# Causes and Factors Associated With Occurrence of External Injuries in Working Equines in Ethiopia

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## ABSTRACT

Equines are the most important animals in the farming and transport systems of Ethiopia. Though disease and related problems (eg, injuries, acute illness) are major constraints to their performance, information emanating from systematic investigation is almost non-existent. A study to determine causes and associated factors of external injuries was carried out in Awassa in southern Ethiopia on a total of 670 working equines that included 320 (47.8%) donkeys and 350 (52.2%) horses. The study revealed a 72.1% overall prevalence of external injuries. Age ($\chi^2 = 16.4$, $P < 0.0001$) and species ($\chi^2 = 16.1$, $P < 0.0001$) significantly influenced the occurrence of external injuries; higher prevalence was recorded in young animals (76.0%, odds ratio [OR] = 4.7, 95% confidence interval [CI] = 3.2 6.8) than in old animals (59.6%) and in donkeys (79.4%, OR = 2.0, CI = 1.4 2.9) than in horses (65.4%). Intensity of injuries was highly associated with species ($\chi^2 = 6.9$, $P < 0.005$); injuries were more severe in horses (57.2%) than in donkeys (47.2%). Injuries caused by improper harness and saddle design were more prevalent ($\chi^2 = 91.8$, $P < 0.0001$) in both donkeys (26.0%) and horses (27.9%). Significant proportions ($\chi^2 = 17.2$, $P < 0.005$) of animals suffering from injuries (donkeys = 38.6%; horses = 40.2%) did not receive help from their owners compared with lower proportions (donkeys = 12.2%; horse = 21.4%) that did receive conventional veterinary care. This study showed external injuries as a major health problem of working horses and donkeys in the region. A comprehensive equine health and welfare promotion program is important to alleviate the problem.

## INTRODUCTION

Ethiopia possesses approximately half of Africa's equine population with 37%, 58%, and 46% of all African donkeys, horses, and mules, respectively.[1] Equines are important animals to the resource-poor communities in rural and urban areas 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.[2,3] Howe and Garba[4] reported that pack animals in remote parts of the country offer the only realistic way of obtaining returns from agriculture above mere subsis-

tence. In Ethiopia, the use of equines for transportation will continue for years to come because of the rugged terrain characteristics inaccessible for modern road transportation facilities as well as the absence of well-developed modern transport networks and the prevailing low economic status of the community.[5] Therefore, the health and welfare of equines should be of crucial importance to Ethiopia.

Despite their invaluable contributions, equines in Ethiopia are the most neglected animals, accorded low social status, particularly the male working equines. Horses involved in pulling carts often work continuously for 6 to 7 hours/day, carrying 3 to 4 persons (195–260 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. Donkeys often are involved in more multipurpose activities than horses. They transport goods to and from markets, farms, and shops, traveling long distances. They also pull carts carrying heavy loads 3 to 4 times their body weight. They work from 4 to 12 hours/day, depending on the season and type of work. Unlike horses, donkeys are not provided with feed supplements. Feed shortage and disease are the major constraints to productivity and work performance of equines in the region. They are brutally treated, made to work overtime without adequate feed or health care. The increasing human population, demands for transport of goods to and from far, remote areas, and construction activities around the town are making equines highly demanded animals. Though equines provide several advantages, health and welfare is a visible problem. Studies to elucidate the magnitude of this problem are lacking. Such information would be useful for designing strategies that would help improve equine health and welfare. This paper describes causes and influencing factors of external injuries in a working population of horses and donkeys in southern Ethiopia.

## MATERIALS AND METHODS

### Study Area

The study was carried out in Awassa in southern Ethiopia situated 275 km south of Addis Ababa (the capital of Ethiopia) at a latitude of 7°04'N and a longitude 38°31'E on the escarpment of the Great Rift Valley. The altitude ranges from 1650 to 1700 m above sea level. The mean annual rainfall and temperature are 900–1100 mm and 27°C, respectively. The region is estimated to have about 15,770 horses, 18,190 donkeys, and 340 mules that account for 15.6%, 18.5%, and 1% of the total livestock population, respectively.[6]

### Study Animals and Design

This was a cross-sectional study of 670 randomly selected, male working horses (350 [52.2%]) and donkeys (320 [47.8%]) of indigenous breeds found in markets and along the roads in Awassa. Clinical examination and a questionnaire survey were both carried out simultaneously.

