

Original Research

Assessment of Socio-economic Importance and Major Constraints of Working Equines in and around Debre Berhan Town, Central Ethiopia

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ABSTRACT

Background

Equines play a crucial role in the Ethiopian economy; however, their welfare is extremely poor. Wounds, eye problems, lameness, hoof problems, parasites, and poor body condition were the most dominant welfare issues identified from different part of the country.

Aim

The objective of this study was to assess the socio-economic importance and constraints of equines in and around Debre Berhan town, North Shewa Zone of the Amhara region, Central Ethiopia.

Material and Methods

A cross-sectional questionnaire-based survey was carried from November 2016 to April 2017 and a total of 150 equine owners from the three districts namely Debre Berhan (97), Basonaworana (41), and Chacha districts (12) were interviewed during the study period.

Results

Accordingly, 66 (44%) and 46 (30.67%) of respondents use their equines for packing and carting. Besides, equines were also used for other social activities such as a funeral (2%), marriage (5.33%), religious ceremonies (23.33%), and mixed uses (69.34%). Diseases (46.67%), feed shortage (26%), water shortage (18%), and market unavailability of what (9.33%) were among the major constraints identified in the area. Moreover, gastrointestinal parasites (30%), back sore (16.67%), lameness (21.33%), colic (12%), and other diseases (20%) were the major health constraints of working equines in the study area.

Conclusion

The welfare and management of working equines in the study sites need more close attention and should be improved. Awareness creation through training in the welfare problems of equines is advantageous to fully exploit these animals.

Keywords

Assessment; Constraint; Debre Berhan; Equine; Socio-economic importance.

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa, which accounts for about 56.7 million cattle, 29.3 million sheep, 29.1 million goats, 2.03 million horses, 0.4 million mules, 7.4 million donkeys, 1.1 million camels, 56.8 million poultry and 5.8 million beehives. The country ranks 8th in the world and is

the second-largest donkey population in the world next to China, specifically kept for work.¹ Ethiopia possesses approximately half of Africa's equine population with 37%, 58%, and 46% of all African donkeys, horses, and mules, respectively.²

The world equine population is estimated at about 59 million horses, 44 million donkeys, and 11 million mules. More than

97% of the world's donkey and mule populations, and over 72% of the world's horse population is found in developing countries and specifically kept for the draft purpose.³ Horses, donkeys, and mules are extensively used, particularly in the rural socio-economic activities.⁴ Horses are transport animals, used for riding as well as for rural and urban transport. Other important working animals include mules that are mainly used in the hilly areas, for packing and riding, as well as in flatter rural and urban for pulling carts and playing an important role in rural communities providing transport at low cost. Donkeys are mainly used to breed mules and light transport in the mountains.^{5,6}

Mules are specialized working animals produced by crossing a female horse with a male donkey. They make excellent, single-purpose working animals, being stronger than horses and donkeys.^{7,8} Mules can be used for various agricultural operations such as ploughing and for transport activities such as carrying water, building material, agricultural products, and people. The efficiency of working equines mainly depends the proper structural framework of harnessing and that is how the animals are connected with the materials they are carrying and how well they have been trained and managed.⁹

Working animals provide more than 50% of the world's agricultural energy for traction, while the internal combustion engines provide less than 30%, with the remaining percentage provided by men or women.¹⁰ In many developing countries rising fuel prices are causing a significant number of urban workers to switch from motorized vehicles to equine powered carts, like Pakistan and India.¹¹ This is more important in developing countries where working equines are still essential and are the only source of income for their owners.^{12,13}

Despite their huge numbers and significant contribution to the communities and the national economy, the attention given to study the health aspects of working equines in Ethiopia is quite minimal.¹⁴ Among the multiple health and welfare problems affecting working equines, infectious diseases are one of the major constraints to their productivity and work performance; this often leads to high morbidity and mortality.^{15,16}

Equine power is most common in the poorer communities, so the animals are generally undernourished, have limited access to water, and receive relatively little husbandry or veterinary attention.^{17,18} Consequently, reports of skin wounds, poor body condition, respiratory diseases, high parasite burdens, lameness, dental problems and gastrointestinal illness in these animals are common, all these are problems directly related to a poor welfare state in these animals not allowing the system to be sustainable in terms of the consequences of work on the equines.^{19,21}

