 (23.3) | 12.6 | ** |
| Multi factorial causes | 52 (34.7) | 49 (32.7) | 101 (33.7) | 0.13 | ns |

*p< 0.05; **p< 0.01 value within the row indicates significant and highly significant on the major causes for the occurrences of external injury, respectively; ns=non significant

## Location of external injury

Table 2 presents the distribution of external injuries on various body parts of working equines in urban and rural areas. The result showed that donkeys in urban Kebeles had more severe injury in part of shoulder (58.3%) than other body parts. In rural areas the major locations of wound in donkeys were on the back (52.2%). Apparently, mules in urban Kebeles were found more severely injured in part of withers (50.0%) than other body parts.

**Table 2. Distribution of external injuries on various body parts of working equines**

| Body parts | Urban N=120 | | | Rural N=180 | | Total N=300 |
|---|---|---|---|---|---|---|
| | Donkey N (%) | Mule N (%) | Total N (%) | Donkey N (%) | Mule N (%) | Total N (%) |
| Withers | 19 (31.7) | 30 (50.0) | 49 (40.85) | 15 (16.7) | 15 (16.7) | 15 (16.7) |
| Flank | 4 (6.7) | 1 (1.7) | 5 (4.2) | 11 (12.2) | 11 (12.2) | 22 (12.2) |
| Back | 15 (25.0) | 8 (13.3) | 23 (19.15) | 47 (52.2) | 32 (35.6) | 79 (43.9) |
| Shoulder | 35 (58.3) | 28 (46.7) | 63 (52.2) | 19 (21.1) | 11 (12.2) | 30 (16.65) |
| Thigh | 11 (18.3) | 6 (10.0) | 17 (14.15) | 10 (11.1) | 13 (14.4) | 23 (12.25) |
| Under tail | 7 (11.1) | 5 (8.3) | 12 (9.7) | 7 (7.8) | 15 (16.7) | 22 (12.25) |
| Front leg | 2 (3.3) | 3 (5.0) | 5 (4.15) | 3 (3.3) | 11 (12.2) | 14 (7.75) |
| Abdomen | 5 (8.3) | 8 (13.3) | 13 (10.8) | - | 10 (11.1) | 10 (5.55) |
| Hind leg | - | 4 (6.7) | 4 (3.35) | 9 (10.0) | 7 (7.8) | 16 (8.9) |
| Wither and head | 4 (6.7) | 5 (8.3) | 9 (7.5) | 8 (8.5) | 14 (15.5) | 22 (12.0) |
| Thigh and front leg | 9 (15.0) | 5 (8.3) | 14 (11.65) | 4 (4.4) | - | 4 (2.2) |
| Wither and thigh | 5 (8.3) | 9 (15.0) | 14 (11.65) | 15 (16.7) | 10 (11.1) | 25 (13.9) |
| Others | 13 (21.7) | 10 (16.7) | 23 (19.2) | 13 (14.4) | 22 (24.4) | 35 (19.4) |

## Management of external injury of equines

There was significant difference ($p<0.05$) between urban and rural areas in the treatment of wounded equines in veterinary health center that most owners in the urban areas took their animals to health clinics. The last choice for treating wounded equines was doing nothing (23.89%) which was significantly higher ($p< 0.01$) in rural than urban area (Table 3).

**Table 3. Management of wounded equines in HuletEjuEnese district**

| Management of external injury | Urban N=120 | Rural N=180 | Total | $\chi^2$ value | *p* value |
|---|---|---|---|---|---|
| | N (%) | N (%) | N (%) | | |
| Take to nearby health center | 38 (63.33 ) | 42 (46.67) | 80 (55.0) | 4.02 | * |
| Medication purchased from local market | 16 (26.67) | 28 (31.11) | 44 (29.0) | 0.34 | ns |
| Take to local healer | 8(13.33) | 21 (23.33) | 29 (18.33) | 2.31 | ns |
| Treat with medicinal plants | 14 (23.33) | 25 (27.78) | 39 (25.56) | 0.37 | ns |
| Locally available traditional drug | 11(18.33) | 36 (40.0) | 47 (29.17) | 7.86 | ** |
| Do nothing | 8 (13.33) | 31 (34.44) | 39 (23.89) | 8.34 | ** |

*p< 0.05; **p< 0.01 value within the row indicates significant and highly significant on the management of external injury, respectively; ns=non significant

## Body Condition scoring of equines

Tables 4 and 5 present the body condition score of donkeys and mules. Equines under different working hours, work type and feeding condition had different body condition scoring ($p<0.05$) while age group and sex did not have significant ($p>0.05$) effects on body condition scoring for both urban and rural areas. In thin body condition category the proportion of donkeys which belonged to traction and cart services were higher than other work type. In good body condition category the proportion of donkeys which were rented out and pack work type were higher. The result showed that in thin body condition division, the proportion of donkeys which belonged to working hours in the range of >9 working hrs were higher than other class of working hours. In good body condition category the proportion of donkeys which belonged to the range of less than 6 working hrs and 6-9 hrs were higher than other class of working hours. Supplementary feeding practices had significant different ($p< 0.05$) on body condition of equines.