### Data Collection and Analysis

A semi-structured questionnaire was developed to collect data, including species, age, injury management, and fate of injured animals. Animals were examined physically, and any grossly visible injuries were characterized and causes identified. For the sake of clarity, injuries were defined as any grossly visible skin/tissue damages with size measuring ≥5 cm and located on any part of the body. Injuries must be active with ongoing tissue damage with or without blood/exudates/pus, abscess formation, or any secondary bacterial complication. Bites (lacerated wounds) were identified by irregular edges with underlying tissues removed as well as hemorrhage.[7] Injuries were categorized as severe when there was ulceration involving a pronounced contusion in wider areas, tissue hypertrophy, and severe complication. Moderate injuries involved coalition of small wounds with tissue sloughing involving no complication and hypertrophy, and some with chronic courses. Injuries were

categorized as mild-severe when they involve only loss of epidermis and the superficial layer with no further trauma. Age of the animals was determined from birth records and dentition characteristics[8] and categorized as young (<8 years) and old (≥8 years). Prevalence of external injuries related to specific risk factors was determined as the proportion of injured animals out of the total examined.[9] Association and influence of factors relating to occurrence of injuries was investigated using chi-square test.[9] Relative frequency (RF) of a specific category of a given factor was computed as the proportion of cases out of the total cases. Odds ratio (OR) was calculated to assess the risk levels of category under each risk factor as the ratio of the odds of injured animals to the odds of uninjured animals.[9] The significance of OR was determined by constructing a 95% confidence interval (CI) using the following formula:

$$\text{Ln (OR)} \pm Z_{\alpha/2}\ \text{ASE}$$

where Ln (OR) represents the value of natural log of OR and ASE is the asymptomatic standard error (the value of $Z_{\alpha/2} = 1.96$ at decision power of 0.95). The corresponding antilog of the CI for OR was determined. When CI for OR did not include 1.0, then the true odds of categories under specified risk factor differed significantly.[10]

**Table 1.** Prevalence of External Injuries by Species.

| Species | Examined, n | Injured, n | Prevalence, % | OR (95% CI) |
|---|---|---|---|---|
| Donkey | 320 | 254 | 79.4 | 2 (1.4 2.9) |
| Horse | 350 | 229 | 65.4 | 1 |
| Total | 670 | 483 | 72.1 | |

CI = confidence interval; $\chi^2 = 16.1$, $P < 0.0001$.

**Table 2.** Prevalence of External Injuries by Age.

| Species | Examined, n | Injured, n | Prevalence, % | OR (95% CI) |
|---|---|---|---|---|
| Young | 161 | 96 | 59.6 | 1 |
| Old | 509 | 387 | 76.0 | 4.7 (3.2 6.8) |
| Total | 670 | 483 | 72.1 | |

CI = confidence interval; $\chi^2 = 16.4$, $P < 0.0001$.

## RESULTS

The overall prevalence of external injuries was 72.1%. Species was found to significantly influence the prevalence of external injuries ($\chi^2 = 16.1$, $P < 0.0001$) (Table 1). Higher prevalence was recorded in donkeys (79.4%, OR = 2.0, CI = 1.4 2.9) than in horses (65.4%). There was a significant variation ($\chi^2 = 16.4$, $P < 0.0001$) in prevalence of external injuries between the age groups (Table 2). Old animals were at about 5-times greater risk (76.0%, OR = 4.7, CI = 3.2–6.8) than young animals (59.6%). Intensity of injuries was reported to be highly associated with species (Table 3). There was a significantly higher proportion of severely injured horses (57.2%, $\chi^2 = 6.9$, $P < 0.005$) than donkeys (47.2%). Injuries caused by improper harness and saddle design were significantly higher ($\chi^2 = 91.8$, $P < 0.0001$) for both donkeys (26.0%) and horses (27.9%) than other causes of injuries (Table 4). Overloading and overworking in donkeys (28.7%) and diseases in horses (24.9%) were the next leading causes of injuries. None of the observed donkeys had injuries caused by nail piercing compared with 10.9% of horses. A significant number ($\chi^2 = 17.2$, $P < 0.005$) of donkeys (38.6%) and horses (40.2%) suffering from injuries did not receive any help from their owners compared with lower numbers of donkeys (12.2%) and horses (21.4%) that did receive conventional veterinary care (Table 5).

