



Working horses welfare assessment and their owners perceive in middle and north Darfur states Sudan

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ABSTRACT

Working horses in Low and Middle income countries have a significant impact on people's lives. In spite of their best, the well-being of Sudanese working horses are neglected. There is no information on Sudanese working horse's welfare. The purpose of this study was to investigate working horse welfare and owners' perceptions in two states. A methodology using owner interviews and direct parameters as well as body condition score and gait abnormality was applied. A total of 150 working horses and their owners were assessed (Middle Darfur =100, North Darfur =50). The results revealed that there was a significant difference between the body condition score of horses from the north and middle state, with 34% and 18% being thin, respectively. There was a significant difference ($P = 0.040$) in nasal discharge, with 24% and 18% of the horses from the north and middle, respectively. Moreover, there was a significant difference ($P < 0.001$) in dirty coat conditions, appeared in 62% and 33% of the horses from the north and middle, respectively. Horses that had external parasites differed significantly between both regions ($P < 0.0001$), with 70% and 23% having parasites in the north and middle, respectively. No significant differences were found between the horses from the north and middle state in terms of skin wounds and kicking behavior. We conclude that the northern state suffers from more direct welfare issues than the middle state. However, indirect parameter measures were worse in the middle state than in north. Owner awareness and additional research are required for both states.

1. Introduction

Working animals are an important role for millions of poor people (Tadich and Stuardo Escobar, 2014). There is growing proof of working equids' socioeconomic contribution to human livelihood, providing revenue for many communities around the world (Popescu et al., 2013). The equids are entrusted with daily tasks such as providing healthcare, transportation, and basic requirements for the owners in most of the marginalized societies around the world (Stringer, 2014). In some places working equids are the only source income (Haddy et al., 2020). The estimated global equids population is 122.4 million, comprising 40 million donkeys, 15 million mules, and 43.3 million horses (Usman et al., 2015). In 2014, the Food and Agriculture Organization of the United Nations (FAOSTAT) recorded a total of 26.03 million equines in

Africa, including 18.9 million donkeys, 6.06 million horses, and 1.02 million mules, according to FAOSTAT production statistics (FAO, 2017). In developing countries as well as Africa, the equid is a very essential animal for people's daily work. They are utilized for pack, draught, agricultural work, and riding, and their owners are often from poor communities with incomes below the international poverty line (Swann, 2006; Dennison et al., 2007). Horses and mules are quicker and more vigorous animals than donkeys for work. However, it is more expensive to buy and keep them than donkeys (Pearson, 2003).

Horses in Sudan are present in both urban and rural communities and they transport water and goods especially in rural areas, and are also used to carry firewood. Moreover, they are extremely valued for work, especially in isolated areas where access is still difficult for motorized vehicles and where short journeys with small loads would be much more

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expensive using other forms of transport (Wilson, 2006). With increasing poverty in Sudan, especially in the Darfur region, the demands on working horses has increased. They travel long distances, carrying people on their back or pulling carts to and from the market or farms, typically carrying heavy loads more than three times their body weight. Farmers frequently demand capable animals, which allow them to occasionally use camels in addition to consuming their meat and milk, keeping them in agriculture in some parts of Darfur, but still rely on equids for draught power.

Animal welfare usually involves five basic freedoms, which provide a common concept of animal welfare (Webster, 2001). First, access to fresh water and food to preserve full health and power means, freedom from thirst, hunger, and nutritional shortages. Second, by providing a suitable environment, including shelter and a comfortable resting spot, an animal can be free of discomfort. Third, by preventing or quickly diagnosing and treating pain, injury, and illness, these make an animal free of pain, illness, and damage. Fourth, by providing appropriate space, good amenities, and the company of other animals of the same species, animals are free to show normal behavior. Fifth, it is possible to be free of fear and distress by confirming conditions that do not cause mental suffering.

Working horses' welfare is poor despite their uses, due to insufficient management and care, particularly in nations like Sudan, where they are susceptible to poor welfare. Mistreatment, cruelty, and a lack of veterinary care for equids have all led to premature death; and at present, a working life of only 4–6 years (Mekuria et al., 2010). Horses, on the other hand, have a lifespan of 20–30 years in countries where animal welfare is safeguarded, with a maximum life expectancy of more than 40 years (Cozzi et al., 2017). The study's aims were to examine and compare the welfare situation of working horses in two separate administrative districts of Sudan, as well as to find out how owners felt about their horses in both the North and Middle Darfur states.

