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Full Length Research Paper

Prevalence and intensity of gastrointestinal nematodes infection in sheep and goats in semi-intensively managed farm, South Ethiopia

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Infections with gastrointestinal nematodes (GIN) severely affect small ruminant's health and compromise their productivity and reproductive performances and can be a major cause of economic losses in small ruminant production. A cross-sectional study was conducted between January and March 2017 in semi-intensively managed sheep and goats farm to determine the prevalence and intensity, and to identify the major genera of GIN. Faecal samples collected from a total of 192 small ruminants (60 sheep and 132 goats) were examined by McMaster technique and those samples positive for GIN were cultured for identification of the major genera. Furthermore, blood samples were collected from 112 goats for determination of the packed cell volume (PCV). The prevalence of GIN infection in the current study was 83.3 and 87.9% in sheep and goats, respectively. There was no statistically significant (p>0.05) difference in prevalence between sheep and goats. The faecal egg count (FEC) result showed that 60% of sheep and 48.3% of goats examined were heavily infected. No statistically significant difference (p>0.05) was noted in mean FEC between sheep and goats. The mean PCV was significantly (p<0.05) lower in parasitaemic goats (23.2±0.35 SE) than aparasitaemic ones (26.9±0.73 SE). Faecal culture from positive animals revealed the same genera of GIN in both sheep and goats. These are *Haemonchus*, *Trichostrongylus, Oesophagostomum*, *Bunostomum* and *Trichuris* species in order of their abundance. In general, the present study showed a high prevalence and intensity of GIN infection in both sheep and goats in the study farm demanding strategic deworming practice and appropriate pasture management.

Key words: Ethiopia, gastrointestinal nematodes, goats, prevalence, sheep.

INTRODUCTION

Sheep and goats were the first livestock to be domesticated in central Asia, over 10,000 years ago, and are both currently widespread throughout the world and they are kept mainly for milk, meat, fiber, leather and showing or as pets (Bates, 2012). Ethiopia owns a considerable potential of small ruminants which are estimated to be 30.7 million sheep and 30.2 million goats (CSA, 2017). These animals play a significant role in food security and food self-sufficiency of rural households in the country. Apart from this, they are important sources

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of foreign currency to the country through export of meat and skin to the Middle East countries. Despite their numerical importance, the productivity of small ruminants in Ethiopia is still low due to poor management, diseases and feed scarcity.

Gastrointestinal nematode (GIN) infections are among the major diseases affecting the productive and reproductive performance of sheep and goats in Ethiopia (Asmare et al., 2016). Infections with GIN severely affect small ruminant health and compromise their productivity and reproductive performances (Baker, 2001; Suarez et al., 2009) and can be a major cause of economic losses in small ruminant production (Coop and Kyriazakis, 2001). GIN infections are a world-wide problem for both small- and large-scale farmers, but their impact is higher in sub-Saharan Africa in general and in Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species (Regassa et al., 2006).

The morbidity and mortality effects of GIN results from the parasites' feeding activities or physical presence, migration and associated host immune response, abomasal hypertrophy, and blood and protein loss. Anemia, a decrease in the red blood cell (RBC) mass, results consequent to blood and protein loss. It is determined by measuring the packed cell volume (PCV that is hematocrit), the amount of hemoglobin in the blood, and the erythrocyte count (Thrall et al., 2012). The PCV value of normal goats ranges from 22 to 38% (Jackson and Cockcroft, 2002).

Over the years, several studies have been conducted in Ethiopia to assess the distribution of GIN infections in small ruminants. According to the available published reports, the prevalence of GIN infection is very high ranging from 24.7 (Aga et al., 2013) to 98.89% (Asha and Wossene, 2007). However, most of the previous studies were conducted in extensively managed sheep and goats and no information is available about the status of GIN in semi-intensively managed farms currently emerging in the country. Hence the objective of this study was to determine the prevalence and intensity of GIN infection, and to identify the major genera in semi-intensively managed sheep and goats.

MATERIALS AND METHODS

Study area

The present study was conducted in KALHARI private sheep and goats farm which is located between 6°45' N latitude and 38°20' E longitude in Dale district, Sidama zone, Southern Nations Nationalities and Peoples Regional State (SNNPR), Ethiopia. The annual mean maximum and minimum temperature of Dale district is 25.4 and 14.5°C, respectively.

Study population

The study population is composed of all adult female goats and black head Somali sheep purchased for breeding purpose from Negelle Borana pastoral area. The animals were raised under semi-intensive management in the farm. They were mainly provided with concentrates and silage and allowed to graze in the compound for some hours during day time.

Study design and sampling methods

A cross-sectional study design was employed to determine the prevalence of GIN nematodes in the farm. The sample size was determined according to the formula given by Thrusfield (2005) considering an expected prevalence of 97.4 and 94.4% for sheep and goats, respectively (Aragaw and Gebreegziabher, 2014). In this study since the population size is small (350 goats and 150 sheep) the required sample size was adjusted according to Thrusfield (2005). Accordingly, a total of 132 goats and 60 sheep were selected following a systematic random sampling technique.

Study methodology

Faecal sample collection and examination

About 5 to 10 g of faecal sample was collected once from each study animal directly from the rectum or during defecation in a screw-capped universal bottle (Hendrix, 1998). The samples were labelled with the required information and transported in cool box soon to Hawassa University, Faculty of Veterinary Medicine Parasitology laboratory for analysis. Those samples which were not examined on the same day were stored at 4°C and examined the next days. In the laboratory, the samples were processed by McMaster technique to detect the presence of GIN and determine faecal egg count (FEC) following the procedure described by Zajac and Conboy (2012) and Hansen and Perry (1994). The intensity of infection was categorised as light (50-800 FEC), medium (801-1,200 FEC) and heavy (>1,200 FEC) according to Hansen and Perry (1994) given for a mixed infection in small ruminants.

Faecal culture and larval identification

Faecal culture and identification of larvae were done according to Hansen and Perry (1994). Faecal samples from positive animals were cultured on Petri dish and then larvae (L_3) were recovered by means of Baermann technique after 14 to 21 days of culture at room temperature (25°C). The recovered larvae were examined under 40x magnification and identification to the genus level was done on the basis of morphological characteristics (Zajac and Conboy, 2012).

PCV determination in goats

Due to limitation of resource and time constraint, blood collection for PCV determination was done only from goats. About 2 ml of blood sample was collected from jugular vein of goats into EDTA coated tubes. Then, the samples were transported with ice box to Parasitology and Pathology Laboratory, Faculty of Veterinary Medicine, Hawassa University for determination of PCV (Coffin, 1995). The PCV value obtained from examined goats was compared with the normal value (22-38%) set for the species (Jackson and Cockcroft, 2002).

Data management and analysis

All the data collected were entered into the Microsoft Excel, coded and analysed using STATA software for Windows version 11.0. Chi-

Table 1. Prevalence of Gastrointestinal nematodes in sheep and goats.

Species	Number examined	Number positive	Prevalence (%)	χ^2	p-value
Sheep	60	50	83.3	0.73	0.394
Goat	132	116	87.9		
Total	192	166	86.5		

Table 2. Intensity of Nematode infection based on fecal egg count (FEC) in sheep and goats.

Intensity of infection	Sheep		Goat		Total	
	Number	%	Number	%	Number	%
Light (50 - 800)	11	22	47	40.5	58	34.9
Moderate (801- 1200)	9	18	13	11.2	22	13.3
Heavy (> 1200)	30	60	56	48.3	86	51.8

Table 3. Mean FEC of Gastrointestinal nematodes in sheep and goats in KALHARI farm.

Species	Number examined	Arithmetic mean	Log mean	Standard deviation	95% CI	t	p-value
Sheep	60	2496.7	2.72	1.29	2.39 -3.05	0.16	0.87
Goat	132	1708.7	2.69	1.10	2.50 -2.88		
Total	192	1954.9	2.70	1.16	2.53 -2.86		

Table 4. Major Gastrointestinal nematodes genera identified by coproculture and their proportion.

Genus	Sheep		Goat	
	Number of larvae	Proportion (%)	No. of larvae	Proportion (%)
Haemonchus species	57	42.5	65	41.1
Trichostrongyilus species	51	38.1	60	38.0
Oesophgostomum species	20	14.9	22	13.9
Bunostomum species	5	3.7	9	5.7
Trichuris species	1	0.7	2	1.3
Total	134	100%	158	100%

square test was used to compare the difference in prevalence between sheep and goats. The difference in mean FEC of GIN between sheep and goats and mean PCV value between parasitaemic and aparasitaemic goats was evaluated by t-test. Statistical significance was set at $p<0.05$ with 95% confidence level.

