Survey of Common Skin Problem of Working Equines in and Around Mekelle, North Ethiopia

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Abstract: Working equine animals are essential for many poor people living in developing countries like Ethiopia however their socioeconomic contribution is often under recognized; as a result their welfare is highly compromised. Therefore this cross-sectional study was conducted to determine the magnitude of skin problem of working equines in three selected areas of Tigray, North Ethiopia (Mekelle, Quiha and Adigudom). The study was conducted aiming to study the prevalence of skin problems in working equines and identify the risk factors associated. A total of 997 working equines that include 969 (97.2%) donkeys and 28 (2.8%) mules were considered for the study. Selected equines were clinically examined for visible skin lesion. Depending on the skin lesion type detailed clinical examination were performed and appropriate samples were taken for microbiology. An overall prevalence of skin problem was found to be 34.3%. Working equines in Mekelle (51.5%) were found to be highly affected (χ²=76.143, p=0.000) than that of Adigudom (49.6%) and Quiha (23.5%) respectively. The skin problems that were recorded in the study includes: wound (30.3%), ectoparasites (4.0%), ring worm (2.57%), sarcoid (2.5%), and dermatophilosis (1.7%) in decreasing order. There was a significant difference (p<0.05) in the prevalence of wound among different body condition scores, equines in poor body condition were five times exposed (OR=5.1, CI=2.82, 9.23) for wound than equines at better body condition. There was a significant difference (p<0.05) in prevalence of wound in donkeys and mules involved on different types of work where equines used for charcoal transportation were highly affected. The anatomical distribution of the occurrence of wound on the equine was found to indicate association between areas of harnessing, packing and inappropriate hobbling. The study has shown that working equines are suffering from skin problem mainly wound. Hence holistic approach of intervention has paramount importance to improve the health and welfare problems of working equines.

Key words: Working Equines • Prevalence • Skin Problem • Wound • Body Condition Score

INTRODUCTION

Ethiopia possesses the largest equid population in Africa, with an estimated 1.91 million horses, 6.75 million donkeys and 0.35 million mules [1]. Tigray is one of the regions of the northern part of Ethiopia having large equine population. The region is estimated to have about 386,737 donkeys, 11,341 mules and 6276 horses [2]. Working equine animals are essential for many poor people living in less economical developed countries however there socioeconomic contribution is often under recognized. Equids earn money for their owners directly by working in range of sectors. They transport people and goods, provide agricultural traction and alleviate the burden of women. Behind every working animal, regardless of its welfare state, stand its owner and family, whose livelihoods are constrained by factors such as poverty, low status and restricted access to resources [3, 4]. Equine power in both rural and urban transport system is cheap and viable. It provides the best alternative in a place where the road network is insufficiently developed, or on rugged terrain and mountains and in cities where narrow streets prevent easy delivery of merchandise [5, 6].

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. Despite their invaluable contributions, equines in Ethiopia are the most neglected animals, they were not even included in the national livestock development programs, this plan and those of aid agencies are aimed towards increasing meat, milk, egg and wool production [7, 8]. This lack of recognition has led equines to suffer from several problems like insufficient feeding, overloading, overworking, lack of treatment in disease conditions and others [7, 9].

Skin pathologies are among the common non infection problems of working equines [1, 10]. A large proportion of donkeys suffers various degree of wounds associated with inappropriate harness, hobbles and saddle design, hyena bite, donkey bite, car accident, injury due to beating [11]. In Tigray like other parts of Ethiopia very little attempt has been made in the past to study the health aspects of these working animals. Therefore this paper tries to study the prevalence and distribution of equine skin problems and the associated risk factors to solicit possible intervention approaches to improve the health and welfare of working equines.