2. Material and method

2.1. Study area

This study was conducted in two states of Darfur (Middle and North). Middle Darfur state is located in Western Sudan at 12° 54' 0" north latitude and 23° 29' 0" east longitude and had a population of 27,258 people in 2009. The state consists mainly of poor savanna, surrounded by desert sands to the north, and the Marra Mountain to the east. North Darfur state is located in northwestern Sudan. It is 205 kilometers northeast of Nyala, Sudan, at 13° 38' 0" north, 25° 21' 0" east, and its original name (with diacritics) is Al Fashir, and it has a population of 264,734 in 2006. This state consists mainly of an arid plateau, covered to the north by the desert sands and to the south by savanna.

2.2. Study population and procedure

The study was conducted over three months, from January to March 2021 to assess major welfare issues and health problems and other related factors that faced working horses in study areas. A total of 150 working horses and their owners were selected, 100 from Middle and 50 from North states were sampled proportionally. The study has examined randomly selected horses and all of which are indigenous breeds. Horses are kept housed in boxes and are provided controlled food and water by their owners or users. This study was carried out on the cart, draught, water tanker pulling and for cultivation horses (Fig. 1). Indirect welfare indicators, such as resource-based variables, were observed from the horses for measurements associated to feeding practices as well as (the provision of food, water and management practices), in addition to direct welfare indicators, such as health indicators and behavioral monitoring with general characteristics. This work was conducted in accordance with the Declaration of Helsinki, the code of ethics of the World Medical Association for human experimentation.

Fig. 1. Described working horse pulling water tanker and also describe the type of harnessing system used by the horse, has been taken by Dr. Abdullah Adam in middle Darfur state.

wma.net/en/30publications/10policies/b3/index.html; EU Directive 2010/63/EU for animal experiments http://ec.europa.eu/environment/chemicals/lab_animals/legislation_en.htm; uniform standards for biomedical journal submissions <http://www.icmje.org>. Additionally, the University of Nyala approved the data, and each participant gave their informed consent before being included in the study. Permission was obtained from the user or working horses' owners after explaining the aim of the study, and we assured them that the data were only to be used for research purposes. If the owner is not willing, then the chance was given to the next willing owner, the same procedure was continued gradually until the required sample size was obtained during the study period as in the of Tesfaye et al. (2016). The owner of the horse was interviewed by researchers and after that, the welfare of the animal was assessed. Scoring one horse took approximately thirty minutes.

2.3. Data collection

In the beginning of January 2021, a pilot study was carried out at the middle and the north state in the west regions of Sudan. Animals were evaluated utilizing a working equid welfare evaluation technique based on previously published literature (Popescu et al., 2013; Pritchard et al., 2005; Burn et al., 2010a). Subsequently the questionnaire and protocol were slightly modified to be more feasible in the field.

2.3.1. Indirect welfare assessment

A total of 150 owners of the working horses (n = 100 from middle state and n = 50 from north state) were interviewed using a consistent, organized questionnaire, which included a mixture of open and closed questions. To record information about sex and age of owners and working practices of horses (work frequency and type), feeding and watering (the frequency of feeding and watering), encouraging horse for the movement (tool type), horse shoeing and trimming practices (frequency), and veterinary consultation (Table 1).

2.3.2. Direct health parameters

The sex of the horses was recorded by observing the external genitalia. The age of horses was classified into four categories (<5, 6–10, 11–15 and >15 years) based on the analysis of the front teeth as in Amante et al. (2014). Each working horse's Body Condition Score (BCS) was scored using a conventional scoring system ranging from 1

Table 1

Description of the indirect welfare (owner interview) indicators applied, the table designed according to previous study (Luna et al., 2017).