**Table 3.** Intensity of External Injuries by Species.

| Intensity of Injuries | Donkey, n (%) | Horse, n (%) | Total, n (%) |
|---|---|---|---|
| Mild | 41 (16.1) | 39 (17.0) | 80 (16.6) |
| Moderate | 93 (36.6) | 59 (25.8) | 152 (31.5) |
| Severe | 120 (47.2) | 131 (57.2) | 251 (52.0) |
| Total | 254 | 229 | 483 |

Percentages may not total 100 due to rounding.
$\chi^2 = 6.9$, $P < 0.005$.

**Table 4.** Causes of External Injuries in Donkeys and Horses in Awassa in Southern Ethiopia.

| Cause | Donkeys, n (%) | Horses, n (%) | Total, n (%) |
|---|---|---|---|
| Improper harness and saddle | 66 (26.0) | 64 (27.9) | 130 (26.9) |
| Overloading and overworking | 73 (28.7) | 26 (11.4) | 99 (20.5) |
| Biting | 49 (19.3) | 8 (3.5) | 57 (11.8) |
| Infectious disease | 14 (5.5) | 57 (24.9) | 71 (14.7) |
| Nail piercing | — | 25 (10.9) | 25 (5.2) |
| Cauterization | 7 (2.8) | 10 (4.4) | 17 (3.5) |
| Unknown | 5 (2.0) | 7 (3.1) | 12 (2.5) |
| Multifactorial causes | 40 (15.7) | 32 (14.0) | 72 (14.9) |
| Total | 254 | 229 | 483 |

Percentages may not total 100 due to rounding.
$\chi^2 = 91.8$, $P < 0.0001$.

**Table 5.** Owners' Responses to the Management of External Injuries.

| Owners' Responses | Donkeys, n (%) | Horses, n (%) | Total, n (%) |
|---|---|---|---|
| Take to nearby health center | 31 (12.2) | 49 (21.4) | 80 (16.6) |
| Treat with medications purchased from local market | 23 (9.1) | 20 (8.7) | 43 (8.9) |
| Take to local healer | 78 (30.7) | 63 (27.5) | 141 (29.2) |
| Treat with medicinal plants | 24 (9.4) | 5 (2.2) | 29 (6.0) |
| Do nothing | 98 (38.6) | 92 (40.2) | 190 (39.3) |
| Total | 254 | 229 | 483 |

$\chi^2 = 17.2$, $P < 0.005$.

Distribution of injuries on body parts showed significant variation ($\chi^2 = 158.9$, $P < 0.0001$) (Table 6). When total animals were considered, the proportion with injured wither (18.6%) was significantly higher than those with other injured body parts alone. For species, however, injuries in horses were more frequently observed on front leg (17.0%) and wither (16.2%) compared with other body parts. Similarly, back/shoulder (22.8%) and wither (20.9%) injuries were common in donkeys. Table 7 shows owners' responses to the fate of injured equines. Significantly large proportions of owners of donkeys (58.8%) and horses (77.4%) reported that they used their animals continuously, regardless of the presence and severity of injuries, compared with fewer proportions of the owners (9.7% and 4.6%, respectively) who gave long-term rest until recovery; 5.9% of donkey owners and 8.6% of horse owners reported that they left injured animals on or alongside the road to let them survive on their own. The proportion of donkey owners who give short-term relief to their animals was relatively higher (25.6%) than that of horses (9.4%).