RESULTS

Prevalence and faecal egg counts

Out of the total 60 sheep and 132 goats examined, 83.3% (n=50) and 87.9% (n=116) sheep and goats, respectively were affected with one or more genera of GIN. No significant ($p>0.05$) variation was noted in the prevalence of GIN infection between sheep and goats (Table 1). The faecal egg counts (FEC) varied from 0 to 20,850 in sheep while 0 - 10,100 in goats. Categorization of the intensity of infection based on FEC revealed that 60% of sheep and 48.3% of goats were heavily infected (Table 2). The difference in mean FEC between sheep and goats was not significant ($p>0.05$) (Table 3).

Gastrointestinal nematodes identified

The result of coproculture in sheep and goats revealed a higher proportion of *Haemonchus* followed by *Trichostrongylus, Oesophagostomum*, *Bunostomum* and *Trichuris* species (Table 4).

Table 5. Mean packed cell volume of parasitaemic and aparasitaemic goats.

Status	Number examined	% of goats with PCV < 22	Mean PCV	Std. Error	95% CI	t	p-value
Parasitaemic	98	26.5	23.2	0.350	22.5 -23.9	3.74	0.0003
Aparasitaemic	14	0	26.9	0.733	25.3 - 28.4		
Total	112	23.2	23.7	0.338	23.0 - 24.4		

Assessment of PCV values in goats

The PCV value of 112 goats was measured to evaluate its correlation with GIN infection. Accordingly, it was found that the mean PCV of parasitaemic goats (23.2 ± 0.35) was significantly ($p<0.05$) lower than that of aparasitaemic animals (26.9 ± 0.73). Moreover, it was noted that 26.5% of parasitaemic goats have PCV value less than 22% while all aparasitaemic animals have PCV values 22% or above (Table 5).

DISCUSSION

In the present study, a high prevalence of GIN infection was recorded in both sheep (83.3%) and goats (87.9%) in KALHARI farm. This finding is higher than the prevalence reported by much of previous studies which ranges between 47.2 to 75.3% in sheep and 34.2 to 84.1% in goats in different parts of the country (Abebe et al., 2010; Admasu and Nurlign, 2014; Yimer et al., 2016; Yimer and Birhan, 2016; Ahmed et al., 2017; Derso and Shime, 2017; Getachew et al., 2017). In contrast, higher prevalence than the present had been reported by other studies (Tefera et al., 2009; Aragaw and Gebreegziabher, 2014; Wondimu and Gutu, 2017). This variation might be due to differences in agro-ecological conditions and management system.

The present study showed lack of significant variation ($p>0.05$) both in the prevalence and intensity of infection between sheep and goats. This is because both sheep and goats had equal chance of exposure to the infective larvae on pasture as all of the study animals were sampled from the same farm and kept under similar management conditions. In agreement to this finding, some of previous studies have also reported absence of significant prevalence differences between the two species (Tefera et al., 2009; Admasu and Nurlign, 2014; Aragaw and Gebreegziabher, 2014; Yimer and Birhan, 2016; Ahmed et al., 2017). In contrast to these, other researchers (Emiru et al., 2013; Belina et al., 2017; Derso and Shime, 2017; Getachew et al., 2017; Wondimu and Gutu, 2017) found significant difference in prevalence between sheep and goats. Similarly, unlike the present study, Abebe et al. (2010) observed significantly higher mean FEC of GIN in sheep than goats.

In contrast to previous studies (Regassa et al., 2006; Tefera et al., 2009; Admasu and Nurlign, 2014) which reported relatively lower proportion of massive infection in sheep and goats, this study demonstrated that a higher proportion of sheep (60%) and goats (48.3%) examined were heavily infected. Consistent to the current finding, a higher proportion of massive infection has also been documented in other studies in the country (Abebe et al., 2010; Ahmed et al., 2017; Getachew et al., 2017). Observation of heavy intensity of infection in the present study may be attributed to lack of regular deworming practice in the farm and consequently increased contamination of grazing pasture with eggs excreted by infected animals. The other possible explanation for the high faecal egg counts is the observation of *Haemonchus* species in more substantial proportion of affected animals. These parasites are very prolific, every single parasite capable of laying thousands of eggs daily and this continues for several successive months as long as environmental factors are favourable (Radostits et al., 2007).

As mentioned above, *Haemonchus* species was the most abundant parasite identified in both sheep and goats in the current study followed by *Trichostrongylus* species, *Oesophagostomum* species, *Bunostomum* species and *Trichuris* species. The preponderance of *Haemonchus* in the present study is entirely in agreement with the recently conducted systematic review of GINs of small ruminants in Ethiopia which revealed *Haemonchus contortus* as the most prevalent parasite in sheep and goats (Asmare et al., 2016). Indeed, it is one of the most pathogenic nematode parasites in ruminants implicated in widespread morbidity and mortality of sheep and goats (Taylor et al., 2007) and thus warrants special attention in gastrointestinal parasite control programs.

Due to limitations of resource, measurement of PCV was carried out. Analysis of the mean PCV revealed a significantly lower value in goats affected with GIN than in those not infected. This could be linked to the blood feeding habit of *Haemonchus* species that was recorded in a higher proportion in the infected animals.

Conclusion

This study revealed a high prevalence and intensity of GIN infection in sheep and goats in the study farm without significant difference between the two species. Perhaps this is attributed to lack of regular deworming practices in the farm. Indeed, the study provides

substantial evidence that GIN could have serious impact on the productivity of the animals and profitability of the farm. Thus, strategic deworming of the animals using most effective anthelmintics and improvement of management practices are required so as to reduce losses associated with the parasites and ensure the profitability of the farm.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

The neglected welfare statue of working donkeys in Ethiopia: The case of Dale district in Southern Ethiopia

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A cross sectional study was conducted on A total of 246 working donkeys from October 2015 to May 2016 with the objectives of assessing the welfare problem and harness related wound in dale district of Sidama Zone. The data were collected using direct (animal-based, using the hand tool) and indirect (owners resource-based, through questionnaire survey) methods. Indirect data was collected on the working management of donkeys whereas direct data was collected through observation of behavior (emotion and energy state), body condition score, wound, lameness and other signs of diseases. The qualitative behavior assessment (QBA) was employed to assess the behavior and communication of donkeys. The overall prevalence of wound occurrence was 43.1% whereas; prevalence of lameness was 22.7%. Majority of donkeys examined for emotional and energy state by QBA showed 39.8% with high-energy state, reflecting poor behavior and communication. The common sites of wound in donkey's were back sore, tail sore, chest wound, bit, girth and bite. From the total of 246 donkeys working, only 57 (23.1) were using improved harness. The occurrence of wounds was found to be statistically significantly associated with age (P=0.000) and use of improved harness (P=0.002). In conclusion, illiteracy and not using of improved harness contributed to the compromised welfare. Therefore, there should be massive awareness creation on animal welfare, sentient being and health management. There should be also significant endeavor at multiple stages; community, local service providers and policy level to improve the welfare statue of working donkeys in the area in particular and in the country in general.

Key words: Dale District, harness, welfare problems, working donkey, wound.

INTRODUCTION

Donkeys in Ethiopia have been used as a beast of burden for a long time and still render their valuable services (Pearson et al., 2001). Working donkeys play a fundamental role in human livelihoods through their direct and indirect contributions to financial, human and social capital. They are also important in communities' and households' socio-cultural lives, as they are often used in celebrations and in supporting households in need by being lent and shared between families (The donkey sanctuary, 2017).

Despite the great contributions of donkeys in the daily life and livelihoods of people, who solely or partly depend on them, they suffer the negative impact of feed shortage, poor health, low social status and poor

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management (Feseha, 1997). The low level of development of the road transport network and the rough terrain of country makes the donkey the most valuable pack animal under the smallholder farming systems of Ethiopia (Birhan et al., 2014). Despite their use, the husbandry practice working equines especially of donkeys. The donkeys in Ethiopia are brutally treated, made to work overtime without adequate feed or health care indicating their poor welfare status (Pearson et al., 2003).

One of the major welfare problems in working animals are the use of inappropriate harness and working implements. The most frequent causes of harness sores in developing countries is modification or improvisation; a proven design has taken place without understanding the principles of traction or the function of each part of harness. A poorly designed or ill-fitted harness can cause inefficient transfer of power from the animal to the implement, fatigue, discomfort or injury to the animal (Hovell, 1998). A poor harness is one that injures the animal and/or hinders natural movement, breathing or blood circulation. When multiple hitches are used, it is generally assumed that the total animal energy available is less than the sum of components in the team (Bobobee, 2007*).* A properly designed, well-fitted and comfortable harness allows the working animals to pull the equipment to the best of its ability without risk of injuries (Wilson, 2007). The use of inappropriate harness is one of the major causes of welfare problems, leading to damage of skin and injuries.