Welfare Indicators	Classification	Explanation
1. <i>Sex and Age</i> Sex Age	Male/Female 0–25/26–40/41–55/ > 56	The owners were asked to tell us their sex. The owner was asked about he/she age, and researcher recorded it in category.
2. <i>Working practices</i> Length of time working with horse Frequency of use per day Frequency of use per week Work type	< year/ 3–6years/ > 6years Hours per day Days per week Type of load	The owner was asked about how many times he/she spent working with horse The owner was asked about how many hours per day he/she uses the horse for work The horse's owner was asked how many days a week he or she works the horse. The owner was asked about the activities in which he/she uses the horse (Luna et al., 2017).
3. <i>Feeding and watering</i> feeding Frequency per day Watering frequency per day	Once daily/two daily/> 2 daily Once daily/two daily/> 2 daily	The owners were asked how many times per day he/she provided feed to their horse (Luna et al., 2017). The owners were asked how many times per day he/she provided water to their horse.
4. <i>Encouraging for move</i> Encouraging horse for move	Tool type	The owner was asked about how he/she often encourages the horse to go fast
5. <i>Shoeing and trimming</i> Frequency of shoeing Frequency of trimming Responsible person	1–2 months/ > 2month/not Every 15 days/ 15–30 days/> 30 days/ not Farrier/owner	The owner was asked about the frequency that his/her horse is shod The owner was asked about the frequency that his/her horse is trimmed The owner was asked about the main person who responsible of the shoeing and trimming the horse(Luna et al., 2017)
6. <i>Veterinary consultation</i>	Never/< 1 year/> 1 year	The owner was asked about the last time his/her horse was examined by a veterinarian. The response was considered as never (if the horse has never been inspected by a veterinarian); less than a year ago; or over a year ago (Luna et al., 2017).

(emaciated) to 5 (obese) (Burn et al., 2010a; Carroll and Huntington, 1988). As a part of Wound Assessment, different parts of the body were examined and the following reported: tail base sores, back sores, head and neck wounds, chest sores, and wounds in the hindquarters, also hobble wounds (Tesfaye et al., 2016). Discharge from orifices was also observed, and the presence of ectoparasites was evaluated, as a condition of the hair coat and skin. The hoof shape, conformation and quality were assessed. By observing a horse walking in a straight line for approximately 10 m gait abnormalities (lameness) were assessed and recorded (Table 2).

2.3.3. Horse behavior observations applied

Observations were made in accordance with the welfare assessment protocol, the horses' general attitudes (alert, depressed or apathetic), their responses to both the researcher and the owner approaching them, their responses to the researcher and the owner walking down the animal side, and their responses to chin contact by the researcher and the owner were all assessed in the same way. Alert: When the horse is alert and reacts to various stimuli in the environment (eyes wide open, active movement of the ears, head, tail, and/or skin to keep flies at away). When it demonstrated decreased responses to environmental cues, it became depressed (head lowered, eyes half closed, complete or partial cessation of tail and skin movements to avoid insects, reduced ear

Table 2

Described categories of direct health welfare assessment in working horses, of (n = 150) in two study areas (Luna et al., 2017).

Welfare Indicators	Classification	Explanation
1. <i>Sex and Age</i> Sex Age	Male/Female < 5 years/5–10 years/ > 10 years	The researchers documented the horse's sex by viewing the external genitalia and defining male/female. (Luna et al., 2017) The researchers described the age of the horse based on front teeth of the animal
2. <i>Body condition score</i>	Very thin/ thin/ good/ fat/very fat	The researchers were assessed on five point from 1 to 5 respectively, according to criteria described by (Carroll and Huntington, 1988; Burn et al., 2010a) and the animals were checked from every angle without being touched.
3. <i>Skin wounds and scare</i>	Absent/ At the neck Back/ Hind quarter Tail base/ Chest	As a part of wound and scare assessment lesions if present, were recorded with regard to anatomical location
4. <i>Orifices Discharge</i>	Absent/ nasal /mouth/ ocular	The researchers were observed abnormal external orifice discharge of horse if present, and record down of each
5. <i>Coat condition</i>	Clean/ dirty	The horse's coat condition was classified as clean if the hair coat was uniform, had a healthy appearance (shiny), and was free of dryness, and as unclean if the horse's hair was mixed with other animals' hair (mud or feces) (Popescu et al., 2014; Pritchard et al., 2005)
6. <i>External parasite</i>	Present/ absent	The finding of ectoparasite parasite was documented present, if there any species of parasite on the hair or skin of the horses, and absent if there no parasite has found (Pritchard et al., 2005).
7. <i>Hoof health</i>	Adequate/ inadequate	Horse hoof quality, shape, and conformation were evaluated. If the hooves were round and smooth, there were no cracks or missing parts, and there were no flaws in the hoof capsule, they were regarded sufficient. Otherwise, it is deemed insufficient. (Burn et al., 2010b; Popescu et al., 2014)
8. <i>Gait abnormality</i>	Present/ absent	The horse was observed by the researchers while walking in a straight line for around 10 m. Lameness, uneven stride, unwillingness to put weight on one or more limbs, and unequal head-nodding or hip movement were all evaluated by the researchers, if there is any documented as present, if not documented as absent (Burn et al., 2010b).

