



ADDIS ABABA UNIVERSITY
COLLEGE OF VETERINARY MEDICINE AND AGRICULTURE
DEPARTMENT OF VETERINARY CLINICAL STUDIES
MVSc PROGRAM IN VETERINARY EPIDEMIOLOGY

A THESIS RESEARCH ON: CART AND HARNESS CHARACTERISTICS
OF DRAUGHT EQUIDS IN THE OROMIA REGION
THE CONTRIBUTION OF LOCAL CART AND HARNESS DESIGN TO
THE WELFARE OF WORKING EQUIDS

MVSc THESIS RESEARCH

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November, 2021
Bishoftu, Ethiopia

**CART AND HARNESS CHARACTERISTICS OF DRAUGHT EQUIDS IN
THE OROMIA REGEION
THE CONTRIBUTION OF LOCAL CART AND HARNESS DESIGN TO
THE WELFARE OF WORKING EQUIDS**

A collaborative study between

**College of Veterinary Medicine and Agriculture of the Addis Ababa
University, Ethiopia and the
Faculty of Veterinary and Agricultural Sciences of the University of
Melbourne, Australia**



DEPARTMENT OF CLINICAL STUDIES
MVSc PROGRAM IN EPIDEMIOLOGY

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**THE CONTRIBUTION OF LOCAL CART AND HARNESS DESIGN TO
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LIST OF ABBREVIATIONS

AAU	Addis Ababa University
BCS	Body Condition Scoring
CSA	Central statistics Agency
CVMA	College of Veterinary Medicine and Agriculture
MSc	Masters
NGO	non-governmental Organization
SPANNA	Society for the protection of Animals Abroad
UoM	University of Melbourne

ABSTRACT

The study was conducted from November 2021 to May 2022 in three selected towns of Oromia region Bishoftu, Selale, and Shashemene to assess cart and harness characteristics and its contribution of local cart and harness design to the welfare of working equids . A total of 369 equines were examined during the study period, with 244 (66.12 %) horses, 122 (33.06 %) donkeys, and 3 (0.81 %) mules being examined for general attitude, gait, response to spinal contact, presence of shoes, lesions on various parts of the body, hoof and limb conditions, and body condition status.

When the proportion of work types was compared to the study region, Bishoftu, Selale, and Shashemene differed. In Bishoftu, 72.88 % use taxis, 19.43 % use transit, and 7.68 % utilize water transportation. A taxi driver, like Bishoftu, was the most frequent type of work in Selale. It was 74.32 %, with goods transport accounting for 21.66 % and water transport accounting for 3.53 %. Cart taxi service is virtually non-existent in the Shashemene area. The bulk of carts were used to transport commodities and water, accounting for 82.84 % and 17.15 %, respectively, of all carts. The study found that 13.11 % of the 122 donkeys were "Very thin," 84.42 % were "Thin," and 2.45 % had "Ideal" physique scores. The condition "Thin" accounted for 53.68 % of the total horse population, followed by "Ideal" condition, which accounted for 23.36 % of the total horse population. The third and last segment was occupied by a very thin body score condition, which accounts for around 22.95 % of the total. From the total sample 75.60% of working equids were found with wound on different body parts in Bishoftu, 67.47% in Selale and 84.55% in Shashemene area because of improper fitting of harness materials. Girth wounds account for the majority of these three major wound results, accounting for 43.90 % of all wounds across the research region. Chest wound 23.30 % and saddle wound 22.49 % took second and third place, respectively. In the current study, we discovered that equines play a significant role as useful animals in both rural and urban communities. Cart and harness features such as unfitted, thinner saddles, use of unbreathable paddings, lameness, wound, overworking, overloading, injuries, and general abuse were common. Further research and appropriate interventions should be explored on the welfare restrictions impeding the optimal use of equines in this critical area.

Key terms: Cart Chest wound Equines Harness Girth Saddle working animals wound welfare

1. INTRODUCTION

Over 85 percent of the world's equids live in developing countries, including 40.5 million horses, 39 million donkeys, and 12.3 million mules. According to the Food and Agriculture Organization, Ethiopia is a place of residence for about 50% of Africa's equine population, with 37 percent, 58 percent, and 46% of all African donkeys, horses, and mules, respectively. In the sedentary sections of the country, there are around 2.2 million horses, 10.8 million donkeys, and 0.4 million mules. Donkeys and mules are commonly utilized in rural areas, especially for socioeconomic reasons.

Over half of the world's population relies on animal traction for energy, and despite a decline in the number of working equids in wealthy countries over the last century, the number of working equids in many developing countries has increased. With the world's growing population, more and more food, water and other goods likely to be needed depends on working animals' traction for its transportation.

In developing countries, working equids have safety and productivity concerns. These animals are suffering from injury during work and have variety of health and welfare problems. These problems cause huge economic impacts to individuals, family, and may cause serious damage to the country. Horses are transport animals, used for riding and for rural and urban transport. Mules, which are mostly utilized in mountainous locations for packing and riding, as well as in flatter rural and urban areas for cart pulling, are also essential working animals. Donkeys are mainly used to breed mules and light transport in the mountains (Gelaye, A., & Fesseha, 2020). Mules are specialized work animals produced by crossing a female horse with a male donkey. They are therefore only found where both horses and donkeys breed well, notably in temperate, semi-arid high-land areas. They make excellent, single-purpose work animals, being hardier than horses and stronger than donkeys. The great disadvantage of mules is that they are not fertile; so female horses have to be kept around to produce baby mules (Kumar et al., 2014). In certain areas of Ethiopia, cart equids often work 6 days per week (Ali et al., 2016) with over a quarter of animals

working every day of the week (Bazezew et al., 2014). As such, the equipment used for draught is extremely important and care should be taken to ensure the adequacy and comfort of this equipment throughout the animal's work life (Lansing, 2010).

Harness related wounds are highly prevalent in working equids in Ethiopia (Teferi et al., 2020) as well as in other low- and middle- income countries (Pritchard et al., 2005). These are mostly attributed to improper harness designs or materials. Skin lesions have been found to be the best predictor of lameness in Ethiopian cart-mules and it has been reported that mules with poor harness quality were 2.5 times more likely to have wounds and 1.6 times more likely to be lame, suggesting that inadequate harnessing has both direct and indirect welfare implications. However, the classification of harness quality in this study was based on the frequency of rubbing points observed and the severity of wounds caused, without investigation of design or assembly characteristics leading to these problems (Ali et al., 2016).

Although it is widely recognized that cart and harness designs are often inappropriate, the specific ways in which they deviate from the ideal are not documented. As optimum draught efficiency is achieved through correct harness fitting at the animal's point of draught (POD) and cart configuration has a significant influence on the distribution of draught forces, inadequate equipment and fitting therefore decreases work efficiency (Lansing, 2010). However, animal draught and power technologies in low-income communities are poorly studied and it is not known how much productivity these animals lose through inefficient cart and harness designs and inappropriate hitching methods. Clearly, a better understanding of these factors would help optimize working animal productivity (Tesfaye et al., 2016). The importance of this issue is often overlooked and responsibility is not shared amongst all stakeholders. Several community training interventions and guidelines on adequate harnessing have been made as well as cart and harness makers being targeted by multiple non- governmental organization (NGO) programs. However, there is limited scientific evidence of the degree and extent of equipment inadequacy, its risk for the development of injuries, and its effect on productivity (Colditz et al., 2013).