A proper health state is not only a prerequisite for welfare but also in the case of working animals it is important for proper levels of work output and efficiency.³ Animals that are undernourished or sick are unable to produce the energy levels required for work, in the same way, young and inexperienced animals are less efficient,⁹ indirectly reducing the income of the people that rely on them.¹⁸ The misuse, mistreatment, and lack of veterinary care for

equines have contributed enormously to early death, the majority of which have a 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.²²

Among 9.83 million total equine population found in Ethiopia, there are about 0.42 million horses, 0.15 million mules, and 2.67 million donkeys found in the Amhara region. Out of total, the North Shewa zone accounts for about 47, 279 horses, 13, 280 mules, and 413, 128 donkeys.¹

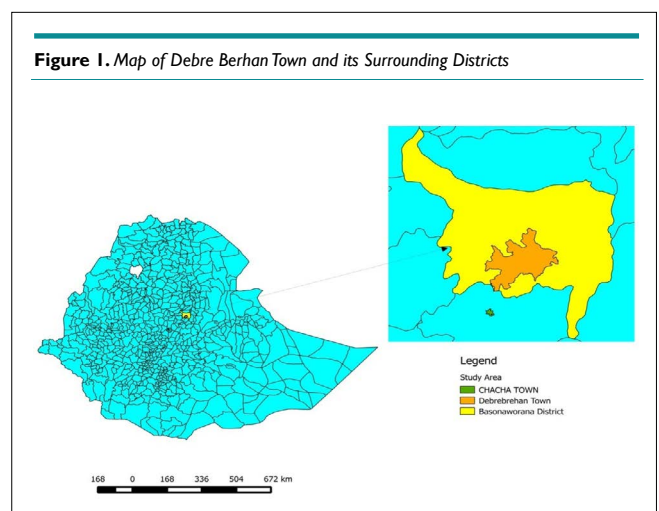
Although there are huge numbers and the increasing importance of equines in the Ethiopian economy as well as in Debre Berhan district, the attention given by governmental and non-governmental organizations to equine has been far below what it deserves. Besides, only a few research papers and projects relating to the socio-economic importance of equines have been carried out. This might be associated with too little attention given for equine-related researches by researchers and a poor source of a research fund for equine issues. Moreover, equines are generally given less consideration than other species of livestock and their welfare is often neglected. Thus, this article was prepared to assess the socio-economic importance and constraints of equine in and around Debre Berhan town, Central Ethiopia.

MATERIALS AND METHODS

Study Area

The study was conducted from November 2016 to April 2017 in and around Debre Berhan town, North Shewa Zone of the Amhara Region, central Ethiopia. Debre Berhan is one of the coolest city located in the North Shewa Zone of the Amhara Region, about 130 kilometers northeast of Addis Ababa. The area has latitude and longitude of 9°41'N and 39°32'E coordinates respectively and an elevation of 2,840 meters above sea level. The average annual temperature of the city during the day and night hour is 17.8 °C and 8.83 °C, respectively. The average monthly minimum and a maximum temperature range from 2.4 °C to 8.5 °C and 18 °C to 23.3 °C, respectively and the average annual rainfall in the area is 920 mm (Figure 1).^{1,4}

Figure 1. Map of Debre Berhan Town and its Surrounding Districts



Study Population

The study animals were working equines, found and work in and around Debre Berhan town of Amhara Regional State, maintained under different management systems. Randomly selected donkeys, horses, and mules irrespective of sex, body condition score, and work type (cart, pack, etc.) were assessed about their socio-economic importance and constraints of keeping them in the study area. Information regarding the study animals was gathered from their owners.

Study Design

A cross-sectional study was conducted with a questionnaire survey for collecting data. A simple random sampling method was carried out with a questionnaire survey among equine owners, to assess the socio-economic importance of equines and their constraints. Information collected includes data concerning the socio-economic importance, nutritional, health, welfare management aspects, and perception of the society toward equines.

