

Study On Welfare Assessment of Cart Pulling Mule in Bahir Dar Town, Northwest Ethiopia

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Abstract: The study was conducted from October 2010 to march 2011, in Bahir Dar town, Amhara regional state, North Western Ethiopia with the aim of assessment of the welfare of cart pulling mules and to evaluate the economic importance of the cart mules for the owners/drivers. It was a cross sectional study design and carried out on 300 mules by direct physical examination to assess the health and behavioural parameter and on 200 owners by questionnaire to assess the management of the mule working condition, the economic contribution of cart mules and relationship between the owners and mules. The study showed almost all cart mule owners provide adequate clean water to their mules. Seventy per cent of the owners were using free grazing as a main source of feed for the mule with alone or other feeds. Majority of cart mule owners (68%) construct a house that protect only rainfall and sunlight and only 5.5% of owner provide a welfare standard housing for their mules. While most cart owners take their sick mules to veterinary clinics directly or after they try to cure themselves, 24% do nothing to their sick mules. Great Majority (78.5%) of the owners abandon their mules at the end of working life. 70.5% of respondent use their carts as the only source of income. Even though the prevalence of wound and epizootic lymphangitis accounts 63% and 33.7% respectively, in the study area, 63.5% of the owners do not give any rest when mules are affected by wound. In general the study revealed that cart mules provide livelihood for most cart owners as sole source of income. But the welfare of these animals, as seen from questionnaire survey about the management input (indirect measure) and physical examination (direct measure), was found compromised. To improve this situation education of owners about overall management of cart mules, public awareness about animal welfare, and proper attention to health of the equines by the veterinary service were recommended.

[Demesiew Dressie, Wudu Temesgen and Melese Yenew. **Study On Welfare Assessment of Cart Pulling Mule in Bahir Dar Town, Northwest Ethiopia.** *Rep Opinion* 2017;9(7):73-86]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). <http://www.sciencepub.net/report>. 12. doi: [10.7537/marsroj090717.12](https://doi.org/10.7537/marsroj090717.12).

Keywords: Bahir Dar, Cart, Epizootic lymphangitis, Equine, Mule, Welfare

1. Introduction

Equidae is the mammalian family comprising the single genus equus consisting of domestic and feral horses, donkey, mules and zebra (Bradley, 1981). Mule is a hybrid, the offspring of different species the dam being mare and the sire a jack or stallion donkey. The mule combines the donkey's longevity, temperance, sobriety, toughness and level headedness with the horses size and superior in intelligence, almost equal to the horses, which is an advantage in certain circumstances such as work in back, cart-drawing and ploughing (Cole and Ronning, 1974).

The Equidae population in the world is 122.4 million including 40 million donkeys, 15 million mules and 43.3 million horses. In the distribution pattern, 98%, 97% and 60% of all donkeys, mules and horses are found in developing countries respectively (Fielding, 1991). The number of Equidae in Africa account 17.6 million from these 11.6 million donkeys, 2.3 million mule and 3.7 million horses (Starkey, 1994). From the above number Ethiopia possess approximately half of African equine population with 37% donkeys, 58% horses and 46% mules of all African populations (FAO, 1996).

More than half of the world's population depends on animals and animal power as its main energy source (Wilson, 2003). Today draught animals and humans provide an estimated 80% of the power in put on farm in developing countries (Pearson, 2005). Equines play an important role in the transportation of farm products, fuel-wood, agricultural inputs and construction material. They use in both a rural and urban transport system which is cheap and viable. It provides the best alternative in place where the road net-work is in insufficiently developed or when terrain and mountainous and in cities where narrow streets prevent easy delivery of the merchandise (Feseha, 1997).

Equines are important animals as a resource of poor communities in Ethiopia, by providing traction power and transport services. It also provides for the urban communities for income generating. The working equines are used for transportation of goods and people, construction materials, water carting and for ceremonial purposes such as wedding and festivals but equines are often neglected in the allocation of resources such as food, shelter and appropriate equipment because they belong to members of the

poorest section of the society (Wilson *et al.*, 1997) and hence their welfare is frequently compromised.

The welfare assessment system can be broadly categorized into animal based or resources based measures and different applications tend to draw from one or both of this type of measure (Main *et al.*, 2003). Indirect methods of evaluating the welfare of animals are based on the measuring the adequacy of input such as resources and management provision. These indicate the risk of welfare problems rather than an actual measure of welfare status. The advantage of such input based assessment methods is that they are usually objective and repeatable; however, a positive score does not guarantee good welfare (Whay *et al.*, 2003).

Previous studies of equine welfare have used a combination of direct and indirect indicators most include body condition. Sometimes with other animal based measures plus indirect measure in the form of resource examination and/or an owner questionnaire. Animal based measurements are particularly appropriate to situation where resources examination is not practical as in case of working equines where housing, feed provision and other inputs cannot be measured during the working day (Christie *et al.*, 2003).

Even though equines provide an essential draft power and play an important socioeconomic role in developing countries like Ethiopia, many of these animals are owned by poor people and work in harsh environment and their welfare is cause of a major concern. Bahir Dar town is one of Ethiopian towns where mule cart transport is widely used. This study was, therefore, conducted in Bahir Dar town with the following objectives:

- To assess the welfare status of the cart pulling mule.
- To indicate the economic importance of cart pulling mule.

2. Literature Review

2.1. Economic Importance of Animal Traction

Despite increased mechanization, 3 billion people living in thirty developing countries still depend on animal traction power for agricultural production and the transport of goods and people. It has been calculated that the annual fuel expenditure power would requires 20 million tons of petroleum costing 6 billion US dollar further the cost of replacing existing animal power systems with mechanized systems has been estimated as being around 300 billion US dollar (Ramaswamy, 1998).

