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Full Length Research Paper

Study on prevalence of parasitic diseases in cattle in Abyei area – Sudan

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This study was designed to compare information on parasitic diseases occurrence in nomadic cattle herds in Abyei area. Collection of data from the veterinary records, Veterinary drug centres, questionnaire and external parasites, faecal and blood samples from animals were carried out for one year. The clinical records showed that, parasitic diseases constitute a major problem, and formed 53% of the total diseases recorded in the clinical records. Veterinary drug centers records also revealed that, within parasitic drugs, anthelmentic drugs were the most used in high quantities constituting 48%, then blood parasites as 37% and external parasites drugs which were 15%. During the wet season, many cattle herds were found in a restricted area sharing the available water and pasture. There were no proper slaughter houses, and also disposal of the offals and carcasses during meat inspection. Cattle parasitic diseases were surveyed at four administrative units in the study area at Muglad, Mayram, Abyei and Dibab. Faecal samples, blood smear, ticks and biting flies were collected. The results of this survey showed the followings: the faecal samples from cattle using floatation and sedimentation methods showed that: *Paramphistomum* sp. constituted 11.25%, *Fasciola gigantica* 5.00%, *Schistosoma bovis,* 1.50%, *Oesophagustomum* sp. 2.50%, *Moniezia* sp. 0.63% and *Eimeria* sp. 4.38%. The occurrence of internal parasites was found higher during the wet season. Blood smear examination revealed that there were *Theileria* species and *Babesia* sp. at prevalence rates of 5.88 and 5.15% respectively. *Theileria* sp. was more prevalent in Muglad compared to other locations, while *Babesia* was more frequently detected in Mayram. It is noticeable that the overall prevalence is almost the same for the two parasites. Herds were found to be 100% infested with hard ticks. 9 different tick species were identified. They belong to three genera: *Amblyomma, Hyalomma* and *Rhipicephalus.* Identified tick species collected from cattle, sheep, goats and camel were: *Amblyomma lepidum, Rhipicephalus sanguineus, Rhipicephalus evertsi, Rhipicephalus simus. simus, Boophilus decoloratus, Hyalomma marginatum rufipes, Hyalomma anatolicum excavatum, Hyalomma truncatum and Hyalomma dromedarii*. The most abundant tick species were *R. sanguineus* (38.60%), *A. lepidum* (29.06%) and *H. m. rufipes* (27.91%). The total count of ticks showed that *A. lepidum* and *Hyalomma m. rufipes* were actively distributed throughout the year among the hosts with relative preference to cattle and camel. Similarly *R. sanguineus* had a significant distribution in sheep with restricted presence on other animal species. The biting flies identified revealed; *Atylotus agrystus, Atylotus fuscipus, Tabanus taeniola* and *Ancala latipes*. The total count showed that, *A. agrystus* and *T. taeniola* were actively distributed in the area. Parasitic disease burden as calculated for individual animals revealed that examined animals (100%) were infested with ticks. 64% of the animals were infested with ticks only. The rest showed 32% with one internal parasite and ticks, and 4% with two internal parasites and ticks. The nomads were found scattered during the dry season, whereas they were found in concentration in five locations during the wet season. The main water sources in the wet season are Rahad, Butta, Hafeir and Al Wadi. Whereas in the dry season, the main water sources are Ragaba and Downki and other additional sources such as Hafeir, Id and Bahr Al Arab. The animal owners have a good knowledge about the parasitic diseases and their symptoms, but their knowledge about the treatment and control was not adequate. They ranked the most important diseases as follows: mixed infection (Alk) 71%, Ticks and tick-borne diseases 27%, Biting flies and Trypanosomosis 20%, Foot and mouth disease and Black quarter as 20% each. The majority of the livestock keepers were 58.60% treating their animals several times throughout the year, and they find the drug in the temporary markets and sometimes in the (Farig). Ticks were 61 and 39%for biting flies were found during wet season, whereas, in the dry season 91% ticks and 9% biting flies.

Key words: Parasitic diseases, Abyei, Sudan.

INTRODUCTION

Abyei locality is an area of rich savanna located in southern part of Western Kordfan state, lies between latitude 9ºN to 11° N / longitude 27ºE to 29° E (Abdallah et al., 2005). The locality is divided into four administrative units these were: Abyei, AL Muglad, AL Dibab and AL Mayram. It is a transitional zone and bordered by Al Salam locality to the North, Southern Darfur to the West, Northern Bahr AL Ghazal and Unity to the South and Southern Kordofan to the East. In the area, there was a conflict between Messeria and Dinka as an extension to the war in the South. This had affected the life pattern and the social relations which became restricted; accordingly the grazing system was limited to certain areas especially during the dry season.

Although, the animal population is very high, and complaint from disease are frequent there were no efforts conducted to evaluate the parasitic disease problems. The common parasitic diseases reported in the area are: ticks and tick borne diseases, helminth and trypanosomosis, causing general emaciation, diarrhea, abortion, fever and other non-specific symptoms in addition to deaths. Although, parasitic diseases are proved to be important yet studies are still limited especially on their economic implications and public health importance. These concerns initiated this study to fulfill objectives:

1. To study the parasitic diseases status in the area.
2. To show the knowledge of livestock owners about the parasitic diseases.
3. To identify the disease vectors in the area and their distribution in relation to environmental conditions and their distribution.
4. To propose a sound and feasible strategy for control of parasitic disease in nomadic livestock production systems.