Method of Data Collection

Questionnaire survey: Questionnaires were delivered to equine owners to collect relevant data about the socio-economic importance of equines and constraints of equine keeping in the study area. A total of 150 respondents in the working places were purposively selected and were interviewed. The number of respondents was determined to be 150 based on their accessibility, willingness of the respondents, ease of logistic and equine population. Moreover, the sampling method was carried out at field level, market, homestead, grind mill houses, around water point areas, and in some purposively selected peasant associations of the district.

Observational study: Observations were applied when equines were working at the study site. The most common different roles of equines such as riding, pack transport, pulling carts, threshing of crops, carrying of firewood and muck, carrying water, transport of cereals to milling house were assessed in the study area. Welfare assessment of equines and management constraints such as work overload, long working hours, a poor harnessing design which inflicts a wound on working equines, were also observed in the study area.

Body condition score was taken according to the criteria described by Pritchard et al²³ and equines of the interviewed owners were examined from all sides without touching them. Then body condition was scored as 0 to 5 in which, (0=very thin, 1=thin, 2=fair, 3=good, 4=fat and 5=very fat). However, for the purpose of simplification and data management, body condition score 0 to 5 were categorized into three groups. Categories 0, 1, and 2 grouped as “poor”, category 3 was defined as “medium” and body condition scores 4 and 5 were categorized as “good”.

Data Management and Analysis

The data collected were coded and entered in Microsoft Excel

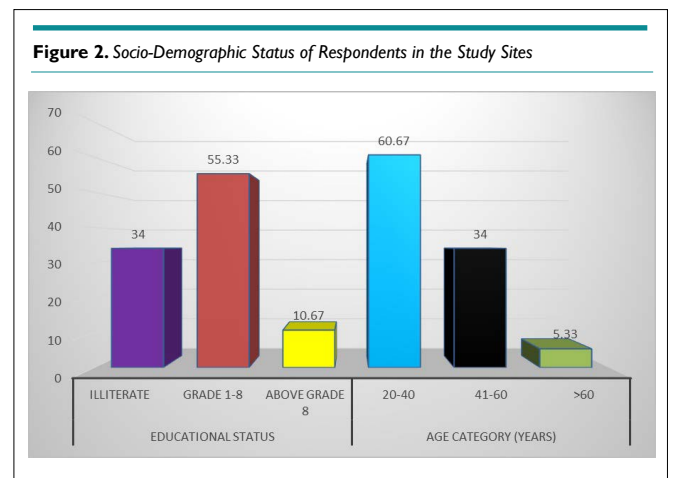
worksheet and were analyzed using STATA version 13 computer software (Stata Corp., 2013). Descriptive statistics were used to determine the frequencies and percentages of the data.

RESULTS

The current study revealed that the result obtained from 150 owners of working equines owning in the study area concerning the socio-economic importance of equines and the constraints faced them, which retards health and productivity.

Frequencies of Educational Status and Age Categories of Respondents

According to the current survey, the proportion of the respondents in the three districts were 97 (64.67%) in Debre Berhan, 41 (27.33%) in Basonaworana, and 12(8%) in Chacha. Based on their educational level background of the respondents, 51 (34%) were illiterate, 83 (55.33%) were from primary school (grade 1-8) and 16 (10.67%) were above grade 8. Thus, the majority of the respondents were able to read and write. The age of respondents were categorized into three groups of years; 20-40-years, 41-60-years, and >60-years with the proportion of 91 (60.67%), 51 (34%), and 8 (5.33%), respectively (Figure 2).



Socio-economic Importance of Equines

The result obtained from the questionnaire survey showed that equines were used in different socio-economic activities or ceremonial activities such as weddings, funeral, religious festivals, and mixed uses (Table 1).

Type of Ceremonial Activities	Frequency	Percent
Funeral	3	2
Religious	35	23.33
Marriage	8	5.33
Mixed use	104	69.34

Working equines are important not only in pack and transportation works but also being as means of generating income for their resource-limited owners. The local current cost of horses in the study area is between 4,000 to 12,000 Ethiopian Birr (ETB), which depends on the age, sex, and body condition of the animals with, the average sale of 6,480 ETB. Also, the local currency cost of donkeys is between 1,500 to 3,000 ETB, which depends on the age, sex, and body condition of the animals with the average sale of 2,073.33 ETB (Table 2).