The welfare of working donkeys is comprehensive, addressing the emotional need, physical need of the animal and naturalness of the animal. Even though, donkeys play vital role in the socio-economy of the local communities, there was limited information regarding donkey welfare status in the study area. Therefore, this study was designed with objectives of assessing the working management of owners and determines the prevalence of welfare problems and it potential causes.

MATERIALS AND METHODS

Study area

The study was conducted in Dale district, Sidama Zone, Southern Ethiopia. Sidama zone has geographic coordinates of latitude, 5°45° and 6°45° and longitude East 38° and 39°. It has total area of 10,000 km square of which 97.71% is covered with dry land where 2.29% is covered with water body.

Study population

The study population was donkeys and their owners in dale district. The study animals were selected from 3487 donkeys' population in the district [The study animals were selected from 5 kebeles' (the smallest administrative unit] of Dale district. The total population of donkey owner's in Dale district was 1760 (The Dale district agricultural Office annual report, 2017).

Study design

A cross sectional study design was followed to assess the welfare problems on working donkeys and management practices of owners. Observational assessment of donkeys and semi-structured pre-tested questionnaire interview were applied in this study. For observational study, welfare of working donkeys were assessed by "The hand Tool" (Galindo et al., 2018). The questionnaire survey was used to assess the common health problems during the last one-year period and to investigate working management. The emotional state of donkeys and the way how owners communicate with them were assessed by qualitative behavior assessment (QBA) in four levels. The QBA tool measures the emotional state and energy level of a donkey in resting condition. It has four out results; positive high energy, positive low energy, negative high energy and negative low energy according to Wemelsfelder et al. (2009).

Sample size and sampling

Random sampling was followed and the sample size was determined on the bases of the 80% prevalence (Donkey sanctuary Hawassa project, annual report, 2014). Accordingly, the sample size was cut to be 246 (Thrusfield, 2007). For interview purpose, 10% of the total donkey owners in the district and 176 donkey owners, were engaged in the study. The desired absolute precision at confidence level of 95% was used.

Ethical clearance

The study was an observational study and no animal and human were subjected to suffer as a result of this study.

Data analysis

The data collected was stored in the Microsoft-Excel Spread Sheet and analyzed using SPSS Version 20. Descriptive statistics was used to summarize the data. Pearson's Chi-square test was used to check the association between variables. P-value less than 0.05 at 95% confidence level was considered in interpreting the results. The odds value calculation was applied to assess the risk ratio.

RESULTS

Respondent's characteristics

The respondent were 144 male and 32 were female from 176 owners. From 176 donkey owner, 151 (85.6%) were owners, 22 (12.5%) rented the donkeys working for their own and 3 (1.7%) were daily labors hired to work for the owners. 134 (76.1%) of the respondents were in age group of 40 to 60 years old. In terms of educational status, illiterate and elementary school attendees were 78 (44.3%) and 68 (38.6%), respectively. Majority of owners, 135 (76.7%), had working experiences of more than 2 years of working on donkeys. The ownership of donkeys were 114 (64.6%) having one donkey, 56 (31.8%) having two donkeys and 6(3.6%) having 3 and more donkeys at house hold level.

Table 1. The welfare condition of working donkeys from September 2017 to April, 2018, in Dale district, Ethiopia.

Description of welfare problems	Frequency	Prevalence (%)
Wound types		
Back sore	64	26
Tail sore	2	0.8
Chest wound	4	1.6
Bit	1	0.4
Girth	6	2.4
Bite	12	4.9
Back and tail	6	2.4
Back and bite	9	3.7
Back and bit	5	2.0
Total	109	43.1%
Behavior and communication		
Positive high energy	122	49.6
Positive low energy	83	33.7
Negative high energy	26	10.6
Negative low energy	15	6.1
Lameness and movement		
Hoof	42	17.1
Joint	7	2.8
Long bone	7	2.8
Total	56	22.7
Other sign of injury		
Respiratory problems	4	1.6
Signs of colic	2	0.8
Emaciation	12	4.9
Depression	33	13.4
Total	51	20.7

Results of questionnaire survey

Common health problems and treatment options

From questionnaire survey, commonly encountered health problems according to owners claims in working donkeys were weight loss, colic and respiratory diseases at prevalence of 39 (22.2%), 7 (4%) and 7 4%), respectively. As treatment options, most of owners, 86 (48.9%), visits veterinary clinic, 12 (6.8%) seek traditional remedies and 23 (13.1%) left them untreated.

Working management

The donkeys in the study area were working over loaded and over time. On average, a donkey was working per day for 4 to 8 h (101, 57.4%) and working for 8-10 h duration per day (60, 34.1%). The majority of load carried at a time was above the capacity of the animal, taking the assumption that a donkey should carry one third on its pack or a triple of its body weight if pulling in cart (The Donkey Sanctuary Ethiopia, annual report, 2017). Regarding awareness of donkey welfare, 81 (46%) did not have awareness whereas, 95 (54%), had no information on the use of improved harness and harnessing of donkeys. Only 37 (21%) of the owners had been using improved harness (Table 1).

Results of observational study

Behavior and communication

The behavior of donkeys and the way the owners were communicating with them were assessed in terms of the

Table 2. The association of risk factors with wound occurrence, from September 2017 to April, 2018, Dale district, Ethiopia.

Variables	Number of donkeys examined	Number of positive	Percentage (%)	X^2	P – Value
Work type					
Cart	85	34	40	0.506	0.283
Pack	161	72	44.7		
Body condition score					
Very poor	27	19	70.4		
Poor	163	78	47.9	26.372	0.000
Medium	56	9	16.1		
Age groups					
5-7 years	119	2	43.1	1.8327	0.000
7-10 years	47	26			
Harnessing conditions					
Using improved harness	57	15	26.3	8.512	0.002
Not using improved harness	189	91	48.1		

apparent feeling of the donkey and its energy status by observing the animal at rest. Accordingly, the results of behavior and communication of donkeys were found to be; positive and had high energy (122, 49.6%), positive and low energy (83, 33.7%), negative and high energy (26,10.6%), and negative low energy (15, 6.1%) (Table 1).

Body condition score

Body condition is one of the pillars for measurements of donkeys' welfare. The finding shown from 161 pack donkeys indicated that 22 (13.7%), 88 (54.7%) and 51 (31.7) were having poor, medium and good body condition scores, respectively. From 85 cart donkeys, 2 (2.4%), 60 (70.6%) and 23 (27.1%) had poor, medium and good body condition scores, respectively (Table 1). The work type and body condition of working donkeys were found to be statistically significantly associated with the occurrence of wound (Table 2).

Prevalence of wound

The overall prevalence of wound was 43.1%. There was a statistically significant difference in the prevalence of wound among different age groups (P=0.000) and body condition scores (P=0.000). Pack donkeys experienced higher wound occurrences as compared to cart donkeys, but it was not statistically significant (P>0.05). The occurrence of wound was found to be statistically significantly associated with use of improved harness (P= 0.002) (Table 2). The donkeys not using improved harness were at greater risk of having wound (48.1%) than those using improved harness (26.3%). The odds of wound occurrence in donkeys not using improved harness were 8.862.

Most common sites of wound occurrence in the donkeys were back sore, 64 (26%); tail sore, 2 (0.8%); chest wound 4 (1.6%); bit, 1 (0.4%); girth 6 (2.4%); bite 12 (4.9%), combined wounds on back and tail 6 (2.4%), combined wound of back and bite 9(3.7%), combined wound of back and bit 5(2.0%).

Prevalence of lameness

The prevalence of lameness in working donkeys was found to be 56 (22.7%). The common type of lameness were hoof problems 42 (17.1%), joint problems 7 (2.8%) and long bones problem 7 (2.8%).

Other signs of diseases

The common health problems and abnormalities in working donkeys were depression, 33 (13.4%); emaciation, 12 (4.9%); signs of colic, 2 (0.8%) and respiratory problems 4, (1.6%) (Table 1).

DISCUSSION

The current study revealed that all donkeys were working in either pack or cart. The behavior and emotional state

of working donkey in this study disclosed 39.8% with high energy. This finding shows that the donkeys are not in friendly situation with their environment, and in poor communication with their owners. This might be due to poor understanding of the behavior of the donkeys by the owners, poor understanding of the animal welfare issues and in appropriate working management.

