

Study of bovine trypanosomiasis in Mali: Case of the Kita region

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Abstract

This study conducted between September and December 2022 in six municipalities in the Kita circle, with the aim of determining the prevalence of bovine *trypanosomiasis*. A sample of 450 cattle had their blood taken to test for trypanosomes. The cattle examined consisted of 239 females and 211 males. The different species of trypanosomes identified using the Buffy coat technique. This technique made it possible to obtain a prevalence of trypanosomes of 22.67%. This prevalence varied depending on sex (male 25.12% and female 20.50%), age (young 33.05% and adults 11.21%) and the species of trypanosomes (*Trypanosoma. congolense* 61.76%, *T. vivax* 26.47% and *T. brucei* 11.76%).

Keywords: Prevalence; *Trypanosomosis*; Bovine; Mali

1. Introduction

Livestock breeding is the second most important economic activity in rural areas of Mali. This subsector contributes approximately 15% to the GDP and 44% to the agricultural GDP of Mali. It represents the third largest export product after gold and cotton. Livestock represents around 20% of total exports. Livestock constitutes the source of income for more than 30% of the population of Mali, according to the DNPIA in 2019. However, African *trypanosomiasis* constitutes a major constraint to the development of livestock in several African countries and in Mali in particular rural in view of the enormous losses it causes. The direct and indirect losses of AAT (African Animal *Trypanosomiasis*) in production and disease control investments vary between 1 and 1.5 billion US dollars per year in Africa, FAO [8]. A *Trypanosomoses* are parasitic blood disorders caused by protozoa belonging to the genus *Trypanosoma* and the family *Trypanomastidae*, which multiply in blood plasma, lymph and various tissues, including the heart muscle and the central nervous system of mammals THOMIERES [13]. In Africa, various blood-sucking insects, the most important of which are tsetse flies, which constitute the true intermediate host of these parasites, transmit these species. Tsetse flies are exclusively African insects [9]. In Mali four species have been reported: two riverine *Glossina palpalis gambiensis* and *G. tachinoides*) and two savannah *G. morsitans submorsitans* and *G. longipalpis*). *G. morsitans submorsitans* DJITEYE and al [7]. The presence of *Glossina morsitans* and *Glossina palpalis* has been reported in several localities in the Kita circle, notably the localities of Toukoto, Kourounikoto, Faréna, Kita, Djélikébfata, Makodi and Kouroundi, DJITEYE and al [7]. Pathogenic trypanosomes affecting livestock in tsetse-infested areas in Mali are *Trypanosoma congolense*, *T. vivax* and *T. brucei*. The subspecies *T. brucei evansi* affects camels outside the area infested by tsetse flies, it is transmitted by mechanical vectors DIALL O [5]. Despite the tsetse fly surveys carried out in the Kita circle, very few studies have been carried out on the prevalence of trypanosomosis in this circle. This is why the present study was conducted to improve knowledge of the trypanosomiasis situation in the Kita circle.

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2. Material and methods

The blood sample was taken from the jugular vein of 450 cattle in the communes of Bougaribaya, Djidjan, Founia-Benkady, Kassaro, Sébécoro and Souransan-Tomoto using a sampling needle in the "Vacutainer" tubes. ' under vacuum containing the anticoagulant "EDTA". The site code, animal identification number and date of collection were marked on each tube. The tubes containing the blood collected were placed in a rack then kept in a cooler containing pieces of ice, then sent to the Central Veterinary Laboratory of Bamako. For the search for trypanosomes, the diagnostic technique used was the "Buffy coat" which consists of filling 2/3 of a microtube with blood from each vacutainer tube and sealing one end of the microtube with plasticine (paste). seal) then Centrifuge the microtube in a hematocrit centrifuge for 5 minutes at 12,000 rpm then Cut the microtube using with a diamond-tipped pencil 1mm below the interphase so as to include the layer of red blood cells. Through the broken end of the microtube, a drop is placed on a slide and covered with a coverslip then we proceed to microscopic observation. The results obtained following the microscopic observations entered with Microsoft EXCEL 2010 software and analyzed with Stata version 12.1 software. The "chi 2" test used to compare the different variables.

3. Results

3.1. Prevalence of bovine trypanosomiasis

450 cattle were examined, among which 102 positive subjects were recorded, representing a prevalence rate of 22.67%. Statistical analysis revealed a significant difference ($p < 0.05$) between the prevalence rates of *Trypanosoma congolense* (61.76%), *T. vivax* (26.47%) and *T. brucei* (11.76%) parasites.), (Table 1).