Species	Average income from renting (ETB/day)	Average income from sale (ETB on cash)
Horse	151	6480
Donkey	90	2073.33

More number of livestock other than equines were kept by higher and medium-income respondents than lower-income respondents (Table 3). This indicates that the lower-income or resource-limited respondents are mainly depending on working equines as the source of income and for their day to day activities. Therefore, equines are more important species and owned by socially and economically deprived, landless, marginal, and small farmers and play a very important role in the socio-economic life of the population.

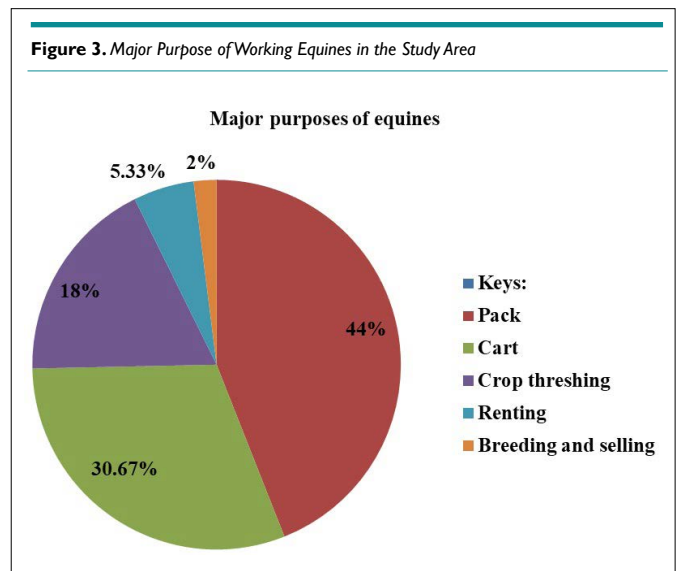
Based on the result obtained, more numbers of equines were found in medium and higher income owners than the lower-income owners, when we compare just by dividing the number of horses and donkeys to each class of respondents (Table 4). But according to the result, well body conditioned animals were found in low- and medium-income owners than higher-income owners. This may be associated with low attention is given for equines by higher-income owners, and indicate that higher-income owners may give high priority to other livestock, unlike equines. Also, the

low-income owners give priority to their equines, because they are the day-to-day source of income for their resource-limited owners.

According to the data obtained the majority of the equines had a medium body condition followed by poor body condition and good body condition with the proportion of 78 (52%), 50 (33.33%), and 22 (14.67%), respectively (Table 5).

Major Purposes of Equines in the Study Area

The working equines play crucial roles in both urban and rural areas, providing agricultural activities and transporting of humans and materials. Equines were kept and used for different purposes in the study area, which includes for packing, cart, (crop threshing and riding), renting and as a source of income by breeding and selling them, which accounts 66 (44%), 46 (30.67%), 27 (18%), 8 (5.33%) and 3 (2%), respectively. According to the response from the respondents, horses were commonly used for riding and cart p-



No. of Respondents	Annual income in ETB	Land size in Hectare	Average Family Number	Average No of Other Livestock		
				Cattle	Sheep	Goat
73	≤18,000 (poor)	<1.0	3	1	2	0
67	19,200-30,000 (medium)	1.0-2.0	5	6	12	0
10	≥31,200 (rich)	>2.0	6	9	16	1

Classification of Respondents	No. of Horse	Average BCS of Horse	No. of Donkey	Average BCS of Donkey	No. of Mule	Average BCS of Mule
Low income	92	2	56	1.8	0	-
Medium income	98	1.98	149	1.97	0	-
Higher income	15	1.71	27	1.6	2	2

Table 5. Observed Body Condition Score of the Working Equines in the Study Area

Body Condition Scores	Frequency	Proportion (%)
Poor	50	33.33
Medium	78	52
Good	22	14.67

purposes (for transportation of humans, vegetables, and building materials), crop threshing, whereas donkeys were commonly used for packing, carrying of water, charcoal, firewood and crop from the field. But the local communities did not use equines for ploughing, rather they use oxen for this purpose (Figure 3).

