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Prevalence of haemoparasites infections among Sheep and Goats in Al Gabal al Akhder, Libya

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Abstract

Haemoparasites in livestock reduce productivity and could result in elevated fatality. To determine the prevalence of haemoparasites and blood parameters in livestock in 9 locations of Gabal al Akhder region in the north east of Libya, 460 randomly collected blood samples (424 from sheep and 36 from goats) between July and September 2014 were examined. Detection of haemoparasites was carried out by preparation of blood smears and staining with Giemsa's stain. Haemoparasites were detected in 20.2% (93/460) of blood samples examined, being 20.3% (86/424) and 19.4% (7/36) from sheep and goats, respectively. Highest prevalence rates of haemoparasitic infection were observed in Marawh (36.1%; 22/61) and Grnadh (30.6%; 19/62) locations whereas the lowest prevalence rate was observed in Sousse (8.2%; 5/61) location. Three haemoparasites were identified in sheep Anaplasma spp. (0.5 %; 2/424), Babesia spp. (0.2% 1/424) and Theileria spp. (17.8%; 75/424). On the other hand only Theileria spp. was detected in goats (19.4%; 7/36). Mixed infection of Theileria spp. and Anaplasma spp. was identified in 1.7% (7/424) and Theileria spp. and Babsia spp. in 0.2% (1/424) of sheep, while no mixed infection was detected in goats. Lower levels of the hematological parameters RBCs, PCV and Hb were found in infected animals.

Keywords: Haemoparasites, *Anaplasma* spp., *Babesia* spp., *Theileria* spp., Al Gabal al Akhder, Libya.

Introduction

Blood parasites and their vectors are the most devastating diseases of animal well-being and the biggest hinders for effective production. Haemoparasites have shown a range of symptoms as anorexia, anaemia, weight loss, infertility and elevated morbidity and mortality by the destruction of red blood cells[1,2]. Haemoparasitism in small ruminants, a consequence of various blood parasites, is widespread worldwide including temperate, subtropical and tropical areas[3]. Haemoparasites prevalence in the tropical regions can be due to favorable conditions of the environment that drive natural selection and the propagation of arthropod carriers responsible for the permeability of these organisms[4]. Ixodes ticks such as members of the genera *Rhipicephalus*, *Hyalomma* and *Haemaphysalis* transmit theileriosis disease while *Boophilus* and *Dermacentor* transmit babesiosis. On the other hand, transmission of anaplasmosis is either mechanically by blood contaminated fomites or biting flies or biologically by infected ticks. In Libya, sheep husbandry and rearing have the priority among all farm animals because of their economic value and importance in inherited traditions. Sheep constitute a significant source of meat, milk and wool production in numerous countries of the world. Meat production from sheep and goats in Africa reach up to 10.9% and 8.4%, respectively[5,6]. However, there is little data on haemoparasites prevalence in sheep and gaots in Al Gabal al Akhder region in north eastern Libya.

Materials and methods

Collection of samples: Samples of blood were obtained from 460 animals of both sexes and different ages during July, August and September in 2014 from Al Gabel al Akader region in the north east of Libya. Blood samples (5 ml) drawn from each animal were placed in bottles of EDTA. Collected samples were then delivered to the Laboratory of Veterinary Parasitology, Veterinary Medicine Faculty, University of Omar El-Mukhtar for haematological and parasitological examination during two hours from collection.

Parasitological examination: Giemsa's stain was used to stain blood smears of collected samples as previously reported[7]. Prepared smears were then investigated by Olympus microscope at X100 magnification.

Hematological parameters examination: A haematocrit reader (Hawksley, England) was used to estimate Packed Cell Volume (PCV) and a Neubauer Counting Chamber to determine Total White Blood Cell count (TWBC)[8]. In addition, Coulter counter Z1 (Coulter Electronics, Hialeah, USA) was employed to estimate the numbers of leucocytes (TLC) and red blood cells (RBC) and haemoglobin (Hb). For differential TLC blood smears were prepared and then fixed using methanolic fixative solution followed by Giemsa stain staining. Using a light microscope a minimum of 200 cells was enumerated. A previously reported formulae[9] was utilized to determine mean corpuscular hemoglobin concentration (MCHC), mean corpuscular hemoglobin (MCH), and mean corpuscular volume (MCV).

Statistical analysis: Chi-square test was applied to calculate *P*-values. Values of $P<0.05$ were regarded significant statistically.

