RESEARCH ARTICLE

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Blood parasites in dairy cattle in Al Nohud and Al Obied cities in West and North Kordufan States, Sudan

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KEYWORDS

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ABSTRACT

This study was conducted during the year 2019. It was aiming at investigating the prevalence of blood parasites in cattle in Al Obied and Al Nohud cities in North and West Kordufan respectively. Sixty-seven blood samples were collected from each city. These samples were subjected for parasitological examination using thin blood smears which stained and microscopically examined. Blood samples collected from Al Obied city; the prevalence of protozoan parasites was 52.2%. The prevalence of *Theileria spp.*, *Babesia spp.*, *Anaplasma spp.* were 14.9%, 25.4%, 11.9%, and 2.9% respectively. Mixed protozoan parasitic infestations represented 3.0% in Al Obied city. The mixed protozoan parasitic infestations were (*Theileria spp.* and *Babesia spp.*) and (*Babesia spp.* and *Anaplasma spp.*). Samples collected from Al Nohud city; the prevalence of blood parasites was 28.4%. The prevalence of *Theileria spp.* was 17.9%, *Babesia spp.* 3.0%, *Anaplasma spp.* 7.5%. The mixed infestation was 1.5%. The mixed protozoan parasitic infestation was 1.5%. The mixed protozoan parasitic infestation was *Anaplasma spp.* and *Theileria spp.*

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INTRODUCTION

Heamoparasites are the main livestock production constraints all over the world causing serious economic losses. In case of infection with these blood parasites up to 75% erythrocytes may be destroyed, leading to severe anemia. Heamoparasites are the main livestock production constraints all over the world. Ticks are regarded as important external parasites of animals' especially in tropical and sub-tropical zones where they transmit most of the serious diseases, among which the majority are blood parasites and *Rickettsia*. Blood parasites are generally transmitted by arthropods either mechanically or biologically (Hartelt, 2004).

Blood parasite infections in cattle are primarily caused by the protozoans such as *Babesia spp.*, Trypanosoma *spp.*, *Anaplasma spp.* and *Theileria spp*. (Abdus, 1989; Abdel Rahman, 2007). These protozoans are transmitted by arthropod vectors such as ticks and flies. Common ticks that can transmit these are Dermatocentor *spp.*, Hyalomma *spp.*, Boophilus *spp.* or Rhipicephalus *spp*. Flies such as Tabanas and Stomoxys are also commonly found (Cheah *et al*., 1999), thus vector control is an important activity in a farm to reduce the morbidity and mortality caused by these infections. Piroplasmosis is highly fatal disease and has serious economic impact on livestock. This disease is caused by protozoan parasites belonging to the family Babesiidae and family Theileriidae of suborder Piroplasmidae. Babesiosis and Theileriosis are of the most important and serious blood parasitic diseases affecting animals in the area (Radwan and El Kelesh 2009; Mervat and Ola, 2010; Ica *et al*., 2007). Babesiosis is caused by intraerythrocytic protozoan parasites of the genus *Babesia*. Transmitted by ticks, Babesiosis affects a wide range of domestic and wild animals and occasionally people (Ali, 2005). Although the major economic impact of Babesiosis is on the cattle industry, infections in other domestic animals, assume varying degrees of importance throughout the world (Kuttler, 2018; Ali, 2005). Two important species in cattle are *B. bigemina* and *B. bovis*, which are widespread in tropical and subtropical areas. The main vectors of *B. bigemina* and *B. bovis* are Rhipicephalus *spp.* and Boophilus *spp.* ticks (Abo Sakaya, 2009; Mullen and Durden, 2009).

Anaplasmosis, formerly known as gall sickness, is a disease of ruminants caused by a rickettsial parasite, family *Anaplasma*taceae, and genus *Anaplasma* the microorganism is gram-negative (Hartelt *et al.*, 2004) and infects red blood cells. Cattle, sheep, goats, buffalo, and some wild ruminants can be infected with erythrocytic *Anaplasma*. Anaplasmosis occurs in tropical and subtropical regions worldwide. It is transmitted by natural means through a number of haematophagous species of ticks. Anaplasmosis can also be transmitted by the use of surgical, dehorning, castration, and tattoo instruments and hypodermic needles that are not disinfected between uses (Capucille, 2011). Two important species infect cattle, *Anaplasma marginale* found worldwide. *Anaplasma centrale* is found mainly in South America, Africa and the Middle East (Boes and Durham, 2017).