Such practices will enhance the income from equines and ultimately improve the household income, which has direct impact on the food security and health of the family. This has a

considerable impact on the One Health approaches in improving the wellbeing of the community. This study was designed to provide practical information on the design and use of harnessing material in cart pulling equines for a better understanding of its impact on working animal welfare perspectives in selected towns of Oromia Regional State. The results of the study will be used in better equipment design and efficient utilization of equines for optimum income and better welfare. The objectives, therefore, include:

- To document the cart and harness characteristics of Ethiopia's draught equids in urban and rural settings;
- To determine the local harnessing practices in relation to those recommended in the literature;
- To investigate the potential impact of equipment design, materials and assembly on health and welfare indicators of working equids;
- To investigate the users' understanding and attitudes towards draught equipment.

2. LITERATURE REVIEW

2.1.EQUINES' SOCIAL AND ECONOMIC IMPORTANCE

Working animals contribute more than half of the world's agricultural traction energy, while internal combustion engines produce less than a third, with the remainder given by men and women. Increasing fuel prices in many developing countries are forcing a large number of city workers to move from motorized vehicles to equine-powered carts(Asfaw and Tadesse, 2020). In Ethiopia's rural places, pack animals are the only feasible way to earn a living from crops other than subsistence(A et al., 2016). Furthermore, Ethiopia's growing human population has increased the demand for horses for transporting commodities to and from remote places, as well as for building activities. The usage of equines in door-to-door transportation services also allows city inhabitants to generate cash (Gelaye, A., & Fesseha, 2020).

Despite their large numbers and growing importance in the Ethiopian economy, equines have received considerably less attention than they deserve from governments and non-governmental organizations(Asfaw and Tadesse, 2020). Injuries during working period is one of the biggest limits to working equines' productivity and work performance, which typically leads to high morbidity and even death.

Because equine power is most frequent in poor communities, the equines are often malnourished, have little access to clean water, and receive no husbandry or veterinary service care(Asfaw and Tadesse, 2020). As a result, complaints of skin sores, poor body condition, lameness, and poor spinal contact in these animals are more prevalent; all of these are problems directly tied to a poor welfare state in these animals, preventing the system from being sustainable in terms of the effects of work on the equines (Tesfaye et al., 2016).

Furthermore, equines are often given less concern than other livestock animals, and their welfare is widely ignored. The welfare of working equines in Ethiopia is so critical, not just for the animals' health and survival, but also for the livelihoods of those who rely on them. In Ethiopia, there is a limitation of information about working equines (Teferi et al., 2020). Cart horses' economic

significance to enhanced living and poverty reduction in Ethiopia is not widely examined(Asfaw and Tadesse, 2020).

2.2.HARNESS PARTS & RELATED TERMS

2.2.1. What is a harness?

A cart and harness is a system or material that is fitted to the working animal's body. Horse harness is divided into two types: (1) "breast strap" or "breast collar" designs, and (2) collar and hames designs. A harness only needs a breast collar for light activity, such as horse show contests when light carts are utilized (Mekuria et al., 2013). Because the burden is placed on the horse's sternum and the surrounding windpipe, it can only be used for lightweight carrying. Heavy weights can compress the windpipe and decrease a horse's air supply; this is not the heaviest skeletal region (Tesfaye et al., 2016).

The collar and harness, on the other hand, distribute the load's weight evenly across the horse's shoulders while allowing the animal to breathe freely. To allow the horse to use its maximum weight and power when pulling big loads, the harness must incorporate a horse collar(Mekuria et al., 2013)r.

Harnessing or harnessing up refers to putting a harness on a horse. Putting to or hitching refers to attaching the harness to the weight (Wiederhold and Riva, 2014). The sequence in which harness components are attached varies by discipline, although a horse collar is normally attached first (Mekuria et al., 2013).

The well-made, well-fitting, and comfy harness allows equids to pull the cart to its full potential without injury (Warren-Smith et al., 2007). A harness that is poorly designed or ill-fitted can result in inefficient power transmission from the equid to the tool, as well as tiredness, pain, or wound to the animal. An excellent harness has these characteristics:

- Effectively conveys the working animal's pulling energy to the connected equipment.
- There are no rough edges that could harm the working animal.
- Fit correctly so, excessive movement or friction does not lead to injuries, irritation, or lesions.
- Does not restrict blood circulation to the tissues or obstruct the animal's movement or routine functions such as breathing.
- Is inexpensive, long-lasting, simple to maintain, and clean.

2.2.2. *Parts of the harness*

Blinkers

Blinkers are the two flaps on a bridle that cover a horse's eyes. They are used to reduce animals' field of vision. The two flaps on a bridle that cover a horse's eyes are known as blinkers (Simalenga and Krecek, 2014). They are used to limit an animal's ability to see objects to its sides and behind him by reducing their peripheral vision. It's important to keep the eyes in the vertical center of the blinder and the blinkers away from the horse's eyelids (Pritchard et al., 2005).

Monocular and binocular vision is available to horses. Because their eyes are situated on the side of their heads, they can see almost entirely around and behind them with their monocular vision. This was created since they are prey animals and must be aware of predators even when grazing with their heads down. There are two blind spots: one in front of their eyes and one behind them (Dziezyc et al., 2011).

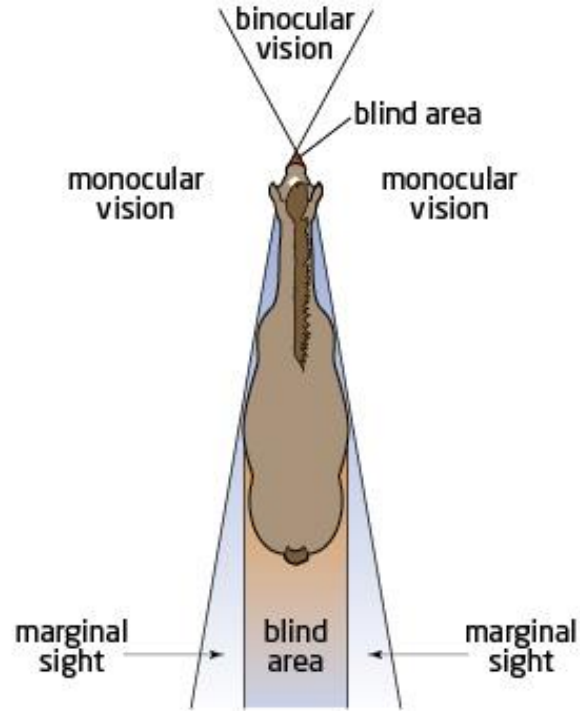


Figure 1 vision of Horse

Their binocular vision helps them to concentrate on the immediate area in front of them. In horse riding, the use of blinkers inhibits the horse's monocular vision and essentially decreases what they can see (Dziezyc et al., 2011; Pritchard et al., 2005). The blinkers are attached to cheek pieces on both sides of the face and to straps that connect in the center. The face piece then continues and is linked to a buckle in the crown piece's center. These straps are typically used to conceal support cables that allow the horse's blinkers to be held at a specific distance from his face. Blinker or Winker Stay is another name for this assembly (Dziezyc et al., 2011; Simalenga and Krecek, 2014). Blinkers come in a variety of forms, including Square, Dee, Round, and Hatchet. On a leisure driving harness with a two-wheeled vehicle, square (with rounded corners) or Dee forms are commonly utilized.



Figure 2 Blinker in Bishoftu town

Reins

Horses are used for a variety of tasks across the world, many of which require communication between the horse and the human. The horse's sense of touch is highly developed in the mouth. Humans communicate with their horses by sending messages through the reins to the bit in the horse's mouth (Kusunose and Yamanobe, 2002).

