Lice infesting horses in three agroecological zones in central Oromia

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Abstract A cross-sectional study was conducted to determine the prevalence and species composition of lice infesting horses in three agroecological zones in seven different districts in central Oromia from November 2011 to April 2012. For this purpose, a total of 420 horses were thoroughly examined for presence of lice. Collected lice were identified to species level under a microscope. The study showed an overall prevalence of 28.8 % (121/420) lice infestation on horses. We identified two spp. of lice on horses namely, *Bovicola (Werneckiella) equi* and *Haematopinus asini* with an overall prevalence of 22.9 % (96/420) and 5.9 % (25/420), respectively. The overall prevalence of lice infestation on horses in districts was 48.3, 43.3, 33.3, 23.3, 21.7, 18.3 and 13.3 %, in Debre Brehan, Shashemene, Hawassa, Akaki, Adama, Modjo and Bishoftu, respectively. *B. equi* was encountered as the predominant

species on horses in all districts. Higher overall prevalence of lice infestation was recorded in highland agroecology than mid and lowland agroecological zones. Similarly, our study revealed significantly higher overall prevalence of lice on saddle horses than on cart horses. In view of the findings of the present study two species of lice are responsible for health and welfare problems of horses in all the districts. Detailed epidemiological studies on the significance, prevalence and role of lice as vectors of zoonotic pathogens in different agroecological zones, breeds and management systems warrant urgent attention. Animal owners and veterinarians should consider lice control in horses as part of the ectoparasite control in other species of animals.

Keywords Agroecology · *Bovicola equi* · Horse · *Haematopinus asini* · Lice · Prevalence

Introduction

Horses are one of the most important domestic animals contributing to many social and economic sectors of the poor communities in Ethiopia. Due to the mountainous nature of most parts of Ethiopia horses play an important role in transportation (riding, pack transport, pulling cart), farming (tillage, threshing) and aid in raising water and milling. They are commonly used in door to door transport services for urban dwellers for income generation (Abajie et al. 2002). Despite the large number of horses and the valuable services they provide in Ethiopia the attention given to their health and welfare is minimal. Shortage of feed, stress and parasitic diseases are the major factors that constrain the health, welfare and overall performances of horses in Ethiopia (Ferede et al. 2010; Kumsa et al. 2012a).

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Ectoparasites are very common and widely distributed in all agro-ecological zones in Ethiopia (Ferede et al. 2010; Kumsa et al. 2011; Kumsa and Mekonnen 2011; Cassini et al. 2012; Kumsa et al. 2012a, b). Lice are one of the most common and economically important ectoparasites of domestic animals including horses. In infested animals lice cause losses in productivity due to unthriftiness, dermatological lesions, anemia, alopecia due to scratching, biting and rubbing, disruption in feeding, secondary skin infections and damage, reduced newborn birth weights, abortion in pregnant animals, and damage to fences, equipment and buildings due to excessive rubbing and scratching (Wall and Shearer 1997; Aftab et al. 2005; Sorrell et al. 2010).

Previous studies on lice of domestic animals in Ethiopia reported several species of lice on Ethiopian cattle; one species of chewing louse, *Bovicola (Damalinia) bovis*, and three species of sucking lice, including *Linognathus vituli* (the long-nosed cattle louse), *Solenopotes capillatus* (the little blue cattle louse) and *Haematopinus quadripertusus* (the cattle tail louse) (Kumsa and Bekele 2008; Kumsa et al. 2012b). On sheep, the biting louse *Bovicola (Damalinia) ovis* and one species of sucking louse, *Linognathus* are common lice species (Kumsa et al. 2012b, c). On goats, one species of biting louse, *Bovicola (Damalinia) caprae*, and the sucking lice *Linognathus stenopsis* have been reported (Beyecha et al. 2012; Kumsa et al. 2012b). On dogs, the biting lice *Heterodoxus spiniger* and *Trichodectes canis* as well as one species of sucking louse, *Linognathus steosus*, were reported. In contrast, lice were not found on cats by previous investigators in Ethiopia (Kumsa and Mekonnen, 2011). Studies from other countries showed that equines including horses are infested by one species of a chewing louse, *Bovicola (Werneckiella) equi*, and one species of a sucking louse, *Haematopinus asini*. Lice infestations on horses are widespread and are of clinical significance in equine medicine (Mencke et al. 2005; Gawler et al. 2005).