movement (Burn et al., 2010b). Each horse's attitude to the researcher and the owner was classified indifference, friendliness, avoidance, and aggression throughout the approach and "walk-by" tests (Popescu et al., 2013). Indifference: Despondent or with a relaxed body and facial expression (with or without moving ears, relaxed lips, possibly half-closed eyes). Friendliness: Turning the head to face the researcher or owner with a calm expression, open eyes, ears forward, and no winking of the lips or nose. Avoidance: The horse maintains an agitated body posture and facial expression (head up, eyes wide open, lips pursed). Aggressiveness: The horse tries to kick or bite the researcher/owner, eyes completely open and head directed toward the

researcher/owner, nostrils dilated with or without crinkles around the mouth, may paw or stamp the ground. In the "chin contact test," the researcher slowly placed his hand under the horse's chin to observe if the horse accepted or rejected the contact, then the horse's response was classified avoidance or acceptance (Burn et al., 2010b). Biting and kicking attempts when being touched, if the horse turns its head in the direction of the observer and tries to bite, then the attempt is a yes; otherwise, it is a no. Kicks made with either the front or back legs, or none at all (Table 3).

2.4. Data analysis

Data both from indirect and direct welfare indicators with general characteristics were properly coded and entered into SPSS (Version 21, IBM Corp, New York, USA). A Percentage and frequency distribution were calculated. The statistical significance of the differences between working horses of Middle and North states were determined using the Chi-square test (χ^2). A P-value of less than 0.05 was considered as statistically significant.

3. Results

3.1. Indirect welfare indicators

In the present study, there was a significant difference ($P < 0.001$) in the age of owners of two states "26–40 years" which 51% in the middle state and 16% in the north state; "41–55 years" which 52% in the north state and 33% in the middle state. The Length of time, which owner had spent working with horse from "3–6 years" there was 36% in the north state and 63% in the middle state in the total of (54%); more than 6 years there were 60% in the north state and 18% in the middle state in total of (32%). Most horses (69.33%) worked 3–6 h per day which 64% in the middle state and 80% in the north state; while (46.66%) of horses working all days per week which 86% in the north state and 27% in the middle state. Most owners (42%) reported that their horses were used for riding, 59% of them are from the middle state. Overall, most owners provided water twice per day, but only 26% of owners from the north state used this frequency compared to 81% in the middle state. In encouraging the horse to increase movement, there was (70%) of owners using a whip to encourage horses to move faster, 84% in the north state and 63% at the middle. Most owners (74.66%) do not trim their horses' hooves, which is 30% in the north state and 97% in the middle state, all those as declared by the owner. No significant difference ($p > 0.05$) was found between the two states regarding feeding frequency, shoeing practice, and responsible person for shoeing in this study, more details in (Table 4).

3.2. Direct health indicators

In terms of the sex of horses there was a significant difference ($P = 0.002$) between the two areas, with 86% being male in the north and 62% in the middle state. Most of the working horses studied were over 10 years of age 43%, 82% in the North state and 22% in the Middle state. Out of 155 working horses assessed for body condition score, 23.33% were scored as thin and most of them 34% in the north state, while 54.66% were scored as good and 20% were scored fat. Abnormal nasal discharges were showed in (20%) of working horses, which 18% of them in the north state, while 15.33% of working horses had abnormal ocular discharges, almost 18% of them in the north state. The evaluation of coat condition of the total population showed that 42.66% of working horses had dirty coat, almost of them 62% in the north state, while 38.66% of horses had external parasites, the majority of them 62% in the north state. No significant difference ($p > 0.05$) was found between two areas in this study regarding skin wound and scare, hoof health and gait abnormality, more details in (Table 5).

Table 3
Description of the behaviours observed in the assessed horses (Luna et al., 2017).