Table 1 Prevalence of bovine trypanosomiasis

Resultats	Number	Prevalence (%)	Stat
Negative	348	77,33	X-squared = 266.78, $p\text{-value} < 2.2e^{-16}$
Positive	102	22,67	
<i>T.brucei</i>	12	11,76	X-squared = 60.618, $p\text{-value} = 6.871e^{-14}$
<i>T.congolense</i>	63	61,76	
<i>T.vivax</i>	27	26,47	
Total	102/450	22,67	-

3.2. Prevalence of bovine trypanosomiasis by sex

The number of cattle examined consisted of 239 females and 211 males. Among females, 49 individuals were positive for trypanosomosis, representing a prevalence of 20.50%. Among males, 53 subjects were positive; representing an overall prevalence rate of 25.12%. In female cattle, there was a statistically significant difference ($p < 0.05$) between the different species of trypanosomes *T.congolense* (65.31%), *T.vivax* (22.45%) and *T.brucei* (12.24%) (Table 2)

There was a significant difference ($p < 0.05$) between trypanosome species in male cattle whose prevalence rates are respectively 65.31% for *T. congolense*, 58.49% for *T. vivax* and 30. 19% for *T. brucei* 11.32%, (Table 2)

Table 2 Prevalence of bovine trypanosomiasis by sex

Sex	Results	Number	Prevalence (%)	Stat
Female	Négative	190	79,50	X-squared = 164.02, $p\text{-value} < 2.2e^{-16}$
	Positive	49	20,50	
	Total 1	239		
	<i>T.brucei</i>	6	12,24	X-squared = 34.959, $p\text{-value} = 2.563e^{-08}$
	<i>T.congolense</i>	32	65,31	

	<i>T.vivax</i>	11	22,45	
Male	Negative	158	74,88	$X\text{-squared} = 102.52,$ $p\text{-value} < 2.2e^{-16}$
	Positive	53	25,12	
	Total 2	211		
	<i>T.brucei</i>	6	11,32	$X\text{-squared} = 26.887,$ $p\text{-value} = 1.451e^{-06}$
	<i>T.congolense</i>	31	58,49	
	<i>T.vivax</i>	16	30,19	
Total		102/450	22,67	-

3.3. Prevalence of bovine trypanosomiasis according to age

In total, 78 young cattle were positive for trypanosomiasis, representing an overall prevalence of 33.05%. Statistical analysis revealed in these young cattle, a statistically significant difference ($p < 0.05$) between the species *T.congolense* (60.26%), *T.vivax* (24.36%) and *T.brucei* (24.36%) (Table 3). In adult cattle, 24 positive cases of trypanosomiasis recorded, representing an overall prevalence of 11.21%. Statistical analysis of the results revealed a significant difference ($p < 0.05$) between the different species of trypanosomes *T.congolense* (66.67%), *T.vivax* (33.33%) and *T.brucei* (0.00%) (Table 3).

Table 3 Prevalence of bovine *trypanosomiasis* according to age

Age	results	Number	Prevalence (%)	Stat
young	Negative	158	66,95	$X\text{-squared} = 52.89,$ $p\text{-value} = 3.528e^{-13}$
	Positive	78	33,05	
	Total 1	236		
	<i>T.brucei</i>	12	15,38	$X\text{-squared} = 39.577,$ $p\text{-value} = 2.547e^{-09}$
	<i>T.congolense</i>	47	60,26	
	<i>T.vivax</i>	19	24,36	
Adults	Negative	190	88,79	$X\text{-squared} = 254.44,$ $p\text{-value} < 2.2e^{-16}$
	Positive	24	11,21	
	Total 2	214		
	<i>T.brucei</i>	0	0,00	$X\text{-squared} = 24,$ $p\text{-value} = 6.144e^{-06}$
	<i>T.congolense</i>	16	66,67	
	<i>T.vivax</i>	8	33,33	
Total		102/450	22,67	-

3.4. Prevalence of bovine trypanosomiasis by municipality

Statistical analysis of the results revealed an overall prevalence rate of *trypanosomiasis* of 22.67% in the six communes of the Kita circle. The commune of Kassaro (32.00%) recorded the highest prevalence rate. The lowest prevalence rate observed in the commune of Souransan Tomoto (18.67%). The communes of Bougaribaya, Djidjan, Founia Benkady and Sébécoro each recorded an overall prevalence of 21.33%.