**Table 4. Body condition scoring of donkeys in HuletEjuEnese district**

| Factors | Rural | | | | | Urban | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Body condition** | | | | | **Body condition** | | | | |
| | **Thin** | **Medium** | **Good** | **chi** | ***p*value** | **Thin** | **Medium** | **Good** | **Chi-square** | ***p*-value** |
| *Age group* | | | | 2.2 | ns | | | | 2.80 | ns |
| <5 years | 16.0 | 68.0 | 16.0 | | | 30.0 | 45.0 | 25.0 | | |
| 5-15years | 10.1 | 63.6 | 26.3 | | | 22.64 | 54.7 | 22.6 | | |
| >15years | 7.7 | 61.5 | 30.8 | | | 12.5 | 54.2 | 33.3 | | |
| Sex | | | | 1.04 | ns | | | | 4.48 | ns |
| Female | 8.96 | 64.2 | 26.9 | | | 18.99 | 49.4 | 31.7 | | |
| Male | 12.1 | 63.9 | 24.1 | | | 25.35 | 51.8 | 16.9 | | |
| Working hours | | | | 15.62 | * | | | | 16.86 | * |
| < 6 hrs | - | 78.6 | 24.4 | | | - | 50 | 50 | | |
| 6-9 hrs | 3.3 | 50.0 | 46.7 | | | 20.8 | 54.2 | 25 | | |
| >9 hrs | 17.8 | 56.5 | 26.1 | | | 34.3 | 50 | 15.7 | | |
| Work types | | | | 14.06 | * | | | | 18.59 | * |
| Traction | 33.3 | 66.7 | - | | | - | 100 | - | | |
| Pack | 3.33 | 70.0 | 26.7 | | | 15.9 | 11.4 | 27.3 | | |
| Ridden | - | - | - | | | 17.8 | 64.4 | 17.8 | | |
| Cart service | 19.7 | 57.6 | 22.7 | | | 27.7 | 36.2 | 36.2 | | |
| Renting out | - | 66.7 | 33.3 | | | 50 | 50 | - | | |
| Feeding practices | | | | 6.6 | * | | | | 7.88 | * |
| supplemented | 5.5 | 67.03 | 27.5 | | | 16.4 | 58.2 | 24.5 | | |
| not supp | 18.6 | 59.3 | 22.03 | | | 37.5 | 40 | 25.5 | | |

*p< 0.05 value within the column indicates significant difference of body condition on different fixed factors; ns=non significant

Like that of donkeys, body condition of mules was affected by working hours, work type and supplementation. But age group and sex of mule did not affect their body condition score. In thin body condition category, the proportion of mules which belonged to traction (33.3%) was higher than other work type. In good body condition groups, the proportion of mules which were engaged in renting out and pack work type were higher. The study showed that in thin body condition category, 34.29% of mules which works for over 9 hrs were higher than other class of working hours. In good body condition group 78.58% of mules working less than 6 working hrs per day were higher than other class of working hours. Supplementary feeding practice had significant effect ($p< 0.05$) on body condition of mules.

**Body weight measurement of equines**

The means and the standard deviations of body weight of donkeys and mules are shown in Table 6. Age of animals showed significant difference on the body weight of donkeys and mules in both urban and rural areas. The body weight of donkey on age group in 5-15 years (107.2±32.6) was found significantly greater ($p<0.05$) than age groups <5 years (92.7±19.3kg) and greater than 15 years (93.7±23.5 kg) in rural area.

The body weight of donkeys involved in cart service (98.19±27.89 kg) was significantly different ($p<0.05$) as compared with donkeys involved in pack service (107.3±33.5 kg). The sex of donkey had significant difference on body weight ($p<0.05$) where female donkeys (96±23.4 kg) were having lower body weight than males (107.2±33.7 kg).