Welfare Indicators	Classification	Explanation
1. <i>General attitude</i>	Alert/ depressed	The horse was observed (only by researcher) from a distance of 3–5 m. The horse's reaction was classified as follows: Alert: when the horse is alert and reacts to various stimuli in the environment (eyes wide open, active movement of the ears, head, tail, and/or skin to keep flies at away). When it demonstrated decreased responses to environmental cues, it became depressed (head lowered, eyes half closed, complete or partial cessation of tail and skin movements to avoid insects, reduced ear movement) (Popescu et al., 2013; Burn et al., 2010b).
2. <i>Approximation test</i>	Indifference/ Friendliness/ Avoidance/ aggressiveness	The researcher approached the horse at a 20-degree angle to the sagittal plane of the animal's body and came to a halt 30 cm away from the horse's head. The researcher documented the horse's reaction as he became immobilized. The owner was asked to follow the identical steps as the researcher, who then recorded the animal's reaction. The following were the responses: Indifference: Unmovable and relaxed, with no attempts to method or move away from the researcher/owner, despondent or with a relaxed body and facial expression (with or without moving ears, relaxed lips, possibly half-closed eyes). Friendliness: Turning the head toward the researcher/owner with a relaxed face and open eyes, ears turned forward, and no crinkling around the lips or nose. Avoidance: The horse maintains an agitated body posture and facial expression (head up, eyes wide open, lips pursed), or the horse turns its head away from the researcher/owner. Aggressiveness: The horse tries to kick or bite the researcher/owner, eyes completely open and head directed toward the researcher/owner, nostrils dilated with or without crinkles around the mouth, may paw or stamp the ground (Popescu et al., 2013).
3. <i>Walk down side</i>	Indifference/ Friendliness/ Avoidance/ aggressiveness	The researcher went beside the horse toward its rear and back, maintaining a 30 cm distance from its body, and then recorded the animal's response. The owner was told to follow the same procedure. As in the approximation test, the horses' responses were faithfully classified. (Popescu et al., 2013).
4. <i>Chin contact</i>	Accept/ avoid	Slowly placing their hand beneath the horse's chin, the researcher assessed whether the animal accepted or avoided the contact. The owner was told to follow the same procedure. The horses' responses were classified as either

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Table 3 (continued)

Welfare Indicators	Classification	Explanation
5. Biting and kicking	Yes/ no	accepting or avoiding contact (Burn et al., 2010b). If the horse turns its head toward the spectator and tried to bites is attempts as yes, if not attempts as no. Attempts at kicking with the front or rear legs, or no attempts at kicking (Burn et al., 2010b).

3.3. Direct behavior observation of working horses

There was a significant difference (P < 0.001) in general attitude of horses, 40% showed a depressed attitude responses towards both the owner and the researchers, which was higher in middle state 53% than 15% in the north state. In the horses response to approximation test there was a significant difference (P < 0.001), 44.66% of them showed indifferent responses, almost of them 72% in the north state. This study also revealed that there was a significant difference (P < 0.001) to walk down side towards both the owner and the researchers, 46% of horses showed indifferent responses which most of them 72% in the north state. In the chin contact test there was a significant difference (P = 0.048), (34%) of horses showed avoidance response to the observer, most of them 39% in the middle state. There was no significant difference (P > 0.05) found in this study, in the term of horses biting and kicking at the owner and researchers (Table 6).

4. Discussion

Working equids make direct and indirect contributions to the livelihoods of the world's poorest people (Popescu et al., 2013). They help to earn income by transporting people, water, products, agricultural produce, and construction materials, among other services (Luna et al., 2017). They also provide draught power for farming (Pritchard et al., 2005; Tadich et al., 2008; Blakeway, 2014). We assessed and compared the prevalence of health and welfare issues among working horses in two states within Sudan in this study. Working horses in research locations are affected by a variety of welfare, management, and health issues, according to the findings of this study.

The fact that all of the owners in this study were men was noted. This finding was in line with earlier research (Mamo, 2019) in which typically 83.8% were male. This agreement would suggest that men are more likely than women to possess working horses. In the term of age groups, 39.66% and 39.66% of owners were in 25–40 and 41–55 years old, respectively, our finding cannot be compared with (Biswas et al., 2013) which 73.3% of the population in the middle age group (18–45 years). This study reveals that the majority (69.33%) of owners were using their animals for 3–6 h a day on average, which differs from Biswas et al. (2013) who report that majority of pack horses work for 9–10 h a day on average. This might be due to different in owner awareness between two studies. The majority (42%) of horses in this study are using as riding animals, most of them (59%) in the middle state. Regarding the working days per week 16.66%, 36.66%, and 46.66% of horses work for 1–2, 3–4 and 5–7 per week, respectively, this finding agrees with Mamo (2019). This agreement with two studies might be due to similar environmental and economic condition which need from the owners to depend on working horses. Horses which are being worked around year need nutrition more than horses that are only worked for short time. Our findings could be a good indicator of horse owners' knowledge levels, in the term of feeding their working horses. This study reported that 88.66% of owners provided feed to their horses more than two times per day, this disagrees with previous study reported by Abebe (2010) that 46% and 24% of the owners provided feed for their working horses once and two times per day, respectively. This could be due to differences in geographical location, management, and horse

Table 4

Results from the variables obtained from the horse owners of (n = 150).