Theileriosis is the name given to infections caused by several species of *Theileria*, of the several *Theileria* species infecting domestic ruminants, the two most economically important are *T. parva* and *T. annulata* (Morrison and McKeever, 2006; Abd El Raof *et al*., 2000). The distribution of *T. parva* is limited to eastern, central and southern Africa where it is predominantly transmitted by the tick *Rhipicephalus appendiculatus. Theileria annulata*, transmitted by several species of Hyalomma *spp*. ticks, it is more widely distributed, extending from northern Sudan and the Mediterranean countries to the Middle East, India, southern Asia and China (Abdul Manan *et al*., 2007; Peter *et al*., 2017).

This study was aiming to investigating the prevalence of blood parasites in cattle in Al Obied and Al Nohud cities in North and West Kordufan States.

MATERIALS AND METHODS

Samples

A total of 134 blood samples were collected from dairy cattle in Al Obied and Al Nohud cities in North and West Kordufan States (67 samples for each).

The Blood samples were collected in the morning from the jugular veins using vacutainers with Ethylene Diamine Tetra

Acetic acid (EDTA). The samples were labeled with animal number, placed in an ice box at 4°C and transported as soon as possible to the laboratory before processing for parasitological examinations.

Parasitological examination (Thin blood film)

Blood smears were prepared according to Soulsby (1982).

RESULTS

Prevalence of blood protozoans parasites in Al Obied city

Out of 67 blood samples collected from dairy cattle in Al Obied city, 35 (52.2%) samples were positive for blood parasites (Figures 1, 5, 6, 7). The prevalence of *Theileria spp.*, *Babesia spp.* and *Anaplasma spp.* was 14.9%, 25.4% and 11.9% respectively (Table 1). Mixed protozoans infestations represented 2 (3.0%). The mixed protozoans infestations were (*Theileria spp.* and *Babesia spp.*) and (*Babesia spp.* and *Anaplasma spp.*) (Figure 2).

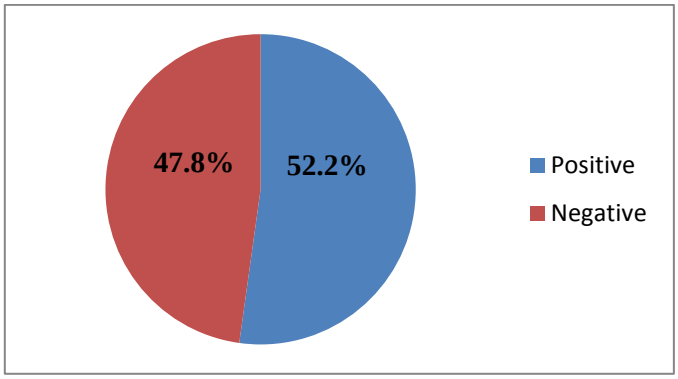

Figure 1: Positive and negative blood samples collected from Al Obied city for detection of blood parasites

Table 1: Number and percentage of blood parasites detected in blood samples collected from Al Obied city.

Blood parasite	Number	Percentage
Theileria spp.	10	14.9%
Babesia spp.	17	25.4%
Anaplasma spp.	8	11.9%
Negative samples	32	47.8%
Total	**67**	**100%**

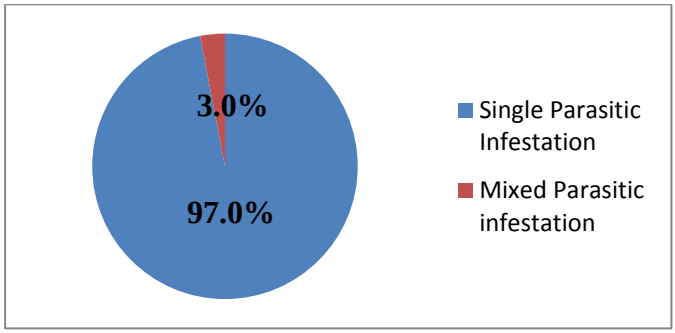

Figure 2: Single and mixed protozoan infestations detected in blood samples collected from Al Obied city.