Based on the result obtained from the survey, working equines involved a great role in different activities of households by transporting of many materials; mainly crop and cereals, water, firewood and muck, building materials, charcoal, and vegetables with their respective proportion of 49 (33.33%), 36 (23.33%), 26 (17.33%), 20 (13.33%), 10 (6.67%) and 9 (6%) (Table 6).

Housing System

In the study area, the housing system of equines were indoor (in a separate house), outdoor (share with other livestock and in the compound), and share with humans which accounts the frequency and proportion of 121 (80.67%), 18 (12%), 11 (7.33%), respectively.

Harnessing and Harnessing Materials

Harnessing was crucial and important management practice, especially in cart working equines. In Debre Berhan town, cart horse owners use harnessing system, made from metal and wood, breast band which was made from rubber and old tire, canvas, rope, and breaching strap. However, the respondents who use pack animals were used homemade padding materials; made from sack filled with straw or crop by-product, old clothes, and sheep skin with non-shared wool. Although the owners use the paddle for their pack animals, it was not proper and enough to protect the animals from injuries resulted from the load.

Major Constraints of Equine Keeping in the Study Area

As perceived by the equine owners; disease 70 (46.67%), feed shortage 39 (26%), water shortage 27 (18%), and market unavailability 14 (9.33%) were the major constraints of equine keeping in the study area. Work overload, long working hours, wounds, poorly designed harness, lack of proper harnessing material, and poor management practices were the other problems, which affect the health and welfare of equines (Figure 4). According to the response of owners, feed shortage is common in urban areas, whereas water shortage is common in rural areas. Except for few

Table 6. Materials Transported by Using Working Equines

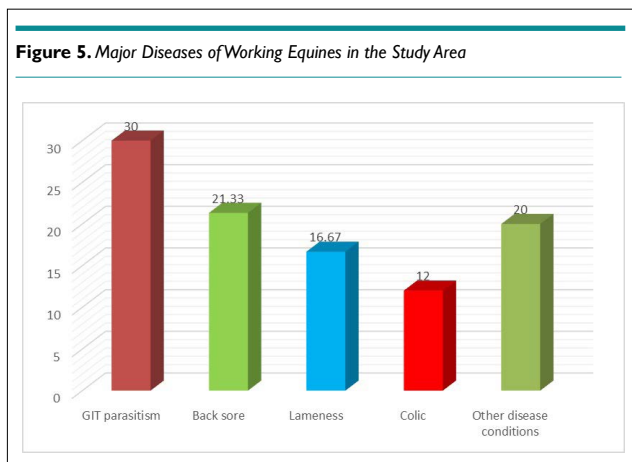
Types of Materials Transported by Using Equines	Frequency	Percent
Crop and cereals	49	33.33
Water	36	23.33
Firewood and muck	26	17.33
Building material	20	13.33
Charcoal	10	6.67
Vegetable	9	6.0

cart horse owners, the majority of users or owners did not provide feed, water, and shelter at the working areas, and the equines stay standing just by carrying the load for long hours until the load is sold. Based on the data collected from the equine owners, the average frequency of use of equines for work per week is 5-days and the average weight loaded for cart horses and pack donkeys were 344.71 kg and 70.01 kg, respectively.



Most equines in the study area did not get regular deworming and some of the owners did not take their equines to the veterinary clinic when they get sick and also some of them were not willing to pay money for treatment and deworming service. From the survey, 40 (26.67%) of the respondents did not take their equines to the clinic when they get sick and they only give traditional treatments, and they answered that modern treatment is not effective for equines, unlike other livestock. About 43 (28.67%) of respondents from rural areas use and have knowledge of traditional methods of treatment for equines by using different types of plants. Based on the data collected from the respondents, the plants given for equines as a traditional treatment by the owners include; garlic, ginger, and by their local name (Feto, Tult, Wegert, Tenadam, Azoareg, Yemdir Emboy, Kulkual, Weynagft, Kebercho, and Chirnkus).