MATERIALS AND METHODS

Study Area: The study was carried out in Mekelle, Quiha and Adigudom, on donkeys and mules visiting the donkey health and welfare project mobile clinics and in market places. Mekelle is the capital city of Tigray region. It is located in the Northern extremes of Ethiopia extending from 33°25' to 39° 38' north latitude and from 36° 27’ to 40° 18’ east longitude at an average altitude of 2000–2200 meters above sea level. The mean annual rainfall ranges from 11.3mm to 39.1mm and the Temperature varies from 12°C (in November and December) to 27°C (In January and March). Mekelle enjoys humid and hot climate [12]. Quiha and Adigudom, are found at about 10km and 35km distance from Mekelle city respectively.

Study Animals and Protocol: A purposive Cross-sectional study was conducted on 997 animals, consisting of 969 (97.2%) donkeys and 28 (2.8%) mules. These donkeys and mules local breeds that visit the donkey health and welfare project mobile veterinary clinics on scheduled dates and those come to markets of the three sites. Donkeys and mules were physically examined for visible skin lesion and based on the skin lesion type detailed clinical examination were performed. Appropriate samples were taken for parasitological and microbiological techniques. During the study information regarding animal identification, feeding, housing, working conditions, harnessing situations and body conditions were recorded for each animal. Age of the animals was determined by dentition characteristics, the age classes were based on ages of first work, productive age and the life span of Ethiopia equines [13, 14].

Clinical Investigation and Identification of Cases: Clinical skin disease investigation was conducted by examination of skin of each animal and through visual inspection and palpation.

- Dermatophytosis was clinically considered based observation of infected hairs becoming brittle, dry, lusterless and ring shaped lesion develop which becomes alopecia.
- Dermatophilosis was clinically considered when lesions form papules; serous exudates causing matting of hairs to form a tufted appearance scab formation which was sever & generalized.
- Sarcoïd was clinically diagnosed tentatively on palpation lesions which were usually firm, nodular, thick and rough and hyperkeratosis or ulcerated.
- Wounds were considered when any grossly visible skin or tissue damage located on any part of the body is seen.
- Ectoparasitosis was diagnosed based on observation and identification of ticks, lice and identification of mange mites from skin scrapings.

Depending upon the clinical presentation of skin diseases, samples such as, skin scrapings, hair specimens and tissue sample were collected and processed in the laboratory.

Laboratory Investigation: For suspected fungal cases specimen of hair plus skin were plucked from lesions suspected using a pair of forceps. These specimens were put in dry universal bottle and transported to the laboratory to demonstrate characteristic fungal elements in a wet mount of lesion scrapings. Collected thin specimen was placed on a slide and 1 or 2 drops of KOH was added and over cover slip were placed over the preparation & waited for 5 to 10 minutes at room temperature or gently heated for a few seconds. Then a drop of lactopenol cotton blue (LPCB) was added covered with cover slip; examined under the microscope. For suspected dermatophilosis cases Exudative crusts were taken by pairs of forceps and transported to the laboratory in the universal bottles where they are subjected to
Giemsa staining for demonstration of *Dermatophilus congolensis* [15]. Histopathological techniques were also used to support the diagnosis of sarcoids, for such purpose tissue samples were preserved in 10% formalin, these tissues were dehydrated with graded alcohols, cleared with xylene, impregnated and embedded with paraffin wax and stained with routine hematoxyline and eosin stain and examined under microscope.

**Data Management and Analysis:** Data were entered in to Microsoft excel spread sheet and analyzed using SPSS version 17 and descriptive statistics were used to quantify the problems, and Pearson’s chi-square were used to compare results obtained and P<0.05 was considered statistically significant in all cases. Odds ratio was manually calculated to examine the strength of association [16].

**RESULTS**

A total of 997 equines (donkeys and mules) were examined, 969 of these were donkeys and 28 were mules. Among the study animals 307 were less than five years age, 467 were adult and 223 animals were old age. 342(34.3%) of the study animals were found to have different types of skin problems.

Table 1: Prevalence of skin problems in donkeys and mules.