Animal traction is in many parts of the world are affordable, appropriate and sustainable technology and increasing this is not restricted to developing countries. A wide range of animals including bovidae

(buffalo and cattle) equines and camelides are used for adverse range of operation that includes, pack, passenger and transport as well as agricultural and mechanical operation (Starkey, 1994).

Animal traction plays a vital role in both urban and rural transport in eastern and southern Africa. It plays an important role in rural economics and help to relieve the transport burdens of rural households but constraint on the use and performances of animals powers system do vary between countries but broadly similarities in the constraints affecting the management welfare and utilization of traction animals can be identified in both agricultural and transport systems around the world (Hell, 2001).

2.2. Economic Use of Equine in Transportation

Equines can transport the harvested farm product; distribute manures and fertilizers to fields and other transport activities such as carrying building materials and fire wood, in the urban and per urban level, in many developing countries (Feseha, 1997). In addition to the power of animals it also has a considerable advantage to the income generating to the owner and contribution to improve standard of life of owners (Starkey, 1994).

Mule has been used for agricultural operations in Mediterranean countries China, Australia and USA and there is now increasing demand for mule in some part of the developing countries (Payne *et al.*, 1999).

The growing performance for mules is because of they require less specialist management than horses, being capable of working faster and living longer than cattle and having more strength than donkeys. In South Africa many farmers requiring to drought animal power mule over cattle (Pearson, 1998) and also in Ethiopia the mule is more expensive than the horse and used primarily for riding (Payne *et al.*, 1999).

2.3. Animal Welfare

2.3.1. State of Art on the concept of welfare

Animal welfare as a formal discipline started with the publication of the Bram bell report on the welfare of farm animals issued by the British government in 1965 (Brambell Report, 1965). The adoption of conventional scientific approach, with experiments focusing on the effects of single factors under controlled circumstances allowed the new discipline to be established as a science, or as a "young science" (Millman *et al.*, 2004).

Animal welfare is a multi-faceted issue which implies important scientific, ethical, economic and political dimensions (Lund *et al.*, 2006). Among the main issues involved in the concepts of welfare is the concept of suffering and need as well as the five freedoms which are more related to animal husbandry and management by men (Millman *et al.*, 2004). In this respect the concept of freedom in animal

husbandry has been introduced and plays a key role. In fact the knowledge about the freedom of animal is limited but the prepared freedom is proposed to all animals revised by UK's farm animal welfare council FAWC (1993) as follows.

➤ Freedom from thirst, hunger and malnutrition- by allowing ready access to fresh water and diet to maintain full health and vigour.

➤ Freedom from discomfort - by providing a suitable environmental including shelter and comfortable resting area.

➤ Freedom from pain, injury and disease - by preventing or rapid diagnosis and treatment.

➤ Freedom to express normal behaviour - by providing sufficient space, proper facilities and company of the animals of its own kind.

➤ Freedom from fear and distress - by ensuring condition which avoid mental suffering.

These provide valuable guidance on animal welfare. They are now internationally recognized and have been adopted slightly in different country in their formulation (Wilson, 2003).

2.3.2. Definition of welfare

The long debate about animal welfare includes the possibility of defining the term welfare itself. This word must reflect a clear concept and which can be used by the scientific community and can be included in laws (Broom, 1991).

Human understanding of animals especially their needs and natures is developing all the time. The physical states of poor welfare are more readily accessible and understandable, but now research leads naturally to greater understanding of mental states; need and natures. This may be why earlier definitions of welfare centered on physical states whereas the latest definitions have reflected the complex, multifaceted nature of animal welfare (Pearson, 2005).

On a scientific basis three main approaches have been followed in order to define and, consequently to find methodologies to assess welfare level. The first approach emphasizes the biological functioning of organisms, "The welfare of an animal is its state as regards its attempts to cope with its environment" (Fraser and Broom, 1990).

The second approach states that the relationship between stress and welfare "welfare is a wide term that embraces both the physical and mental well being of the animal "welfare is a state of complete mental and physical health where the animal is in harmony with environment (Hughes, 1976). The third approach emphasizes natural living stating that animals should be allowed to like according to their natural attitudes and behaviour mainly developing and using their natural adaptation (Price, 1984).

2.3.3. Terms related with welfare

There are different terms that can be used as the expression of a welfare by comparing the term with the word welfare (Nutt and Nutt, 1965). The difference between animal welfare and animal rights is explained in the session on "Ethical and philosophical" theories in brief this can be explained as follows. Animal welfare denotes the desire to prevent unnecessary animal suffering that is whilst not categorically opposed to the use of animals, wanting to ensure a good quality of life and humane death. Animal's rights denote the philosophical belief that animals should have rights including the right to live their lives free of human intervention (ultimate death at the hands of humans). Animal's rights are philosophically opposed to the use of animals by humans (Duncan 2005).

There is also a key difference between conservation and animal welfare. Conservation cares about species and extinction where as animal welfares cares about the individual animal and its suffering. Animal welfariest believe that each individual animal has an intrinsic value and should be respected and protected. They recognize that animals have biological determined instincts interests and natural, and can experience pain and suffer (Main *et al.*, 2003).

It has often been stated that in moving the best reasonable estimate of with wellbeing or animal suffering we should take account of all the available evidence. This will included evidence of the animals health, productivity, physiology and behaviours suffering occurs when unpleasant subject feeling are acute or continue for long time, because an animal is unable to carry out the action that would normally reduce risks to life and reproduction (Dawkins, 1990).

