

Survey on Gastro-intestinal Parasites Infection in One Humped Camels (*Camelus dromedarius*) in Al-Butana area, River Nile State, Sudan

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Abstract

A cross-sectional study was conducted from August-September (2018) to determine the prevalence of gastro-intestinal parasites of camel and associated risk factors such as age groups, sex, breed, health status and water sources in Al-Butana area in River Nile State, Sudan. A total of 148 camels were sampled according to Non-probability Multi-stage Cluster Sampling Method (location, herd, camel). Faecals samples were collected directly from the rectum of the camel in plastic containers in formalin solution 10%, labeled, and transferred to the laboratory for faecal examinations (flotation and sedimentation). Both descriptive and analytical statistics were used for data analysis by using SPSS version 20. The result revealed that the overall prevalence of gastro-intestinal parasites of camel in Al-Butana area in River Nile state was 58.8% (n=87). The prevalence by location revealed that the highest prevalence 64.2% (n=43) was recorded in the East (Umm Shadeeda-Wadi Bseria) followed by South (Meaa Al-Gedehat and Oagad-Alegool) 60.0% (n=24), West (Wadi Taweel, Shandi and Hafeer Umm-Sunot) 53.1% (n=17) and North (Aldamer) 33.3% (n=3). Statistically, there was no significant difference observed ($\chi^2=3.658$, P-value=0.301) between locality. The most dominant gastro-intestinal parasites were *Strongyle*, *Trichostrongyle* egg 76.8% (n=67) and (*Eimeria* spp.) 18.4% (n=16). In contrast, *Moniezia* spp. And *Trichuris* spp. were observed with low percentage 2.3% (n=2), and 2.3% (n=2), respectively. On the other hand, a positive association ($\chi^2=30.973$, P-value 0.014) was reported for different age group with respect to presence of gastro-intestinal parasites and highest positive cases were observed in age group >5 years. Furthermore, breed has shown a great effect on presence of gastro-intestinal parasites in camels ($\chi^2=10.993$, P-value=0.012). The highest prevalence was recorded for Araby 73.6% (n=39) followed by Anafy 60.0% (n=24), Dlaamy 48.6% (n=17) and Bushari 35.0% (n=7). Similarly, poor health status and source of water such as Meaa and Hafeer were found to be associated with the presence of gastro-intestinal parasites at significant level P-value <0.05. In conclusion, a high prevalence of gastro-intestinal parasites was recorded in the current research work which indicates wide spread of infection they reducing the productivity of the camels. Hence, more epidemiological studies are required as well as an attention should be made regarding application of control measures to minimize the level of infection.

Keywords: One humped camels; Gastro-intestinal parasites infection; Protozoa

Introduction

The one-humped camels (*Camelus dromedarius*) are structurally unique animals in semi-arid and arid tropical areas of Africa [1]. Camel is well adapted to harsh climatic conditions where others animal suffers to survive. Camel-keeping represent a type of culture found in ancient time of human civilization till now consequently it looked as a valuable asset and has a high economic value providing meat, milk and wool as well as transportation and labor [2]. Camel population in Sudan exceeds (4.85) millions of heads and in River Nile (83.550) heads [3].

A relatively, high infection rate of gastro-intestinal parasites of one-humped camels has been reported from a number of countries rearing camels in Africa and Asia such as Somalia [4]; Sudan [1,5-10]; Ethiopia [11,12]; Kenya [13]; Tanzania [14]; Nigeria [2]; Egypt [15,16]; Iraq [17]; Saudi Arabia [18]; Iran [19]; Pakistan [20]; and India [21].

Sudanese camels harbor a number of helminths as stated by previous mentioned Sudanese researchers. These studies confirmed presence of internal parasites: nematode, such as, *Haemonchus longistipes*, *Trichostrongylus probolurus*, *Trichostrongylus* spp. *Cooperia pectinata*, *Oesophagostomum columbianum*, *Trichuris globulosa* and *Setaria labiatopapillosa* as well as trematodes, such as *Fasciola gigantica* and *Schistosoma bovis* and Cestodes, such as *Avitellina* spp. and *Moniezia expansa*.

Diagnosis of internal parasites could be achieved by clinical signs (fever, colic, emaciation or growth disorders, and diarrhea) or by

microscopic examination of faecal sample. Worms cannot be eradicated but should be cured early to stop increasing worm burden, which can lead to death [22]. Oral, drench or bolus (Albendazole), injectable dewormed (subcutaneous injection) e.g. Ivermectin (1%), as well as pasture control (animal movement) and husbandry is very important in control of infection [23].