All the previous reports on the lice of domestic animals in Ethiopia resulted from studies of other ectoparasites, specifically ticks and mange mites. The only lice-specific study in Ethiopia was carried out by Kumsa and Bekele (2008) on the lice of cattle in the Endegagn district. However, several studies have been conducted on helminths and other internal parasites of donkeys and horses (Getachew et al. 2008, 2012) and ticks of horses and donkeys (Ferede et al. 2010; Kumsa et al. 2012a). To the best of our knowledge there is no any information on prevalence and species of lice on horses in different agroecological zones of Ethiopia. Therefore, the present study was designed with the objectives to determine the prevalence and species of lice infesting horses in seven different districts located in three agroecologies mainly in central Oromia region in Ethiopia.

Materials and methods

Study areas

The study was conducted from November 2011 through April 2012 in seven districts in Ethiopia namely; Adama, Akaki, Bishoftu, Debre Brehan, Hawassa, Modjo and Shashemene. The districts are located in 5 zones in the central and southeastern parts of the country, with various climates and agroecology (Table 1). These towns with their surroundings are working areas of the mobile clinic of the Society for the Protections of Animal Abroad (SPANNA). The study areas are also known for their high equine population, poor welfare condition and low income status of horse owners. The farming system in all of the districts is characterized by a mixed crop-livestock production system. The livestock in the study areas are traditionally managed under extensive production systems.

Study animals

The study was carried out on horses coming to the Clinic of Society for the Protection of Animals Abroad (SPANNA). Study animals were obtained by regular weekly visiting of the SPANNA Clinic at Bishoftu and SPANNA mobile clinics at Debre Brehan, Akaki, Adama, Modjo, Hawassa and Shashemene for various purposes including deworming, vaccination, hoof trimming, teeth rasping and seeking veterinary assistance against other clinical diseases. In this study a total of 420 horses from six different districts were thoroughly examined for lice infestation. During the study period horses were selected randomly irrespective of their age, body condition, sex and color.

The body condition score was subjectively estimated based on the existing guidelines (Carroll and Huntington 1988). Study horses were categorized into three age groups as: young horse when less than 6 years of age, adult horses if the age is greater than six up to 10 years of age and old horses when they are greater than 10 years of age.

Study design and sample size

A cross-sectional type of study was used to determine the prevalence and species composition of lice infesting horses of different age groups, body condition scores, study districts and types of work. The sample size was determined using the formula given by Thrusfield (2005). As there was no any previous estimated prevalence of lice infestation on horses in Ethiopia, 50 % was considered as expected prevalence and desired absolute precision 5 %. Thus, the minimum overall sample size required for the study was 384 and therefore 60 horses from each district was assumed as the appropriate sample size of the present study.

Table 1 Description of study sites and number of carthorses in each site in central Ethiopia

Study area	Regional State	Zone	Agro-ecology	Altitude (asl)	Average annual rainfall (mm)	Temp (°C)	No. of carthorses
Debre Brehan	Amhara	North Shoa	Highland	2750	950	17.6–22.5	735
Shashemene	Oromia	Western Arsi	Highland	2080	1750	15–23	3673
Adama	Oromia	East Shoa	Midland	1500	400–800	13.9–27.7	1673
Akaki	Addis Ababa	Addis Ababa	Midland	1850	1151.6	8.7–30.7	1000
Bishoftu	Oromia	East Shoa	Midland	1900	1151.6	8.5–30.7	1170
Hawassa	SNNPR	Sidama	Midland	1790	900	20.1–30	4490
Modjo	Oromia	Eastern Shoa	Lowland	1500	500	11.3–35	531

Source NMSA 2004; CSA 2008; SPANA 2008

Therefore, a total of 420 horses were examined during the entire study period.

Lice collection and identification

Study horses were properly restrained and the entire observable body surface of the animal was visually examined for presence of lice. During examination great attention was paid to the already determined predilection sites of both chewing and sucking lice of horses, namely mane, neck, flank, head, base of the tail, forelock and above the hooves (Mencke et al. 2004). The hair from these sites directly demonstrating visible lice and lice nits were combed with fine toothed comb on white paper sheet and parting matted hairs to visually inspect visible as well as actively moving lice and also to demonstrate lice eggs (nits). Fine toothed comb was used to easily manipulate lice and lice eggs (nits) from the hairs and the white paper sheet allowed thorough examination of lice and lice nits. Lice were carefully removed manually, using forceps or by combing to avoid any damage to the body and were then placed in previously labeled vials containing 70 % ethanol for subsequent identification. Other data such as date of sample collection, age of animals, body condition score of animals, type of work, sample code and site of sample collected for each study horse were recorded on registration format prepared for this particular purpose. A horse was considered positive when a single louse of either species was noted at any of these examination sites. All the collected lice were identified to the species level under a microscope using morphological identification keys as described by Taylor et al. (2007).