The overall prevalence of wound occurrence was 43.1%, which is lower than the report of Herago et al. (2015), in Wolaita Soddo (58.6%). The present finding is also lower than that reported by Burn et al. (2009), in Jordan (59%). Furthermore, the result of current study is markedly lower than the previous report of 77.5 and 79.4% by Curran et al. (2005) and Biffa and Woldemeskel (2006), respectively in Ethiopia. The variation in occurrence of wound in working donkeys could be due to the difference in working conditions, donkey owner's literacy level and age and seasonal factors (Pearson et al., 2003).

The common sites of wound occurrence in this study were back sore, tail sore, chest wound, bit, girth, bite, back and tail, back and bite and back and bit. This wound may be caused by a combination of multi-factorial reasons associated with management and type of harness material (natural or synthetic) and harnessing (Pearson et al., 2003).

The finding of prevalence of lameness (22.7%), was greater than that of 21.8% reported Herago et al. (2015). It is also higher than the report of Kumar et al. (2014), in Mekelle city (18.2%) whereas, the finding of current study is lower than that reported by Sameeh et al. (2014) (32.2%) in Jordan. This might be due to working condition; overloading and lack of hoof care and continuous movement in various landscapes and working on rough roads.

On this study, there was a statistically significant difference in the prevalence of wound among different age groups and body condition scores. Concerning work type higher prevalence of wound was observed in pack donkey than cart donkeys. This finding is probably due to the fact that, donkeys with a poor body condition score might have less natural padding, which could be protecting them from pressure, friction and shear lesions caused by saddle. But, the finding of the current study is not in agreement to the reports from morocco by Sells et al. (2010).

Majority of respondents (48.9%), were seeking veterinary service and 13.1% were leaf untreated, which is in agreement with the reports of Herago et al. (2015) and disagreed with those of Kumar et al. *(*2014). This difference might be due to owner economic status, knowledge on donkey welfare issues as well as literacy of owners.

Conclusions

The working donkeys in the present study area were experiencing multiple welfare problems and the major constraints that contribute for poor treatment include that most donkey owners were in lower economic status and the donkey owners mainly depend on donkeys for their livelihood. The illiteracy of majority of people working with donkeys and not using of improved harness and harnessing contributed to the compromised welfare of donkeys in the area. Therefore, there should be massive awareness creation on animal welfare, sentient being of animals and health management to the people working with donkeys and the general public. There should be significant endeavor at multiple stages; community, local service providers and policy level to improve the neglected welfare statue of working donkeys in the area in particular and in the country in general.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Reproductive health problems and associated risk factors in intensively managed dairy cows in Alage, Southern Ethiopia

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Cross sectional study was conducted in Alage dairy farm with the objectives of determining the causes of reproductive wastages, their prevalence and the risk factors on 173 dairy cows (68 Holstein Friesian (HF) and 105 Borena breed) from November 2017 to April 2018. Additionally, a one year data, from September, 2016 to September, 2017 on a total of 172 cows were analyzed. From the one year record data, 33.72% (n=58) of the cows has showed either one or more of major reproductive health problems. In the cross sectional survey, out of the total cattle 31.79% (n=55) were found to be affected either with one or more of major reproductive health problems. The common causes of reproductive wastages identified include repeat breeder, metritis, retained fetal membrane (RFM), abortion, anoestrus, and dystocia with prevalence of 16.18, 6.36, 5.78, 4.05, 3.47 and 2.9%, respectively. The breed and body condition of cattle were found to statistically significantly associated with the occurrence of reproductive problems ($p<0.05$). The reproductive health problems were observed more frequently in HF breed and poor body conditioned cows. Number of parity and age of the cows were not found to be statistically significantly associated with the occurrence of reproductive problems ($p>0.05$). In conclusion, there were high reproductive wastages and multiple causes leading to reproductive wastages in Alage dairy farm, which needs due attention. Appropriate strategies to improve reproductive health in farm including training of farm workers to improve heat detection and artificial insemination efficiency, and enhancement of the general health management of the cows by applying appropriate herd health programs is recommended. Identification of etiologies of infectious diseases and their potential risk factors should be further studied in dairy cows.

Key words: Alage, dairy cows, reproductive health problems, risk factors.

INTRODUCTION

Agriculture is the back bone of Ethiopian economy, which contributes above 48% of the national GDP (The Economist Intelligence Unit, 2007). The Livestock production takes share of 30% of the total agricultural

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GDP. The livestock contributes to 16% of national foreign currency earnings (IBC, 2004).

Livestock keeping is in almost every family and been a traditional practice in Ethiopia. The livestock population of Ethiopia is estimated to be 52.13 million cattle, 24.2 million sheep, 22.6 million goats, 0.99 million camels, 8.73 million equines and 48.89 million chickens. From the total livestock population of the county, 45.13% are males and 54.87% are females (CSA, 2012).

The economic contribution of cattle to the country is limited as compared to its large population size. A number of reasons can be involved to the low productivity of the cattle such as poor nutrition quality, high prevalence of diseases, poor management system and the types of breed (Shiferaw et al., 2005; Lobago et al., 2006). The other most important factors that contribute for decreased reproductive efficiency and performance of cattle is the prevalent reproductive health problems and disorders (Del-Vecchio et al., 1992).

Reproductive performance of dairy cows could be affected by associated factors including abortion, dystocia, retained fetal membrane (RFM), metritis, prolapse (uterine and vaginal), anoestrus and repeat breeder (Benti and Zewdie, 2014). Much attention has been given to control and prevent dairy cow's epidemic and economically important diseases in the last few decades. Less consideration has been given to the prominent reproductive health problems and associated risk factors. Therefore, the objective of this research was to determine the causes and prevalence of reproductive health problems and assess potential risk factors associated to it in Alage dairy farm.

MATERIALS AND METHODS

Study area

This study was conducted in Alage dairy farm, situated at 217 km distance from Addis Ababa, Southern Ethiopia. The area is located at a longitude of 38°30' East and latitude of 7°30' North. The average altitude of the area is 1600 m above sea level, and characterized by mild subtropical weather with temperature ranging from 11 to 29°C. Alage has a bimodal rainfall distribution with an annual average of 700-900 mm (CSA, 2008).

Study animals

The study animals were dairy cows owned by Alage College, both Borena breeds and Holstein Friesian (HF) breeds. To know the previous history of prevalence of major reproductive health problems in the dairy farm, recorded data of 172 dairy cows in the last one year period (September, 2016 to September, 2017) were used. For observational study conducted from November, 2017 to April, 2018, including a new entered cow, a total of 173 dairy cows were included in the study. From 173 cows, observed in the study, 25 were pregnant and 148 were dry cows. Body condition scoring of cows was conducted according to Matthew (1993). The age of cows was determined on the bases of the record data for individual cow.

Study methodology

A cross-sectional observational study and data recorded for the previous one year were used.

Sample size and sampling technique

All cows (dry and pregnant) in the farm were observed for the occurrence of reproductive health problems. Information on the number of parity, breed, type of feed, health management were collected from the recorded data of 172 cows. The major reproductive problems such as abortion, dystocia, retained fetal membrane, anestrous, repeat breeder, vaginal prolapse and uterine prolapse were collected from farm record documents. For observational study, a pre-tested checklist was used to record information about the number of parity, breed, health management and major reproductive problems; abortion, dystocia, retained fetal membrane, anestrous, repeat breeder, vaginal prolapse and uterine prolapse were recorded on the bases of observation of cows.

Data management and statistical analysis

Data generated from record and observational study were coded and entered in to Microsoft Excel spreadsheet. The data were analyzed using STATA13.0. The association between risk factor's with overall occurrences of reproductive health problems were analyzed by chi-square ($\chi 2$) test. The cow is said to be having reproductive health problem if the cow shows one or more of the listed reproductive health problems. A p-value < 0.05 was considered to be a cut point for statistically significant association of variables.

RESULTS

Results from one year recorded data

From a total of 172 cows data from record during the last one year, 33.72% (n=58) were found to have reproductive health problems. Among the all reproductive health problems, repeat breeder accounted for the highest prevalence of 18.6% followed by retained fetal membrane (RFM), abortion, anestrous, dystocia, metritis, vaginal prolapse that accounted for 6.98, 5.81, 4.65, 4.65, 4.07 and 1.16%, respectively in the farm (Table 1).