2.3.4. Assessment of animal welfare

Animal welfare describes the state of an animal with regard to three concerns natural living, biological functioning (i.e. health, growth reproduction functioning of physiological systems) and the feeling of the animal (Broom, 1991). At least according to the common view of science feeling can only be assessed indirectly using animal-based indicators such as behaviour or health. The interpretation of the respective indicator may not always be clear-cut, partly because knowledge may be missing. This leaves us with some uncertainty and room for debate when it comes to conclusions about the actual state of the animal (Knierim *et al.*, 2001). Animal welfare has developed into a science; as a result there is a growing amount of research to this subject. It is often used as the basis for the reform of animal welfare legislation. It is also used to improve conditions for animals reared for food, used in research kept in captivity or as companion animals (Wilson, 2003).

Three components are important for welfare assessment, these are using the five freedoms as the

frame work, assess welfare inputs and out puts (Smidt, 1983). Inputs are the factors that affect welfare, output are the actual impact of these factors on welfare. Example of the three types of welfare input are stock man (knowledge and observation skills), environment (housing bedding, feed quality and water provision) and animal (suitable breed, age and sex for the system) (Christie *et al.*, 2003).

2.4. Management of Cart Pulling Equine

There is no doubt that poor working condition of many of the world's draught animal negatively affects their productivity (Ramaswamy, 1998). Aside from improvement and development in animal technology and the development of traction infrastructure and support systems, management and husbandry practices that will improve draught animal welfare offer the single most effective method which improves draught animal performance. Therefore to utilize the working animal with maximum efficiency. It is necessary to optimize their welfare by understanding their management, their working capacity and the factors which will affect their performance (Pearson, 1998).

To provide relevant results estimates of work capacity must also take in to account external factors. These include the condition of the animal, its nutritional status, the experience of animal, the type of terrain, type of cultivation and type of implements used whether condition and harness system (Main *et al.*, 2003).

Nutrition, disease control, handling and the management and construction of animal housing form major facets of management affecting the welfare and subsequent performance of the traction animal (Hall, 2001). Recent research in animal traction has tended to build up on the principle embodied in these recommendations and seeks to shift socio-economic and environmental demands faced by the owner /users of traction animals in developing countries (FAO, 1996).

2.4.1. Feeding and watering management of equine

Good nutrition is vital to the health and welfare of working equines. Equine in good condition can better withstand disease and injury and is better equipped to fight parasite infection (Hammond, 1997). There are two main types of feed stuffs available for equines, forages and concentrate. Forage nutrients and roughage and may be sufficient to meet the demands of non-working or non-productive equines. Concentrate or hard feeds are required by the equine which are unable to eat enough forage to meet their nutritional requirement such as those that are pregnant, lactating and growing (Svendson, 1997).

Grass is a natural feed stuff of equine and is a major important pasture feed supplies but hay is produced from forage (usually grass) crops by cutting

drying in the field and it is not usually fed until at least six month. In average equine require approximately 2 to 3 kg of food hay and 3 to 4 kg of feed straw per day. In terms feed value 3kg straw is roughly equivalent to 1kg of hay and hay has an average 9mg DE/kg DM of energy (Wilson, 2003).

Concentrate feed is called because of they provide a more concentrate source of energy than forage at between 12 and 16 MJ DE/kg DM concentrate feed can be provided either as grains or as specially manufactured compound feeds (Cole and Ranning, 1974).

Water constitute about 65-70% of the body weight of adult equine, water is vital to the life of animal life water is taken with feed to act as a fluid medium for of digestion and propulsion through the GIT (Pearson, 1998). The daily water requirement of equines ranges from 20 to 70 liters depending on environment and physiological factors (Bradly, 1981). In good environment equine requires approximately 2 liters in 1 kg dry matter in take for maintenance but in intensive work in hot climates this increase to 6-8 liters per kg dry. Excessive dehydration can be fatal (Broom, 1991).

2.4.2. Housing

Equine should be housed in stables; stabling provides protection for the horse and conveniences for its owner. Stable protect the horse from the cold wet and wind during the winter months and from heat flies and sun during the summer. There are many other advantages of stabling. Obviously it is easier to monitor and control the horse food and water intake when it is inside. The stable horse is easier to control, both as regards exercise and where necessary restraint and also stable is essential in case of ill-health or sickness when isolations is desirable (Lund *et al.*, 2006).

Stable structure should be simple, safe and well ventilated area. The structure should allow free access to feed and water and also the size should be sufficient to allow the equines to lie down. The stable should have the size of 3m x 3m for small equine is considerable to allow movement of equine freely and minimum of 2.4m height. And also it must allow for hygiene includes the regular cleaning of feed and water containers and the removal of faces. Stable hygiene is vital tool in the control of ectoparasite and other diseases (Brennan, 2001).

2.4.3. Health

Health is a natural state of equine to do three fundamental thing to survive, to nourish itself and to reproduce. It eats and drinks in response to hunger and thirst and thus grows to maturity and maintains its strength. In sexual desire it reproduce and so continuity species. These three things are key points

which are characteristic of health equine (Main *et al.*, 2003).

Most condition related to poor health or disease can be prevented and controlled relatively by improve husbandry and better care of the animal, on its feeding, work and others (Wilson, 2003). Consideration of both health and welfare behaviour is important when assessing welfare (Durham *et al.*, 2003). Disease level is considerable importance in welfare assessment because the welfare of diseased animals is almost always poorer than that of healthy animals (Fraser and Broom, 1990).