MATERIALS AND METHODS

Study area description

Selected area

Abyei locality was selected to study the parasitic diseases problems. The locality is divided into four administrative units these are: Abyei, Al Muglad, Al Dibab and Al Mayram. It is a transitional zone bordered by Al Salam locality to the North, Southern Darfur to the West, Northern Bahr Al Ghazal and Unity States to the South and Southern Kordofan State to the East. The major towns are Abyei, Al muglad, Al Mayram and Al Dibab (Figure 1). It was selected, because of the high animal population and there were no surveys conducted to evaluate the parasitic disease problems.

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Community perception (questionnaire)

The annexed questionnaire was used in the study area. The questionnaire was aiming at finding out the knowledge of the pastoralists or nomads about the parasitic diseases; symptoms, ranking, importance and their effects. Also it was aiming at finding the link between diseases and environmental factors, life pattern to detect the real parasitic diseases problems. In order to get the information on the local community perception of disease and symptoms, the participatory appraisal (PA) methodologies were conducted. PA tools described as combined matrix and ranking (Catley and Ahmed, 1996; Catley et al., 2001). These techniques were adapted in the study area as a ranking method for parasitic diseases problems. One hundred livestock keepers were selected and subjected to the questionnaire using convenience sampling.

Combined matrix

Matrix scoring was used to investigate the parasitic diseases symptoms. Participants were asked to name the most important diseases and their important symptoms in the area, and then written in local terms on pieces of cards. The diseases cards were placed side by side on the ground and a column of the symptoms at right angles. Each participant was supplied by 20 beans. Then they scored against the different symptoms.

Ranking

Here ranking method was used to rank the diseases. Participants were asked to name the most important diseases in the area, and then written in local terms on pieces of cards. The diseases cards were placed on the ground, and then each participant was asked to rank them according to the importance.

Veterinary records

Clinical records

The clinical cases records were collected from the veterinary clinics in the study area during the study time**.** Then the parasitic cases were calculated and analyzed in relation to other diseases using Microsoft Excel (Windows, 2003).

Drugs records

The records of the parastic drugs consumed in the study area during the study time, were collected from the drug stores, and were classified to anthelmentics, blood and external parasites drugs, then analyzed using Microsoft Excel (Windows, 2003).

Laboratory findings

The following samples were collected from different locations during the seasons: dry (December to May) and wet warm (July to October). 136 cattle were sampled for all possible parasites, sex and age groups were considered. Samples were collected from the three morhals.

Blood smear

136 cattle were sampled in the study area. Thin blood smears

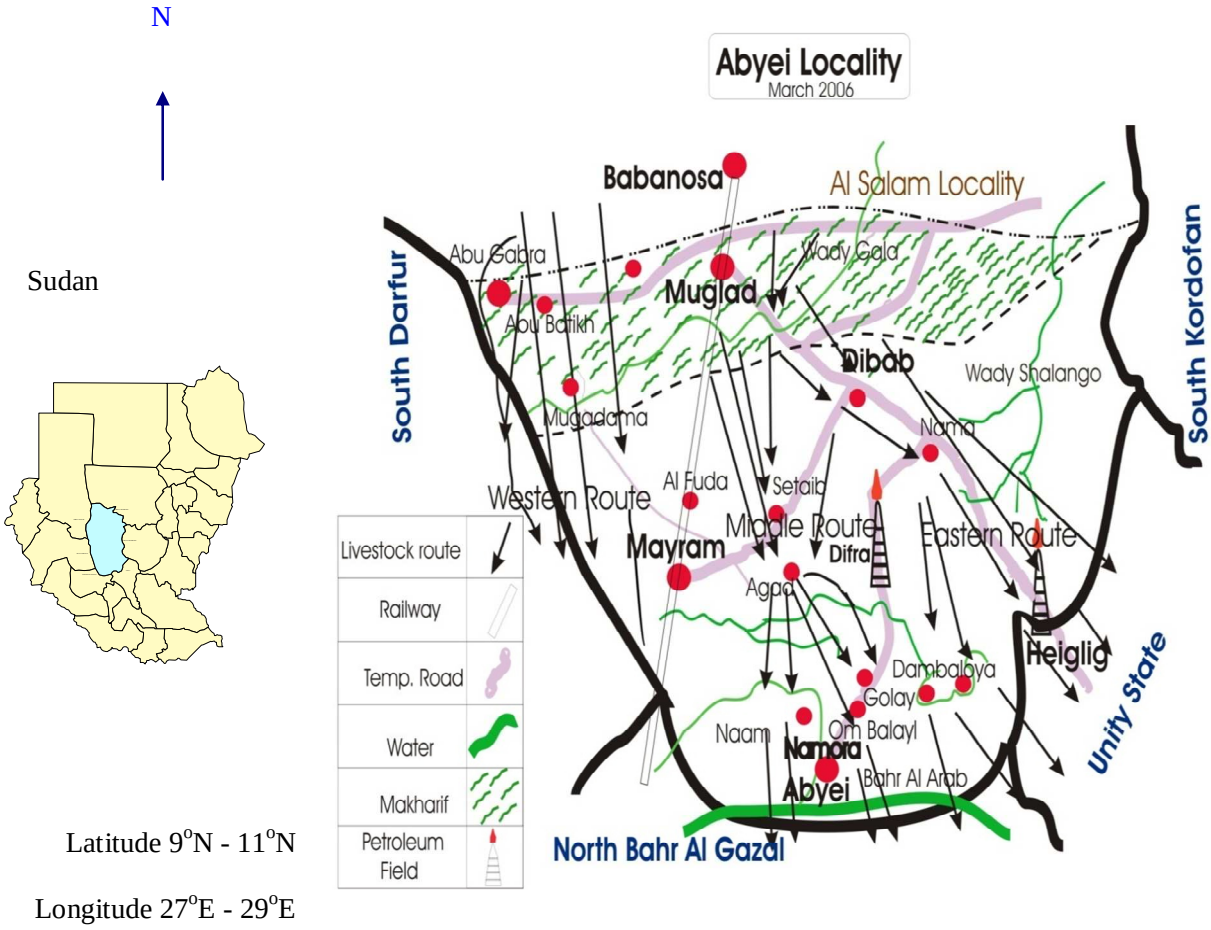

Figure 1. Abyei locality map.