Variables	North state (%)	Middle state (%)	Total (%)	(χ ²)	P-value
Owner's sex					
Male	50(100)	100(100)	150 (150)	150	< 0.001
Female	0(0)	0(0)	0(0)		
Owner's Age					
10–25	0(0)	4(4)	4(2.66)	22.58	< 0.001
26–40	8(16)	51(51)	59 (39.33)		
41–55	26(52)	33(33)	59 (39.33)		
More than 56	16(32)	12(12)	28 (18.66)		
Length of time working with horse					
<years	2(4)	19(19)	21(14)	28.23	< 0.001
3–6 years	18(36)	63(63)	81(54)		
> 6years	30(60)	18(18)	48(32)		
Horse working in hours per day					
<3 h	0(0)	18(18)	18(12)	10.30	0.006
3–6 h	40(80)	64(64)	104 (69.33)		
> 6 h	10(20)	18(18)	28 (18.66)		
Horse working in days per week					
1–2 days	0(0)	25(25)	25 (16.66)	47.9	< 0.001
3–4 days	7(14)	48(48)	55 (36.66)		
All week	43(86)	27(27)	70 (46.66)		
Horse work type					
Transport of people by cart	29(58)	3(3)	32 (21.33)	76.4	< 0.001
Transport of goods by cart	11(22)	28(28)	39(26)		
Riding animal	4(8)	59(59)	63(42)		
Agriculture	6(12)	3(3)	9(6)		
Other	0(0)	7(7)	7(4.66)		
Feeding frequency per day					
One time per day	0(0)	1(1)	1(0.66)	2.7	0.261
Two time per day	8(16)	8(8)	16 (10.66)		
> 2 time per day	42(84)	91(91)	133 (88.66)		
Water frequency per day					
One time per day	1(2)	10(10)	11 (7.33)	63.10	< 0.001
Two time per day	13(26)	81(81)	94 (62.66)		
> 2time per day	36(72)	9(9)	45(30)		
Encouraging horse for move by					
Stick	4(8)	2(2)	6(4)	14.55	0.002
Whip	42(84)	63(63)	105(70)		
Voice	4(8)	33(33)	37 (24.66)		
Hand	0(0)	2(2)	2(1.33)		
Trimming practice					
Every 15 days	1(2)	1(1)	2(1.33)	80.9	< 0.001
15–30 days	10(20)	1(1)	11 (7.33)		
> 30 days	24(48)	1(1)	25 (16.66)		
Not	15(30)	97(97)	112 (74.66)		

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Table 4 (continued)

Variables	North state (%)	Middle state (%)	Total (%)	(χ^2)	P-value
Shoeing practice					
1–2 month	1(2)	0(0)	1(0.66)	4.01	0.134
> 2 month	0(0)	4(4)	4(2.66)		
Not	49(98)	96(96)	145 (96.66)		
Responsible person of shoeing					
Farrier	0(0)	1(1)	1(0.66)	2.06	0.358
Owner	0(0)	3(3)	3(2)		
Not	50(100)	96(96)	146 (97.33)		
Veterinary consultation					
Never	8(16)	75(75)	83 (55.33)	51.54	< 0.001
< year	25(50)	21(21)	46 (30.66)		
Year >	17(34)	4(4)	21(14)		

health care provided at different locations. While, 88.66% of owners in this study provided feed for their working horses more than 2 times daily. A few of them (30%) had access to drinking water more than two times per day, this percent is lower than in Luna et al. (2017), which according to the owners, (90%) of the animal have access to drinking water throughout the day.