It is natural for most people to spend money on visible disease conditions. This includes lameness, saddle sores some external parasite and skin disease. In general many equine owners tend to treat health at later stage of development of disease rather than in the early stages. Here as in many other aspects of life, prevention is better than cure. Prevention is clearly good for keeping the welfare of the animal (Freeman *et al.*, 1999).

2.5. Behaviour

Behaviour is changed in response to many environmental difficulties. It is a component of both regulatory and emergency responses, some measurement of behaviour responses to difficulties are actions that help to animal to cope, where others are of behaviour pathologies that may have no beneficial effect to the animal. Behaviour is indicators of welfare (Fraser and Broom, 1990).

Abnormal behaviour is behaviour that differs in pattern, frequency or context from that which is shown by most members of the species in conditions that allow a full range of behaviour. An abnormal behaviour might help indicators to cope, but it is still that the animal's welfare is poorer than that of other animals (Hutt and Hutt, 1965).

Abnormal behaviour can be distinguished in redirected behaviours and a stereotype, stereotypes is a repeated action relatively in variate sequence of movement that has no obvious purpose. This happen for example when mule is in the house or tethers for long period of time. This type of behaviour is great importance in welfare assessment (Field, 1991).

Both communication and social interaction are necessary for social cohesion within the mule groups with the exception of sexual behaviours. Social behaviour may be classed as either agonistic that is behaviours that increase distance between individual or affiliative that is behaviour which reduce the distance between animals which encompasses greeting mutual grooming and playing (Dawkins, 1990).

2.6. Veterinarians in Animal Welfare

Veterinarian trained to identify, cure and prevent disease in animals. Thus many veterinarians consider health is a key part in animal welfare and agree that

disease for instance caused by microorganism or injuries are cause poor welfare (Broom, 1991). Veterinarians have major responsibility in society to address animal welfare issues because of their training in animal physiology, pathology, microbiology animal hygiene etc (FAWC, 1993). But this is not enough; their knowledge must be phased together with that of biologist who has a better understanding of animal behaviour and mental state of animals (Wilson, 2003).

Veterinarians are related to society in many various ways, such as by being the experts in society on animal health and disease, by employed in organization such as animal health service to protect the welfare of the animals (Durhma *et al.*, 2003). There are three main levels of responsibilities that veterinarian has expected to work on the context of welfare. The first responsibilities are to inform the person that has the animal in his or her home there exist welfare problem. A second important role of veterinarians in relation to welfare is to help reveal to society in general what welfare problems that presently exist within animal husbandry. The third veterinarian must be prepared to be part of a general debate in society or what is human obligation to animals (Lund *et al.*, 2006).

Veterinarian constitutes an important resource in society to address issues about animal welfare not only in the diagnosis of welfare problems and what actions are needed to handle the problem. But veterinarians should also take part in the societal debate about how are should house and treat our animals (Duncan, 2005).

2.7. Legislation on Animal Welfare

Animal welfare science is well developed in many countries in Europe and elsewhere and a variety of methodologies may be applied within discipline, for these reasons it is essential that we build on international collaboration in the broad field of animal welfare and that we integrate and interrelate the most appropriate specialist expertise in order to develop refine, standardize and collaborate in welfare measure and to identify validate practical remedial measures (Knierim *et al.*, 2001).

Legislation is written established law. In democratic countries legislation is the result or the formulation of the objective of society. There are two main areas that constitute the legal back ground of welfare. These are the statutory area and the administration of justice by courts and the discussion on legal aspects of welfare (Ramaswamy, 1998).

There are basic principles of modern animal welfare there must be housed, provided with food water and manner which having regard to their species. Their degree of development, adaptation and domestication is appropriate for their physiological and ethological needs in accordance with established

experience and scientific knowledge. The freedom of movement appropriate to an animal having regard to its species and in accordance with established experience and scientific knowledge may not be restricted in such manner as to cause it unnecessary suffering or injury (Smidt, 1983).

There is a considerable amount of legislation in developed and in some developing countries covering animal welfare much of legislation is being continually updated but not all is applicable to work animals. Animal welfare cost money; this is why provisions on with animal welfare must be studied in the light of equal opportunities for competition some international conventional could act contrary to improved welfare. This would be the case, for example where some countries prevented under the guise of free trade in the import of animals from others countries with lower or no welfare standard (Wilson, 2003).

3. Material And Methods

3.1. Study Area

The study was conducted at Bahir Dar town, Northern Western part of Ethiopia, which is located at a distance about 565 km from Addis Ababa. The altitude of the area is 1830 meter above sea level with an average annual rainfall of 1500 mm and the lower and the higher temperature is 10°C and 30°C, respectively. There are about 158,564 cattle, 18,827 sheep, 8000 equines and 366, 666 poultry in Bahir Dar and its surroundings. The major farming system is mixed crop-livestock system (Bahir Dar zuria rural and agricultural office, 2004).

3.2. Study Animal

Study animals were cart pulling mules in the study area, kept mainly for cart pulling purpose. In the area around 500 cart pulling mule are existing in the town (Bahir Dar zuria rural and agricultural office, 2004). They are kept under extensive management system. The mule recruited for cart work from the surrounding area of Bahir Dar town. Gharries (carts) are a common form of transportation of goods, construction material, farm product and others.

3.3. Study Design

The study was across sectional study which was conducted from October 2010 to march 2011. Active data were generated from randomly selected gharry drivers or owners and cart mules. Gharry drivers or owners were asked about their mule management practice, its benefit to them and also their relationship with the mules at the working times were collected by closed and opened ended questionnaires with aim of assessing the mule's welfare status. Direct physical examination of the mules was carried out by visualization and palpation.