On other hand, Agab [24] stated that shortage of veterinary services, parasitic diseases and diarrhea in calf camel, poor pasture, scarcity of water resources and security problems reduce herd fertility camel production in Al-Butana Region. Therefore the objectives of the current study were:

1. To determine the prevalence proportion of gastro-intestinal parasites in one humped camel (*Camelus dromedarius*) in Al-ButanaArea, River Nile State, Sudan.

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2. To identify the risk factors associated with gastro-intestinal parasites in one hummed camels such as age, sex, breed, health status and source of water.

Materials and Methods

Study area

The study was conducted in River Nile State which is located in Northern Sudan (semi-arid zone) between 22-16° N latitude and 36-32° Longitude exactly in Al-Butana area of the State, between the east bank of the River Nile and west bank of the Atbara River. A temperature of 48°C occur during the summer with hot dry weather and low humidity. During winter the weather is cool and dry with a mean daily temperature of 8°C. The average rainfall range 25 mm-150 mm (Figure 1).

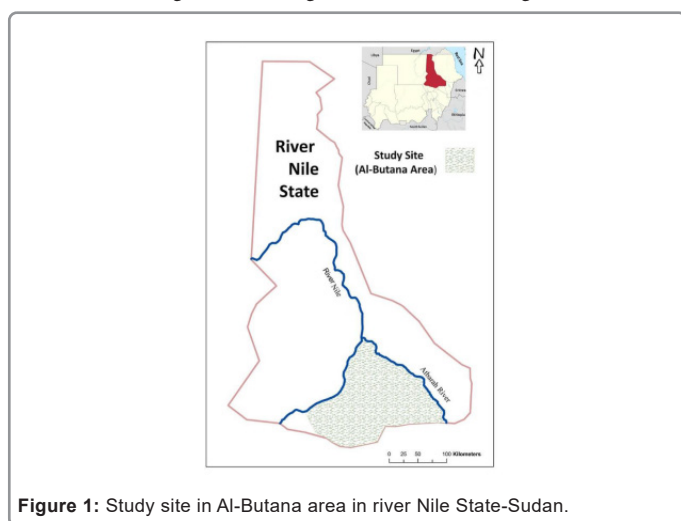


Figure 1: Study site in Al-Butana area in river Nile State-Sudan.

Study population

The study animals were indigenous camels which rose in herds from (15-150) heads in free grazing land and housing. Information such as location, age, sex, breed, health status and source of water were recorded as well. The description of camel population in study site is summarized in Table 1.

Parameters	Site				Total
	North	West	East	South	
Count (%)					
Sex					
1. Male	3 (2.0%)	3 (2.0%)	6 (4.1%)	14 (9.5%)	26 (17.6%)
2. Female	6 (4.1%)	37 (25.0%)	61 (41.2%)	18 (12.2%)	122 (82.4%)
Sub-total	9 (6.1%)	40 (27.0%)	67 (45.3%)	32 (21.6%)	148 (100.0%)
Age (years)					
1. ≤ 2 years	2 (1.4%)	0 (0.0%)	1 (0.7%)	6 (4.1%)	9 (6.1%)
2. 3-5 years	6 (4.1%)	9 (6.1%)	18 (12.2%)	14 (9.5%)	47 (31.8%)
3. >5 years	1 (0.7%)	31 (20.9%)	48 (32.4%)	12 (8.1%)	92 (62.2%)
Sub-total	9 (6.1%)	40 (27.0%)	67 (45.3%)	32 (21.6%)	148 (100.0%)
Breed					
1. Anafi	7 (4.7%)	3 (2.0%)	13 (8.8%)	17 (11.5%)	40 (27.0%)
2. Bushari	2 (1.4%)	5 (3.4%)	0 (0.0%)	13 (8.8%)	20 (13.5%)
3. Araby	0 (0.0%)	13 (8.8%)	38 (25.7%)	2 (1.4%)	53 (35.8%)
4. Dlaamy	0 (0.0%)	19 (12.8%)	16 (10.8%)	0 (0.0%)	35 (23.6%)
Sub-total	9 (6.1%)	40 (27.0%)	67 (45.3%)	32 (21.6%)	148 (100.0%)
Water sources					

1. Well	9 (6.1%)	0 (0.0%)	5 (3.4%)	10 (6.8%)	24 (16.2%)
2. Meaa	0 (0.0%)	40 (27.0%)	62 (41.9%)	0 (0.0%)	102 (68.9%)
3. Hafeer	0 (0.0%)	0 (0.0%)	0 (0.0%)	22 (14.9%)	22 (14.9%)
Sub-total	9 (6.1%)	40 (27.0%)	67 (45.3%)	32 (21.6%)	148 (100.0%)

Table 1: Description of camel population in study site.