Prevalence of blood protozoans parasites in Al Nohud city

Out of 67 blood samples collected from dairy cattle in Al Nohud city, 19 (28.4%) samples were positive for blood parasites (Figure 3, 5, 6, 7). The prevalence of *Theileria spp.*, *Babesia spp.* and *Anaplasma spp.* was 17.9%, 3.0% and 7.5% respectively (Table 2). Mixed protozoans infestation represented 1 (1.5%) (Figure 4). The mixed protozoans parasites infestation was *Theileria spp.* and *Anaplasma spp.*

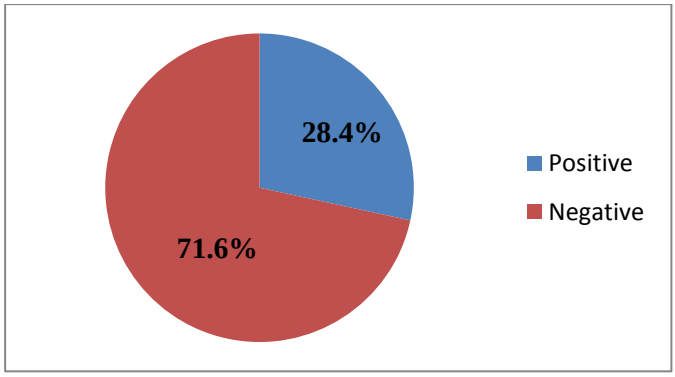

Figure 3: Positive and negative blood samples collected from Al Nohud city for detection of blood parasites.

Table (2): Number and percentage of blood parasites detected in blood samples collected from Al Nohud city.

Blood parasite	Number	Percentage
Theileria spp.	12	17.9%
Babesia spp.	2	3.0%
Anaplasma spp.	5	7.5%
Negative samples	48	71.6%
Total	**67**	**100%**

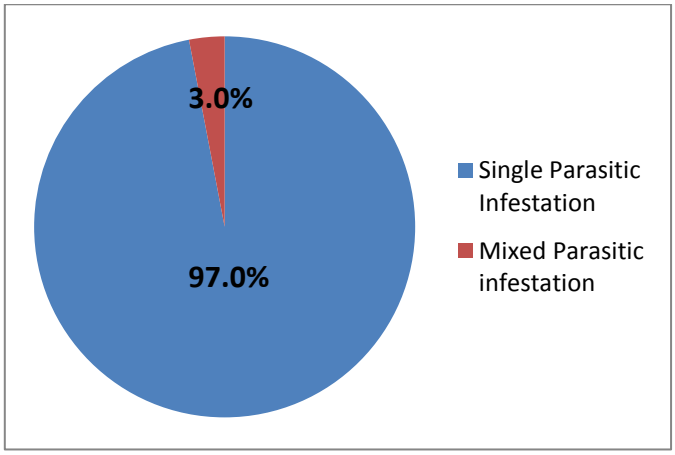

Figure 4: Single and mixed protozoan parasites infestations detected in blood samples collected from Al Nohud city.

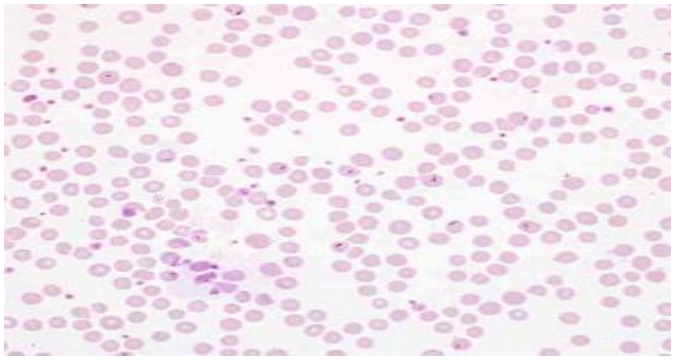

Figure 5: Thin blood smear stained with Giemsa stain and positive for *Theileria spp.*

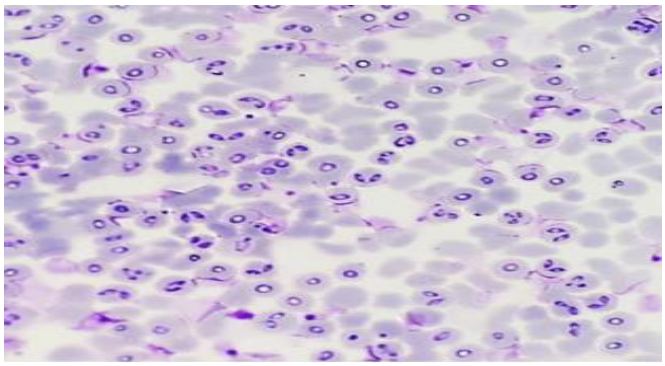

Figure 6: Thin blood smear stained with Giemsa stain and positive for *Babesia spp.*