Results of observational study

In the observational study, out of 173 cows 55 (31.79%) were found to be positive for reproductive health problems (Table 3). The causes of reproductive health problems identified in the farm were repeat breeder, metritis, RFM, abortion, anestrus and dystocia in order from high to low. Uterine prolapse and vaginal prolapse occurred at lower rate of prevalence in relation to others (Table 2). The prevalence of reproductive problems in relation to breed was found to be statistically significantly associated (p=0.00) to the occurrence of reproductive health problems. Holstein Friesian breed's was affected at more in reproductive health problems as compared to

Table 1. The prevalence of major reproductive problems in Alage dairy farm from September 2016 to September 2017.

Types of reproductive problems	No of cow's positive (%)	
Repeat breeder	32	(18.6)
RFM	12	(6.98)
Metritis	7	(4.07)
Abortion	10	(5.81)
Dystocia	8	(4.65)
Anoestrus	8	(4.65)
Vaginal prolapse	2	(1.16)
Total	79	(45.92)

Table 2. The prevalence of major reproductive problems in Alage dairy farm from November, 2017 to April, 2018.

Types of reproductive Problems	No of cow's positive (%)	
Repeat breeder	28	(16.18)
Metritis	11	(6.36)
RFM	10	(5.78)
Abortion	7	(4.05)
Dystocia	5	(2.89)
Anoestrus	6	(3.47)
Vaginal prolapse	1	(0.58)
Uterine prolapse	3	(1.73)
Total	71	(41.04)

that of Borena breed in the study area. On the other hand, number of parity and age of cow were not statistically significantly associated with the occurrence of reproductive health problems (Table 3). The body condition score (BCS) of cows was found to be statistically significantly associated ($p<0.009$) with the occurrence of reproductive health problem (Table 3).

DISCUSSION

In this study, 31.79% of cows were found to show reproductive health problems. These results are in close agreement with previous reports of Wujira and Nibret (2016) in Wolaita Sodo town, Ebrahim (2003) in and around Kombolcha, Gizaw et al. (2007) in and around Nazaret town, central Ethiopia and Gashaw et al. (2011) in Jima town, southern Ethiopia, who reported the prevalence of reproductive problems as 35.5, 34.8, 31.76 and 33.59%, respectively. The reproductive health problems prevalence found by this study is higher than the report of 18.5%, Hunduma (2013) in Asella town and 26.5% Molalegne and Shiv (2011) in Bedelle. Whereas, Findings of the present research are lower than the reports of Hadush et al. (2013) in central Ethiopia, Haile et al. (2014) in urban and per urban areas of Hosanna, Southern Ethiopia and Dawit and Ahmed (2013) in North-East Ethiopia, reported 44.3, 43.07 and 40.3%, respectively. These differences in the reproductive health problems might be due to sample size differences in the studies, the difference in management system and the breeds of animals.

The prevalence of occurrence of repeat breeder, 16.16%, found in the present study is significantly higher than the findings of Hadush et al. (2013) and Haile et al. (2014), reported 10.3 and 13.08%, respectively. However, it is lower than that of reported by Hunduma (2013) 26.8% in Asella town. The causes of repeat breeder in cows and factors affecting its occurrence includes, use of infertile bulls, malnutrition, reproductive tract infections and poor management practices. The timing of insemination or proper detection of heat, appropriate semen handling and skilled insemination techniques were of paramount importance in preventing the occurrence of repeat breeder (Noakes, 2009). Hence the difference between the findings of the current study and previous reports may be attributed to either/or the above factor/s differences in the studies.

The 5.8% prevalence of retained fetal membrane in current study is in line with reports of Haile et al. (2014), Molalegn and Shiv (2011) and Tigabneh et al. (2017), who reported, 7.18, 8.6 and 7.6%, respectively. The

Table 3. Reproductive problems in relation to breed and parity in Alage dairy farm from November 2017 to April 2018.

Risk factor	No of cows examined	No. with reproductive health problems (RHP) (%)		χ2 (p value)
Breed				
Holstein Friesian	68	40	(23.12)	37.75 (0.00)
Borena	105	15	(8.67)	
Total	173	55	(31.79)	
Number of parity				
1	25	11	(6.36)	
2 and 3	102	29	(6.76)	2.26 (0.322)
Above 3	46	15	(8.67)	
Total	173	55	(31.79)	
Body condition				
Poor	95	36	(20.8)	
Medium	69	15	(8.67)	13.4 (0.009)
Good	9	4	(2.3)	
Total	173	55	(31.79)	
Age				
< 5	117	38	(21.97)	0.079 (0.779)
≥5	56	17	(9.83)	
Total	173	55	(31.79)	

finding of the current study is lower than that or reports of 14.28% by Mamo (2004) and 19.2% by Gashaw et al. (2011). The variation in the prevalence of RFM may be attributed to variations in predisposing factors to which the animals are subjected, which may include management, lack of exercise, dystocia, and infectious diseases. The prevalence of abortion recorded in this study was 4.05% and is in agreement with reports of Shiferaw et al. (2005) in Holetta, Wujira and Nibret (2016), Gebremariam (1996) at Mekele and its environs and Oumer (2003) in Kombolcha, 5.33, 4.8, 6.1 and 3.19%, respectively. The prevalence of abortion recorded in this study is lower than reports by Hunduma (2013) in and around Asella town 14.6 and 13.0% reported by Molalegne and Shiv (2011) in and around Bedelle. The lower prevalence rate of abortion may be attributed to breed, management system, study methodology and geographical location differences.

Previous report on the prevalence of dystocia by Gashaw et al. (2011) 3.8%, Hadush et al. (2013) 2.9%, Benti and Zewdie (2014) 3.4% and Esheti and Moges (2014) 3.3% is in line with the finding of this research, 2.9%. However, the finding of current study is lower than the prevalence of 7.75, 5.79 and 5.9% reported by Dawit and Ahmed (2013), Mamo (2004) in small holder dairy cows in and around DebreZeiet and Haile et al. (2014), respectively. This variation in the occurrence of dystocia may be due to factors such as, age and number of parity, breed. Inseminating cows with semen collected from large sized bulls without taking into account the size and age of cows is also an important factor in precipitating dystocia (Noakes, 1984).

The prevalence of anestrous observed in study was 4.05% is in line with Wujira and Nibret (2016) and Tigabneh et al. (2017), who reported the prevalence of the problem as 4.8 and 5.3%, respectively. However, the finding of current study is lower than the results reported by Hadush et al. (2013) 12.9% in dairy cattle in DebreZeit and Haile et al. (2014) who reported 12.26% in urban and Peri urban area of Hosanna. The prevalence found by this study is higher than the prevalence reported by Molalegn and Shiv (2011), Zewdu (1992) and Ebrahim (2003) reported 1.7, 0.7 and 1.7%, respectively. The variation in prevalence of anestrous might be due to the age, inappropriate heat detection, breed, nutritional status, poor body condition and management system. The finding of vaginal and uterine prolapse was 0.58 and 1.73%, respectively, in this study and it is in agreement with report of 0.66% vaginal prolapse and 0.76% uterine prolapses by Molalegn and Shiv (2011). But the finding of this study is lower as compared to report of vaginal prolapse of 5.2% by Kidusan (2009). This variation might be due to management system differences, sample size and breed of animals. The high prevalence rate of reproductive problems in HF breed, 23.12% is higher than that of Borena breed, 8.67%, which may be due to the fact that European breeds are less adapted to tropical conditions of high temperature and humidity, disease and low feed quality than Borena breed (Mukasa, 1989). The HF requires better management in terms of feed, health

care than the Borena to get better reproductive performance and productivity in the tropics (Tekelye et al., 1991). So, the finding of this study is agreement with the reports of above researchers.

This study revealed that there was statistically significant association (p=0.009) between the prevalence of reproductive problems occurrence with the body condition of cows. The current finding has indicated higher prevalence of reproductive health problems in cows with relatively poor body condition. This finding is in line with Wujira and Nibret (2016), reported reproductive health problems in poor body condition being 30.8%. The cow's being in poor body condition, lead to higher occurrence of reproductive problems in cows in this study may be due to cows with poor body condition have weak expulsive force leading to higher probability of RFM or and requiring assistance for delivery. As a result, these conditions are usually leading to the secondary complications and subsequent poor reproductive performance (Hoojjer, 1999).