The reins are driving lines which is the part of the harness that allows us to communicate with the horse or donkey. They go from the bit, on the saddle, to driver's hands. Supporting rings or "terrets" may be used to carry the reins over the animal's back on various harnesses. When two horses are used to pull a wagon or coach, the reins on the outside of each pair are usually attached to the reins, and the inside of the bits are usually joined by a short bridging strap or rope (Clayton et al., 2011; Simalenga and Krecek, 2014; Warren-Smith et al., 2007).

Collars: Neck, Full, or Round, and Breast

The part of a harness that goes over a horse's shoulders or chest is called a collar. The horse's pressure on the collar is transferred to the forward motion of a vehicle or other object. Collars

come in two basic styles: neck collars and breast collars(Teferi et al., 2020).

A round or complete collar is another name for a neck collar. A cushioned attachment that completely encircles a horse's neck and rests against his shoulder is known as a neck collar. Neck collars contain a slot for hames, which are used to attach the traces. A neck collar is typically worn by formal cars and vehicles with a strong draft(Fraser et al., 1997; Tesfaye et al., 2016).

A breast collar is a broad strap that is worn across the horse's chest, rather than his neck. The traces are attached to the breast collars directly (either buckled or stitched). Because the weight of the vehicle is centralized rather than dispersed over the entire shoulder area, a breast collar is not suited for hauling big loads. Breast collars are more suited to casual vehicles with a light draft, such as two-wheeled carts. A breast collar is required when using a singletree. If solid trace attachments are allowed, typical shoulder mobility against a breast collar is likely to cause shoulder discomfort(Mekuria et al., 2013; Simalenga and Kreck, 2014).

Neck Strap:

The breast collar is supported by the neck strap. It adjusts by going around the neck and connecting to the breast collar with buckles (typically two per side). To direct the reins to the bit, the neck strap normally has either fixed or flexible rein turrets(Zekarias and Tesfaye, 2019).



Figure 3 Neck strap and Breast collar

Saddle, Pad or Backpad

A saddle is a well-made, cushioned leather component that is put on the back of the horse. It serves as the central harness anchor, with a checkrein hook in the front, a back strap Dee in the back, and rein terrets included (Teferi et al., 2020). To keep the saddle in position on the horse's back, billets at the ends of each side panel are buckled into a girth. The majority of modern saddles have some patent leather (Pritchard et al., 2005).

A saddle's primary role is to support the shafts of a single harness. To prevent the saddle from resting on the horse's spine, it should be thoroughly padded on each side panel. A rear band is mentioned in several sources for bearing the shaft tugs. It's sometimes referred to as a separate harness component that fits through slits in the saddle's seat and lining (Tesfaye et al., 2016;

Warren-Smith et al., 2007). In today's saddles, the rear band is usually included as an integrated element of the saddle assembly. It appears as a second set of billets, raised slightly above the girth billets. Each of the second set of billets has the shaft tugs buckled to it(Dittmann et al., 2021). The smaller lightweight "saddle" of a pair harness is referred known as a Pad or Backpad. Because no (shaft) weight is transferred to the horses' backs, it can be lighter(Dyson and Greve, 2016).



Figure 4 Saddle and Girth

Girth and Belly Band

A girth is a band or strap that is wrapped around a horse's belly to secure a saddle or other item. Associated terms include: Girth & Wrap Straps, Shaft Wraps, or Tie down Straps A bellyband is a strap that runs around an animal's belly and is used to secure the shafts of a vehicle. The bellyband can be either a short strap with a buckle on either end or a long billet with a buckle on each end(Murray et al., 2013). The short bellyband is attached to shaft tugs that have a billet built in. The billets of the longer bellyband are wrapped around the shafts of open tugs before being clasped back into place(Simalenga and Krecek, 2014).

There is lots of confusion about this phrase. Aside from the misunderstanding between the short

and shaft wrap styles of bellyband, several sources cite bellyband and girth interchangeably. Because most bellybands are lightly secured to the girth with one or two keepers, this is especially simple to comprehend(Mekuria et al., 2013).

Back strap, Turn back (to fold back)

The crupper is connected to a Dee on the rear of the saddle by the back strap. It normally contains a hole for a hip strap that may be adjusted for the appropriate hip strap and crupper location. The crupper can be buckled or sewed onto the back strap solidly(Simalenga and Krecek, 2014; Zekarias and Tesfaye, 2019).

Traces

Traces are straps that link a breast collar or hames on a neck collar to a device, often a vehicle's singletree. They convert the animal's push against the collar into the vehicle pulling. Traces in leather harnesses can range from one to multiple sewn-together pieces of leather(Simalenga and Krecek, 2014). A layer of synthetic material may be incorporated in the sandwich in some circumstances. Some draft harnesses have chains that are coated to keep the animal from chafing. Leather traces are normally fastened into the breast collar or the hames (indirectly through hame tugs) and can be modified for length. Adjustment is accomplished at the singletree by selecting one of the normally three slots provided in the trace ends if the trace is firmly connected to the collar or hames. This type of adjustment does not have the same exquisite appearance as buckle-in traces(Clayton et al., 2011; Zekarias and Tesfaye, 2019).

Breeching

A breeching is a broad strap that wraps over a horse's hindquarters as it is being harnessed. It's a piece of equipment that allows the horse to stop or reverse a vehicle hitched to it. A hip or loin strap that runs across the rump keeps the breeching in place(Tesfaye et al., 2016). The breeching should be approximately horizontal and rest about the point where the rump curves into the leg. It has a tendency to ride up towards the tail if it is set too high. It restricts leg mobility if it is set too low. When the horse is in draft, the breeching should be adjusted so that around four fingers (the breadth of a hand) may pass between the back of the horse and the breeching(Dyson and Greve, 2016; Simalenga and Krecek, 2014).

Breeching Straps, Holdback Straps, Quarter Straps

Straps that extend from the breeching ring to the shafts are known as breeching straps. Before being coiled around the shaft, they often pass through a breeching Dee or footman's loop. They're called holdback straps because they're used to halt the carriage from moving forward when the horse stops. When a horse backs up, the carriage's breeching or holdback straps cause it to reverse direction(Tesfaye et al., 2016).

Crupper

The crupper is the portion of harness that secures the saddle from behind. The crupper's purpose is to keep the saddle from being pulled forward along the horse's back, which is most probable when no breeching is used or when a checkrein is employed(Mekuria et al., 2013). There is considerable ambiguity in the use of this terminology. Crupper is now often used to refer to the soft, smooth (linseed-filled) tailpiece that fits beneath the horse's tail. However, the term crupper is frequently used to refer to the entire assembly, which includes the backstrap and tailpiece, as well as maybe the hip strap(Mekuria et al., 2013).

Singletree, Whiffetree, Whippetree, Swivel tree, Swingle tree

The traces are coupled to a Singletree, which is a pivoting (wooden) bar on a vehicle. The singletree delivers the horse's and harness's pull to the vehicle. It gives the harness greater movement at the horse's shoulders than a solid trace attachment. It must be worn with a breast collar to avoid aching shoulders(Simalenga and Krecek, 2014).