were collected from the ear vein of the cattle. A drop of blood was taken on a clean slide, spread by another slide at an acute angle, air dried and fixed in absolute methanol for 3 to 4 min. Then the slides were labeled and kept in slide box. In the laboratory, the smears were stained in 5% Giemsa's stain for 45 min, after that washed off with water. Finally plotted dry and examined under oil immersion objective.

Faecal samples

(160) samples were collected from the rectum of cattle and preserved in 10% formal saline. These samples were examined by sedimentation and floatation methods for helminthes ova or cysts.

Sedimentation method

A spoonful of faeces was thoroughly mixed with 30 to 40 volumes of water; the suspension was poured through a wire mesh screen with an aperture of 0.15 mm in a cylinder and left for 20 min. The supernatant was removed and washed by water (4) times. Finally, small quantity of the deposit was taken using a pipette and put on microscope slide, a cover slip was applied and examined microscopically under the low power (Kelly, 1984).

Floatation method

A spoonful of faeces was placed into 10 times volume of saturated salt solution (660 mg sodium chloride dissolved into 2.4 L of water) in a stoppered glass, thoroughly shaken to mix and the suspension was poured into a wire mesh with an a aperture of 0.15 mm , standing in a funnel into a tube. The tube was filled to the brim and allowed to stand in a rack for 30 min. The meniscus was touched by underside of a cover slip held horizontally. The resulting drop on the cover slip was then placed on microscope slide for examination (Kelly, 1984).

Ticks collection

(140) cattle were sampled; the samples were collected directly from the animals using thumb forceps. The chosen animals were restrained and because, ticks infestation was very high, great efforts were exerted to collect half body ticks concentrating on the predilection sites of different tick species such as briskets, dewlap, perineal region, udder, inner legs, eyes and tail. All ticks collected were preserved in 70% glycerol - alcohol labeled with reference number, date, host and location. In the laboratory, each tick collection was sorted out. Each specimen was examined under stereoscopic dissecting microscope and identified using taxonomic key to Ixodid ticks (Hoogstraal, 1956; Walker et al., 2003).

Flies collection

(215) flies were collected from the Southern parts of the study area where there is heavy plantation and natural sources of water (valleys, Ragaba, etc) that is, (Logam) areas during the rainy season. Two methods were used: direct collection of the flies using hands and nets when the animals are grazing outside and the other was mobile car method.

Mobile clinic method for fly's collection

This method was used for the first time in this research survey in Abyei area using a mobile clinic car (easy field practice). A mobile clinic car was located at the fly's area and left for 30 min with the rear door open, then the door was closed and the flies were collected using hands. The process was repeated several times a day.

This field practice was found easier, quicker and collects more different fly species which are not easy to enter the normal trap. The flies collected were preserved in 30 ml screw capped plastic bottles with 5% glycerol alcohol and labeled with reference number, date and location. Then in the laboratory, each flies collection was sorted out. Each specimen was examined under dissecting microscope and identified.

Data analysis

Microsoft Excel (Windows, 2003) and Stata 6.0 for Windows 98/95/NT were used for data analysis. Chi-square (χ^2) was used to assess the statistical association of various factors (season, age and sex) with occurrence of both blood and internal parasites. Odds Ratios was obtained to quantify only significant association. Odds Ratio greater than one, considered to be a risk factor for presence of blood and internal parasites. Pie Charts were used to demonstrate the effect of season on infection with blood and internal parasites. Microsoft Excel (Windows, 2003) was also used for analysis of: ticks and flies count, clinic and drugs data, and disease burden. Pie charts were used to demonstrate the most prevalent ticks and flies, the proportions of parasitic drugs used, proportion of parasitic diseases to others and parasitic disease burden in or on individual animal.

SPSS 11.5 for windows was used for analysis of the questionnaire data. Descriptive statistics were used to find out the frequency of most of the variables mentioned in the questionnaire. Moreover, crosstabs were used to correlate between the most important diseases mentioned, their local names, scientific names and season of treatment. In addition to that the crosstabs were used to correlate between the season and occurrence of biting flies and ticks.

RESULTS

Internal and blood parasites

The results of presence of internal parasites during different seasons are shown in (Table 1). Blood smear examination revealed that there were *Theileria* sp. and *Babesia bigemina*. Their prevalences were 5.88% and 5.15% respectively. The overall prevalence was 11.03% for the two parasites. *Theileria* sp. was found more prevalent in Muglad compared to other locations, while *Babesia* was more frequently detected in Mayram although the difference was not significant. It is noticeable that the overall prevalence is almost the same for the two parasites (Table 2). When seasonality was, however, considered prevalence of *Theileria* was found the same during the two seasons, whereas *Babesia* was slightly higher during the wet season (Table 3).