**Table 5. Body condition scoring of mules in HuletEjuEnese district**

| Factors | Rural | | | | | Urban | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Body condition | | | | | Body condition | | | | |
| | Thin | Medium | Good | chi | p-value | Thin | Medium | Good | Chi-square | p-value |
| *Age group* | | | | 2.2 | ns | | | | 2.80 | ns |
| <5 years | 16.0 | 68.0 | 16.0 | | | 30.0 | 45.0 | 25.0 | | |
| 5-15years | 10.10 | 63.64 | 26.26 | | | 22.64 | 54.72 | 22.64 | | |
| >15years | 7.69 | 61.54 | 30.77 | | | 12.5 | 54.17 | 33.33 | | |
| Sex | | | | 1.04 | ns | | | | 4.48 | ns |
| Female | 8.96 | 64.18 | 26.87 | | | 18.99 | 49.37 | 31.65 | | |
| Male | 12.05 | 63.86 | 24.1 | | | 25.35 | 51.75 | 16.90 | | |
| Working hours | | | | 15.62 | * | | | | 16.86 | * |
| < 6 hrs | - | 78.58 | 24.43 | | | - | 50 | 50 | | |
| 6-9 hrs | 3.3 | 50.0 | 46.67 | | | 20.83 | 54.17 | 25 | | |
| >9 hrs | 17.78 | 56.52 | 26.09 | | | 34.29 | 50 | 15.71 | | |
| Work types | | | | 11.0 | * | | | | 18.59 | * |
| Traction | 22.3 | 77.67 | - | | | - | 100 | - | | |
| Pack | 3.33 | 70.0 | 26.67 | | | 15.91 | 11.36 | 27.27 | | |
| Ridden | - | - | - | | | 17.78 | 64.44 | 17.78 | | |
| Cart service | 19.7 | 57.58 | 22.73 | | | 27.66 | 36.17 | 36.17 | | |
| Renting out | - | 66.67 | 33.33 | | | 50 | 50 | - | | |
| Feeding practices | | | | 6.6 | * | | | | 7.88 | * |
| supplemented | 5.5 | 67.03 | 27.47 | | | 16.36 | 58.18 | 24.46 | | |
| not supp | 18.64 | 59.32 | 22.03 | | | 37.5 | 40 | 25.5 | | |

*p < 0.05 value within the column indicates significant difference of body condition on different fixed factors; ns=non significant

Supplementary feeding of donkeys had significant difference on body weight ($p$<0.05) where supplemented donkeys had higher body weight (104.436±30.08 kg) than not supplemented donkey (98.97±32.10 kg). Donkeys working for >9 hrs (92±17.2 kg) had significantly lower body weight ($p<0.05$) than donkeys working in range of less than 6 working hrs (128.1±34.6kg) and 6-9 hrs(123.4±41.7kg), respectively.

The research result showed that the body weight of mules on age group had significant difference ($p<0.05$) in all age range of less than 5 years, 5-15 years and greater than15 years were 437.4±45.7 kg, 488.3±30.2kg and 466.5±34.6 kg, respectively. Apparently, the work type showed that cart service (467.4±34.2 kg) had significant difference ($p<0.05$) as compared with pack (487.14±39.5kg), riding (486.04±25.5kg), but no significant difference ($p> 0.05$) with traction (435.3±23 kg) and renting out (467.7±38.5kg). The sex of mules had significant difference on body weight ($p<0.05$) where female (467.8±36kg) had lower body weight than males (486.95±34.7 kg). Supplementary feeding of mules is associated with significant difference on body weight ($p< 0.05$) where supplemented (482.9±32.7kg) mules had higher body weight than not supplemented mules (459.5±24kg).