## DISCUSSION

The results of this investigation demonstrated that external injuries were highly prevalent (72.1%) among the working equines in the region, showing their inhumane suffering due to inappropriate management and neglect. Compared with the 44% prevalence reported from central Ethiopia,[11] the prevalence of injuries in donkeys (79.4%) was higher, which may be due to the variation in husbandry and management. The study also revealed that donkeys were much more affected than horses contrary to the widely prevailing opinion that they are tolerant to hardship conditions. Donkeys were involved in a wide array of activities, yet very little management was accorded to them. They were made to carry heavy loads over long distances and hours. They travel as far as 70 km/day while carrying an average weight load of 150 kg. This was evidenced by the present findings as more cases of injuries in donkeys (28.7%) were due to overloading and overweight compared with a smaller proportion of horses (11.4%). Pearson et al[11] reported a similar situation in central Ethiopia where over-

**Table 6.** Distribution of External Injuries on Various Body Parts.

| Location of Injuries | Donkeys, n (%) | Horses, n (%) | Total, n (%) |
|---|---|---|---|
| Wither | 53 (20.9) | 37 (16.2) | 90 (18.6) |
| Flank | 3 (1.2) | — | 3 (0.6) |
| Back/shoulder | 58 (22.8) | 7 (3.1) | 65 (13.5) |
| Thigh | 35 (13.8) | 4 (1.7) | 39 (8.1) |
| Under tail | 23 (9.1) | 19 (8.3) | 42 (8.7) |
| Front leg | — | 39 (17.0) | 39 (8.1) |
| Abdomen | 3 (1.2) | 6 (2.6) | 9 (1.9) |
| Wither and head | 28 (11.0) | 5 (2.2) | 33 (6.8) |
| Thigh and front leg | 5 (2.0) | 2 (0.9) | 7 (1.4) |
| Wither and thigh | 9 (3.5) | 11 (4.8) | 20 (4.1) |
| Wither, shoulder, and thigh | 11 (4.3) | 23 (10.0) | 34 (7.0) |
| Head, neck, wither, flank, and front and hind legs | — | 12 (5.2) | 12 (2.5) |
| Mouth and tail | 5 (2.0) | 4 (1.7) | 9 (1.9) |
| Wither and front leg | 12 (4.7) | 24 (10.5) | 36 (7.5) |
| Wither, abdomen, and front and hind legs | — | 3 (1.3) | 3 (0.6) |
| With, thigh, and front leg | 2 (0.8) | 17 (7.4) | 19 (3.9) |
| Back and thigh | 5 (2.0) | 9 (3.9) | 14 (2.9) |
| Head, under tail, and thigh | 1 (0.4) | 4 (1.7) | 5 (1.0) |
| Wither and hind leg | 1 (0.4) | 3 (1.3) | 4 (0.8) |
| Total | 254 | 229 | 483 |

Percentages may not total 100 due to rounding; $\chi^2 = 91.8$, $P < 0.0001$.

weight and type of load/work contributed to high cases of back sores in donkeys. In agreement with this observation, Fred[12] also reported that donkeys in Kenya developed extensive sores and wounds due to overworking. Therefore, studies on effects of pack load on health condition and work performance of working equines under Ethiopian conditions need to be carried out, as they could also help establish what practices can bring optimum and sustainable performance of the animals.

In agreement with the present report, improper harness and saddle were major causes of injuries in equines from central[11] and northern Ethiopia.[13] Injuries were demonstrated to be commonly distributed on wither and back coinciding with poorly designed and ill-fitted harnesses and saddles. Manufactured by unskilled artisans, equine-drawn carts are often designed unbalanced and too heavy and do not consider load distribution in relation to the body balance and style of movement. Wooden- or iron-made saddles are constantly put on the back/shoulder and strongly tied to the body by plastic rope, which causes persistent irritation and injuries. In most cases, harnesses were made of car tire strips, which cut in to the skin of the equines and form large open wounds. Yilma et al[14] reported 33.7% prevalence of back injuries in donkeys loaded without a saddle. It can be concluded that whenever an animal works, there is a potential for injuries caused by either absence of or inappropriate equipment and harnessing.

The high prevalence of infection-related injuries in horses suggests the microbial pathogens as either primary or secondary causes. Such types of injuries were characterized by ulceration, abscess, or suppuration. Mycotic dermatitis and ulcerative and epizootic lymphangitis, the major infectious skin diseases of equines in Ethiopia,[15,16] contributed to the high occurrence of injuries reported in the present study. Etana[17] reported that fungal skin infection is a serious problem of cart-horses in Awassa, contributing to a decrease in sale value and work performance.