Source of water

The source of water in the study site was:

a. Well

b. Hafeer which is dug by machines in pasture land where the water from rain and floods are assembled for drinking animal and human.

c. Meaa is natural depression in the pasture land in which rain accumulate.

Study design

A cross sectional study was conducted to determine the prevalence of gastro-intestinal parasites infection and associated risk factors.

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Sampling method and sample size

A non-probability multi stage cluster sampling method was used as described by Thrusfield [25]. A total number of 148 camel were sampled and the selection was done based on different levels (location, herd, camels) as well as only 10% for each herd was sampled. The details of sample size are presented in Table 2.

Site	No. of samples	No. of animals	No. of herds (10% for each herd)
North	9	92	6
West	43	429	9
South	40	404	8
East	56	557	14
Total	148	1482	37

Table 2: Determination of the sample size in the study site.

Faecal examination

Faecal sample collection: Faecal samples were directly collected from the rectum (15-30 gram) of the camels in plastic containers in formalin solution 10% to prevent hatching of the egg and development of larvae, and were labeled, and transferred to the laboratory for fecal examinations.

Flotation methods: The test was used to detect the presence of the eggs of nematodes and cestodes, as well as oocysts of protozoa. Two to three grams of faces was taken in a mortar washed from formalin with tap water three times and then emulsified with 50-42 ml salt solution (sodium chloride). The suspension was then poured through sieve into a beaker to remove the large particles. The sieve suspension was then poured in a test tube until it was completely full and then covered with a cover slip. The cover slip was removed after 20 min and it was placed into a clean slide and examined under the microscope [26].

Sedimentation method: The test was used for detecting those eggs which do not float well in available flotation solutions. Those are the

operculate eggs or *Fasciola*, *Paramphistomes* and *Schistosoma*. Two to three grams of faeces were taken in a mortar to break down and washed with tap water. The suspension was then poured through a sieve into a beaker to remove the large particles. The sieved suspension was then poured in a centrifuge tubes and centrifuged at 1500 rpm for two min (this was the first wash). The dirty supernatant was poured off and re-suspended in water and centrifuged at 1500 rpm for two min. This was repeated four times till the supernatant fluid was clear. A bit of the deposit was taken and smeared on slide covered and examined under the microscope [26].

Statistical analysis: SPSS for Windows version 20.0 was used for data analysis. Descriptive statistic such as count and percent was used for all variables, while chi-square was used for risk factors analysis. The results are presented as text, tables and figures.

Results

Prevalence of gastrointestinal parasites in Camel of Al-Butana area in river Nile State, Sudan

The overall prevalence of gastro-intestinal parasites in camels in Al-Butana area in River Nile State was 58.8% (n=87). The highest prevalence 64.2% (n=43) was recorded in the East of Al-Butana area (Umm Shadeeda-Wadi Bseria) followed by South (Meaa Al-Gedehat and Oagad Alegool) 60.0% (n=24), West (Wadi Taweel, Shandi and Hafeer Umm-Sunot) 53.1% (n=17) and North (Aldamer) 33.3% (n=3). Statistically, no significant difference was observed ($\chi^2=3.658$, P-value=0.301) (Tables 3 and 4).

Site	Prevalence %	No. of positive cases	No. examined	χ^2	df	P-value
North	33.30%	3	9	3.658	3	0.301
South	60.00%	24	40			
East	64.20%	43	67			
West	53.10%	17	32			
Total	58.80%	87	148			

Table 3: The prevalence of gastro-intestinal parasites in camels in River Nile State, Sudan (P-value >0.05 (Not significant)).

Type of gastrointestinal parasites in Camel of Al-Butana area in river Nile State, Sudan

A different genera of gastro-intestinal parasites of camels was recorded in River Nile State. The prevalence of different parasites were, *Eimeria* spp.18.4% (n=16), *Strongyles*, *Trichostrongyle* egg 76.8% (n=67). In contrast, low percentage was reported for *Moniezia* spp. 2.3% and *Trichuris* spp. 2.3%. A significant difference was observed for location and different species of gastro-intestinal parasites ($\chi^2=61.021$, P-value 0.000). Results are summarized in Table 4 and Figures 2-5.