**Table 6. Body weight of donkeys and mules in HuletEjuEnese district**

| Factors | Rural | | Urban | |
|---|---|---|---|---|
| | Donkey | Mule | Donkey | Mule |
| | No.=90 | No.=90 | No.=60 | No.=60 |
| | Mean±S.D | Mean±S.D | Mean±S.D | Mean±S.D |
| **Age group** | * | * | ** | ** |
| <5 years | 92.7±19.30$^{b}$ | 437.4±45.7$^{c}$ | 86.9±8.95$^{b}$ | 430.78±28.9$^{b}$ |
| 5-15 years | 107.2±32.6$^{a}$ | 488.3±30.2$^{a}$ | 117.7±36.8$^{a}$ | 488.7±32.5$^{a}$ |
| >15 years | 93.7±23.5$^{b}$ | 466.5±34.6$^{b}$ | 94.6±15.3$^{b}$ | 459.1±25.98$^{c}$ |
| **Work type** | * | * | ns | ns |
| Pack | 107.3±33.5$^{a}$ | 487.14±39.5$^{a}$ | 111.6±34.2 | 490.8±42.9 |
| Ridden | - | 486.04±25.5$^{a}$ | - | 478.6±21.8 |
| Traction | 106.5±17.2$^{ac}$ | 435.3±23.00$^{bc}$ | - | - |
| Cart service | 98.2±27.9$^{bc}$ | 467.38±34.2$^{c}$ | 101.9±36.9 | 455.1±45.0 |
| Renting out | 100±29.4$^{ab}$ | 467.7±38.5$^{abc}$ | 110.01±37.2 | 466.3±38.5 |
| **Feeding practices** | * | * | ns | * |
| Supplemented | 104.36±30.08$^{a}$ | 482.89±32.69$^{a}$ | 107.09±35.12 | 475.25±35.72 |
| Not supplemented | 98.97±32.10$^{b}$ | 459.46±24$^{b}$ | 104.97±33.88 | 469.45±41.13 |
| **Working hrs** | * | * | * | ns |
| < 6 hrs/day | 128.05±34.60$^{a}$ | 501.87±33.15$^{a}$ | 120.05±34.60$^{a}$ | 493.33±34.87 |
| 6-9 hrs/day | 123.35±41.69$^{a}$ | 478.05±39.75$^{ab}$ | 127.35±44.69$^{a}$ | 486.99±27.60 |
| >9 hrs/day | 92.00±17.18$^{b}$ | 472.54±36.03$^{b}$ | 94.00±27.18$^{b}$ | 469.28±38.74 |
| **Sex** | * | * | ns | ns |
| Male | 107.17±33.7 | 486.95±34.7 | 104.2±33.7 | 478.95±37.2 |
| Female | 95.98±23.4 | 467.81±36 | 99.8±33.3 | 468.4±36.8 |

a,b,cMeans with different letters in the same column are significantly different at the indicated level; *p<0.05; *p<0.01; NS – None significant

## Discussion

The study demonstrated that the major causes of external injuries of mules and donkeys in the study area were improper harness (66.7%), over loading (53.3%), over working (33.3%), and multi factorial causes. Harness as cause of external injury was more significant in mules ($p<0.05$) than donkeys. This might be due to the aggressive behavior of mule leading to improper fitting of harness to their body and work type variation of the two species where mules are used for cart. Over working and over loading factor for the cause of external injury were higher in donkeys ($p<0.05$) than mules. Pearson *et al* (2000)

reported a similar situation in central Ethiopia where over weight and type of load/work contributed to high cases of back sores in donkeys. In agreement with this observation, Fred (2002) also reported that donkeys in Kenya developed extensive sores and wounds due to over working.

The reason for significantly high unknown causes of external injury in mules which might be due to the characteristics of mule were difficult to determine the causes for the occurrence of injury. In agreement with the present study, improper harness and saddle were major causes of injuries in equines in central and northern Ethiopia (Pearson *et al*., 2000; Bradbury, 2002). Similarly, sores due to harness in Ethiopia are common and are present in the form of saddle sores, fistulous withers and girth sores (McLeod, 1998; ILPH, 1999). Where equine are in poor body condition and lack the layer of subcutaneous fat, there will be a higher prevalence of sores due to ill-fitting or badly made harness (ILPH 1999; Bradbury and Bubear, 2001). In agreement with the present study in Ethiopia 26.9%, 20.5%, 14.9% of external injury of equines caused by improper harness and saddle, over loading and over working, multi factorial, respectively (Alemayehu *et al*., 2000; Biffa and Woldemeskel, 2006).

More severe shoulder injuries (58.3%) than other body parts of donkeys in urban Kebeles might be harness for cart services have more impact on shoulder than other parts. In rural areas, the major locations of wound of donkeys were on the back (52.2%) as the animals are used for pack service. According to Biffa and Woldemeskel (2006) back/shoulder (22.8%) and wither (20.9%) injuries were common in donkeys. Apparently, mules in urban Kebeles were found more severally injured in part of withers (50.0%) than other body parts whereas, in rural areas the major location of wound of mules were on the back (35.6%). This difference may be due to work type in urban and rural area, respectively. Similarly, Biffa and Woldemeskel (2006) reported that injuries were demonstrated to be commonly distributed on wither and back coinciding with poorly designed and ill-fitted harnesses and saddles.