Hard ticks identification

Herds were found to be 100% infested with hard ticks. Out of 3,110 ticks collected from animals, 9 different tick species were identified. They belong to three genera; *Amblyomma, Hyalomma* and *Rhipicephalus.* Identified tick species collected from cattle, sheep, goats and camel were: *Amblyomma lepidum, Rhipicephalus sanguineus, Rhipicephalus evertsi, and Rhipicephalus simus. simus, Boophilus decoloratus, Hyalomma marginatum rufipes, Hyalomma anatolicum excavatum, Hyalomma truncatum and Hyalomma dromedarii*. The most abundant tick species were *R. sanguineus* (38.60%), *A. lepidum* (29.06%) *and H. m. rufipes* (27.91%). Other species found in decreasing order of abundance were *H. anatolicum excavatum* (1.25%)*, H. truncatum* (1%), *Hyalomma dromedarii* (0.71%)*, B. decoloratus* (0.64%), *R. evertsi* (0.64) and *R. simus. Simus* (0.16%) (Table 4).

The total count of ticks showed that *A. lepidum* and *H. m. rufipes* were actively distributed throughout the year among the hosts with relative preference to cattle and camel. Similarly *R. sanguineus* had a significant distribution in sheep with restricted presence on other animal species as in. Mange, lice and soft ticks were not encountered during this study. Also larval stages of soft ticks were not found.

Biting flies

215 flies were collected and identified as follows: *A. agrystus, A. fuscipus, Tabbanus taeniola* and *A. latipes*. The total count showed that *A. agrystus* and *T. taeniola* were more abundant in the area (Table 5).

Parasitic disease burden

Parasitic disease burden as calculated for individual animals revealed that all animals (100%) were infested with ticks. 64% of the animals were infested with ticks only. The rest showed 32% with one internal parasite (helminthes or blood) and ticks, and 4% with two internalparasites and ticks (Figure 2).

Veterinary records

The clinical records showed that, parasitic diseases constitute a major problem and were found to constitute

Table 1. The presence of internal parasites in cattle during different seasons in the study area.

Internal parasites*	No. of positive prevalence (%)		Total positive	Over all prevalence (%)
	Dry season (%)	Wet season (%)		
Paramphistom sp	6 (50.00)	12 (42.86)	18	11.25
Fasciola gigantica	3 (25.00)	5 (17.86)	8	5.00
Schistosoma bovis	-	2 (7.14)	2	1.25
Oesophagustomum sp	1 (8.33)	3 (10.71)	4	2.50
Moniezia sp	1 (8.33)	-1	1	0.63
Eimeria sp	(8.33)	6 (21.43)	7	4.38
Total	12 (100.00)	28 (100.00)	40	25.00

*Total number of cattle examined = 160 animals.

Table 2. The prevalence of blood parasites in cattle in the study area.

Location	No. of cattle examined	Prevalence (%)		Overall prevalence (%)
		***Theileria* sp**	***Babesia* sp**	
Muglad	34	1 (2.94)	5 (14.71)	6 (17.65)
Dibab	34	2 (5.88)	-	2 (5.88)
Mayram	34	3 (8.82)	1 (2.94)	4 (11.76)
Abyei	34	1 (2.94)	2 (5.88)	3 (8.82)
Total	136	7 (5.15)	8 (5.88)	15 (11.03)

Table 3. The presence of blood parasites in cattle during different seasons in the study area.

Blood parasite	Prevalence (%)		Overall prevalence (%)
	***Theileria* sp**	***Babesia* sp**	
Theileria sp	4 (50)	4 (50)	8 (100)
Babesia sp	3 (42.86)	4 (57.14)	7 (100)
Total	7 (46.67)	8 (53.33)	15 (100)

Table 4. The prevalence of adult tick species in the study area.

Tick species	Count	Percentage (%)
sanguineus	1,202	38.60
A. lepidum	903	38.60
H. m. rufipes	868	27.91
H. A. excavatum	39	1.25
H .truncatum	31	1
H .dromedarii	22	0.71
B. decoloartus	20	0.64
R. evertsi evertsi	20	0.64
R. simus simus	5	0.16
Total	3,110	100

53% of the total diseases in the study area. The records also showed that, anthelmentic drugs were the most frequently used (48%), then blood parasites (37%) and external parasites drugs which were 15%. During the wet

Table 5. Numbers of blood sucking flies caught in the study area.

Fly	Number caught	Percentage (%)
Atylotus agrystus	122	56.74
Tabanus taeniola	74	34.42
Ancala latipes	12	5.58
Atylotus fuscipus	7	3.26
Total	215	100.00