3.3.1. Questionnaire survey

It helps for indirect welfare status assessment. It was based on measuring of the inputs, such as resources and management provision. This was carried out by using questionnaires administered by interview on 200 cart mules' owners/drivers. These drivers were asked about their mule management practice, relationship with their mule and economical benefit of the mule to them, the working condition of the mule (loading and time of work) and fate of mule.

3.3.2. Observational study

A direct method of welfare status assessment was carried out by direct physical examination of the mules. It was carried out on 300 cart mules (200 of them were those whose owners were included in the questionnaire). The physical examination was done by visualization and palpation of the each mule. The data were recorded and when possible photos were taken. The examination was used for both health and behavioural assessment of the mules.

In this method of study the following information was collected: body condition of the mule (this was estimated according, to (NAWC, 2005)), activity status in response to the new stimuli, natural orifice condition, limb musculoskeletal condition, dermatological condition and presence or absence of wound/injury on the mules body.

3.4. Sampling Strategy and Sampling Size

The study was conducted in purposely selected 'kebeles' and form the study area. The owner and cart mule were randomly selected. Observational visits were under taken to key location and institution of important to the defined gharry mule population including veterinary clinic, livestock market, and goods market, around mill houses and in area where construction materials were available. 300 animals were taken for the study out of which 200 are by questionnaire and physical examination at the same time and 100 were added for physical examinations alone.

3.5. Data Analysis

All the data that were generated from the cart pulling drivers/owners and the data that collected from direct physical examination were interred to Microsoft excel and analyzed using Intercooled Stata version 7 (Stata 1984-2001). The descriptive part were done by Microsoft excel and the analytical part by Intercooled Stata. Descriptive results were expressed using percentage and chi-square test was used to analysis the relationship between different variables.

RESULTS

Questionnaires Survey

Feeding, housing and common management practice

The questionnaire survey was carried out on 200 cart pulling mule drivers or owners (respondents) and

the response rate to the questionnaire was 100%. From the total of 200 respondents 70% of them used free grazing as a main source of feed for their mules in addition to the hay and concentrate, 25% used hay as a main source of feed and other owners give also additionally concentrate to their mules. All respondents were found to give adequate amount of water for their mules per day.

The respondents who constructed houses for their mules only by considering protection from rainfall and sun light were 136 (68%), about 53 (26.5%) of the respondents have no house for their mules and only 11 (5.5%) of them had constructed relatively good houses that can protect rainfall, sun light, wind and insects. Eighty five (42.5%) of the owners practice daily care to their mules health status like foot care, bathing, hair cut, grooming and other activities. Sixty two (31%) of the respondents take their mules to veterinary service, 48 (24%) of them do not do anything when the mules get sick and 90 (45%) of the owner try to treat by themselves without any modern veterinary service.

At the working days 141 (70.2%) of the respondent give rest at the working interval with or without shadows and 59 (29.5%) of the owner do not give any rest at the time of working days. Fifty four (27%) of the respondent give feed at the working time during rest. Ninety (45%) of the mule was tether together with other mule and 56 (28%) of the mule were hobbled alone. In addition to this about 79 (39.5%) of the respondent use beating to drive the mule with alone or with other means of communications and the rest 121 (60.5%) of the respondent use different mechanisms of

communication at the time of driving: like, voice, pulling of ears, weaving of stick on the air and others.

Ninety six (48%) of the respondent allow to graze at the end of working time just after takeoff the cart and 56(28%), and 48 (24%) respondent hobble and keep in the shelter respectively, after the end of working days. From 200 respondent 43 (21.5%) of the respondent continues taking care for their mule at the end of working life of the mule humanly and 157 (78.5) of the respondent abandon (left astray) in the surrounding area to live by themselves.

Health and other problems

From the total of 200 respondent 98 (49%) put feed as the main problem along other problems and 97 (48.5%) had, a major problems of disease alone or with other problems like water, shelter, harnessing and other problems. About 63 (31.5%) of the respondent had a major problems of wound alone or with other problems. 71 (35.5%) of the respondent indicated that epizootic lymphangitis was the major health problems in the area. Even though wound account 31.5% of health problems in the area, only 73 (36.5%) of the respondent give rest at the time of working days because of the wound but the rest 127 (63.5%) of the respondent did not give any rest when the mule is affected by wound.

Economic importance and working condition

About 141 (70.5%) of cart mule respondent from 200 participants, use gharry as the only source of income for their livelihoods and 41 (20.5%) of the cart owners used as mule a significantly in their livelihood (Table 1).

Table 1: Contribution of cart to the owners

No	Contribution to livelihoods.	No of drivers	Proportion (%)
1	Use as the only source of income	141	70.5
2	Play Significant role in the livelihood	41	20.5
3	Play only minor role in the livelihood	18	9

Table 2: Loading practice of material in kg

Load of material in kg in average	Owner that can load their mule	Proportional (%)
500-900	51	25.5
1000-2000	100	50
>2000	49	24.5

According to the result of the study the cart respondent on average earn 56.20 Ethiopian birr (ETB) per day, with the minimum of 20 and the maximum of 70 Ethiopia birr. Accordingly one respondent can earn 1686 Ethiopia birr per month; from this income about 366.90 ETB will be spent for feed, water, treatment and other activities. On average a cart mule works 5.2 days (minimum of 3 days and maximum of 7days) a week and 8.75 hours a day on

average (with minimum and maximum of 4 and 10 hours respectively). the loading practice in the study area is indicated in Table 2 and figure 3 indicate over loaded mule pulled by the driver.