There was significant difference ($p<0.05$) between urban and rural areas in the treatment of wounded equines in veterinary health center that most owners in the urban areas took their animals to health clinics. The reason may be due to availability of veterinary service and most of the equine owners in urban area were literate. The last choice for treating wounded equines were doing nothing (23.9%) which was highly significant ($p< 0.01$) might be due to, in rural area the majority of households were illiterate and veterinary services were not

accessible. In contrast to the present study Biffa and Woldemeskel(2006) reported that only 21.4% of the respondents take wounded equines to the nearby veterinary clinic while 8.7% treat with medications purchased from the local market, 27.5% take to a local healer, 2.2% treat with medicinal plants and 40.2% do nothing. Shelima *et al* (2007) made similar observation, where 38.3% of wounded equines treated using traditional medicine and 36.2% of wounded equines had no chance to go to veterinary clinic or 17.7% due to financial constraint. Khalil and Omer (2013) reported that care for animals' wounds was generally similar between farmers, and the majorities of the farmers (60%) buy medicines and treat the animals by themselves; 19% did nothing and wait for the wounds to heal; 12% used local remedies and only 3% took their animals to the veterinary centre.

In thin body condition animals the proportion of donkeys which belonged to traction and cart service were higher than other work type this might be higher working effort in these work type leading to loss of weight. In good body conditioned animals group, the proportion of donkeys engaged in renting out and pack work type were higher which might be the load on pack service and traction work type were simple. The result showed that in thin body conditioned animals the proportion of donkeys which belonged to working hours in the range of >9 hrs were higher than other class of working hours which might be low exposure for grazing and losing much more energy. In good body conditioned the proportion of donkeys which belonged to the range of less than 6 working hrs and 6-9 hrs were higher than other class of working hours which might be higher exposure for grazing, getting resting time and type of work they perform required simple effort not the case. Supplementary feeding practice had significant effect ($p< 0.05$) on body condition which might be due to substitution of energy loss by work. Like that of the donkeys, body condition of mules was affected by working hours, work type and supplementation. Age group and sex of animal did not affect body condition score. In thin body condition, the proportion of mules which belonged to traction (33.3%) were higher than other work type which might be because of the higher working effort in these work type which in turn leads to loss of weight. In good body condition groups, the proportion of mules engaged in renting out and pack work type were higher which might be the load on pack service and renting out work type were relatively less.

The study showed that in thin body condition, the proportion (34.29%) of mules which belonged to working hours in the range of >9 hrs were higher than other

class of working hours which might be low exposure for grazing and losing much more energy. In good body condition the proportion (78.58%) of mules which belonged to working hours in the range of less than 6 working hrs per day were higher than other class of working hours which might be higher exposure for grazing, gave rest time and type of work they perform needed simple effort. Supplementary feeding practices had significant effect ($p< 0.05$) on body condition which might be due to weight of mules.

The body weight of donkey on age group of 5-15 years was found significantly greater ($p<0.05$) than other age groups <5 years and greater than 15 years in rural area which might be due to the physiological maturity development. Similarly, the mean live weight of donkeys in Ethiopia was found to be 105 kg (Sileshi *et al*., 2002). The body weight of donkeys involved in cart service was significantly low as compared with donkeys involved in pack service, this might be due to the fact that cart service have high work load and frequent working days that may lead to weight loss.

Supplementary feeding of donkeys had significant effect on body weight ($p<0.05$) where supplemented donkeys had higher body weight than not supplemented donkey.The reason why donkeys working over 9 hrs had significantly lower body weight than those in working for less than 6 working hrs and 6-9 hrs might be due to long working hrs which restricts grazing and high weight loses due to high energy utilization.

The possible reason why there is difference in body weight of mules at different age might be due to the physiological maturity. Apparently, the work type showed that cart service had significant difference as compared with pack, riding, but no significant difference ($p>0.05$) with traction and renting out which might be due to the fact that cart service, renting out and traction have high work load that leads to weight loss.

## Conclusion

For both mules and donkeys, the major causes for the occurrence of injury were improper harnessing, over working and over loading and multi factorial causes. The major causes for the occurrence of external injuries of mule and donkey were not different. Sex, feeding condition, working hours and work type had significant effect on body weight of equines. Work type, feeding con-

dition and working hours had significant effect on body condition of equines; however, sex and age group did not significantly effect body condition. The location of injury on different body parts of equine varied based on species, work type and harness type. The mules and donkeys owners should focus on the selection of harness based for fitting without any injury occurrences rather than on cost of harness.Training and extension advices are required about causes of wound and wound management and harnessing systems to improve the working performance of equines in the study area.

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## Conflict of interest

The authors declare that there is no conflict of interest.

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