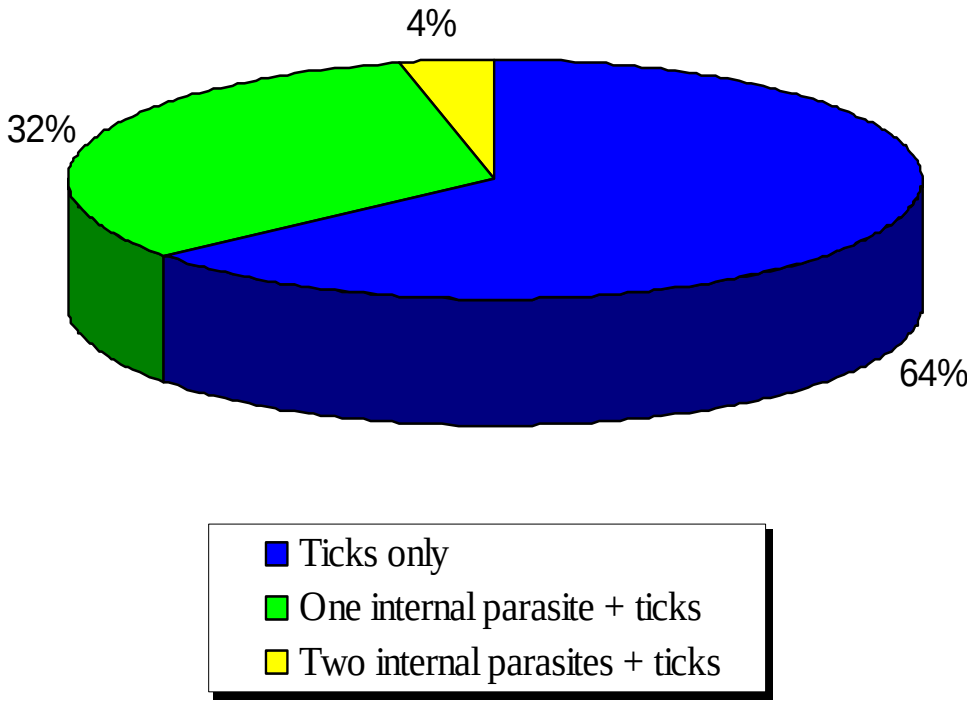

Figure 2. Parasitic disease burden on individual cattle.

season settlement areas (Makharif), many cattle herds were found in a restricted area sharing the available water and pasture, which increases the contamination. Regarding the public health, there were no proper slaughter houses and disposal of the offals and carcasses during meat inspection and disease outbreaks.

Questionnaire results

There were 29 settlement areas during the dry season (Massayif), and five during wet season (Makharif). The nomads were found scattered in different places during the dry season, whereas they mainly congregate in five locations during the wet season**.** In the wet season, the main water source is Rahad. Some places have additional sources which are: Butta, Hafeir, Al Wadi or Butta and Hafeir. In the dry season, the main water sources are Ragaba and Downki. There are additional sources which are: Hafeir, Id, Bahr Al Arab or Id and Hafeir.

The livestock composition in the study area was: mainly herds of cattle, sheep and goat, and few camel and equines as pack animals. The nomads have a good knowledge about parasitic diseases and their symptoms, but their knowledge about the treatment and control was not adequate. They mentioned the following diseases and vector problems as the most important: Alk (mixed infection of internal parasites and tick-borne diseases), Ticks and tick-borne diseases, Loggam (insects) and trypanosomosis, FMD, B.Q, Fascioliasis, H.S, PPR, Pneumonia, Sheep-pox and green fodder poisoning. They ranked the most important diseases as follows: mixed infection (Alk) 71%, tick-borne diseases 27%, Biting flies and Trypanosomosis 20%, Foot and mouth disease and Black quarter, each as 20% (Table 6). The majority of the livestock keepers (58.60%) were treating their animals several times and throughout the year

Table 6. Ranking of the most important diseases in the study area as mentioned by respondents.

No	The most important diseases	Local names	Ranking (%)		
			1st	2nd	3rd
1	Mixed infection (internal parasites + tickborne diseases)	*Alk*	71	19	5
2	Biting flies (Tsetse, Tabanus, etc) / Trypanosomiasis	*Logam/Abu*	1	20	14
3	Plant poisoning	*Fasookh*	4	3	7
4	FMD	*Um Futfut*	3	15	20
5	H.S	*Abu Lissan*	2	2	15
6	B.Q	*Abu Khananyga*	3	7	20
7	PPR	*Al Wagaa*	1	4	6
8	GITworms / Fascioliasis	*Om Tibail*	1	2	5
9	Ticks and Tick-borne diseases	*Didan*	12	27	10
10	Pneumonia	*Goradia*	0	1	1
11	Ringworm	*Abu fishaifeesh*	1	0	2
12	Sheep pox	*Goob*	1	0	3
13	Brucellosis	*Jadari*	0	0	1
14	NA	*AL DAb*	0	0	1
Total			100	100	100

Table 7. Times of treatment of the most important parasitic diseases.

Times of treatment of the most important parasitic diseases	Ranking of times of treatment (%)			Mean (%)
	1st	2nd	3rd	
Several times	72.00	53.90	50.00	58.60
Twice	16.00	18.00	26.90	20.30
once	12.00	28.10	23.10	21.10
Total	100.00	100.00	100.00	**100.00**

Table 8. Season of treatment of the parasitic diseases asmentioned by animal owners.

Parasitic diseases	Season of treatment of the parasitic diseases (%)		
	Dry	Wet	All over the year
Mixed infection (internal parasites + tickborne diseases)	5.32	5.32	89.36
Biting flies (Tsetse, Tabanus, etc)/Trypanosomiasis	50.00	14.00	36.00
GITworms / Fascioliasis	22.22	11.11	66.67
Ticks and tick-borne diseases	20.68	5.17	74.15
Equine mange	0	0	100

(Table 7). They do not find veterinary services when in remote areas. They find the different types of drug in the temporary markets. Regarding seasonal occurrence of external parasites, especially ticks and biting flies, ticks were found 61 and 39%for biting flies during wet season, whereas, in the dry season 91% for ticks and 9% for biting flies (Table 8). They also mentioned the followings as general problems: In the dry season, the pasture is poor and water is scarce so they are forced to migrate with their livestock for long distances or crowd and overgraze certain places which lead to other problem as appearance of diseases such as Mixed infection (Alk). Moreover, when the nomads start moving to the South (October to November), some of them burn the vegetation and the grass in order to fight the biting flies (Loggam).This practice influences the nutrition during the dry season. Darfour war and the tribal conflicts lead to displacements which predispose to disease transmission and appearance of new diseases and vectors such as ticks. The previous vast pasture lands were reduced by the extending oil fields, and the newly constructed roads blocked some of the natural water valleys. Animal teats

were damaged by ticks and affected milk production.