2.3.ATTACHMENT OF EQUIDS TO HARNESS MATERIALS

The harness and its attachment to a vehicle or tool should, in theory, allow an animal to apply full force to the load and maintain a valuable work output for several hours without undue stress or skin or muscle injury caused by poorly fitted or maintained equipment. In underdeveloped nations, however, the most common cause of harness sores is an inadequate design wherever a proven method has been modified or improvised without a basic grasp of the principles of traction and the role of each member of a set of harnesses.

Draught materials

Draught animals should really push rather than pull. They push against the collar with their shoulders and chest at the base of the neck, and the vehicle or cultivator is towed behind. When the animal is working hard, this activity is more visible (Teferi et al., 2020). It must be emphasized that a draught animal should be supported to utilize its maximum energy when necessary in completing the main job by leaning into the pushing point: it should not be hampered in this by the additional strain of carrying unneeded or unproductive weight that bears on the back (Dyson and Greve, 2016; Murray et al., 2013). This results in inefficiency, as does traction from the thorax, where too little of the entire body weight is therefore behind the correct pushing point.

Draught harnesses and the occurrence of injuries

Saddle sores, chest sore, and girth galls are the most common harness injuries in equines due to excessive pressure and/or friction. A girth is typically worn with a saddle, with the front of the latter being responsible for injuries that result in fistulous withers on occasion (Mekuria et al., 2013). The collar isn't always to blame for injuries. Careless tethering rope attachment to the pastern is the second most common cause of injury (Tesfaye et al., 2016).

The majority of issues come when a single horse is transported in a cart, when the balance of the cart and weight has a significant impact on performance. Back injuries are prevalent in this area, and may be caused by the cart's excessive height in relation to the animal's size, or by too much weight put in front of the cart's point of balance (Fraser et al., 1997). The difficulty is aggravated when the saddle is improperly positioned. Donkey carts, the most common mode of animal transport in Ethiopia, rely heavily on traction from the region of a poorly made saddle on the animal with short trace connections to the front of the shafts. There is usually a belly band to keep the shafts from rising if the cart tips back, but there is generally no girth to keep the saddle firmly in place. This is done rather inefficiently in the back with a cord wrapping around the hindquarters between buttock and thigh, and in the front with cords forward on each side of the top section of the neck, connected to a light neck collar (Zekarias and Tesfaye, 2019). This collar also has a little role in traction, although the contribution of the animal's forequarters is mostly lost. The saddles appear to stay in place due to downward pressure from the shaft suspensions on the back. Breech straps are not used for braking in any of the three harnessing techniques described (Kusunose and

Yamanobe, 2002).



Figure 5 Girth Wound



Figure 6 Chest wound

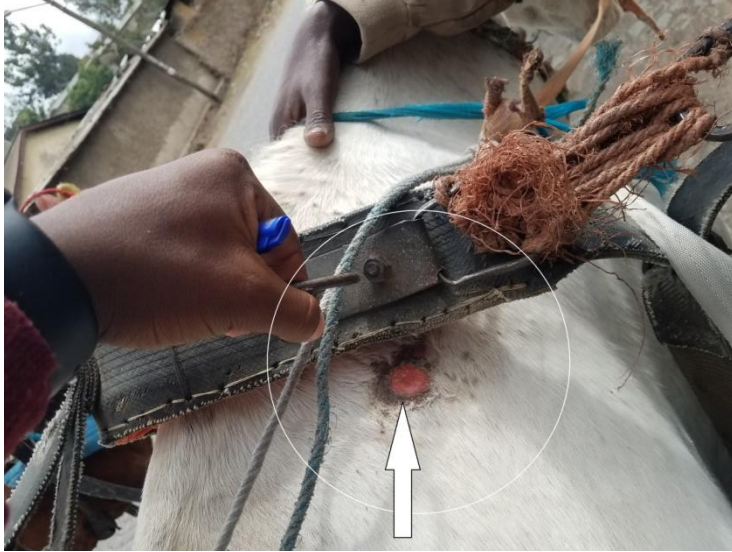


Figure 7 saddle wound

Unusual ways of harnessing and attaching animals to vehicles are responsible for poor work performance, unfitness assessed by days of forced rest, and premature retirement in many situations where equines are used with two-wheeled carts (Clayton et al., 2011; Dittmann et al., 2021).

2.4. WHAT IS ANIMAL WELFARE?

The physical and emotional condition of an animal is influenced by the environment in which it lives and works, human attitudes and habits, and the resources accessible to it (Pritchard et al., 2005). Animals are fully contributing members of our communities which may feel pain, fear, and tension as well as a wide spectrum of pleasant emotions (Wiestner and Weishaupt, 2010).

Developing countries lack the resources and technical developments that developed countries have, thus they must rely on physical or animal labor to help in product manufacture, collection, and distribution. The primary function of a working equid in Ethiopia is to deliver commodities to and from marketplaces. It is very uncommon for one equid to carry loads three times its own

weight and make up to six journeys per day, covering up to 50 kilometers (Brizgys and Brady, 2017). Equid health and performance suffer dramatically when they are subjected to harsh environmental and physical limitations. Equine owners may ignore seeking medical treatment or other charges linked to their working equid due to a lack of revenue to support a family (Upjohn et al., 2012).

The equid's lifespan and overall health are sometimes neglected, as the animal is overworked, further compromising its wellbeing. According to studies, the estimated 91.8 million working equids in developing nations have major welfare difficulties, including restricted availability to clean water, limited grazing options, poor body condition scores, facial and body wounds, and anxiety of human-equid interactions (Lansing, 2010).

2.5. WELFARE ASSESSMENT

Indirect techniques of assessing animal welfare are based on assessing the appropriateness of inputs such as resources and management. These methodologies reflect the likelihood of welfare problems rather than the status of welfare (Pritchard et al., 2005). The benefit of such input-based assessment systems is that they are typically objective and reproducible; yet, a positive score does not always imply excellent wellbeing. In recent years, the use of direct, animal-based metrics to assess the welfare of working animals has grown. Lameness, skin lesions, body condition score, response to spinal contract and general attitude have all been assessed using scoring systems. Although subjective assessments of animal wellbeing are common, they should give a more direct, and hence more reliable, evaluation of welfare than resource measures (Colditz et al., 2013).

3. MATERIALS AND METHODS

The study was conducted in three main locations, to access populations consisting of both cart horses and cart-donkeys, therefore widening the range of equid species reached. Two of the selected locations are regularly exposed to community training interventions by the NGO SPANA (*Society for the Protection of Animals Abroad*), including sessions on harnessing practices. To decrease this bias, a third location where no SPANA community training takes place was included.

The research was carried out in Oromia Region from November 2021 to April 2022 in the highlands of Semen Shewa, where the SPANA does not function, and East Shewa, where the SPANA does. Oromia Region is located in central Ethiopia, between the latitudes of 7.5460° N and 40.6347° E, with elevations ranging from less than 500 meters to more than 4300 meters above sea level. The Oromia Regional State shares boundaries with all of Ethiopia's regional states except the Tigray Regional State. Sudan (66 kilometers) and Kenya (521 kilometers) share international border lines in the west and south, respectively. Oromia is one of Ethiopia's most populated regional states, situated in the country's heartland. Finfinne (Addis Ababa), which is also the capital of Ethiopia, is the region's capital.