Although the majority 42% of working horses were above ten years old, 23.33% of horses under five years of age, most of them 32% in the middle state. This was also confirmed by prior research findings (Chaburte et al., 2019). This suggests that horse owners in the research area start using their horses for labor before they are fully mature (Chaburte et al., 2019). Equine maturity is estimated to be at four years old and working with them before this age predisposes them to anatomical malformations including drooping back and early mortality (Chaburte et al., 2019). The animals' body conditions were observed, and it was reported that 23.33% were thin body condition score, with no significant difference in two study areas, which agreed with a previous study reported by Abebe (2010) that 26.2% of horses had thin. The explanations that working horses have low BCS are multifactorial, such as diseases, internal parasites, overworked and the deficiency of feed and supplementary diets. Our study revealed that 42.66% of working horses showed abnormal coat condition, which is higher in the north state 62% than 33% in the middle state. This result is disagreement with finding of Luna et al. (2017) which only found 14% in dirty coat condition. This difference might be due to the owner awareness or housing system, which is poor in our study in terms of coat cleanliness. Observations regarding external parasites revealed that 38.66% of animals had ectoparasites infestation. The present finding is higher than finding of Biswas et al. (2013) who found only 16% of the equines to be infested with ectoparasites. This may be due to lack knowledge of health care, feeding and irregular or no medication for parasites (Biswas et al., 2013). Lameness, anomalies in the foot, and poor hoof care are all common problems in working animals (Burn et al., 2010a; Tadich et al., 2008). The significant incidence of the condition in the research area indicates a lack of veterinary services, a lack of farriery training courses, and inadequate management practices by the owners (Chaburte et al., 2019). In this study the frequency of inadequate hoof was 26.66%, with no differences between two regions. The prevalence of lameness was found to be decreased in our study and hoof abnormalities in working horses when compared with the prevalence 53% reported from a study on working horses (Luna et al., 2017). This disparity could be attributable to differences in grazing and working practices between the two research regions. According to the findings of this research 22% of working horses had abnormal gait, with no significant difference between two areas. The finding was in disagreement with 48% of previous study (Biswas et al., 2013). Environmental factors, the owner's conduct,

Table 5

Distribution of horses general characteristic and direct health parameters of (n = 150).

Variables	North state (%)	Middle state (%)	Total (%)	(χ^2)	P-value
Horse sex					
Male	43(86)	62(62)	105(70)	9.14	0.002
Female	7(14)	38(38)	45(30)		
Horse age					
< 5 years	3(6)	32(32)	35 (23.33)	49.34	< 0.001
5–10 years	6(12)	46(46)	52 (34.66)		
> 10 years	41(82)	22(22)	63(42)		
Body condition score					
Very thin	3(6)	0(0)	3(2)	12.7	0.005
Thin	17(34)	18(18)	35 (23.33)		
Good	24(48)	58(58)	82 (54.66)		
Fat	6(12)	24(24)	30(20)		
Very fat	0(0)	0(0)	0(0)		
Skin wound					
Absent	41(82)	74(74)	115 (76.66)	6.97	0.222
At the neck	3(6)	12(12)	15(10)		
Back	4(8)	12(12)	16 (10.66)		
Hind quarter	1(2)	0(0)	1(0.66)		
Tail base	1(2)	0(0)	1(0.66)		
Chest	0(0)	2(2)	2(1.33)		
Skin scare					
Absent	39(78)	73(73)	112 (74.66)	8.4	0.138
At the neck	2(4)	9(9)	11(7.33)		
Back	7(14)	12(12)	19 (12.66)		
Hind quarter	0(0)	3(3)	3(2)		
Tail base	2(4)	0(0)	2(1.33)		
Chest	0(0)	3(3)	3(2)		
Orifices					
Discharge					
Absent	26(52)	68(68)	94 (62.66)	8.31	0.040
Nasal	12(24)	18(18)	30(20)		
Mouth	3(6)	0(0)	3(2)		
Ocular	9(18)	14(14)	23 (15.33)		
Coat condition					
Clean	19(38)	67(67)	86 (57.33)	11.5	< 0.001
Dirty	31(62)	33(33)	64 (42.66)		
External parasite					
present	35(70)	23(23)	58 (38.66)	31.05	< 0.001
Absent	15(30)	77(77)	92 (61.33)		
Hoof health					
Adequate	41(82)	69(69)	110 (73.33)	2.9	0.065
Inadequate	9(18)	31(31)	40 (26.66)		
Gait abnormality					
Present	13(26)	20(20)	33(22)	0.69	0.263
absent	37(74)	80(80)	117(78)		

the frequency and type of labor, the type of harness materials used, ill-fitted harness, and the absence of padding on the backs of the horses may all have a role in the occurrence of wound problems, as evidenced by previous studies (Ashinde et al., 2017). Our study showed that 10% and 10.66% of working horses had wounds at their neck and back, respectively, in. Excessive rubbing on the site by the rope that goes

Table 6
Described direct behavior observation of working horses of (n = 150).