Common diseases of equines in the study area: Based on their percentage gastrointestinal parasitism, back sore, lameness and colic were the major disease constraints which accounted for 45 (30%), 32 (21.33%), 25 (16.67%) and 18 (12%) respectively. The remaining 30 (20%) of the problems were occupied by different diseases types such as verminous pneumonia, strangles, tetanus, anthrax, extra growth of teeth, hoof problem and hyena bite, as shown below in Figure 5.



Perception of the Society for Equines

Equines do have a cultural prestige by the society of the study area. Based on the proportion given by respondents of study area male horses (also called locally, Senga) were more prestigious and got higher priority than other working equines.

Although there is a change of attitude given for equines, some of the equine owners (respondents) give low priority for working equines despite their importance. Some of them did not have the same perception of equines as cattle. This is because cattle provide meat, milk, and hide and they give high priority for bovines more than equines. Equines also did not get proper feeding and after long working hours, they were left to browse and feed by grazing and left on garbage. This affects the welfare, health, and quality of life of working equines.

According to the data obtained from 150 respondents, 44 (29.33%) and 56 (37.33%) owners did not have the same perception for equines with other livestock and they did not feed their equines the same nutrition with other livestock. The major feed of working equines in the area was forage which is followed by crop by-products, and only a few owners feed hay and concentrate on their equines. The majority of the equine owners did not take any welfare training of equines. From all respondents, only 35 (23.33%) owners had got training concerned about the welfare and regular deworming of equines, which is offered by Non-Governmental Organization; Society for the Protection of Animal Abroad (SPANNA).

DISCUSSION

The survey was carried out on working equines to collect information on socio-economic importance and constraints of equines in and around Debre Berhan town. According to the survey, equines were used in different socio-economic activities; ceremonial activities such as weddings, funeral, religious festivals and also being a means of generating income for their resource-limited owners and means of transportation. The result agreed with the survey of Hassan et al²⁴ who said that equines are used to generate income and as entertainment during ceremonies, which indicates that

equines still play significant roles in the life of smallholder farmers in northwest Nigeria. Besides, they are used in transportation and carrying of water from far wells for both humans and other livestock kept around the house and transporting farm products to a home or local market. However, farmers differed in their opportunity to own and utilize equines due to differences in resources, wealth, economic activities, and labor demands between the rural and urban locations.

The local current cost of horses in the study area was between 4000 to 12000 ETB and the local currency cost of donkeys was between 1500 to 3000 ETB, which depends on the age, sex, and body condition of the animals. The current study has a variation with the report of Zegeye et al²⁵ in Kombolcha district, in which the local costs of donkeys were 1200 to 1500 ETB.

The present study showed that working equines were involved and have a great role in different activities of households by transporting various materials mainly, crop and cereals, water, firewood, building materials, charcoal, and vegetables. The idea was in agreement with the result of Biffa et al² which stated that increasing human population in Ethiopia has increased the demands of donkeys for multipurpose activities such as transport of crops, fuelwood and water, building materials and people by carts or on their back from farms and/or markets to home. Working equines, particularly donkeys, play a significant role in helping to empower and to take the burdens of women in many developing countries.^{2,12,13}

The current study revealed that equines (donkeys, mules, and horses) were kept and used for different purposes in the study area, which includes for packing, crop threshing, carting, riding, renting and as a source of income by breeding and selling them, this result was in agreement with Feseha et al²⁶ who reported that equines play an important role as working animals in many parts of the world, for packing, riding and carting and they have a prominent position in agricultural systems of many developing countries including Ethiopia.^{13,27}

Moreover, the current findings in agreement with Feseha et al²⁶ who explains that equine power is very crucial in both rural and urban transport system. This is because of its cheapness and availability and so provides the best alternative transport means in places where the road infrastructure is insufficiently developed and the landscape is rugged and mountainous and in the cities where narrow streets prevent easy delivery of commodities²⁸; and who said that in areas away from roads, many people use mules and donkeys to transport food and other supplies to villages. Horses involved in pulling carts and donkeys often are involved in more multipurpose activities than horses. They transport goods to and from markets, farms, shops, and traveling long distances.^{2,13}

The current study revealed that management, harnessing, and husbandry practices had great effects on the presence of back sore and welfare problems of working equines. This idea was in agreement with Mekuria et al⁷ and Birhan et al²⁹ the management husbandry practices including environmental factors, the type of

harness material used, fit of the harness, the behavior of the owner, the frequency of work and the load were among risk factors that contribute to the onset of different type of wounds in working equines.