Selected locations from Oromia region are:

- Bishoftu: urban, predominance of cart-horses
- Shashamene: rural, predominance of cart-donkeys
- Selale: peri-urban, predominance of cart-horses, unexposed to SPANA community training

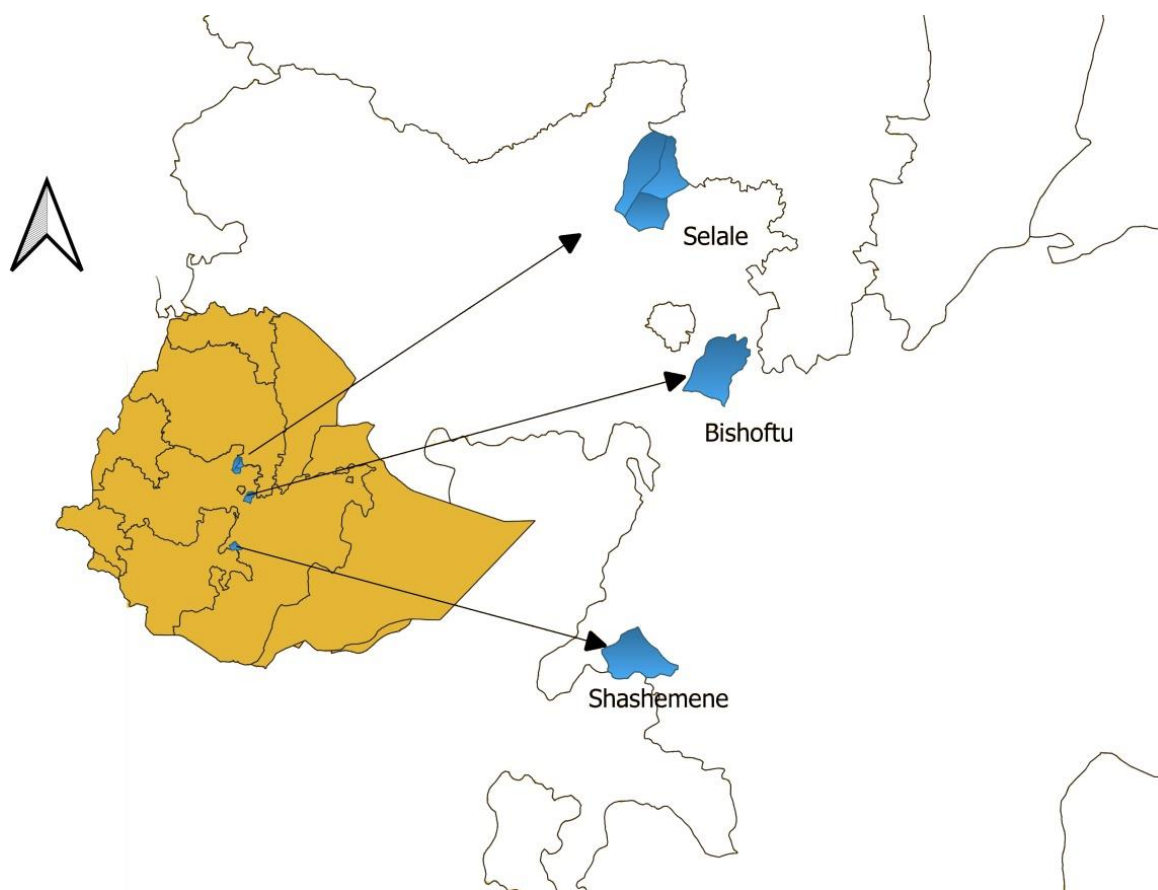


Figure 8 Map of Ethiopia and Oromia Regional State depicting the locations of the Study areas

Selale is located at $9^{\circ}48'N$ $38^{\circ}44'E$, with a height ranging from 2,738 to 2,782 meters above sea level. The rainy season in Selale is chilly and usually overcast, whereas the dry season is pleasant and partially cloudy. The temperature normally ranges from $7.778^{\circ}C$ to $22.7778^{\circ}C$ throughout the year, with temperatures seldom falling below $5^{\circ}C$ or rising over $25.5^{\circ}C$. From February 9 to October 26, the rainy season lasts 8.5 months, with a typical 31-day rainfall of at least 12mm. August is the wettest month in Selale, with an average rainfall of 228.6 mm.

The second study area was Bishoftu. The city located 45 kilometers south-east of Ethiopia's capital, Addis Ababa. In an elevation of 1950 meters above sea level, it is located at 90 degrees

north latitude and 400 degrees east longitude. The area's typical maximum and lowest temperatures are 34.7 °C and 8.5 °C, respectively, with a 61.3 percent relative humidity. There is a bimodal pattern to the rainfall. It receives 1151.6 mm of annual rainfall, with 84 percent falling during the long wet season, which runs from June to September, and the remainder falling during the short rainy season, which runs from March to May.

The last study area was Shashemene. it is an Ethiopian town 250 kilometers south of Addis Ababa, the country's capital, and 25 kilometers north of Awassa, according to the SNNPRS. SNNPR borders it on the south, Seraro on the west, Arsi Negele on the north, and East Arsi Zone on the east. The district's elevation varies between 1500 and 2300 meters above sea level. The district's agroecology is divided into three categories: Kolla (50 percent), Woina Dega (29 percent), and Dega (29 percent) (21 percent). The average annual rainfall in the Shashemene district is 700–950 mm, with a lowest and highest annual temperature of 12°C and 27°C, respectively. The region has a total land covering of 76,888 hectares, with 48,975 ha of farmland and 7440 ha of forest land.

3.1.STUDY POPULATION AND SAMPLING PROCEDURE

Donkeys, mules, and horses were used in the study, and they were from three separate towns in the Oromia region. During the study period in the study regions, randomly chosen donkeys, mules, and horses, regardless of age, sex, or color, were assessed for any welfare concerns related to cart and harness features in fourteen cart stations.

A cross-sectional study of 369 working equids, which play an important role in the area as pack animals, was done. All of the animals were indigenous to the Ethiopia. After stratifying the equids based on their kind of employment, such as taxi transportation, commodities transportation, water transportation, construction activities, multipurpose, and flour transportation from the milling house, sampling was carried out. A proper cart station was assigned to each site, and a proper sample was assigned to each station. Then a direct evaluation was performed on 369 randomly selected equines, followed by an indirect examination of 369 randomly selected owners and

drivers.

Sample Size and Sampling Method:

Thrusfield's (1995) simple random sampling approach provided a formula for calculating the total number of needs for the research. When there is no information for a given study area, it is reasonable to assume a prevalence of 40%. The following formula is used to compute the sample size in this study: 40% prevalence, 5% required degree of accuracy and 95% confidence interval.

$$N = \frac{1.962 (p) (1-p)}{D^2}$$

Where N= sample size

P= Expected prevalence

D= Desired level of precision (5%)

$$\begin{aligned} \text{Therefore } N &= \frac{1.962 (0.4) (1-0.4)}{(0.05)^2} \\ &= \frac{3.8416 \times (0.4) (0.6)}{0.0025} \\ &= \frac{3.8416 \times 0.25}{0.0025} \\ &= \frac{0.9219}{0.0025} \end{aligned}$$

=368.79

=369 equine and owners

3.2.DATA COLLECTION

Direct Assessment:

Data was collected by direct physical examination of the animals using a systematic direct assessment approach. This consists of various of health parameters, such as:

- Equids' age profiles and Breed of animal
- The type of work
- The score for body condition
- Gait condition
- Hoof and limb conditions
- Visible mucous membrane issues and eye problems
- Response to Spinal contract

And also wound assessment. Wounds are a typical presentation for professional equine veterinarians, and they are often preventable. Understanding the underlying causes of wounds is critical for reducing the number of wounds that arise in the future. There are many parameters used for wound assessment classified by size: small, medium and large. They were also graded based on the severity of their skin, subcutaneous, and deeper structures.