Conclusion

Reproductive health problems; repeat breeder, RFM, metritis, abortion, dystocia, anestrus and prolapse (vaginal and uterine), are responsible for reproductive wastages in dairy farms. The study revealed that reproductive problems had occurred as a complex (more than one causes occur at a time) rather than appearing as a single abnormality. The reproductive health problems in dairy farm has leading high economic loss, which warranted further studies in terms of loss and how to prevent and control them.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Health and welfare problems of pack donkeys and cart horses in and around Holeta town, Walmara district, Central Ethiopia

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This study was conducted from October, 2013 to May, 2014 to identify and compare common health and welfare problems of pack donkeys and cart horses in and around Holeta town, central Ethiopia. The presence of the problems was directly assessed on 301 pack donkeys and 84 cart horses, and indirectly assessed in the areas where the study animals were living, grazing and working. Indirect assessments of the problems were also conducted using focus group discussions with 64 equine owners and 8 animal health professionals. Oral problems (2.3 and 16.7%), back sore (13.6 and 1.2%), girth sore (2.7 and 17.9%), tail base sore (15.6 and 0%), abnormal behavior (14.3 and 0%), epizootic lymphangitis (EL) (0 and 10.7%), wound (33 and 44%) and hoof overgrowth (62.5 and 35.7%) were identified on pack donkeys and cart horses, respectively. Indirect assessments indicated that the animals are affected by strangles, tetanus, anthrax, colic, lameness, EL, wounds, parasites, sarcoids, rabies, African horse sickness, owner abuses, shortage of feed and water, and housing problems in the area. This study revealed that back sore, tail sore and abnormal behavior were more frequently occurring in pack donkeys whereas girth sore and oral problems were more common in cart horses. Cart horses were highly affected by epizootic lymphangitis. Both species were more or less similarly affected by lameness, strangles, tetanus, colic, wounds, parasites, owner abuses, and lack of proper feeding, watering and housing. Therefore, awareness creation of the population about the use of these animals for working and good management system should be promoted by the government in the area. Capacity building services should also be delivered for local animal health professionals.

Key words: Donkeys, horses, health, welfare, Ethiopia.

INTRODUCTION

According to production statistics of the Food and Agriculture Organization of the United Nations (FAOSTAT), the population of equines in Africa was estimated to be 26.03 million, consisting 18.9 million donkeys, 6.06 million horses and 1.02 million mules in the year 2014 (FAO, 2017). In Ethiopia, there are about 7.43 million donkeys, 2.03 million horses and 0.4 million mules in the sedentary areas of the country (CSA, 2015). Accordingly, Ethiopia possesses approximately one third of the equine population of the African continent with

39% of all horses and donkeys each and 34% mules.

Equines have a prominent position in the agricultural systems of many developing countries (Feseha et al., 1998). In Ethiopia, the low level of development of the road transport network and the rough terrain of the country make donkeys and horses the most valuable, appropriate and affordable pack animals under the small holder farming system (Gebrewold et al., 2004). They play a great role in rural communities providing power and transport at low cost. They are used for various agricultural operations and provide the needed transport especially in rural areas where the infrastructure is not well paved. They transport water and food to remote areas during war and peace as well as guns and ammunition during war.

They are also used to carry building materials, fire wood, animal dung and charcoal, agricultural products and people. Horses and mules are faster and more powerful animals for work. However, it is more costly to buy and maintain them than donkey (Pearson et al., 2003; The Brooke, 2017).

Even though equines have huge number of population and invaluable contributions as an engine that power rural as well as urban economic development of the nation, they (particularly donkeys) are the most neglected and misused animals in Ethiopia. They suffer from a number of diseases including infectious and non-infectious, and shortage of feed that lead to poor productivity and work performance. Overloading for long distances and loading without proper harness (padding) cause external injuries to equines and expose them to other diseases. They are made to work overtime without adequate feed or health care, indicating poor welfare status of the animals in the country as is also seen in many other developing countries (Mekuria et al., 2013; Sumbria et al., 2017).

There is a paucity of information regarding the status of health and welfare problems of pack donkeys and cart horses in and around Holeta town, Walmara district. Such information would be useful for designing better strategies that would help to improve the health and welfare of pack donkeys and cart horses. Therefore, the objectives of this study were to assess the health and welfare status of pack donkeys and cart horses and to compare the problems between the two species in the study area.

MATERIALS AND METHODS

Study area

This study was conducted from October 2013 to May 2014 in and around Holeta town, Oromia Regional State, Oromia Special Zone Surrounding Finfine, central Ethiopia. Holeta town is found in Walmara district which lies at a distance of 40 km west of Addis Ababa. Its location is 9°30' N latitude and 38°30' E longitude at an altitude of 2400 m above sea level. It experiences a bimodal pattern of rainfall with the long rainy season extending from June to September and a short rainy season during March and April (Shiferaw et al., 2003).

However, there may be rains in any months of the year from small amount of clouds, letting additional moisture for the area. The least amount of rain fall occurs in November and the average rain fall is 1134 mm. The mean annual temperature of the area is about 14.3°C with a maximum of 24.5°C recorded from January to May and minimum of 1.6°C which is recorded during December (National Meteorological Services Agency). The district has an estimated number of 14,000 donkeys, 1,400 horses and 700 mules.

Study animals and sampling procedure

The study involved a total of 385 equines (301 pack donkeys and 84 cart horses) that were selected by, simple random sampling method from different market sites (Asgori, Gudu, and Holeta town), grain milling houses, animal health clinics and along the roads in Walmara district. Then, health and welfare problems of the randomly selected animals were assessed using direct observation and indirect assessments (Focus group discussion and assessments of the environment).

Study methods and data collection

The study employed direct observation of the randomly selected 301 pack donkeys and 84 cart horses for signs of health and welfare problems and observation of the environment where these animals were living, grazing and working. Focus group discussion with owners and attendants of the animals was also used to collect information regarding issues related to the animals' health and welfare.

Species, age, sex, body condition score (BCS), presence or absence of oral problems, wounds, lameness, clinical signs of different diseases and behavior of the study animals were observed and recorded properly.

The BCS of the animals was assessed according to Svendsen (1997); by observing and palpating fats and muscles covering body parts such as neck, ribs, vertebral column (spinal process), loin and rump of the animals. These indicators were strictly observed and the body condition of each study animal was recorded as poor, medium and good.

The presence or absence of any kind of wounds such as back sore, girth sore, bit sore, proud flesh, hobble sore, joint swelling, tail sore, hyena bites and other sores on the body of pack donkeys and cart horses was examined. The number and severity of wounds were identified and recorded. The type and location of the wound were assessed and recorded using body mapping. Abnormalities in the oral cavity and eyes were also assessed. The mouth of the animal was opened and examined for the presence of lesion and other abnormalities on its lip, tongue, gum, palates and teeth. At the same time, the age of each animal was estimated using the eruption and wearing of the incisor teeth.

The presence of hoof overgrowth, hoof deformity, hoof cracking

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puncture wound in the hoof, fracture and hoof loss (in abandoned animal), hobble wounds, posture and gait abnormality and musculoskeletal disorder were also assessed. The severity of the abnormalities, their location and the number of legs affected were also identified and recorded.

The alertness, reaction to human approach, proximity and touch, responsiveness to environment, depression (ear and head drop, tail tuck), difficulty to catch or handle, nervousness and other abnormal behaviors of the study animals were assessed by approaching and closely observing all the animals using “The Hand” tools.

The study animals were carefully assessed for any typical clinical signs of various diseases such as epizootic lymphangitis, strangles, pneumonia, African horse sickness, dermatophilosis, colic, ocular problem and other illness.

In order to triangulate the data obtained by direct observation on the status of health and welfare of the study animals, indirect assessment was also conducted using focus group discussions (FGD) and observation on the environment where the study animals were living, grazing and working. Focus group discussion (FGD) guide was designed and conducted among 72 people consisted of randomly selected 48 pack donkey owners, 16 cart horse owners and cart horse drivers, and eight animal health professionals living in the district (Holeta town, Asgori and Gudu villages).

All the members were males above 25 years old and have more than five years experiences of working with either pack donkeys or cart horses.

The participants of the discussion were grouped into nine FGD each consisting of eight members. The participants were given a chance to identify health and welfare problems of cart horses, pack donkeys in their localities and discuss severity and endemicity of the problems. Each participant got a chance to participate in the discussion.

Finally, the participants ranked the problems based on their effects on the animals from mild to severe. The status of the areas where the study animals were grazing, living and working was assessed carefully. The quality and quantity of feed and water made available to pack donkeys and cart horses in the field, markets, milling houses and homestead was also observed and recorded.

Data analysis

The data obtained from the study were entered into Microsoft excel spread sheets and then transferred to Stata statistical software version 11 for analysis. Descriptive statistics were computed for summary of both qualitative and quantitative data. Comparisons of prevalence of health and welfare problems among pack donkeys and cart horses were made using Pearson’s Chi-square test. P-values less than 0.05 were considered as a significant in all analyses.

RESULTS

In this study, a total of 301 pack donkeys and 84 cart horses were included. All cart horses and majority of pack donkeys (81%) were males.