Variables	North state (%)	Middle state (%)	Total (%)	(χ^2)	P-value
General attitude					
Alert	43(86)	47(47)	90(60)	21.13	< 0.001
Depressed	7(14)	53(53)	60(40)		
Approximation test					
Indifference	36(72)	31(31)	67 (44.66)	22.94	< 0.001
Friendliness	8(16)	43(43)	51(34)		
Avoidance	5(10)	19(19)	24(16)		
Aggressiveness	1(2)	7(7)	8(5.33)		
Walk down side					
Indifference	36(72)	33(33)	69(46)	23.12	< 0.001
Friendliness	7(14)	43(43)	50 (33.33)		
Avoidance	7(14)	17(17)	24(16)		
Aggressiveness	0(0)	7(7)	7(4.66)		
Chin contact					
Accept	38(76)	61(61)	99(66)	3.34	0.048
Avoid	12(24)	39(39)	51(34)		
Biting					
Yes	2(4)	6(6)	8(5.33)	0.26	0.465
Not	48(96)	94(94)	142 (94.66)		
Kicking					
Yes	4(8)	12(12)	16 (10.66)	0.6	0.328
Not	46(92)	88(88)	134 (89.33)		

under the neck of working horses, where there is frequent movement and rubbing as the horse moves forward, and incorrect equipment on the back of the horse causes these wounds. This a lower prevalence than a previous study 44% (Chaburte et al., 2019), and could be due to differences in the types and frequency of work done, the materials utilized, and the owner's level of awareness of horse welfare at the two research sites. In the term of scars, 7.33% and 12.66% of working horses had neck and back scars, respectively, which was a lower prevalence than the finding of Biswas et al. (2013) and Pritchard et al. (2005).

Behavioral examinations are an important part of a working animal's welfare assessment (Luna et al., 2017). These tests reveal how the animal interacts with the environment in which it lives to some extent (Pritchard et al., 2005) and can assist in determining the human–equid relationship's quality (Ali et al., 2016). According to the current study, general attitudes of horses toward the owner and the observer was responded to by 60% and 40% of alert and depressed behavior, respectively, which alert response higher in the north state 86% than the middle state 47%, while depressed was higher in the middle state 53% than the north state 14%. This suggests that the human–animal relationship, as well as the proper treatment of horses by owners, may differ. This result has been supported by Luna et al. (2017) where an alert attitude is highly prevalent. However disagreed with Chaburte et al. (2019) which assessed cart horses and no type of strange behavior has been showed. This study also revealed that 44.66% and 46% of horses showed indifference in approximation and walk down side test, respectively, which is high in the north state more than the middle state. These results were agreed with previous studies (Popescu et al., 2013; Pritchard et al., 2005) the most common behaviors found in working equids were negative. Good attitudes toward animals were linked to more positive encounters, and these positive interactions were negatively associated with the animals' fear of people (Hemsworth et al., 2000). As a result, it's probable that the owners surveyed in this study have a low level of positive regard for their equids, as evidenced by the higher occurrence of negative comments.

5. Conclusion

The higher prevalence of welfare problems in terms of trimming, shoeing practice and veterinary consultation, indicate that there is a poor welfare status for the majority of working horses of the two regions in this study. Educational programs for owners and local farriers are needed; due to lack thoughtful of basic husbandry practices has been showed in this study. The present study revealed that dirty coat condition, the presence of ectoparasites and bad behavior responses, are more prevalent in the north state more than in the middle state. This might indicate that lack of owners' awareness or veterinary service. Further research on working horses in the north and the middle state and preliminary guideline development to improve horses' well-being, particularly in the north state is needed.

Author agreement

This memo certifies that all authors have seen and approved the manuscript. As the corresponding author, I warrant that the article is the author's original work and that the article has not received prior publication and is not under consideration for publication elsewhere. On behalf of all co-authors, as the corresponding author, I shall bear full responsibility for the submission.

Conflict of interest

There were no conflicts of interest by any of the authors.

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