The score for body condition

Body condition score 1 and 2 were classed as "very thin" and "thin," respectively, while body condition score 3 was defined as "ideal," and body condition score 4 and 5 were labeled as "fat" and "very fat," respectively(Lansing, 2010).

Condition	Neck	Withers	Back & Loin	Ribs	Hind Quarters
1 Very thin	There is no muscular shelf where the neck joins the shoulder, therefore bone structure is plainly seen.	The bone structure is plainly discernible.	3 plainly felt vertebral points	Each rib is plainly felt.	The tail head and hip bones protrude
2 Thin	can feel bone structure- little shelf where neck joins shoulder	can feel the structure of the bones	The spinous process is plainly felt, but the transverse processes have a thin layer of fat covering them.	minimal fat coating, but still detectable	can touch hip bones
3 Ideal	fat layer on top of bone structure	Depending on conformation, fat deposits over the withers	fat on top of spinous processes	Ribs cannot be seen, but they can be felt.	fat covering the hip bones
4 Fat	The neck slips gently into the shoulder.	withers round out the neck	The rear is level.	fat layer on the ribs	hip bones are not detectable
5 very Fat	fat accumulation on the neck	Withers were padded with fat.	positive crease down the back	Spongy fat over and between the ribs	hip bones are not detectable

Table 1 Descriptions of anatomical differences between body condition scores



Figure 9 Abel, Mathilde and Belay assessing working equid equipment in Selale, Ethiopia.

Cart and harness often cause injury to the animals' where it is placed and touched. Physical injuries/wounds on working equids most frequently caused by cart and harness materials such as bit, blinker, chest band, Saddle, Girth, Tail , shaft Encouragement material, hobble, traditional practices. These cart and harness materials and parts of the animals where they placed are carefully studied.

Indirect Welfare Assessment:

A structured questionnaire was designed to gather information on the principal barriers to using equines, condition of their own cart and harness, knowledge to manage cart and harness, attitude to animal welfare as well as the veterinary care program and wound management system. These were gathered through interviews with 369 equine owners or drivers who were chosen at direct

examination of animal to provide necessary information.

For each sampled animal-cart unit, a cart-driver structured interview was conducted, focused on:

- Demographics, socio-economic circumstances, type of work, experience and ownership;
- Role in the selection, assembly and maintenance of cart and harness;
- Sources of information and advice relating to draught equipment;
- Perception of the relationship between work equipment and animal health and efficiency.

Extensive training on the structured interviews was provided by the University of Melbourne collaborators, as well as support and consultation throughout. Data collection was also piloted with a short sample of cart-horse users in Bishoftu prior to commencement of the study sampling.

Owners' educational level

The response to the question about the owners' educational level was divided into six categories: 'no formal education', 'Primary education', 'early secondary education', 'secondary education', 'late secondary education', 'tertiary education', and 'Rather not say'.

3.3.Focus Group Discussion:

A focus group discussion brought together people from a comparable study region with almost similar experiences to discuss a certain topic chosen by the research team.

It was designed and validated to cover a wide range of role of equine, major constraints, design and characteristics of cart and harness. In each district, focus group discussion were held, with 8 person per group; totally 72 people participate in three focus group discussion per one study area. The method applied to each district is the same and information obtained from three districts of focus groups discussion were recorded by audio recorder and also all ideas raised from the discussion registered on pre-prepared paper clearly.

4. DATA ANALYSIS:

REDCap software was used to enter the obtained animal-cart unit data and user questionnaire data into a specially created cloud-based work space. REDCap (Research Electronic Data Capture) is an EDC software and workflow approach for developing clinical and translational research databases that is browser-based and metadata-driven. In the academic research community, it is commonly utilized.

Collected data assembled and analyzed at group and individual level. Statistical analysis was done using R software and STATA. Data analysis was consisting of descriptive statistics, logistic regressions during the analysis period. To calculate the distributions of the study's variables, a descriptive analysis was used. In each study area, we hypothesized that there was variation in harnessing practices and welfare indicators seen in the animals wearing the equipment. Variations between the demographics of the respondents or their harnessing techniques and the reported harness attributes and animal welfare indicators were also hypothesized. Percentages and proportions were used to examine categorical data. The difference between study factors was analyzed using and analyzed using descriptive statistics. Statistics were stratified based on research criteria such as animal level traits like age and sex, as well as user-level characteristics like experience level, education, and geographic location.

5. RESULTS

SPECIES AND WORK TYPE DISTRIBUTIONS:

Draught, pack, riding, and other forms of working equid were classified. "Draught" animals were equids utilized for cart transportation of goods and people and water. "Pack" animals were equids that were used to convey items by the pack.

The distribution of working equids in each area of the chosen location was studied during the research period. A total of 369 equines were examined during the study period, with 244 (66.12 %) horses, 122 (33.06 %) donkeys, and 3 (0.81 %) mules being examined for general attitude, gait, response to spinal contact, presence of shoes, lesions on various parts of the body, hoof and limb conditions, and body condition status.

Species	No. animals observed	Work type in Baishoftu			Work type in Selale			Work type in Shashemene		
		Taxi	Good Transport	Water transport	Taxi	Good Transport	Water transport	Taxi	Good Transport	Water transport
Donkey	122							82.84 %	17.15%	
Horse	244	72.88 %	19.43 %	7.68 %	74.32 %	21.66%	3.53%			
Mule	3					0.49%		0.01%		

Table 2 distribution of equines according to study area

When the proportion of work types was compared to the study region, a difference was found between Bishoftu, Selale, and Shashemene. In Bishoftu, 72.88 % use taxis, 19.43 % use goods transit, and 7.68 % use water transport. The most common sort of job in Selale was taxi, which is the same as Bishoftu. It was 74.32 %, with 21.66 % for goods transport and 3.53 % for water transport. Cart taxi service is basically non-existent in the Shashemene area. The majority of carts

were used to move commodities and water, accounting for 82.84 % and 17.15 % of all carts, respectively.

Body Condition Assessment

Body condition score 1 and 2 were classed as "very thin" and "thin," respectively, while body condition score 3 was defined as "ideal," and body condition score 4 and 5 were labeled as "fat" and "very fat," respectively.

According to the study, 13.11 % of the 122 donkeys were "Very thin," 84.42 % were "Thin," and 2.45 % were in "Ideal" body score condition. "Thin" body score accounted for 53.68 % of the whole horse population, followed by "Ideal" body score condition, which accounted for 23.36 percent of the overall horse population. The third and last section was occupied by a very thin body score condition, which accounts for around 22.95 %.