The majority of cart horses (54.7%) and pack donkeys (43%) were in the age group of 6 to 10 years, while 14 and 36% of cart horses and pack donkeys, respectively were young (five years old or less). Only 13% of the horses and 4% of the donkeys had good body condition (Table 1).

Animal based assessment results

Health and welfare problems of pack donkeys

Different health and welfare problems of 301 pack donkeys were observed and quantified. Hoof overgrowth, wounds, diseases, dehydration, tail sore and back sores were among the most commonly observed problems (Table 2). Among the pack donkeys affected by hoof overgrowth, 45.2, 10, 35.1 and 9.6% had problem on their four, three, two and one legs, respectively (Figure 1).

Health and welfare problems of cart horses

The direct assessment done on cart horses identified that, wounds, girth sore, hoof overgrowth, diseases and dehydration were the most frequently observed problems (Table 3).

Comparison of health and welfare problems of pack donkeys and cart horses

Different health and welfare problems were identified on pack donkeys and cart horses. Epizootic lymphangitis (10.7%) was only observed on cart horses, but tail sore (15.6%) and abnormal behaviors (14.3%) were only observed on pack donkeys ($P<0.05$). Cart horses were more affected by oral problems and girth sores than pack donkeys, however; pack donkeys were more affected by back sore and hoof overgrowth than cart horses ($P<0.05$). The other problems occurred more or less in equal proportion on both species ($P\geq0.05$) (Table 4).

Indirect assessment results

The focus group discussion made among the donkey owners showed that the general health and welfare of pack donkeys in the study area were mainly affected by anthrax, strangles, sarcoids, owner abuse, colic, wounds, hoof overgrowth, parasites, rabies and black leg. The problems were ranked based on their acuteness, rate of transmission, severity and epidemiology in the population of the animals from severe to mild. The participants agreed that, poor management system is practiced by the owners which expose pack donkeys to different health and welfare problems. They also identified that over loading, drenching with local medicinal plants, loading pregnant and young donkeys, and reluctance to bring their donkeys to the veterinary clinic are problems that are poorly recognized by the owners but have major effect on health and welfare of pack donkeys in the district. The discussion was also made among the owners of cart horses during focus group discussion which indicate that cart horses are affected by epizootic

Table 1. Demographic data of pack donkeys and cart horses used in the study.

Factor	Level	No. observed	
		Donkeys (%)	Horses (%)
Age	0-5 years	108 (36)	12 (14)
	6-10 years	129 (43)	46 (54.7)
	≥11 years	64 (21.26)	26 (31)
Sex	Male	244 (81)	84 (100)
	Female	57 (19)	0
Body condition	Good	12 (4)	11 (13)
	Medium	220 (73)	51 (60.7)
	Poor	69 (22.9)	22 (26.2)
Total		301	84

Table 2. Major health and welfare problems of pack donkeys identified (N=301).

Problems	Number affected	Percentage
Oral problem	7	2.3
Wound	99	33
Back sore	41	13.6
Tail sore	47	15.6
Girth sore	8	2.7
Hobble sore	7	2.3
Bite sore	8	2.7
Abnormal Behavior	35	11.6
Disease	88	29.2
Dehydration	63	20.9
Ocular problem	26	8.6
Hoof overgrowth	188	62.5
Hoof Deformity	13	4.3
Posture/ gait abnormality	6	7.1

Figure 1. Lameness due to hoof overgrowth on the legs of a donkey.

Table 3. Major health and welfare problems identified in cart horses (N=84).

Problem	Number affected	Percentage
Oral problem	14	16.7
Wound	37	44.1
Girth sore	15	18
Disease	29	34.5
Ocular problem	4	4.8
Dehydration	16	19.1
Epizootic lymphangitis	9	10.7
Hoof overgrowth	30	35.7
Hoof Deformity	2	2.4
Posture/gait abnormality	9	10.7

Table 4. Comparison of health and welfare problems in horses (N=84) and donkeys (N=301).

Problem	No. affected (%)		P-Value
	Horse	Donkey	
Oral problem	14 (16.7)	7 (2.3)	0.000
Wound	37 (44.0)	99 (33)	0.059
Back sore	1 (1.2)	41 (13.6)	0.001
Bite sore	1 (1.2)	8 (2.7)	0.431
Hobble sore	2 (2.4)	7 (2.3)	0.976
Girth sore	15 (17.9)	8 (2.7)	0.000
Tail sore	0 (0)	47 (15.6)	0.000
Abnormal behavior	0 (0)	35 (14.3)	0.001
Disease	29 (34.5)	88 (29.2)	0.351
Ocular problem	4 (4.8)	26 (8.6)	0.241
Dehydration	16 (19.0)	63 (20.9)	0.706
Epizootic lymphangitis	9 (10.7)	0 (0)	0.000
Hoof overgrowth	30 (35.7)	188 (62.5)	0.000
Posture/gait abnormality	9 (7.1)	6 (3.0)	0.082
Hoof deformity	2 (2.4)	13 (4.3)	0.417

lymphangitis, colic, parasites, owner abuse, strangles, lameness, wounds and sarcoids which were ranked based on their severity, epidemiology and rates of transmission of the diseases. It was also identified that epizootic lymphangitis was the most common problem of cart horses in the area. Many cart horses were observed suffering from disease which eventually resulted to death. Infected cart horses were also working until the disease gets severe.

The result of the discussion made among eight animal health professionals showed that, pack donkeys are suffering from different health and welfare problems (Table 5) in Walmara district. These problems are mainly due to the low attention given to pack donkeys by their owners. The scarcity of facilities in the clinics was also found as one of the constraints to provide appropriate treatment for donkeys suffering from different health problems and to initiate owners to bring their sick donkeys to the clinic.

Based on their clinical experiences at their respective sites of the district, the professionals were also able to rank the problems after making participatory discussions. Accordingly, parasites (18.5 %), owner abuse (Over loading, beating, loading under aged donkeys and pregnant donkeys, improper housing) (17.4%) and wounds (14.2%) were mentioned to be the most important causes of health and welfare problem in donkeys in the district (Table 5). The status of health and welfare problems of cart horses in the study area was also discussed among the professionals. It was identified that cart horses are suffering from epizootic lymphangitis (14.5%), parasites (14.1%), and owner abuse (13.2%)

Table 5. The proportional effect of health and welfare problems of pack donkeys and cart horses identified by animal health professionals working in the district.

Health and welfare problems	Percentage value	
	Pack donkeys	Cart horses
Owner abuse	17.4	13.2
Colic	12.6	10.5
Tetanus	11.3	9
Epizootic lymphangitis	0	14.5
Strangles	8.1	7.6
Hoof problems	10.3	9.4
Parasites	18.5	14.1
Wounds	14.2	9
Anthrax	4	6.5
African Horse sickness (seasonal)	3.6	6.2

among others (Table 5). The participants agreed that cart horses are given more attention than pack donkeys by their owners. This is because; horses are more respected in the community and expensive to purchase than donkeys.

The assessment made in the environment where pack donkeys and cart horses were living, grazing and working indicated that the attention given to pack donkeys by their owners is minimal. Donkeys do not have separate house and live together with cattle. Their stable is not paved evenly and not cleaned regularly. As a result, the stables are muddy with scattered stones inside. Most of the pack donkeys do not have access to feed and water for at least three hours in the markets until the owners finish their business. The milling houses where donkeys are also kept in muddy, have no enough space for the number of donkeys they serve.

In most of the fields where donkeys are grazing, sufficient grass was observed but scarcity of water was noted. In contrast, cart horses had separate houses with 2 to 3 horses living together. Their stables were cleaned regularly and paved with flat stones. In the market, they were kept on feed but without water.

DISCUSSION

In this study we identified and compared common health and welfare problems of pack donkeys and cart horses in and around Holeta town, Walmara district. The result has revealed that pack donkeys and cart horses are affected by multiple management, health and welfare problems in the area. Although the majority of pack donkeys and cart horses were adults, six and above years old 36% of pack donkeys and 14% of cart horses were below five years of age. This indicates that owners in the study area begin to use donkeys and horses for work before they are mature enough. Age at maturity of equine is estimated at four years and it is recommended not to work with them until this age, as this predisposes them to structural deformity such as sagged back (lordosis) and early demise.

Although good body condition was observed in 4 and 13% of pack donkeys and cart horses, respectively, the majority of the population were with poor to medium body condition (BCs$\leq$2). This indicates that apart from health and management associated problems, shortage of quality feed and clean water may be the main factor that contribute for poor body condition of pack donkeys and cart horses. This was also supported by the findings obtained from focus group discussions and assessments done on the study area. Interestingly, whilst equines are considered as one of the most important animals for the security of the household economy, as it was indicated during focus group discussions, they, particularly donkeys are given low priority in terms of access to quality feed and water in the society. This was also supported by the findings of previous studies (FAO, 2014; Pritchard et al., 2005; Wilson, 2002).