Results and discussion

Haemoparasites were detected in 20.2% (93/460) of blood samples examined, being 20.3% (86/424) and 19.4% (7/36) from sheep and goats, respectively (Table-1). Table-2 shows the prevalence of haemoparasites among animals examined from 9 locations in Al Gabal al Akhder region. Highest prevalence rates of haemoparasitic infection were observed in Marawh (36.1%; 22/61) and Grnadh (30.6%; 19/62) locations, whereas the lowest prevalence rate was observed in Soussa (8.2%; 5/61) location. Haemoparasites were detected at a statistically significant higher rate in Mrawha location than in Alusswayta ($P<0.02$), in Jrds ($P<0.02$), in Alfaidiha ($P<0.006$) and in Soussa ($P<0003$). Furthermore, haemoparasites were detected at a statistically significant higher rate in Grnadha than in Alfaidiha ($P<0.04$) and in Soussa ($P<0.002$).

Three species of haemoparasites were identified in sheep that include *Anaplasma* spp. (0.5 %; 2/424), *Babesia* spp. (0.2% 1/424) and *Theileria* spp. (17.8%; 75/424). *Theilleria* spp. was significantly ($P<0.0000001$) more prevalent in sheep than *Anaplasma* spp. and *Babesia* spp. However, only *Theileria* spp. was detected in goats (19.4%; 7/36). Combined infection of *Anaplasma* spp. and *Theileria* spp. was identified in 1.7% (7/424) and *Theileria* spp. and *Babsia* spp. in 0.2% (1/424) of sheep, while no mixed infection was detected in goats. Furthermore, combined infection of *Anaplasma* spp. and *Theileria* spp. was significantly ($P<0.04$) more prevalent in sheep than mixed infection of *Theileria* spp. and *Babsia* spp.

Table-1: Prevalence rates of haemoparasites in sheep and goats in Al Gabal al Akader.

Animal	No. Examined	No (%) infected
Sheep	424	86 (20.3)
Goat	36	7 (19.4)
Total	460	93 (20.2)

Table-2: Prevalence of haemoparasites in 9 locations in Al Gabal al Akhder.

Location	Number sampled	No. (%) positive
Mrawha	61	22 (36.1)
Shahat	30	6 (20)
Grnadha	62	19 (30.6)
Alusswayta	60	10 (16.7)
Almansoura	30	5 (16.7)
Jrds	62	10 (16 .1)
Samalos	32	7 (21.9)
Alfaidiha	62	9 (14.5)
Soussa	61	5 (8.2)
Total	460	93 (20.2)

Prevalence of haemoparasites was higher among female than among male animals examined being 20.6% (91/441) and 1.1% (2/19), respectively. The difference in haemoparasites infection rates according to gender is not statistically significant ($P>0.05$). Haemoparasites infection rates among studied animals according to different age groups are shown in Table 3. The highest infection rate was observed in age group 5-6 years (22.8; 28/123) and lowest infection rate in age group ≤1 year (14.5%; 9/62). The differences in the prevalence rates of haemoparasites among various age groups of animals were not significant statistically ($P>0.05$). Furthermore, during the study period of three months the highest infection rate with haemoparasites among sheep and goats was observed in June (28.6%; 44/154), followed by July (18.4%; 28/152) and decreased in August (13.6%; 21/154). The variations in rates of prevalence of haemoparasites between animals during the three months were not significant statistically ($P>0.05$).

Table-3: Prevalence of haemoparasites in different age groups of sheep and goats in Al Gabal al Akhder.

Age (years)	No. of animals examined	No. (%) of animals infected
≤1	62	9 (14.5)
2-4	245	49 (20.0)
5-6	123	28 (22.8)
>6	30	7 (23.3)
Total	460	93 (20.2)

Table-4 shows mean values (mean±S.D.) of hematological parameters in haemoparasite-infected and uninfected animals. Mean PCV value was significantly (P<0.03) higher among uninfected animals (34.8±6.9) compared with infected animals (27.24±7.7). However, no significant differences were observed for the rest of hematological values tested among animals infected with haemoparasites compared with uninfected animals.

Table-4: Mean values (mean±S.D.) of hematological parameters in haemoparasite-infected and uninfected animals.

Hematological parameters	Animals		Normal range
	Infected	Uninfected	
RBCs (106 µL-1)	5.73 ± 2.58	8.4 ± 3.36	9-15
PCV (%)	27.24 ± 7.7	34.8 ± 6.9	27-45
Hb (g dL-1)	9.5 ± 2.17	10.2 ± 1.78	9- 15
MCV (fL)	56,1 ± 29	46.04 ± 13.2	28-40
MCHC (g dL-1)	36.84 ± 12	30.6 ± 6.8	31-34
WBC (103 µL-1)	8.1 ± 5.10	7.4 ± 2.69	04-12
WBC Differentials			
Lymphocytes (%)	41.20 ± 20.02	42.4 ± 16.8	40 – 55
Neutrophils (%)	50.33 ± 15.5	51.2 ± 17.7	10 – 50
Eosinophils (%)	5.33 ± 5.1	3.2 ± 2.3	0 – 10
Monocytes (%)	3.16 ± 1.2	3.2 ± 1.8	0 – 6
Basophils (%)	0	0	0 – 3