Physical Examination Results

Table 3: Relationship between BCS by educational level of the respondent

Educational level of respondent	BCS		Total
	poor	Good	
illiterate	47	79	126
primary education	21	28	49
secondary education	2	23	25
Total	70	130	200

From a total of 300 mules physically examined 108 (36%), 165 (55%), 27 (9%) were found to have body condition score (BCS) of 2, 3 and 4 respectively. During the study period there was no mule encountered with BCS of 1 and 5.

The BCS was compared with educational level of the respondent. There was no statistically significant difference ($p>0.05$) in body condition in different education level of their owners. The relationship between BCS of the mules and feed given was also assessed. But the difference was again not statistically significant ($P>0.05$) (Table 4).

Table 4: the relationship between BCS of the mules and feed supply

Feed type	BCS		Total
	0	1	
feed without concentrate	36	67	103
feed with concentrate	34	63	97

P= 0.988

From the 300 mules examined 158(52.7%) had quit alert response for the new stimuli and 85 (28%) had dull response (Table 5).

Table 5: activity status and number of mules

Number	Activity status or response to new stimuli	Number of mule	Proportion
1	Exaggerated	15	3
2	Bright alert	42	14
3	Quite alert	152	52.7
4	Dull	85	28

From totally examined animals 183(61%) of the mules had shown normal natural orifice and 117 (39%) of them had a problem of one or the other type of problem. Again 129(43%) of the examined mules showed musculoskeletal problem of one type or other. From musculoskeletal abnormalities lameness accounted 86(28.7%) of the cases. Again from those affected 27 (9%) of the mules had a problems of hoof injury alone or with others problems.

Table 6: wound or injury sites on the animal body and their proportion

Number	Wound/injury body part	Number Injured animal	Proportion (%)
1	Back sore	94	31.3
2	Girth sore	80	26.7
3	Breast sore	69	23
4	Tail sore	15	5
5	Hobble sore	33	11
Total		291	97

Two hundred sixty nine (89.7%) of the mules that physical examined had a dermatological problems. Also 101 (33.7%) were affected by epizootic Lymphangitis alone or with others (Figure 1). 189 (63%) of the mule had a problems of wound/ injures alone or with other problems on different part of the body like on the back, girth, breast, tail and on the legs (Figure 2) (Table 6).



Figure1. Mule affected by epizootic lymphangitis at working condition.



Figure 2. Mule affected by back sore.



Figure 3. Over loaded mule pulled by the driver.

Discussion

In terms of feeding management it was observed that all respondent provide adequate and clean tap water for their mules. This insure the one of the welfare requirements i.e. freedoms of access of clean and adequate water and protect the mule from thirsts; FAWC (1993). 140 (70%) of the owner use free grazing as a main source of feed and additionally use hay for their mules, while the rest 25% of them used hay as the main source of feed and add other like free grazing. About (48.5%) of the owner use concentrate in addition to free grazing supplementation of hay. When the body condition of mules was evaluated and compared with the feeding type, there was no significance difference indicating even in those animals in which concentrate is given the amount is not sufficient to bring change in the body condition. The feeding practice in general seems insufficient as it is primarily based on roughage. But working animals should have additional concentrate (Duncan, 2005).

Out of 200 of mule owners that had participated in the questionnaires surveys only 11(5.5%) of the owner constructed relatively good house that can protect the mules from rain fall, sunlight, winds and insect. When this is seen, the housing system provided to working mule in the study area is not adequate. Lack of shelter is indicators poor welfare (FAWC, 1993). The reason for this could be due to low income of cart owners but there was also a belief by the cart owners that the house of mules should be open.

About 42% of the respondents had regular daily care for their mules. These activities were hoof care, haircut, bathing and grooming and prevent occurrence of diseases in animal like: ecto- parasite and used to insure the health status of the animals. But 85 (42.5%) of the owner do nothing for their mules and they do not take care about their mules disease prevention before occurrence. Prevention of diseases is a good measure for insuring the welfare of the animal (freeman *et al.*, 1999). Sixty two (31%) of the owner used to take their mules to veterinary Clinic when the animal is diseased, directly or after trying their best to cure the mules. This figure was higher than 16.6% of the studies reported by Demelesh and Moges (2006) in Awassa, southern Ethiopia. This might be attributed the access to different private and governmental veterinary clinics and presence of nongovernmental organizations like donkey sanctuary which give free service for equines, in the study area.

About 24% of the owner didn't do anything when the mules get diseased; this was also lower than the result of Demelash and Moges (2006) who reported 39.3% in Awassa, Southern Ethiopia which might be because of the same reason with the above. Apart from this 90(45%) of the owner use different types of mechanism to cure diseased mules, like

giving modern drug from the market and also use of different chemical like Grease, Engine Oil, Salt Water and other. Similar result (44.1%) was studied by Demelash and Moges (2006) in Awassa. Since these owners do not took their animals to veterinary clinics or they try themselves to cure them, the animals will suffer from different disease problems, due to lack of appropriate diagnosis, treatment and this affects the welfare of the mules.

Majority of respondants (70.5%) give rest at the time of working day but the rest may be exempted if they get business (transportable good). This leads to the mule to exhaust and stressed by over work. During rest time 54 (27%) of the owners give feed for their mule, 90 (45%) tether in working place and 56 (28%) of the respondent hobble their mule. These two groups that tether mules each other and those who hobble mules alone at the working place leads to the mule to kick and bit each other and the inferior group would suffer more in working places. In addition to the above condition during working 79 (39.5%) of the respondents use beating to drive the mule alone or with other system like waving stick on air, shouting, pulling their ear or pushing the loaded mule. Beating induces pain and injury to the animal and this reduce the quality of welfare of animal by intervening into the freedom of pain and injury (FAWC, 1993).