Figure 2: *Moniezia* Spp.



Figure 3: *Moniezia* Spp.

Species	Sites				Total	χ^2	df	P-value
	North	South	East	West				
<i>Coccidia (Eimeria spp.)</i>	1	3	8	4	16	61.021	24	0.000**
	6.25%	18.75%	50.00%	25.00%	100.00%			
<i>Moniezia</i> spp.	0	1	0	1	2			
	0.00%	50.00%	0.00%	50.00%	100.00%			
<i>Strongyles/trichostrongyle egg</i>	2	20	35	10	67			
	2.90%	29.80%	52.20%	14.90%	100.00%			
<i>Trichuris</i> spp.	0	0	0	2	2			
	0.00%	0.00%	0.00%	100.00%	100.00%			
Total	3	24	43	17	87			
	3.40%	27.60%	49.40%	19.50%	100.00%			

Note: (**P-value=0.000 <0.01 (highly significant))

Table 4: Types of gastro-intestinal parasites in camels in different sites of river Nile State, Sudan.

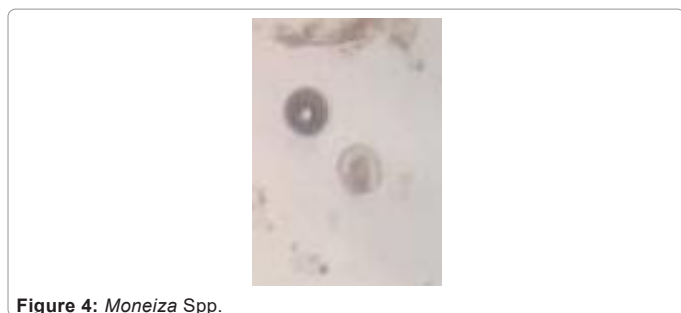


Figure 4: *Monezia* Spp.



Figure 5: *Monezia* Spp.

Risk factors analysis

A positive association ($\chi^2=30.973$, P-value=0.014) was reported for age groups with respect to different genera of gastro-intestinal parasites in camels. Highest positive cases were observed in age group >5 years in camels infected with *Strongyles* group. A percentage of 76.8% (n=67) was recorded for *Strongyles* group, followed by infection with *Eimeria* spp.18.4% (n=16) and then equally infection with *Monezia* Spp. And *Trichuris* spp. 2.3% mentioned age group in Table 5. Furthermore, a similar positive relationship was obtained for sex and different genera of gastro-intestinal parasites in camels ($\chi^2=16.351$, P-value=0.038). The prevalence was found high in female 81.6% (n=71) compared to male 18.4% (n=16). The results were summarized in Tables 5 and 6.

Breed has shown a great effect on presence of gastro-intestinal

Negative	Age groups (years)			Total	χ^2	df	p-value
	0-2	3-5	>5				
<i>Coccidia</i> (<i>Eimeria</i> spp.)	2 12.50%	7 43.75%	7 43.75%	16 100.00%	30.973	16	0.014*
<i>Monezia</i> spp.	1 50.00%	1 50.00%	0 0.00%	2 100.00%			
<i>Strongyles/trichostrongyle</i> egg	4 5.90%	16 23.80%	47 70.10%	66 100.00%			
<i>Trichuris</i> spp.	0 0.00%	1 50.00%	1 50.00%	2 100.00%			
Total	7 8.00%	25 28.70%	55 63.20%	87 100.00%			

Note: (*P-value=0.014 <0.05 (significant))

Table 5: Association between age groups and presence of different species of gastro-intestinal parasites in camels in River Nile State, Sudan).

Species	Sex		Total	χ^2	df	p-value
	Male	Female				
<i>Coccidia</i> (<i>Eimeria</i> spp.)	4 25.00%	12 75.00%	16 100.00%	16.351	8	0.038*
<i>Monezia</i> spp.	1 50.00%	1 50.00%	2 100.00%			
<i>Strongyles/trichostrongyle</i> spp.	9 13.40%	58 86.60%	67 100.00%			
<i>Trichuris</i> spp.	2 100.00%	0 0.00%	2 100.00%			
Total	16 18.40%	71 81.60%	87 100.00%			

Note: (*P-value=0.038 <0.05 (significant))

Table 6: Association between Sex groups and presence of different species of gastro-intestinal parasites in camels in different sites of River Nile State, Sudan).