Wound assessment

From the total sample 75.60% of working equids were found with wound on different body parts in Bishoftu, 67.47% in Selale and 84.55% in Shashemene area. Bit wounds, blinker wounds, tail/tail base wounds, and encouragement wounds were all thoroughly examined and determined to be 12.73 %, 3.25 %, 5.69 %, and 8.13 %, respectively, throughout all research locations. When compared to other results, such as chest wounds, girth wounds, and saddle wounds, these findings are insignificant. Girth wounds account for the majority of these three major wound results, accounting for 43.90 % of all wounds across the research region. Chest wound 23.30 % and saddle wound 22.49 % took second and third place, respectively. Wounds were identified in all species, however, there was a variation in study areas. The prevalence of chest wounds, girth wounds, and saddle wounds were all linked to harness material type.

wounds_saddle_no	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
2.saddle_shape	.2300639	.1833721	1.25	0.210	-.1293389 .5894667
1.saddle_material__1	.1158246	.5128234	0.23	0.821	-.8892908 1.12094
2.saddle_pressure	-.521466	.1988612	-2.62	0.009	-.9112268 -.1317053
_cons	-.833076	.1921521	-4.34	0.000	-1.209687 -.4564649

Table 3 Association analysis of saddle pressure and saddle wound

The biggest risk factor for saddle wounds is that narrower saddles. They produce greater pressure than wider ones, which can result in injuries. Here it is appreciated that, there is a significant association between Saddle pressure and back wound

As a response to a spinal contract, In Bishoftu, 71 animals showed a weak response to spinal contract, whereas the remaining 52 had a high response. 8 of the 123 animals in the Selale region did not react to spinal contraction. The remaining 53 had a weak reaction and 62 had a strong reaction. In Shashemene, 6 animals are unable to react to spinal contractions, 75 animals have a mild reaction, and 42 animals have a strong reaction.

Gait assessment

Limb-related abnormality (lameness) was common in all study areas, with 28.45% of working animals in Bishoftu, 36.58 % of working equids in Selale, and 14.63 % of working animals in Shashemene showing some degree of gait abnormality, ranging from moderately lame to severely(Immobile) lame.

5.1.QUESTIONNAIRE SURVEY

A total of 369 horse owners from four cart stations in Bishoftu, namely Getishet station, Abo-Dembi station, Kajima station, and Gebeya station, were chosen. Commando Mazoriya, Mazegaja,

Gebeya 1 and 2, and Ugagani site were chosen as the five cart stations from Selale. Cart owners were questioned at four cart stations in Shashemene: 30 Road, Hawassa mewcha, Wondo mewcha, and Gebeya. Data was collected on owner demographics, educational levels, and experience, responsibility for harness and cart equipment selection, factors influencing owners' equipment selection (cost, design, availability, tradition, material, ease of use, and popularity), equipment maintenance, assembly, and hitching, and animal equipment interaction. (rest period, animals' ability to work, load distribution, lameness, wound management) indicated that all animal owners do provide on questionnaire interview.

Owners' educational level

Out of 369 interviewed equine owners, 29(7.85%) had no formal education. Primary education was mentioned by 126 persons, or 34.14 % of the entire study population, which is the highest proportion of the overall population. The second-largest group is early secondary education, which accounts for 29.26% of the whole population (108 people), followed by late secondary, which accounts for 27.37 % (101 people). The final and smallest share was the tertiary level of education, which accounts for only 1.35 percent of the entire population, or only 5 persons.

Educational Level	No formal education	Primary education	Secondary education	Late Secondary	Tertiary education	Rather not to say
Number of drivers in %	7.85	34.14	29.26	27.37	1.35	0

Table 4 Distribution of Owners' Educational Level

Driver Experience

There were three categories for driver experience, the first was for those with less than two years of driving experience, the second was for those with two to five years of driving experience, and the third was for those with more than five years of driving experience. When compared to other

drivers, 22.76 % of the 369 respondents had less experience. They just have two years of experience.. Between the years of two and five, 49.05 % of drivers fall into this category. Drivers in this group have a medium level of experience. It is the largest population category, making up about half of all drivers. People with more than five years of experience were the second-largest category. This group of drivers accounted for 28.18 % of all drivers.

Wound management

The last question concerned equid welfare particularly wound treatment. Only 62 or 16.80% of the 369 owners of working equines were more attentive to their animals when they were injured at work. They verified that they will take their animal to the clinic for wound care or use homemade treatment. However, due to the belief that animals do not require treatment, the remaining 263 owners kept their animals untreated.

Focus Group Discussion:

The method applied to each district was the same and information obtained from three districts of focus group discussion indicated in revealed that equine have multipurpose (Transportation of grain, water and fire wood to market, grain milling houses, people) with various percentages of use types. The participants of focus group also indicated that overworking, over loading, lack of food and water, lack of housing and poor attitude toward equine were the major problems related to management constraints of equine. Welfare, wound management, hitching and assembly of harness, full harness materials, good and bad materials for working that the owners reflected during discussion.

According to respondents, the key limitations of cart animals and owners in each study area were the availability of harness materials, a lack of supply for the use of non-hazardous materials, and harnessing challenges while hitching and installing the animal. Other restrictions of the cart horses in each research region, according to the focus group respondents, included overworking,

overloading, and a lack of additional nutrition. Wheat straw, Teff straw, barley and its straw, green grass, hay, and maize residue were all common feeds for cart horses in the study area.

6. DISCUSSION

The goal of this study was to get a better knowledge of cart and harness procedures in Ethiopia's draught equids, as well as the suitability of the work equipment employed and the resultant consequences on health and welfare in the study region. Concerns can then be prioritized in terms of animal welfare, and more research can be done.

After identifying the risk factors connected with each issue, approaches for reducing or eliminating the consequences of these risks may be incorporated into particular treatments that will be designed and implemented. In this investigation, it was discovered that all of the equines seen (100%) were utilized for work, mostly for hauling commodities, people, and water using various sorts of carts.

This discovery agreed with (Pritchard et al., 2005; Tesfaye et al., 2016; Zekarias and Tesfaye, 2019) assessment that equines were kept primarily for transportation rather for meat or milk production. Donkeys were the most common (80.59 %), followed by horses (16.41 %), and mules (2.98 %); the population distribution of equines indicates that these animals are highly valued by most rural people for pack and cart transportation due to their well-built nature and manageable behavior.

The study found a wide range of welfare issues in the subject animals, the majority of which were significantly associated with the presumed risk variables. According to the study, 13.11 % of the 122 donkeys were "Very thin," 84.42 % were "Thin," and 2.45 % were in "Ideal" body score condition. "Thin" body score accounted for 53.68 % of the whole horse population, followed by "Ideal" body score condition, which accounted for 23.36 % of the overall horse population. The third and last section was occupied by a very thin body score condition, which accounts for around 22.95 %, which could indicate management shortcomings related to poor nutrition and/or health care and over workload. The significant number of skinny and very thin animals could be attributed to heavy workload combined with dietary inadequacies. Another study in Ethiopia (Ayalew et al., 2018) found a negative relationship between physical condition and parasite burden. Furthermore, poor people who cannot afford to provide supplemental food to their family

and pet animals may be the cause. This study found that draught animals had much greater proportions of skinny and girth wound when compared to livestock animals and other work types. This might be related to the increased burden on draught animals compared to others, since these animals were working for long hours each day without adequate nutrition because animals were normally offered adequate meal at home either before or after work.

Out of 369 working equids examined, 75.60 % had wounds on various body parts in Bishoftu, 67.47 % in Selale, and 84.55 % in the Shashemene area. This might demonstrate the scope of the problem in the research region. The back, girth, and chest of equines are the most afflicted body components. The majority of these injuries were caused by improperly fitting harness materials, and some owners intentionally damaged equines, particularly cart horses, to heal their animals, while others purposefully created wounds to beat directly on it, causing the equine to move very quickly. The majority of owners compel their animals to labor despite mechanical injuries. This is due to a lack of a revenue-generating mechanism, and all proprietors are aware that injury affects working productivity. Equines had a substantially greater percentage of lip lesions at 12.73%. This might be related to the bit used to lead and brake draught and riding horses. The prevalence of lip lesions was very widespread across all species, work kinds, and material utilized for a bit, while there was a substantial variance within each of these parameters, according to (Mekuria and Abebe, 2010).