<table>
<thead>
<tr>
<th>Animal</th>
<th>No of examined</th>
<th>No of affected</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donkey</td>
<td>969</td>
<td>330</td>
<td>34.1%</td>
</tr>
<tr>
<td>Mule</td>
<td>28</td>
<td>12</td>
<td>42.9%</td>
</tr>
<tr>
<td>Total</td>
<td>997</td>
<td>342</td>
<td>34.3%</td>
</tr>
</tbody>
</table>

There was no significance (p>0.05) difference in the prevalence of skin problem between donkey and mule.

Table 2: Prevalence of equine skin problem based by age group.

<table>
<thead>
<tr>
<th>Age group</th>
<th>No of examined</th>
<th>No of affected</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>307</td>
<td>96</td>
<td>28.1%</td>
</tr>
<tr>
<td>Adult</td>
<td>467</td>
<td>159</td>
<td>34.0%</td>
</tr>
<tr>
<td>Old</td>
<td>223</td>
<td>87</td>
<td>39.0%</td>
</tr>
</tbody>
</table>

Different age groups of the study animals haven’t shown significant difference (P>0.05) on the prevalence of skin problem in both equine species.

Table 3: Prevalence of equine skin problems by area.

<table>
<thead>
<tr>
<th>Area</th>
<th>No of examined</th>
<th>No of affected</th>
<th>Prevalence</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mekelle</td>
<td>130</td>
<td>67</td>
<td>51.5%</td>
<td>42.65% - 60.33%</td>
</tr>
<tr>
<td>Adigudom</td>
<td>272</td>
<td>135</td>
<td>49.6%</td>
<td>43.55% - 55.72%</td>
</tr>
<tr>
<td>Quiha</td>
<td>595</td>
<td>140</td>
<td>23.5%</td>
<td>20.22% - 27.19%</td>
</tr>
</tbody>
</table>

There was a significant difference (p<0.05) in prevalence among Quiha and the other two study sites, which indicated donkeys and mules in Mekelle (51.5%) and Adigudom (49.6%) were highly affected than Quiha (23.5%).

Table 4: Prevalence of equine skin problem by body condition.

<table>
<thead>
<tr>
<th>Body condition score</th>
<th>No of examined</th>
<th>No of affected</th>
<th>Prevalence</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75</td>
<td>43</td>
<td>57.3%</td>
<td>45.4% - 68.5%</td>
</tr>
<tr>
<td>2</td>
<td>372</td>
<td>146</td>
<td>39.2%</td>
<td>34.29% - 44.4%</td>
</tr>
<tr>
<td>3</td>
<td>354</td>
<td>123</td>
<td>34.7%</td>
<td>29.8% - 40%</td>
</tr>
<tr>
<td>4</td>
<td>196</td>
<td>30</td>
<td>15.3%</td>
<td>10.72% - 21.3%</td>
</tr>
</tbody>
</table>

There was a significant difference (p<0.05) in prevalence of skin problem up on body condition, that indicated equines in thin body condition were highly affected.
There was a significant difference (p<0.05) in prevalence of wound between Quilha and the other two study sites, which indicated that Adigudom (47.1%) and Mekelle (43.1%) were highly affected than Quilha (19.8%).

There was a significant difference (p<0.05) in the prevalence of wound among different body condition scores, donkeys and mules in poor body condition were highly affected, then moderate body condition and significantly lower prevalence of wound was recorded in donkeys and mules with good body condition score.

There was a significance difference (p<0.05) in prevalence of wound between donkey and mules that have shelter, none sheltered and sheltered with other animals, significantly higher prevalence was recorded in non-sheltered in than the other two groups.

There was a significant difference (p<0.05) in prevalence of wound in donkeys and mules involved on different types of work.

Prevalence of wound based on anatomical location is presented by the bar graph below (Fig. 1).

The overall external parasite infestation was 4% and this was mainly due to mangemite infestation 1.2%, lice infestation 1.3% and tick infestation 1.5%.