Data analysis

Data collected were entered into Microsoft excel spread sheet and statistical analysis was carried out using SPSS

version 15 for windows. Descriptive statistics was used to summarize the data and association between prevalence of lice infestation and age, body condition score, study districts (agroecology) and type of work of study horses were assessed by Chi square test. Differences were considered significant when P value was less than 0.05 at 95 % confidence interval.

Results

Out of the total 420 horses examined in seven different study districts in the present study an overall prevalence of 28.8 % (121/420) lice on horses was recorded. The prevalence of lice on horses in each study districts is presented on Table 2. Highest percentage of lice infestation was noted on horses in Debre Brehan with highland agroecology. On the contrary, lowest percentage of lice on the study horses was recorded in Bishoftu and Modjo study sites with midland agroecology.

Significantly ($p = 0.00005$) higher overall prevalence of lice on horses in highland agroecology (Debre Brehan and Shashemene) than midland agroecology (Akaki, Bishoftu and Hawassa) was observed. Similarly, a very significantly ($p = 0.0003$) higher overall prevalence of lice in the highland than lowland agroecology (Adama and Modjo) was recorded. However, statistically significant ($p = 0.57$) difference was not observed in the overall prevalence of lice between those horses from the midland and lowland agroecology.

Results of this study demonstrated the presence of two species of lice on infested horses. In this study *B. (Werneckiella) equi* and *H. asini* species of lice with a respective overall prevalence of 22.8 % (96/420) and 5.9 % (25/420) were observed on the study horses. *B. equi* was encountered as the predominant lice species on horses with significantly higher overall prevalence than *H. asini*. In

Table 2 Species and prevalence of lice infesting horses in central Oromia

Study district	Lice species			
	Agroecology (No examined)	<i>Bovicola equi</i> No positive (percentage)	<i>Haematopinus asini</i> No positive (percentage)	Total No. positive (percentage)
Adama	Lowland (60)	13 (21.7)	0 (0)	13 (21.7) ^b
Akaki	Midland (60)	9 (15)	5 (8.3)	14 (23.3) ^b
Debre Brehan	Highland (60)	27 (45)	2 (3.3)	29 (48.3) ^a
Bishoftu	Midland (60)	5 (8.3)	3 (5)	8 (13.3) ^b
Hawassa	Midland (60)	16 (26.7)	4 (6.7)	20 (33.3) ^b
Modjo	Lowland (60)	8 (13.3)	3 (5)	11 (18.3) ^b
Shashemene	Highland (60)	18 (30)	8 (13.3)	26 (43.3) ^a
Overall	420	96 (22.8)	25 (5.9)	121 (28.8)

No number

^a significantly ($p < 0.05$) higher than ^b**Table 3** Prevalence of lice in horses by age, body condition score and type of work

Risk factor category	Sub category	No. examined	Prevalence No positive (%)	p value
Age (year)	<6 (young)	57	20 (35.1)	0.35
	6 ≤ 10 (adult)	190	49 (25.8)	
	>10 (old)	173	52 (30.1)	
Body condition score	Poor	69	26 (37.7)	0.06
	Moderate	221	66 (30)	
	Good	130	29 (22.3)	
Type of work	Cart horses	399	109 (27.3)	0.006
	Saddle horses	21	12 (57.1)	

addition in all districts the prevalence of *B. equi* was higher than the prevalence of *H. asini* (Table 2). In our study the overall prevalence of lice was significantly higher ($p = 0.006$) in saddle than cart horses (Table 3), however statistically significant variations in the overall prevalence of lice infestation was not observed among horses of different age groups and among horses with different body condition scores (Table 3).