DISCUSSION

In this study the prevalence of blood protozoans parasites in Al Obied city was 52.2% and 28.4% in Al Nohud city. In Al Obied city the prevalence of *Theileria spp.*, *Babesia spp.* and *Anaplasma spp.* was 14.9%, 25.4% and 11.9% respectively. In Al Nohud city the prevalence of *Theileria spp.*, *Babesia spp.* and *Anaplasma spp.* was 17.9%, 3.0% and 7.5% respectively.

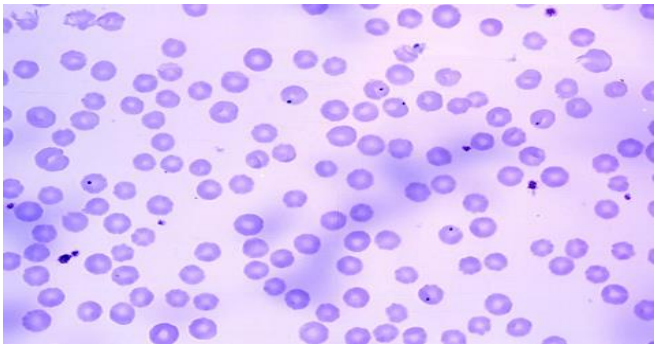

Figure 7: Thin blood smear stained with Giemsa stain and positive for *Anaplasma spp.*

In Pakistan Khan *et al*. (2004) reported the prevalence of blood protozoans parasites to be 27.7%. Ibrahim *et al.* (2010) reported the prevalence of 33.3% for *Theileria spp.*, 28.2% for *Anaplasma spp.* and 5.1% for *Babesia spp.* in two farms in Bhari locality. A prevalence rate of 0.12% of Babesiosis was reported in indigenous cattle in Sagadi area (Abdalla, 1984) during a field survey on Tick Borne Diseases (TBDs) in the Blue Nile and the White Nile regions. Abo Sakaya (2009) reported Babesiosis as one of the diseases which causes high motility of exotic heifers imported to El Gezira State. *B. bigemina* was the causative agent of the nine cattle cases of red water disease reported in Kassala region (Mohamed and Yagoub, 1990). In Khartoum State, Anaplasmosis was occasionally diagnosed, but babesiosis was not encountered in blood smears from cattels surveyed in Soba, Shambat and Hillat Hamad areas (Mohammed Safieldin *et al*., 2011). Zein El aabdeen (1995) was not able to diagnose any case of Babesiosis in cattle and sheep slaughtered in Khartoum State. However, 16 (10.8%) and 39(50%) positive cases of bovine Babesiosis were parasitologically and serologically detected, respectively (Sulieman, 2004). In Khartoum State, Mohammed Safieldin *et al.* (2011) mentioned that the prevalence of blood parasites was 8, 5%. The prevalence of *Theileria species* infection was found to be 7, 5.25 and 6.32% for dry cool, dry hot and wet hot season, respectively. While the prevalence of *Babesia* species infection was only recorded in the dry cool season as (1%). There was no effect ($\chi 2 = 0.6$, $p > 0.05$) of the season on the occurrence of blood parasites. Strong association (t-test= –43.6, $p < 0.05$) was found between the presence of

blood parasites and milk yield. Idriss *et al*. (2012) reported the prevalence of 5.9% and 5.2% for *Theileria* and *Babesia* in Abyei area in South Sudan respectively.

CONCLUSION AND RECOMMENDATIONS

The current study revealed that the prevalence of *Theileria spp.*, *Babesia spp.* and *Anaplasma spp.* in Al Obied city were 14.9%, 25.4% and 11.9% respectively. In Al Nohud city the prevalence of *Theileria spp., Babesia spp.* and *Anaplasma spp.* was 17.9%, 3.0% and 7.5% respectively.

Education or extension program must be done for animals' owners in order to increase their awareness about blood parasitic disease, their transmission, treatment and control. Enough water and feeds in the areas of livestock must be provided during the dry period of the summer. Marketing and transporting the livestock prior to slaughter and export problems must be solved. Good infrastructure such as research, extension, roads, education and health services must be provided.

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