Microscopic examination of tissue samples from sarcoid suspected cases, using routine hematoxiline and eosin stain, had shown hyperkeratosis, epidermal hyperplasia and dermal fibroblast proliferation as shown in the figure below.
Fig. 1: Prevalence wound based on anatomical location

Fig. 2: Prevalence external parasites

Fig. 3: Microscopic features of sarcoid (400X resolution)

Fig. 4: Prevalence of sarcoid based on anatomical location

Fig. 5: Fungal skin infection on the face

Fig. 6: Sarcoid on the nose

Fig. 7: Sarcoid on the leg

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DISCUSSION

The study revealed that the overall prevalence of skin problems in donkeys and mules were (34.3%) in the study area. Most of the study animals were highly affected by wound (30.3%) followed by ectoparasitosis (4.0%), Dermatophytosis (2.57%), Sarcoïd (2.5%) and the least was Dermatophilosis (1.7%).

The prevalence of wound in this study is relatively comparable with a survey done by the Donkey health and Welfare project in Amhara and Tigray region that has recorded a prevalence of 33.63% wounds in donkey population [17]. The study shows that equines affected by different skin problem, which is, due to the minimum management attention given to them. Keith [17] explained that skin of equine are highly affected by wound due to inadequate packing or by strap holding the load (i.e. harness and husbandry related) and the rest were due to different trauma and hyena bite. The anatomical distribution of wounds in this study is also indicative of the association of the problem with harnessing, packing and management problems. Back sore 11.8% (39% of all wounds) was the highest prevalence indicating inadequate padding in pack donkeys, preceded by ventral abdomen wounds (12.25%) and under tail wound (9.9%) which are due pressure of inappropriate straps and cruppers respectively. Except the wounds on thigh (9.9%) which was often due to hyena bite A large proportion of donkeys were found suffering from various degree of wounds associated with inappropriate harness, hobbles and saddle design, injury by owners or by other people. Pearson and her colleagues [11] also explained that harness related problems were raised from incorrect size, inappropriate fitness, too narrow or too thin, made of unsuitable synthetic materials, poor paddle, poor design and synthetic rope to tried be fitted to the animal. The high prevalence of back sore might be due to overloading without proper saddling for
long distance to Mekelle city from surrounding areas and involvement in a wide array of activities without care and management provision. Pearson [18] also reported a similar situation in central Ethiopia where overweight and heavy load contributed to high cases of back sores in donkeys. Demelash and Moges [9] reported 79.4% prevalence of external injury in donkey in Hawassa. This variation in prevalence may be due to a variation in husbandry and management practices, the type of work the donkeys are involved and the distance travelled by loaded animals, in Mekelle and its surrounding the pack animals have been reported to travel more than six hours to the destination. In this study, the adult and old donkeys were seen much more affected than younger. This is supported by Demelash and Moges [9] who reported that older animals were at about 5 times greater at risk than younger equine. This may be due to more exposure of work and carrying, heavy load over long distance for hours. Prevalence of equine wound was assessed based on the body condition and a significant difference (p<0.05) in the prevalence of wound among different body condition scores was recorded. Equines in poor body condition were five times exposed (OR=5.1, CI=2.82, 9.23) for wound than equines at better body condition. Though it is possible for wounded animals to lose body condition, dehydration and decrease elasticity of the skin in poor body condition animals and the prominence of bones may lead to easy skin injury. This finding was in agreement with researches done by Demelash and Moges[9] and Pearson and her colleagues [11].

There is significant difference (P=0.00) in prevalence wound among the three study sites, which indicated that Adigudom (47.1%) was highly affected, Mekelle (43.1%) was next and Quiha (19.8%) was the least affected out of the study areas. This is due to the working condition, in Adigudom most of the equines used for charcoal and wood transportation, in Mekelle for multipurpose, construction material and salt transporting. They do not use proper thickness and size of saddle design during transportation. Wood and charcoal have sharp edges which can pass the available padding as well it may rest on wide parts of the animal which may not covered by the padding and leading to skin injury than the other materials.