Disease, feed shortage, water shortage, and market unavailability were the major constraints of equine keeping in the study area. The constraints were ranked from higher to lower rank based on their impact on equines; accordingly, diseases were the first major constraints (46.67%), followed by feed shortage (26%), water shortage (18%), and marketing problem (9.33%). This result was inconsistent with the result of Zenebe et al³⁰ who reported that feed shortage was the most important constraint in keeping equines in Kaffeche zone. This variation might be associated with differences in geographical location, awareness of the owners, and the presence of diseases in the current study area.

In the current study diseases were encountered in the following proportions; gastrointestinal parasites (30%), back sore (21.33%), lameness (16.67%), and colic (12%). Accordingly, gastrointestinal parasitism was the most likely health constraint while colic was the least one. This result disagrees with the result of Meselu et al³¹ who reported that epizootic lymphangitis (48%), anthrax (26%) and colic (6%) as the major health problems of working equines encountered in Bahir Dar town. The difference might be due to the presence of geographical difference, awareness of the owners, and deworming and vaccination status of the animals.

The result obtained in this survey relating to the musculoskeletal system or lameness (21.33%), which is comparable with the finding of Moltumo et al¹³ in Hosaena (13.5%), and Kumar et al⁸ in Mekelle city (18.2%). However, it is lower than the finding of Sameeh et al³² in Jordan (32.2%). The difference might be due to many reasons such as overloading, lack of hoof care, and continuous movement in various landscapes and on rough roads that were the main reasons for the occurrences of musculoskeletal problems.

According to the present study, most owners did not have the same perception for equines as compare to other livestock. Unlike oxen, low priority is given to donkeys and horses in feeding allocation. Besides, these animals are often engaged in work for long hours and when they get free, they are left to browse and feed on garbage which has a potentially negative effect on their welfare and quality of life. Yilma et al³³ had justified that a low number of working equines were presented annually to the clinic compared to other domestic animals, and equines suffer from several diseases including infectious and non-infectious diseases throughout the globe affecting their health status.³⁴

The current result revealed that the welfare of equines is not protected properly to live in their environment without affecting their health and well-being. This finding is in agreement with the reports of Moltumo et al¹³ in Hosaena and Alujia et al³⁵ in Mexico, who reported that equines are certainly the most neglected and abused animal. Good welfare will result if the equines are provided with appropriate food, water, shelter, and health care (free from pain, injuries, and diseases), free from discomfort, free

from fear and distress, and freedom to express normal behavior. Therefore, the freedoms and welfares of equines should be properly maintained. Thus, more close attention and improvement in the welfare and management of these working animals is mandatory and detailed studies on various aspects of equines are advantageous to fully exploit these animals.

CONCLUSION AND RECOMMENDATIONS

Equines are among the most important domestic animals most intimately associated with humans. They contribute a lot through their involvement in different social and economic sectors, particularly in developing countries like Ethiopia. In the present study area, in and around Debre Berhan town, working equines play crucial roles in both urban and rural areas providing draught power, transport, crop threshing, work opportunities, improvement of livelihoods, and generating of income for their resource-limited owners. However, the attention given to equines was not sufficient and the well-being and productivity of equines were affected by many health and management problems in the study area. Disease and feed shortages were the major constraints of equine keeping in the study area. Also, they were given less consideration than other species of livestock and their welfare was often neglected.

Thus, the socio-economic importance of working equines should be well understood in all aspects of their roles. Proper management, feeding, and watering practices should be given for working equines. Using appropriate and enough harnessing material should be improved for working equines. Veterinary care and disease prevention with regular deworming should be mandatory for working equines. The attention should be given to the health and welfare aspects of working equines in Ethiopia at large, and particularly the study area. Additionally, equine welfare training should be addressed to improve the welfare of equines and to change their attitude towards working equines.

ETHICAL CONSIDERATION

The research was conducted with considering the welfare of the animals and full ethical clearance was taken from the university ethical review board.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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