parasites in camels ($\chi^2=10.993$, P-value=0.012). The highest prevalence was recorded for Araby 73.6% (n=39) followed by Anafi 60.0% (n=24), Dlaamy 48.6%. The result is presented in Figure 6. Moreover camels with poor health status showed high prevalence of gastro-intestinal parasites 88.5% (n=77) compared to camels with good health status (determined by signs of health) 11.5% (n=10) and statistically the difference was significant ($\chi^2=8.607$, P-value=0.014). The results are shown in Table 7. Regarding source of water, more gastro-intestinal parasites of camels infection was observed for Meaa and Hafeer with 45.3% (n=67) and 7.4% (n=11), respectively. Statistical significant difference was also recorded ($\chi^2=7.194$, P-value=0.027). The results are shown in Figures 7-10.

Discussion

Camels are better adapted than any other domestic animal to the very hot and dry desert or sub desert regions. Nevertheless, it suffers from various internal and external parasites infection which are major constrains in improvement of camel health. These infection cause substantial economic losses due to decrease in working capacity, growth and productivity.

In current research work, high overall prevalence 58.85% (n=87) of gastro-intestinal parasite infection in camels was recorded in Al-Butana area in River Nile State. Most of the heavy infection was observed in east part of Al-Butana area where the Atbarah River is. High infection rate are in agreement with 18. Al-Megrin [18] who found that 143 cases (59.6%) were positive for gastro-intestinal parasites in camels in the Riyadh region central Kingdom of Saudi Arabia. Similar results 62.75% (n=121) by Swai et al., [14] were obtained for prevalence of intestinal parasite eggs in camels in the Northern Tanzania. Fadl et al., in Al-Butana plains Sudan [9] reported that the prevalence was 69.0% and the nematodes were the highest percentage particularly in July. A cross-sectional study for determination the prevalence of major gastro-intestinal parasites affecting camels in Yabello district, Southern Rangeland of Ethiopia revealed that 73.8% (n=304) of the camels excreted helminthes eggs /protozoon oocyst in their faeces [11]. Furthermore, the overall prevalence of gastro-intestinal parasites in semi-intensive dairy camels systems and free grazing system in Mogadishu, Somalia was 50.3% (n=167) [4].

Gastro-intestinal parasites infection	Health status		Total	χ^2	df	p-value
	Good	Poor				
Negative	7	54	61	8.607	2	0.014*
	11.70%	88.50%	100.00%			
Positive	77	10	87			
	88.50%	11.50%	100.00%			
Total	84	64	148			
	56.70%	43.30%	100%			

Note: (*P-value=0.014 <0.05 (significant))

Table 7: Association between health status and Present of gastro-intestinal parasites in camels in River Nile State, Sudan).

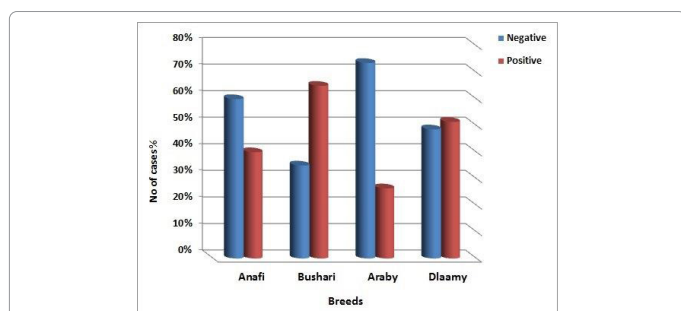


Figure 6: Relationship between breed and presence of gastro-intestinal parasites of camels in river Nile State, Sudan ($\chi^2 = 10.993$, P-value=0.012 <0.05 (significant)).

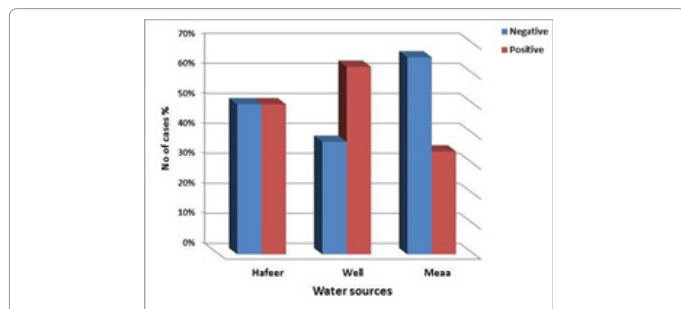


Figure 7: Relationship between water source and result of gastro-intestinal parasites of camels in river Nile State, Sudan ($\chi^2=7.194$, P-value=0.027 <0.05 (significant)).