Discussion

In the current study the overall prevalence of 28.8 % (121/420) infestation on horses in central Oromia suggests the great importance and widespread occurrence of lice in horses that possibly contribute to losses in overall productivity, reduced power for all types of works and welfare problems of horses in the study districts. The overall prevalence of lice infestation in horses of our present study is less than the earlier report of 100 % prevalence of both lice species in Russia (Egri et al. 1995), the prevalence of 40.9 % *B. equi* in Iceland (Larsen et al. 2005). However, on the other hand the overall prevalence of lice on horses of the current study is higher than the earlier prevalence of 0.7 % in Nigeria (George et al. 1992) and the absence of

any lice on donkeys in Oodi villages of Kgatleng district in Botswana (Mushi et al. 2003). This variation in prevalence of lice on horses in different countries of the world is most probably attributed to differences in seasons of studies, agroecologies of the study areas and breed and management of horses in different localities as has been suggested by Larsen et al. (2005).

In the present study the species and prevalence of lice infestation was assessed in association with study district (agroecology), age group, body condition score and purpose of the horses. Our study showed statistically significantly higher overall prevalence of lice on horses in highland agroecology (Debre Brehan and Shashemene) than those horses from both mid and lowland agroecologies of the study. This variation is most probably attributed to differences in environmental factors like humidity and low temperature that are suitable for the survival and reproduction of lice population in the highland agroecology due to cool skin temperature, denser coat and relative cooler weather condition suitable for female lice fecundity leading to increase in lice population on horses (Talyor et al. 2007). This finding is also in line with the previous observation of higher prevalence of lice on different species of animals in highland agroecology in different parts of Ethiopia and elsewhere in the world (Kumsa and Bekele

2008; Beyecha et al. 2012; Kumsa et al. 2012c). Similarly, higher prevalence of lice is reported in highland agroecology especially during cold weather and lack of hygiene in humans (Raoult and Roux 1999). On the contrary high temperature and exposure to sunlight in the mid and lowland agroecologies cause decline in lice infestation on horses (Wall and Shearer 1997).

The present study showed the occurrence of two species of lice (*B. equi* and *H. asini*) on horses of the study districts. The study also revealed that *B. equi* is the most common species of lice on horses in all the studied districts. This finding is in agreement with the previous investigation (Wall and Shearer 1997, Mencke et al. 2005; Taylor et al. 2007).

Significantly higher prevalence of lice ($p = 0.006$) on saddle horses than cart horses recorded in our present study most probably suggests poor management of saddle horses by their owners than cart horses. Moreover, saddle horses are allowed to graze on small areas with other horses and animals and therefore have greater chances of exposure to direct physical contact with lice infested horses unlike cart horses that are usually kept clean and offered good quality feeds individually in houses and not allowed to graze with other animals.

In our study statistically significant ($p = 0.06$) difference was never noticed in the overall prevalence of lice infestation among horses of different body condition scores. Likewise, we also never observed statistically ($p = 0.35$) significant variations among horses of different age groups (Table 3). We speculate that the absence of statistically significant difference among the aforementioned categories of horses in our study is most probably affected by our small sample size and short study period. Thus, we suggest a future study with larger sample size of horses for longer study duration of up to 1 year is preferred to make better conclusions on these parameters that might affect the prevalence of lice in horses in the country (Kumsa et al. 2012a).

Several health problems, welfare issues and decline in overall working power due to blood loss, pain, irritation, debilitation, mechanical damage, inflammation and hypersensitivity, secondary complications and transmission of pathogenic agents to horses in the current study areas are possibly associated with the lice identified (Taylor et al. 2007; Kumsa et al. 2012a, c). In addition, Kumsa et al. (2012b) recently reported zoonotic bacteria pathogenic to humans from *L. vituli* of cattle, *B. ovis* of sheep and other lice of ruminants in different parts of Ethiopia. Having all these established facts in mind, lice of animals deserve more attention than previously thought due to the possibility of biological or mechanical transmission of arthropod-borne pathogens to their hosts and humans.

In conclusion, the results of the present study showed that lice infestation is a problem of horses of all age, body condition score, sex and types of works in all studied districts. In view of the findings of the present study it is possible to conclude that two species of lice are responsible for health and welfare problems of horses in the studied districts. Thus, detailed epidemiological studies on the significance, prevalence and role of lice as vectors of diseases of horses and zoonotic pathogens in different agroecological zones, breeds and management systems warrant urgent attention. Animal owners and veterinarians in Ethiopia should consider lice control in horses as part of the ectoparasite control in other species of animals.

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