Table 4 Prevalence of bovine trypanosomiasis by municipality

Cercle	municipality	Results	Number	Prevalence (%)
Kita	Bougaribaya	Negative	59	78,67
		Positive	16	21,33
		S/total 11	75	-
		<i>T.brucei</i>	0	0,00
		<i>T.congolense</i>	9	56,25
		<i>T.vivax</i>	7	43,75
	Djidjan	Negative	59	78,67
		Positive	16	21,33
		S/total 12	75	
		<i>T.brucei</i>	1	6,25
		<i>T.congolense</i>	12	75,00
		<i>T.vivax</i>	3	18,75
	Founia Benkady	Negative	59	78,67
		Positive	16	21,33
		S/total 13	75	
		<i>T.brucei</i>	3	18,75
		<i>T.congolense</i>	10	62,50
		<i>T.vivax</i>	3	18,75
	Kassarou	Negative	51	68,00
		Positive	24	32,00
		S/total 14	75	
		<i>T.brucei</i>	2	8,33
		<i>T.congolense</i>	16	66,67
		<i>T.vivax</i>	6	25,00
	Sébécoro	Negative	59	78,67
		Positive	16	21,33
		S/total 15	75	
		<i>T.brucei</i>	3	18,75
		<i>T.congolense</i>	10	62,50
		<i>T.vivax</i>	3	18,75
Souransan Tomoto	Négatifs	61	81,33	
	Positifs	14	18,67	
	S/total 16	75		
	<i>T.brucei</i>	3	21,43	
	<i>T.congolense</i>	6	42,86	
	<i>T.vivax</i>	5	35,71	
Total 3			102/450	22,67

4. Discussion

The overall prevalence rate of bovine *trypanosomiasis* in the cercle de Kita was 22.67%. This result is comparable to the work of Dawit and al [4], who recorded a prevalence rate of 25.8%. Bocoum et al [3] obtained different results after observing an overall prevalence rate of 30.86%. Different results obtained by Ashagrie and al [1] who observed an overall prevalence rate of 4.7%. This high prevalence of bovine *trypanosomiasis* could be due to the crossbreeding of trypanotolerant local breeds from the Kita region with trypanosensitive Moorish zebus from the Sahelian zones of the Diéma and Nioro circles. The uncontrolled treatment of sick cattle by pastoralists and agro-pastoralists without the assistance of veterinary services could also be at the origin of the increase in the prevalence rate of this disease in the Kita cercle. This high prevalence rate could also be explained by the reported presence in several localities in the Kita cercle of the main vectors of the three *trypanosome* species, notably *Glossina morsitans* and *Glossina palpalis* DJITEYE and al [7]. The overall prevalence rates observed for the trypanosomes *Trypanosoma. Congolense*, *T. vivax* and *T. brucei* are 61.76%, 26.47% and 11.76% respectively. The predominance of *Trypanosoma congolense* over the other two species may be due to their high concentration in the blood of infected cattle. Similar results obtained by Dinaol and al [6], who reported prevalence rates of 60% for *Trypanosoma congolense*, 28% for *Trypanosoma vivax* and 12% for *Trypanosoma brucei*. Our results differ from those obtained by Bocoum and al [3] who observed prevalence rates of 89.72% for *T. congolense*, 9.58% for *T. vivax*, and 0.68% for *T. brucei* for the different trypanosome species. Our results also differ from those obtained by Tilahun and al [14] who observed prevalence rates of 66.67%, 28.89% and 2.22% for the trypanosomes *Trypanosoma. Congolense*, *T. vivax* and *T. brucei*. The overall prevalence rates of trypanosomiasis observed in male and female cattle are 20.50% and 25.12% respectively. This shows that male and female cattle have the same level of susceptibility to *trypanosomiasis*. These results are comparable to those obtained by Dawit et al [4], who observed overall prevalence rates of 26.9% in male cattle and 24.7% in females. Our results differ from those obtained by Sitena [12], who observed overall prevalences of 1.4% and 2.7% in male and female cattle respectively. Different results obtained by Ashagrie et al [1] who observed prevalence rates of 4.6% in male cattle and 4.8% in females. Our results also differ from those obtained by Bekele and al [2] who observed prevalence rates of 3.55% and 7.47% in male and female cattle. The overall prevalence rates of trypanosomiasis observed in young and adult cattle were 33.05% and 11.21% respectively. This could be explained by the fact that young cattle were 3 to 4 months old and grazed with adult cattle. Our results differ from those obtained by Dawit and al [4] who observed prevalence rates of 54.7% in adult cattle and 5% in young cattle. Our results also differ from those obtained by Jirata et al [10], who observed prevalence rates of 3.80% in young and 32.60% in adult cattle.

5. Conclusion

The results of this study show that bovine trypanosomes are present in the Kita cercle and constitute a constraint for cattle breeding.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest disclosed.

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