DISCUSSION

Most of epidemic diseases controls were directed towards viral and bacterial diseases and most of them are controlled by vaccination and antibiotics administration. To plan proper animal health improvement strategies it is necessary to assess the parasitic diseases status and their impact on livestock production. It is also important to map the prevalence of diseases to help in determining the geographical distribution and to assess the impact of environmental factors and their effect on the epidemiology of these diseases. This study was aimed to: Study the parasitic diseases prevalence in the area, show the knowledge of livestock owners about the parasitic diseases, identify the disease vectors in the area and their distribution in relation to environmental conditions and their distribution, and to propose a sound and feasible strategy for control of parasitic disease in nomadic livestock production systems. This study was also intended to provide more information on the parasitic disease burden on nomadic livestock. Prevalence among different age groups, animal species and in the two sexes was calculated.

The perception of pastoralists about animal diseases, their knowledge and practice were also probed. The overall results confirmed the presence of gastro-intestinal, blood and external parasites which constitute an alarming situation.

Each selected animal in the study population had been examined for all possible parasitic infection. In Abyei locality, parasitic diseases constitute a major problem. Presence of parasites in the study area was most likely attributed to the production system, management practices used and the environmental conditions in the area. It was observed that, the high tick infestation was one of the major problems in the area due to lack of application of proper management system and inadequate use of acaricides. Moreover the ecosystem with its vegetation cover and soils constitute a hiding place and source of parasitic infestation.

There is no strategic treatment and application of preventive measures. The majority of livestock owners use the drugs randomly without a clear plan. Moreover, the veterinary services in the area were in a continuous decline due to poor infrastructure, lack of laboratory facilities, wars, tribal conflicts and government financial problems. As public health facilities are concerned, there were no proper slaughter houses and disposal of the offals and carcasses during meat inspection and disease outbreaks. Furthermore, absence of public awareness and limited extension programmes in the area. Recently after Darfur civil strife, changes were noticed on the livestock movements. Trade animals which used to come from western Sudan to Khartoum throughout the year, changed their route to pass across the study area. Hamar tribes from Northern Kordofan, who used to spend the dry season in Darfur, changed their ordinary route to spend the dry season in the study area. These changes in the live patterns, influenced the disease prevalence and animal susceptibility. This is a fact which tallies with the expected changes of prevalence when herds are introduced in to a new area. It is well established that nomads move North / South in a regular seasonal pattern on three routes (morrhals) searching for better pasture and water for their large herds. This continuous periodic movement is an established practice with advantages that; it is a sort of rotational grazing system which is one of the cheapest systems in animal breeding. It is also a kind of preventive practice by keeping part of the pasture clean during the wet season, where the infection, vectors and intermediate hosts were present. On the other hand, the disadvantages of this system were: the stress due the continuous migration for long distances (100 to 600 km), reduces the production and predisposes to disease transmission, this had also been described by Duval (1994).

The severity of disease manifestation is affected by the pasture condition, where the general livestock health improves during the wet season as compared to the dry season poor condition. This is also an agreement point with Duval (1994). Also Hansen and Perry (1994), reported that in West Africa, during the dry season, shortages of fodder place many animals under nutritional stress, which can influence the severity of GI infection. Poor pasture and scarcity of water during the dry season, wars and tribal conflicts, the extending oil fields and the newly constructed roads, blocked some of the natural water valleys were problems as mentioned by the respondents. These problems act as predisposing factor for parasitic diseases severity.

Concerning the internal parasites from the overall (25%) positive cases, the study showed that *Paramphistomum* sp. showed the highest prevalence (11.25%), followed by *F. gigantica* (5%), *Eimeria* (4.38%), *Oesophagostomum* sp. (2.5%), *S. bovis* (1.25%) and *Moniezia* sp. (0.63 %). These results tend to be low compared with the results from other parts of Sudan, this may be due to the treatment administered by owners and resistance developed to parasitism by the animals or a positive consequence to nomadism as mentioned above. *Paramphistomum* sp. in this study was found to be (11.25%) which was less than the results reported in dairy cattle by Ahmed (2004) being (40%) in White Nile and 17.6% in Gazira, due presence of water. Gasmelsid (2005) found that the prevalence of *Paramphistomum* sp. infection was 2% during the dry cool season, 0% during the dry hot season and 1.05 % during the wet hot season in dairy cattle kept under intensive system. *F. gigantic* was found to be 3 (37.50%) during the dry season and 5 (62.50%) during the wet season. The general prevalence in the area was found as (5%), which is also less than the results found by Ahmed (2004) in White Nile (34.4%) and

14.4% in the Gizera. This is due to presence of adequate water sources and intermediate host in in White Nile and Gizera. In spite of the difference in the prevalence from area to another, the flukes are widely distributed (*Fasciola*, *Paramphistome* and *Schistosoma*) in study area. This agree with Hansen and Perry (1994) and Edward (2006), they indicated that the presence and spread of these flukes commonly throughout Africa, South America, Middle East and Asia where there are good water sources in which the snail intermediate hosts are found. This is agrees with the respondents in that, there were different water sources in the area, which act as source of infection and spread. The prevalence of *Coccidia* was found 4.38%, its frequency was higher during the wet season, because it provide good conditions for the GI parasites to flourish. *Oesophagostomum* sp. was found 2.5%, and its frequency was higher during the wet season. Also it was observed there were considerable numbers of fibrous nodules in the intestinal wall of cattle slaughtered in the area. This strongly related to faecal result of the parasite. The percentage of *Schistosoma* and *Moniezia* were 1.25 and 0.63% respectively, which showed that some parasites which are not transmitted, can be confined to certain areas. This may create a hazard, if the infected animals move and contact other susceptible ones.