The next frequently observed problem was wounds on different body parts of pack donkeys (33%) and cart horses (44%).This might be caused by different factors such as environmental factors, the behavior of the owner, the frequency and type of work, type of harness materials used, ill-fitted harness and absences of padding on the back of the animals which is supported by the previous works (Ashinde et al., 2017; Biffa and Woldemeskel, 2006) that indicated frequent beating, overwork, loose fit and synthetic harness materials that may induce wounds. Moreover, the present finding has also showed significantly higher prevalence of wounds in cart horse than pack donkeys which is similar with the findings of Fikru et al. (2015). This might be due to the fact that cart horses are exposed to different types of injuries as a result of improper infrastructure of the working areas, stress and beating during training and driving which may affect the normal healing process of wounds.

Our study revealed lower prevalence (33%) of wounds in donkeys than a previous study (47.7%) from another

Figure 2. (a) Girth sore due to improper use of harness (b) Lip lesion due to improper and ill-fitted bit.

part of Ethiopia (Ashinde et al., 2017). This may be due to the variation in the type work, frequency of work, harness materials used and the level of awareness of the owner or donkey driver about animal welfare in the two study sites.

In the present study, pack donkeys had significantly much higher proportion of tail base sore (15.6%) than cart horses (0%). The lesion is induced by excessive rubbing on this site by the rope that passes under the tail of pack donkeys where there would be frequent movement and rubbing as the animal moves forward. None of the cart horses included in the study had tail base sore. This is because; cart owners do not use rope under the tail in the study area. The study done on working equids in Hawassa town, Southern Ethiopia, also showed higher prevalence of tail base lesion in donkeys (62.5%) than horses (51.3%) (Mekuria et al., 2013). However, in the present study, the magnitude of the lesion in both species is much lower than that of the previous study. This might be due to the fact that our study was exclusively done on pack donkeys and cart horses, while the other previous study was done on draught, pack, riding and other type of working equids.

In this study, oral problems (16.7%) and girth sore (17.9%) were more frequently observed on cart horses than donkeys (see Figure 2a). This might be due to the frequency of the application of the harness materials used and ill-fitted harness, particularly lip lesions which significantly associated with the bit type (Figure 2b) used for leading cart horses (Usman et al., 2015). Similar findings (oral problem (3.4%) and girth sore (10.1%)) were also reported by Amante et al. (2014) from Nekemte Town, East Wollega Zone, Ethiopia. The magnitude of the prevalence of oral lesion and girth sore in the present study area is higher than in the previous study site. This can be associated with the differences in the type of the harness materials or bits used, type and duration of work, and the level of awareness of the owners and donkey drivers in the two areas.

Our study revealed that back sore is more prevalent in pack donkeys (13.6%) than in cart horses (1.2%) in the study area (Figure 3). This indicates that pack donkeys are loaded without saddles or improper and ill-fitted saddles in the area. The owners also did not take their donkeys to animal health clinics to be treated. This is supported by the information from focus group discussion with animal health professionals. However, the prevalence is lower when compared with the prevalence (19.5%) of back sore in donkeys reported from a previous study (Amante et al., 2014). This might be related to the differences in the type of work, harness and saddle design, and level of awareness of owners or users about how to load the animals.

Lameness is one of the most prevalent health problems of equines and it can be caused by a wide range of conditions (Putnam et al., 2014). In this study, the high proportion of observed lameness on cart horses (35.7%) and pack donkeys (62.5%) was caused by hoof overgrowth. This high prevalence of the problem indicates lack of veterinary services, lack of farriery training courses and poor management practice by the owners in the study area. Our finding showed higher prevalence of lameness in donkeys when compared with the prevalence (40.2%) of lameness reported from a study on cart pulling donkeys in Hawassa, Southern Ethiopia (Fekadu et al., 2015). This difference might be due to the difference in working and grazing areas, and type of work in the two study areas. The previous study was done entirely on cart pulling donkeys that may face lameness due to injuries at knee joints, elbow and shoulder areas, and hoof cavity. The working area of the previous study is also relatively dry which facilitates natural trimming of the hoof of the donkeys. However, the present study was done on pack donkeys and the area is

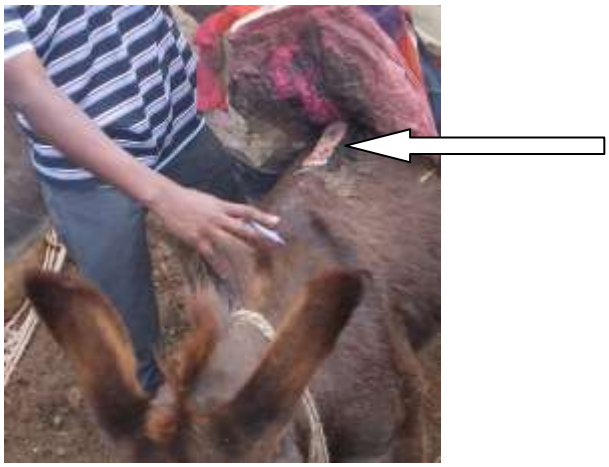

Figure 3. Back sore on pack donkey.

wetter because it gets relatively more rain. This facilitates the overgrowth of the hoof of the animals.

In this study epizootic lymphangitis was only observed on cart horses (10.7%). This may be due to the fact that horses have less resistance to the disease than donkeys. The use of a single harness for different cart horses is well practiced in the area. This can facilitate the transmission of the disease among cart horses and may contribute to the high prevalence of the disease. The current prevalence is lower when compared with the prevalence (24.9%) of the disease reported from central Ethiopia (Asfaw et al., 2012) and from a study on cart horses in 28 towns' cart horses in Ethiopia (Ameni, 2006). This might be associated to the difference in the number of animals involved in the studies (large number of cart horses (390 and 19,082), respectively) in the previous studies. The altitudes of the study areas may also contribute to the difference in the prevalence of the disease.

The current study indicated that 88% of the observed pack donkeys showed normal behavior (alert, responsive to surroundings, head and ears up) and 14.3% of male donkeys showed abnormal behavior (nervousness, depression, unresponsiveness). However, none of the assessed cart horses showed any type of abnormal behavior. This might be due to the low level of awareness of pack donkey owners on how to approach and change the abnormal behavior of their donkeys. The owner of cart horses have more frequent approach and work with their animals and this may shape the behavior of cart horses.

The information from animal health professionals revealed that pack donkeys and cart horses are suffering from different diseases and conditions (tetanus, strangles, parasites, anthrax, African horse sickness (AHS), colic, owner abuse, hoof problems). When the burdens of the problems are compared among two species of the animals, except anthrax and AHS, it is more prevalent in pack donkeys than cart horses. This is because pack donkey owners are reluctant to bring their donkeys to the clinic for treatment. They also have wrong perceptions that donkeys are resistant to pain, injuries, diseases, and they do not know whether donkeys are treated in veterinary clinics. This was also supported by the information obtained from discussion with animal health professionals working in the clinics of the study area.

CONCLUSION AND RECOMMENDATION

The present study revealed that pack donkeys and cart horses are suffering from multiple health and welfare problems in Walmara district. Back sore, tail sore and abnormal behavior were more frequently occurring problems in pack donkeys whereas girth sore and oral problems were more common in cart horses. Cart horses were highly affected by epizootic lymphangitis. Both species were more or less similarly affected by lameness, strangles, tetanus, colic, wounds, parasites, over loading and beating.

Apart from the occurrence of health problems, the attention given to proper feeding, watering and housing by the owners was found very limited. Therefore, awareness creation of the population about the use of these animals for working should be promoted by the government through delivering mass education and extension program, training and advice services in the area to ensure better management practices, and hence productivity of the animals. Capacity building services should also be delivered for animal health professionals on how to treat different health and welfare problems of the animals in the study area.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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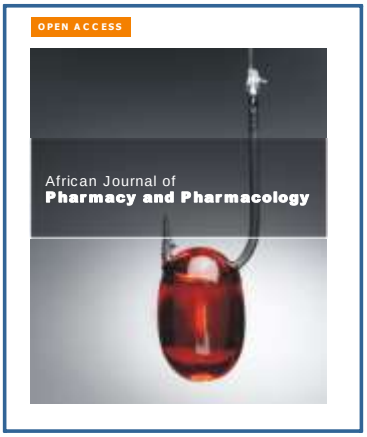

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