At the end of working days 96 (43%) of the participant allow their mules to Graze in the filled. These create chance for the mules to relax its body and communicate with other groups (species), but 28% and 24% of the owners hobble and keep them in their shelter after they finished the work at the end of the day, respectively. These hinders their probability of relaxation and the chance to communicate with their species, it affect the expression of its natural behaviour like grooming, rolling and playing with their species. Expressing of normal behaviours of the animals is a good indicator of the quality the welfare of the animals (Dawkin, 1990).

From a total of 200 of respondents, only 21.5% of the respondent continue taking to care of their mules humanly at the end of working life or when they severely diseased; but most respondents (78.5%) abandon their mules at the end of useful life. These were because of the cost to owner to handle the non-working mules. This leads to serious breach of the five freedoms of animals like, lack of sufficient feed and water, lack of shelter, freedom free of diseases and freedom of fear and distress (FAWC, 1993).

Feed and health were mentioned to be the main problems for mule owners. Feed being mentioned by slightly higher number of respondents indicates major problem. Other problems were, shelters, water, harnessing material or others problems. In managing or handling the mule the problem of health and

malnutrition were also indicative of the poor welfare of the mule. In addition to the above problems in respect to the health 31.5% of respondents had problems of wound alone or with other health problems like epizootic Lymphangitis, Lameness, and Dermatological problems, Colic, Tetanus, Africa Horse sickness and others. The owners also indicated that epizootic lymphangitis account 35.5% of health problems alone or with others health problem listed above. Even though wound account 31.5% of health problems of cart mule alone or with other problems, 36.5% of the respondents allow to rest and stop working on affected (injured) mules. The other 63.5% of the respondent work with their mules inhumanly with the wounded, this were almost similar to the study by Demelash and Moges in Awassa (2006). These were because of the mules handled in poorest society had no other mule to work as an alternative. This cause the mule more injured, stressed, pain and also aggravate other health problems and those will leads to the poor welfare of the mules.

Cart business was the only source of income for 70.5% respondents and contributes significantly to livelihood of 20.5% respondents. Those respondents which use cart as the only source of income and that uses significant role in their family use their mule frequently within a week and they give limited rest within the day. These cause mules to over work and become exhausted, stressed and suffer leading to violet welfare of the mules. Stress and suffering is a sign of poor welfare (Fraser, 1990).

Forty nine per cent of the owner use mules for transportation of market goods as a major means of transportation and the other activity like transportation of farm products, construction material, fire wood, water and other materials. Forty four per cent of the owners used for transportation of farm product alone or with others material.

Regarding loading practice 25.5% of the respondent loaded their mule with 500-900kg load on average, 50% of the drivers loaded 1000-2000 and 24.5% with greater than 2000kg. These indicate that totally 74.5% of the mules were over loaded during transportation. This leads to the mule to be exhausted, stressed and suffered these affecting the welfare of the animals. Above 1000kg cart pulling mule is already considered as over loaded (Wilson, 2003).

Education level of the respondent was not found important in terms of body condition score of animals. This indicates the education level does have influence in maintain of the welfare on cart mules.

From 300 of cart pulling mules 28.3% of the mules had dull response to the new stimulus is recorded. This was because of the animals were in hard work load, working long periods of time and it may also be due to diseases. This dull response of the

mules was results of harsh, rough handling, and it was a sign of abnormal response to new stimuli and the animal was not good in physiological state (Duncan, 2005).

One hundred eighty three (61%) of the mule from 300 physically examined were with normal natural orifice, and 39% of the mule had one or more abnormalities in the natural orifices like, ocular, oral, genital or soiled perineum in one case or multi-case face together. These were because of the physiological disorder by health problems and it might be due to excessive work in the working days and leads to exhaustion this decrease the quality of welfare the mules. A gain from the physically examined mule 43% of them had abnormal locomotion manifesting musculoskeletal abnormalities. This could be an indication poor shoeing. From physically examined 89.7% of the mules had been recorded with a dermatological problem like, alopecia scar, ectoparasite (tick, mange and egg of *Gastrophilus*), Sarcoids and epizootic lymphangitis. Those listed dermatological problems were due to improper (rough) harnessing system, and does not take care about the skin problems and they assumed that skin problem was not a disease until it become sever and interfere the working ability of the mules. Particularly wounds account 63% of the cases. This may be because of the respondents, does not think wound was a problem of cart pulling mules and neglecting the animals. In addition to this rough harnessing aggravate the presence of wound.

One of the difficult diseases that encountered in the study area was epizootic lymphangitis, it has a pathognomonic sign of lymph node enlargement following the lymph vessels, and it affected 33.7% of the working mules. This number was almost similar to other studies in Debre Zeit (30%) Gobal and Hennager (1983) in cart horses. The disease was so common because of the environment factors which are favorable for the disease like high land and humid. In addition to the environmental factor management system of the owner also aggravate the prevalence of the disease like abandoning non-working animals which create the chance of contamination of the non-diseased mules during contact and flies on the grazing area. Most of the owners did not take care of the mule when affected by wound. This leads to the mule easily affected by disease and in addition to those listed reasons the owner also did not take care of their rough harnessing and when exchange the harnessing material from one mule to the others.