Generally, it was found that the prevalence of internal parasites was increased and become high during the wet season, because the climatic conditions become favourable for the development of internal parasites. This agrees with the result of the questionnaire, in which the respondents ranked the first important parasitic disease is Alk (82%), which means; the mixed infection that results from contaminated land due to presence of high animal population grazing in one area for many years leading to complicated disease problems. This can be strongly related to the result that the nomads congregate in five major locations (Makharif) during the wet season.These agree with Magzoub (2002), he stated that, stock management and high density have an important role on contamination of the environment. Moreover, the structure and type of the grass depend upon soil type, and that determine the degree of formation of the space between the soil and the grass (mat). The mat is mainly found at the old grazing lands, and it keeps the high humidity for weeks in dry seasons. Presence of this humidity and air pockets in the mat decreases the change of temperature, which helps in presence and growth of larvae of worms, ticks and other larval stages of insects (Magzoub, 2002).

There was no information available regarding parasitic diseases in Abyei area. In addition there was no any research conducted in this field. Ticks infestation was found high (100%), also the animal owners clarified that, ticks were 61 and 39% for biting flies during wet season, whereas, in the dry season 91% for ticks and 9% for biting flies. Ahmed (2004) found that; the prevalence of ticks infestation on cattle in the White Nile dairy farms was 49.6 and 44% at Gezira. This due to the differences in management systems. In addition Maiju (2005) in Pibor area found that among animal species, cattle were highly infested 53% with different tick species than other animals.

This investigation concluded the presence of nine tick species infesting livestock in four selected locations (the administrative units) in Abyei locality. The tick species identified was similar to those reported from Kordofan. It is also similar to that from Pibor and Kosti, however in this study *A. variegatum* and *Boophilus annulatus* were not found. It differs from Julla (2003) in *A. variegatum, B. annulatus, Rhipicephalus parvus, Haemaphysalis leachi* and *Rhipicephalus appendiculatus* which is a tick of high rainfall. *H. m. rufipes* were found higher and actively distributed throughout the year among the hosts with relative preference to cattle and camel, this agree with Osman et al. (1982). But *R. sanguineus* was found the highest one with a significant distribution in sheep with restricted presence in other animal species. In addition to that *R. simus. Simus*, the glossy tick was found the least one, and only in the southern part of the area (Abyei town). This agrees with Walker et al. (2003) and Maiju (2005) results in that it is a tick of savanna climate, widely distributed in the moderate to high rain fall regions. Ticks results were strongly relevant to the livestock owners ranking of parasitic diseases, in which the mixed infection, Alk is the most important, then ticks and tick-borne disease, *Goradia* and biting flies and Trypanosomosis, *Abu Fasookh*. In Unity State *Messeria* ranked African Animal Trypanosomosis (AAT) according to its importance to be in the fourth place (Omer, 2005). Maiju (2005) in Pibor area found that, the three most abundant tick species were *A. lepidum* 54.6%, *R. sanguineus* 20.5% and *R. evertsi* 16.2%, whereas in this study, the most abundant ones were *R. sanguineus* 38.60%, *A. lepidum* (29.06%) and *H. m. rufipes* 27.91%. According to Walker et al. (2003) and Maiju (2005), *A. lepidum*, was widely infesting animal species and occurs in a wide variety of climatic regions from temperate to savanna and desert, but it most commonly inhabits arid habitats with 250 to 500 rainfall. This is also agree with Osman et al. (1982).They reported that, the ecological distribution of *A. lepidum*, *Amblyomma variegatum*, *H. m. rufipes, H. truncatum, R. simus, B. decoloratus, B. annulatus,* paralleled the distribution of cattle in savannah zones. They also found that *H. m. rufipes* appeared to be the most common *Hyalomma* on cattle in the area, and *A. lepidum* was mainly collected from cattle, but it was also found on sheep and goats. This is of significance to the epidemiology of heartwater, theileriosis, anaplasmosis and babesiosis. Therefore, incidence of these diseases is expected to be high in the study area, whenever the conditions become favorable. The pan-tropical dog tick, *R. sanguineus* group was found the most abundant one in this area. This agrees with Walker et al. (2003). They

showed that, this species has become the most widespread tick throughout the tropics and sub-tropics due to its specialized feeding on domestic dogs. Furthermore, it is a tick of warm and moist climates and is sparse in desert climate.