Discussion: We believe that this is the first work to report on prevalence of anaplasmosis, babesiosis and theileriosis in ruminants in Al Gabal al Akhder in Libya with an overall prevalence rate of 20.2%. Opara *et al.*[10] reported similar prevalence rate of 20.2% of parasites in 104 sheep and goats in Nigeria. Variable prevalence rates have been reported by several investigators from Turkey (51.9%)[11], Mozambique (48%)[12] and Iran (23.5%)[13]. Such variation can be attributed to several factors that may include, among others, difference in localities and climatic conditions which affect the vector activity.

A significant higher prevalence rate of haemoparasitic infection was observed in Mrawh (36.1%) and Grnadh (30.6%) localities compared with Alfaidiha (14.5%) and Soussa (8.2%). This can be the result of the supportive character of habitat for the persistence and multiplication of the insect carriers (particularly ticks) to transmit haemoparasites in both Mrawh and Grnadh localities. Tenter and Friedhoof[14] reported that there is a strong connection between the occurrence of sheep blood parasites infection and the geographic dissemination of the tick vector.

Of the three species of parasites detected in the present investigation *Theileria* spp. predominated in sheep (17.8%) and in goats (19.4%). This is in accordance with the report by Nagore *et al.*[15] They examined sheep population from Northern Spain and found the animals were predominantly infected with *T. ovis* (18%) than *B. ovis* (2.5%). Similarly, Rjeibi and colleagues.[16], using molecular methods, found higher prevalence rates of *T. ovis* than *B. bovis* among sheep in Tunisia being 16.3% (44/270) and 7.8%; (21/270), respectively. On the other hand, Abdalla et al.[17] reported that sheep from different localities in north western area of Libya were more infected with *B. ovis* (23.8%; 107/450) than *T. ovis* (10.4%; 47/450).

Low prevalence rate (0.2%) of *Babesia* spp. was observed in this work. This possibly because of the reality that animals recover from babesiosis develops resistance to re-infection[18]. In addition, sheep and goats are locally not stable for *Babesia* spp.[19]. Combined infection of *Anaplasma* spp. and *Theileria* spp.was identified in 1.7% (7/424) and *Theileria* spp. and *Babsia* spp. in 0.2% (1/424) of sheep in present investigation. A study from Turkey reported mixed infection of *T. ovis* and *B. ovis* in 1.7% (7/421) and in 1.3% (2/152) of the examined sheep and goats, respectively[20]. No mixed infections were detected in goats in the present study. Mixed infection may attribute to exposure of animals to more than one genus of vectors or the capability of tick to spread several parasites. This indicates that some farmers are unaware of their livestock's need for veterinary health management.

Although higher prevalence rates of haemoparasites was observed among female (20.6%) than among male (1.1%) animals examined the difference was not statistically significant (P>0.05). This could be attributed to larger number of females sampled and relatively higher number of females kept by the owners for breeding purpose[21]. Investigators from Tunisia reported similar findings who found no difference between prevalence rates of *T. ovis* in male and female sheep[16]. Rejeibi *et al.*[16] reported that prevalence of *T. ovis* was higher in adult sheep (23%; 23/100) compared to lambs (12.3%; 21/170). In the present work, higher prevalence rates of haemoparasites (≥20%) were also observed in animals older than one year compared to young animals (14.5%). The infection rate was low among young animals may be due to innate resistance that enhanced by maternal antibodies, this resistance declines gradually leaving the animal with high susceptibility to infection.

A previous study from western Libya found the highest prevalence of *T. ovis* in sheep during spring (18%; 20/110) followed by summer (11%; 12/110)[17]. In the present work, the prevalence of haemoparasites was examined in three months of the summer with the lowest rate of infection being recorded in

August (13.6%). The prevalence of these parasites is closely influenced by the climatic and sanitation conditions.

A significant decrease in the PCV value as well as low RBCs and Hb levels was observed in infected animals than in healthy animals. Our results accords with Adejinmi *et al.*[4] and Okorafor and Nzeako[22] who noted that anemia is a good sign for the ferocity of haemoparasites infections. However, the effect of the parasites on TWBC was greater in infected animals. The rise in TWBC value is due to eosinophilia that is related to infection with haemoparasites. Okaiyeto *et al*.[23] reported similar observation. The effects of the blood sucking actions of these organisms might be the reason of anaemia in animals infected with such parasites.

Conclusion

In conclusion, haemoparasites are prevalent among livestock particularly in certain localities in Al Gabal al Akhder region of north eastern Libya. More studies are required to determine the economic losses associated with these parasites and to establish policies for their control.

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