Lesions on the girth (girth wound) were seen 43.90 %, chest wound 23.30 %, and saddle wound 22.49 % on draught on working equids. This is due to the usage of ill-fitting and ragged harnesses on animals while hauling and ridding. Excessive rubbing on the chest by the chest band/rubber rope/unpadded plastic harnessing material and excessive pressure imposed on the chest due to the absence of a swingletree were the most common causes of chest lesions. (Biffa and Woldemeskel, 2006) reported similar findings, when working equids fitted with bad unpadded materials, the chance of chest and neck area lesion occurrence was very high.

According to the findings of this study, the Selale region scored top in terms of chest wound prevalence. Chest wounds were found on 31.70 % of the equines. When this finding was compared

to the other two research areas, it took a greater amount, 21.95 % from Bishoftu and 16.26 % from Shashemene. The absence of a freely moveable swingletree on the cart, which is crucial for balancing the pull of a draught animal when drawing a cart, is a risk factor for a chest wound. Only 25.20 % of the carts in Selale possessed this mechanism, and only 3.22 %, or 1 cart, of these carts had moveable swingletree carts. That's why there is more chest wound prevalence recorded in Selale area.

Girth wounds are skin wounds in working equids caused by friction between the girth (or harness) and the animal. Girth wound is more common than other wounds, accounting for 43.90 % of tested animals with varying degrees of severity. Girth wounds are often referred to as girth blisters. This usually occurs when the girth is overly tight and pinches, or when the girth is dirty or hard. Girth galls are an extremely painful problem to have on a working animal. (Nejash et al., 2017) found similar findings, that when cart equids were hitched by an unbreathable plastic or rubber girth, or when the material was thinner than the standard, or the degree of tightness or looseness of the girth, the likelihood of girth wound lesion incidence increased.

According to the current analysis, incorrect saddle material was a major source of 22.49 % back injuries in all study areas' equines. Injuries were found to be most prevalent on the wither and back, and to be associated with poorly constructed and ill-fitting harnesses and saddles. Equine-drawn carts are frequently designed imbalanced and overly heavy by incompetent craftspeople, who do not consider weight distribution in connection to body balance and movement style. Saddles constructed of wood or iron are continually placed on the back/shoulder and tightly tied to the body by plastic rope or rubber, causing chronic pain and injury. Harnesses were typically constructed of automobile old tire strips, which ripped against the equines' skin and formed enormous open wounds. (Abdisa and Tagesu, 2017) reported a 33.7 % frequency of back problems in equines saddled incorrectly. It may be inferred that whenever an animal works, there is a risk of injury due to a lack of or improper equipment and harnessing. According to the findings of this study, the Bishoftu area ranked highest in terms of saddle wound prevalence. Saddle wounds affected 34.14 % of the equines in Bishoftu. When this finding was compared to the other two research regions, it took a bigger amount, 12.19.95 % from Selale and 18.99 % from Shashemene. The biggest risk factor for saddle wounds is that narrower saddles produce greater pressure than wider ones, which

can result in injuries. When compared to the Selale and Shashemene areas, all 123 carts in Bishoftu possessed this thin saddle type.



Figure 10 type of saddle in Bishoftu



Figure 11 different types of saddle in Selale Area



Figure 12 types of saddle in Shashemene area

The current study comes up with a similar observation to (Abdisa and Tagesu, 2017) findings, just 16.80% transport injured horses to a nearby veterinary facility while treated with pharmaceuticals obtained from a local market, going to a local healer, or treated with medicinal herbs. Due to budgetary restrictions and a lack of awareness, the remaining 71.27% of owners left their animals untreated.

7. CONCLUSION AND RECOMMENDATION

Equines are among the most significant domestic animals that are deeply intertwined to humans. They make significant contributions through their engagement in many social and economic sectors, particularly in underdeveloped nations such as Ethiopia. Working equines perform critical roles in both urban and rural communities in the current research locations, in and around Bishoftu,

Selale, and Shashemene cities, providing draught power, transport, crop threshing, labor opportunities, improving lives, and creating revenue for their resource-limited owners. However, the attention provided to equines was insufficient, and equines' well-being and production were harmed by several health and management issues in the study region. There aren't enough veterinary clinics or veterinarians in Selale to help equestrian owners maintain their animals healthy.

Veterinarians and animal welfare experts should educate owners and cart drivers on the correct usage of harness materials. The community should promote the usage of swingletree, particularly in Selale and Shashemene. Swingletree shields the working animal's chest wound. Additionally, people in Bishoftu should develop utilizing the right saddle type. Proper saddle types have appropriate space around the spine, comfortable and breathable padding, and enough size to relieve pressure.

The most prominent factors of working equid welfare are load distribution during loading and enough rest between successive jobs.

Through the extension practice service of the government and NGO's, mass education should be conducted to create awareness about the importance of how to handle animals to avoid misuse of harness material, stress due to overworking, load balancing, and proper wound management. A comprehensive study on the epidemiology of wound prevalence and equine welfare, as well as their feasible control and prevention methods, should be undertaken

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ANNEX 1 ETHICAL CLEARANCE

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ADDIS ABABA UNIVERSITY
College of Veterinary Medicine
and Agriculture
Bishoftu

Animal Research Ethical Review Committee
(ARERC)

Ethical clearance certificate

Certificate Ref. No: VM/ERC/36/07/13/2021

Name of Applicant: Mathilde Saebra Merridale Punter (PhD student) and Dr Peta Hitchens (PhD supervisor)

Address: Faculty of Veterinary and agricultural Sciences, University of Melbourne in collaboration with College of Veterinary Medicine and Agriculture, Addis Ababa University

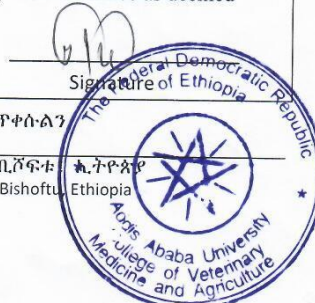
Title of the project: *Cart and harness characteristics in Ethiopia's draught equids-Part I: Contribution of local cart and harness design to the welfare of working equids*

Date of application: **July, 2021**
Tentative project start date: **October/2021**
Nature of the project: **Non-invasive/little stress**
Target animal species: **Cart equids**
Number of animals involved: **369**
Study area: **Bishoftu, Shashemene and Selale (Ethiopia)**
Valid until: **31 October, 2022**
Minutes No. and date of review: **VM/ERC/07/13/021, 01/09/2021**

The above indicated research project is acceptable from ethical perspective, relevance, originality and technical competence points of view. The ARERC also recognizes and endorses the human ethics application approved by the Office of Research Ethics and Integrity of the University of Melbourne (reference 2021-22261-21145-3). Hence the project is **approved** to be executed provided that:

1. All procedures and conditions stipulated in the proposal are respected and any deviation or changes be reported to the committee
2. The project activities be open for occasional supervision by the committee as deemed necessary

Professor Getachew Terefe (DVM, PhD)
Chairman



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Bishoftu, Ethiopia

ANNEX 2 SCRIPT FOR RECRUITMENT DIALOGUE

Cart and harness characteristics in Ethiopia's draught equids MSc 1: Recruitment of animal-cart unit and structured interview participants paper attached

ANNEX 3 CONSENT FORM

Consent Form Attached

ANNEX 5 QUESTIONNAIRES'

Animal Cart Unit record and Owners questionnaires. Attached.