From mule which were be affected by wound/injuries, almost all were due to bad harnessing system. This was inferred from the site of wounds. Wounds occur in harness contact areas like on the back, girth, breast, tail or leg (due to hobbling). These

were due to neglecting of the owners to their animal and low attitude about the wound and its effect on animals and economic impact. These neglecting of the mules influence on the health of the animals, and this in turn reduces the quality of welfare of the mules.

Conclusions And recommendations

Equine traction plays a vital role in both urban and rural part of Ethiopia in alleviation of poverty, but equines have been completely omitted from the national development programs. This exclusion of equines makes the livestock development program incomplete. In the study area cart mules were widely used in transport of various goods. This study revealed that cart mules are a sole livelihood means for large proportion of cart mule owners. It was also seen that they generate substantial amount of money per day for cart owners.

Despite these facts the welfare of these cart mules was not found optimum when seen from the perspectives of both direct measures (from physical examination of animals) and indirect measures (interview about management inputs). Although it was found that the cart mules get sufficient access to clean water, the feeding, housing and work rest were not found sufficient. Most owners overload their mules.

The physical examination revealed that majority of the animals had inadequate body condition, majority of mules working in the cart business were affected by one or other type of health problems especially musculoskeletal, dermatological and wound (injury). Epizootic lymphangitis, which is a serious disease of equines that highly damage the welfare equines, was quite a prevalent health problem affecting one third of the mules examined. And worst of all most of cart mules were abandoned after they finished their useful life or if they suffer serious disease that make them out of function for their owners. In General it can be said the welfare condition of working mules in the study area is seriously compromised. These seem due to poor socioeconomic all status of the respondents, low level of awareness about animal's welfare by the society, and lack enough attention by the government. Based on the above conclusion the following recommendations were forwarded:

➤ The government should give attention to equines in general and mule in particular should be covered by the research and extension system to optimize the economical gain from these animals and improve their welfare status.

➤ Public awareness about animal welfare must be done to improve the welfare status working equines.

➤ A serious attention must be given for epizootic lymphangitis by veterinary service personnel and control work must be instituted.

➤ Cart mule owners should be educated about feeding, housing and health management; and appropriate loading and harnessing of mules.

Acknowledgements

We would like to thank University of Gondar, Faculty of Veterinary Medicine for letting us to write study on welfare assessment of cart pulling mule in bahirdar town, northwest ethiopia. We wish also to express our profound gratitude to personnel of the faculty of Veterinary Medicine, who assist during study period and suggest valuable comments.

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Annexes**Annex -1. Body Condition Score (Source NAWC 2005)**

1. All bones easily felt ribs can be seen from a distance and felt with easily back bone prominent, hip bones visible and felt easily. Dorsal spine of withers prominent and easily felt.
2. Some muscle development overlying on neck, ribs may not visible but van be felt with easy. Poor muscle cover on hind quarter, hip bones felt with easy, dorsal and transverse processes felt with light pressure.
3. Good muscle development, good cover of muscle fat over dorsal spinous, cannot feel individual spinous or transverse processes. Good muscle covers on hindquarters.
4. Shoulder covered in even fat layer, withers broad, bones felt with firm pressure, can only feel dorsal and transverse processes with firm pressure hind quarters rounded.
5. Shoulder round and bulging with fat; withers unable to feel bones, ribs not palpable, back broad unable to feel spinous or transverse processes, cannot feel hip bones fat may over hang either side of the tail head fat uneven and bulging on hind quarters.

Annex.2. Questionnaire Format for Cart Mule Owners (Drivers)

Owner's questioner number (code) _____

1. Background detail

Interviewers/owner's name -----Area /kebele

Educational level of interviewers?

Illiterate 1^o school 2^o school higher school

2. Cart mule detail

2.1. Contribution to livelihood? The only source additional (minor) source of income significant role

2.3. How much money do you make in a day (specify)? -----

2.4. How many days do you work your mule in a week? -----

2.5. How long do you work your mule in a day? -----

2.6. How much loads does your mule pull once (on average) in kg?

<500 500-900 1500-2000 >2000

2.2 What type of load? Market goods construction material

Form product fire wood water other

3. Cart mule management

3.1. Do you give enough water? Yes No.....

3.2. The type of feed? Free grazing hay concentrate

Other, specify-----

3.3. How often do you feed per day? One twice

Three times four times

3.4. Do you give rest per day of working time? Yes No

If, yes under shade no shade

3.5. What happens to your mule at the end of its working life? Abandon

Euthanasia continue taking care

3.6. What is the major problem your face while managing the animal?

Disease feed water shelter harnessing problem other specify-----

3.7. How much money do you spend (on average) in a month to manage your mule? <200 210-300 320-400

410-500

>500

3.8. What are the major health concerns of your mule?

Wounds epizootic lymphangitis lameness

Poor body condition Dermatological problem

Africa horse sickness tetanus colic

Other (specify) -----

3.9. What do you do when your mule gets sick?

Take it to vet service treat myself do nothing

3.10. If treat myself, what are the treatment practice you use?

- Branding bloodletting injections (modern drugs)
Drenching Salt water Battery acid
Engine oil Grease Others specify
- 3.11. Are wound enough reasons to rest a mule? Yes No
- 3.12. Does you mule have shelter? Yes No,
- 3.13. Does the shelter protect? Insect rain full wind sunlight
- 3.14. What do you do with the mule after working day?
Allow free grazing tether up keeps it in shelter
- 3.15. What is the common husbandry practice you use?
Regular hoof care hair cut Bathing (washing) Regular grooming other (specify)
- 3.16. How to communicate at working time?.....beating.....voice.....waving stick on
air.....pushing.....pulling by ear
- 3.17. At working place. provide feed Tether with other hobble alone

7/23/2017