The study revealed that there were *Theileria* sp. 5.88% and *Babesia* sp. 5.15%, of overall prevalence 11.03%. The frequency of *Theileria* sp. was found the same during the different seasons, where as *Babesia* sp. was slightly higher during the wet season. This agrees with tick identification results in the area. Siddig (1997) calculated the prevalence of Bovine tropical theileriosis in Khartoum state as (34.07%), whereas Ahmed (2004) found (6.4%) theileriosis and (4.8%) babesiosis at the White Nile dairy farms, besides, (4%) and (1.6%) for theileriosis and babesiosis respectively at Gezira. These differences in results were due to high susceptibility of the foreign breeds in Khartoum and resistance of the local Zebu breeds in Abyei area. This is agree with Jongejan (2003), who reported that, Sudan is in the unique position to host all major tropical tick-borne diseases that occur throughout Africa. There is tropical theileriosis in cattle in the North, East Coast fever in cattle in the South, Malignant theileriosis in sheep, Bovine babesiosis and anaplasmosis and heartwater, which constitutes mainly a problem in small ruminants.

Regarding the biting flies, *A. agrystus, Atylotus fuscipus, Tabanus taeniola* and *A. latipes* were found in the area, of which *A. agrystus* and *T. taeniola* were the more abundant in the area.This indicates that there is possibility of mechanical transmission of Trypanosomiasis in the area. This agrees with Cheneau (1995) and Kheir and Majid, (1999). They clarified that, The main tabanid species found throughout Sudan involved in animal irritation and incriminated in the mechanical transmission of pathogens are: *Atylotus agrestis, Atylotus fuscipes, T. taeniola, T. Sufis, T. biguttatus, T. gratus, philoliche magretti, A. latipes* and *Ancala Africana*. Kheir and Majid (1999) also added, most of the cattle owners spend the dry season in tsetse infested areas where grass and water are plenty. During their stay, their animals contract trypanosomiasis and on their way back to their rainy season grazing lands, the disease was disseminated to resident cattle by mechanical vectors. Therefore, Trypanosomiasis has been recorded from many areas outside tsetse belt, because of biting flies. This is also agrees with the respondents in that biting flies (Loggam) annoying them during the wet season, therefore they migrate to Northern parts of the area. Other biting flies may be present in the area, although they were not found during the survey.

In this study, trypanosome species were not found in cattle. This may be due to the breed resistance and continuous treatment throughout the year using Samorin, Novidum, Ethedium or Berenil. That was clarified by what the cattle keepers mentioned in drug consumption in the area. Other animal species (e.g. camel, wildlife, etc), may be carrying the parasite in the area. Trypanosoma vivax was found at other places in Sudan; Omer (2005) in Unity State, found *T. vivax* in cattle with infection rate of 15% in the dry season and 6% in the wet season, whereas, Abdel (1993) found at the Central State of Sudan, the infection rate with *T. vivax* in cattle, sheep, goats and camel was found to be 2.75, 4.40, 3.75 and 21.60% respectively.

As the parasitic disease burden on an individual animal is concerned, it was found that, 64% of the animals were infested with ticks only, 32% with one internal parasite and ticks, and 4% with two internal parasites and ticks. Moreover, from the clinical records it was appeared that, parasitic diseases constitute a major problem, and constitute 53% of the total diseases in the study area. The records also viewed that, anthelmentic drugs were the mostly used in high quantities (48%), than blood parasites (37%) and external parasites drugs which were 15%. These results and findings in the study area, were strongly relevant to each other. Therefore, parasitic diseases constitute a real problem in the area. In addition, from the low consumption of the external parasites drugs (the lower one), it became obvious that, cattle keepers knowledge about the acaricides and prevention was inadequate. Therefore, ticks infestation was very high and represents a major problem which needs more extensive control measures. Blood parasites drugs consumption was reasonably agrees with results in that, the vectors (ticks) were present, but the parasites (*Theileria* species. and *Babesia* sp.) prevalence, were not high.

The participatory study showed that PRA technique can be used to collect useful information on parasitic diseases and their impact on livestock. Livestock keepers were fully participated in the PRA practices and were very keen to discuss their animal health problems. The application of this technique encouraged the herders to re-evaluate their own knowledge of diseases and their problems and enable them to rank the diseases and scoring the symptoms relative to each one. The nomads distinguished between the important diseases and they possessed a good knowledge on local diseases, their symptoms, to some extent the causative agents and the relative environmental conditions. This agrees with Catley and Mariner (2002).The high agreement between the participants indicated that, the ranking and matrix scoring methods were valuable in expressing or evaluating animal health problems. Regarding the validity of the results produced by these methods, the information given were valuable and similar to veterinary knowledge. For instant, the participants considered Alk (mixed infection) to be the main animal health problem in the area. This evidence supported the findings of Hansen and Perry (1994).

Based on results of participatory survey obtained, it is clear that the cattle owners are not oriented about the strategic treatment (using of drug) of the different parasitic diseases, management and environment. This

indicates that there was no complete awareness about disease treatment, management and proper environmental usage among cattle keepers in the study area. Therefore, public awareness programmes are very essential by application of extensive extension services to livestock owners with regard to the importance of parasitic diseases, the economic benefit of control programme and the efficient ways of control should be considered to control parasitic diseases in the area. It must be directed at all levels of the public-producers, consumers, traders, transporters, processors, wholesalers, retailers and travelers, and it must include decision-makers from all levels of government, private industry and livestock organizations (FAO, 1999). Because of the limited veterinary services and general life pattern in the area, Community participation is considered to be one of the most important elements for the control of parasitic diseases, particularly for prevention and epidemic logical surveillance. Epidemiological studies of parasitic diseases as threats to livestock production should be conducted in the near future in order to minimize the risk of parasitic diseases in Abyei area. It become clear that parasitic diseases constitute a real problem in the study area, mainly the mixed infection (Alk), which the most important one, then Ticks and tick-borne disease Goradia, besides biting flies (Logam).

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