There was a significant difference (p<0.05) in prevalence of wound in donkeys and mules involved on different types of work. The highest prevalence was recorded in charcoal transporting (50.7%) animals followed by wood (41.6%), multipurpose (28.5%), stone (18.1%), salt (17%) and water (13.7%). The highest prevalence in charcoal transporting animals may be due to wider surface area of sack that lay on the back of the donkeys in which the whole surface not covered by saddle leading to at least one injury in any one area of the anatomical location.

There was a significance difference (p<0.05) in prevalence of wound between donkey and mules that have shelter, none sheltered and sheltered with other animals. Significantly higher prevalence was recorded in none sheltered in than the other two groups. This is due to the exposure of donkeys and mules to hyena during night time.

The result of this study shows that the prevalence of ectoparasitosis (4.0%) in equines was high among the different infectious clinical cases encountered in the three study areas. Among the ectoparasitosis tick, mange and lice were noticed to affect donkeys and mules. Animals, which were mildly infested, are being not having any pathogenic effects where as those animals which were highly infested being associated with extensive skin damage. This could be due to higher irritation or piercing behavior of the lice in those animals found haematopinus species or it could be due to the biting behavior of the lice in those animals found damalina species. Lice will not immediately cause hair loss but will eventually irritate the animal enough to rub the hair out and cause skin irritation [19].

Among the total infectious diseases skin problem nearly 2.57% of the animals in the study areas were shown to suffer from dermatophytosis. Most of the owners did not practice isolation of the sick animals from the healthy ones. Since it is highly communicable disease ringworm infection can be spread directly from Equine to equine and by using common grooming tools, saddle pads, harnesses and saddles [20].

Dermatophilosis was the least prevalent (1.7%) among the skin diseases found in the study areas. This might be due to low level of rainfall in the study period, which limits clinical streptotrichosis from coming to picture [21].

The prevalence of sarcoid in the study area was (2.5%). Comparable findings (3%) were recorded by Yilma and colleagues [22] in Debre Zeit and by Ayeleand colleagues[23] in central Ethiopia. The anatomical distribution of sarcoids was high on the ear (36%) followed by face (16%), neck (12%), leg (8%) around the eye (8%) and ventral on the belly (8%). The lowest proportions were recorded on the lip (4%), the sternum (4%) and perineum (4%). The highest prevalence on the ear (36%) may be due to the presence of excessive trauma at the indicated body sites. Researchers have explained that sarcoids tend to occur in areas of previous trauma or...
irritation by insects or tack, including the chest, legs, girth and base of the ears along with areas of thin skin found in the peri-ocular, muzzle and ventral abdomen [24].

**CONCLUSION**

From the present study, it is possible to conclude that there is high prevalence of skin disorders in equines at the three study areas (Mekelle, Quiha and Adigudom). Large proportion of donkeys and mules suffered various degrees of wounds, sarcoids, dermatophyllosis, dermatophytosis and ectoparasitism. Especially wound has been found to affect one third of working donkeys and mules in the area. The occurrence of wound have been found to be associated with harnessing, loading, hobbling, body condition status and general husbandry practices of working equines. This showed skin problem is a major health constraint of donkeys and mules performance at the study area. Even though donkey and mule utilization is more common in this area, a care and management system followed for working equines is undoubtedly poor.

Therefore to improve health and welfare of working equines and thereby to enhance the utilization and improve the livelihood of the community, Training of local hobble and saddle makers and farmers on making better fitting and less traumatic hobbles and saddle harness have paramount importance. Awareness creation among farmers in feeding, husbandry and isolation of sick animals should be carried out to improve body condition, proper harness use, hobbling, loading and management of healthy and sick equines. Awareness creation among farmers and schools in the villages regarding animal welfare, equine handling and management will have long term impact in advancing animal welfare in the society and training of community animal health workers who are locally accessible to treat wounds can help intervening the problem practically at the grass root level. Detailed investigations should be carried out on skin disorders covering wider area of the region to plan appropriate control measures regionally.

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