**Table 7.** Fate of Injured Equines.

| Fate of Injured Animals | Donkeys, n (%) | Horses, n (%) | Total, n (%) |
|---|---|---|---|
| Used continuously regardless of the presence and severity of injuries | 188 (58.8) | 271 (77.4) | 459 (68.5) |
| Given long-term rest until recovery | 31 (9.7) | 16 (4.6) | 47 (7.0) |
| Given short-term rest | 82 (25.6) | 33 (9.4) | 115 (17.2) |
| Left on the road to survive on their own | 19 (5.9) | 30 (8.6) | 49 (7.3) |
| Total | 320 | 350 | 670 |

$\chi^2 = 41.9$, $P < 0.0001$.

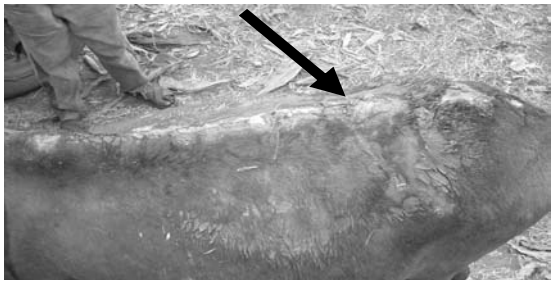

**Figure 1.** A donkey suffering from chronic back injuries due to overloading.

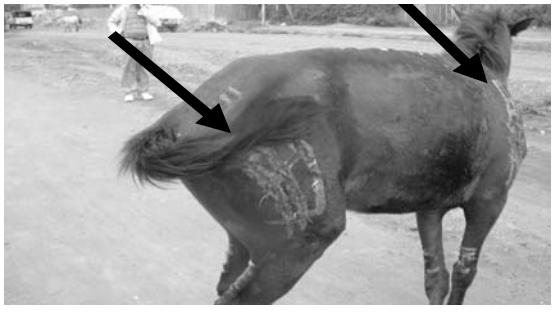

**Figure 2.** Lame cart-horse with front- and hind-leg injuries due to cauterization.

**Figure 3.** A donkey with an ulcerated wound involving tissue hypertrophy induced by persistent rubbing by rope.

A higher number of donkeys with lacerated wounds due to bites was reported in the present study (19.3%) (Table 4). Damages caused by barbed wire and other sharp objects were also reported to be common causes of lesions in donkeys in central Ethiopia[7]; however, in the present study, trauma due to fighting among donkeys and hyena bites were other major causes of bite-related injuries. After long hours of laborious work, fatigued as well as sick horses and donkeys are often made to find night resting places where they are exposed to hyenas. Therefore, it is not uncommon to find lacerated dead bodies on open streets in and around the town.

A higher proportion (39.3%) of the owners did not provide any treatment to their donkeys or horses, regardless of the presence and severity of injuries. This signifies the widely prevailing equine welfare problem in the area. Few owners managed their sick equines differently by allowing them to have access to appropriate veterinary care (16.6%) and long-term rest until recovery (7.0%). Even those taken to veterinary clinics, as a last and desperate measure, were at their terminal stage and no longer able to work. Similar situations have been reported elsewhere in the country where only a few people look for veterinary advice on treatment of sores in donkeys.[11]

Injuries with multifactorial causes were reported as high (14.9%), suggesting the decreased integrity and resistance of the body to physical exertions and disease. In agreement with this observation, Pearson et al[11] indicated that poor physical condition due mainly to malnutrition is the leading causes of sores in donkeys in central Ethiopia. The condition is exacerbated by lack of appropriate veterinary care as ~75% of animals studied did not receive any

appropriate health care. Adequate feeding and proper health care should thus be an integral part of injury prevention.

## CONCLUSION

In conclusion, this study showed higher prevalence of external injuries among the working population of equines in Awassa, and lack of proper management was the major contributing factor. A comprehensive equine health and welfare promotion program through a legal institution is recommended to alleviate the problem.


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