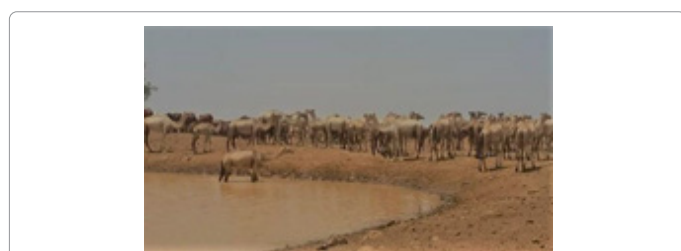


Figure 8: Water source (Hafeer) in river Nile Stat.

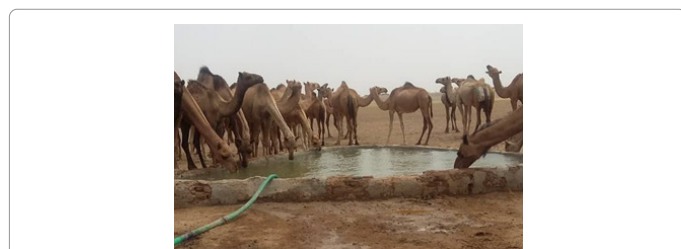


Figure 9: Water source (well) in river Nile state.



Figure 10: Water source (Meaa) in river Nile State.

As seen from the results, *Strongyles* group (76.8% n=67) was the most prevalent gastro-intestinal parasites infection in Al-Butana area in River Nile State. High prevalence of *Strongyle* type eggs 49% (n=100) was reported in indigenous camels, with traditional husbandry and management in Iran [19]. In Borno State Nigeria, Yakaka et al. [2] confirmed that the *Strongyle* eggs 41.1% (n=83) was the most dominant gastro-intestinal parasites in one humped camels (*Camelus dromedarius*) slaughtered at the Maiduguri Metropolitan abattoir.

In the current study, Coccidia was found in faecal samples of camels 18.4% (n=16) in Al-Butana area in River Nile State. Similar findings were detected in 17.4% (n=40) from camels in the Eastern Region of Sudan by [7]. Yakaka et al., [2] confirmed the presences of Coccidia (7.4%) (n=15) in camels slaughtered at the Maiduguri Metropolitan abattoir Borno State in Nigeria. On the other hand, *Moniezia* spp., and *Trichuris* spp. were observed with low percentage in camels in the current study. Similarly, Yakaka et al., [2], Ararsa et al., [11] and Muhomed et al., [12] were found these internal parasites of camels in Nigeria and Ethiopia.

During this research work, highest positive cases 63.2% (n=55) of gastro-intestinal parasites in camels was observed in age group greater than five years in River Nile State. This finding was confirmed by Yakaka, et al., [2] who stated that prevalence was found to be higher in adult compared to young camels. Moreover, camels with poor health status showed high prevalence of gastrointestinal parasites in camels compared to camels with good health status in this study ($\chi^2=8.607$, p-value=0.014). Yakaka et al. [2] stated that the occurrence of these parasites is more frequent in slim body condition score compared to camels in good body condition. Regarding significant level (P-value=0.038 <0.05) that obtained for sex, could be attributed to fact that most camel herds in the study site constituted more females rather than males, and this might be affected the outcome of the statistical analysis. On other side, more infections in this study were detected in Hafeer and Meaa. An assumption has been made these sources of water are responsible for heavy infection of gastro-intestinal parasites of dromedary camel in pastoral production systems in tropical countries.

Conclusions

1. The overall prevalence of gastrointestinal parasites in camels in Al-Butana area in River Nile State was high (58.8%) and *Strongyles* group were the most frequent parasites.

2. Factors such as age, sex, breed; health status and sources of water were found to be associated with occurrence of gastro-intestinal parasites of camels in Al-Butana in River Nile State, Sudan.

Recommendations

1. Control measures should be applied in order to reduce the infection with gastro-intestinal parasites to minimum level in different camel herds so as to maintain some degree of immunity in the camel herds.

2. An attention should be made in order to increase the awareness of the owners about impact of gastro-intestinal parasites infection particularly on productivity of the camels.

3. Further epidemiological studies regarding gastro-intestinal parasites infection including other parameters and environmental factors as well, are required to clarify the occurrence of the infection in different regions of Sudan.

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