Prevalence of Major Skin Diseases among Nilotic Zebu Cattle in Bahr El Ghazal Region, South Sudan

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ABSTRACT

1860 Nilotic Zibu cattle were subjected to a three-month cross sectional study, involving clinical examination, questionnaire and direct interview, to assess knowledge, attitude and practices of the pastoralists toward skin diseases. The major skin diseases identified in Bahr el Ghazal region were ecto-parasites, Papilomatosis (Wart), Dermatophilosis, mange mites, photosensitization, cutaneous myiasis, lumpy skin disease and wounds, with their mean prevalence rate of 27.8% , 0.7 % , 1.3 %, 0.9 % , 1.2 %, 0.7 %, 0.9 %, 0.9%, respectively. But the overall mean prevalence rate was 4.3%, with ecto-parasites presented the highest prevalence (27.8%). Comparing prevalence per study areas, Tonj state had the highest prevalence rates of 38.7%, 6.6%, 3.5% and 4.8% for ecto-parasitic infestation, Dermatophilosis, lumpy skin disease and cutaneous myiasis, respectively. Calves and heifers were more susceptible to skin diseases than cows and bulls. Although pastoralists were aware of the skin diseases, most of them were ignorant about their zoonotic aspects; they have low attitudes toward skin diseases, reflected in poor treatment and adoption of prompt control measures. Most of the major skin diseases were identified in the region with high prevalence of ectoparasites and the young animals are more susceptible. The study recommended awareness creation and strategic campaign be undertaken to control skin diseases especially those with attached economic impacts and zoonosis, and that similar studies in other regions of South Sudan with more emphasis on seasonal dynamics of individual skin disease is recommended.

Keywords: Nilotic Zebu cattle; Bahr el Ghazal Region; skin diseases; prevalence

INTRODUCTION

South Sudan has substantial livestock resources. In 1954, the British colonial assessment found that, South Sudan had considerable livestock resources, a great asset that would be significant for sustainably increasing the financial self-sufficiency of the region (Sudan Government, 1955).

Today, South Sudan's ruminant livestock wealth is still largely in the hands of traditional agro-pastoralists and pastoralists that hold 47% and 43 % of South Sudan's livestock wealth respectively. The remaining 10% being in the hands of small holder livestock keepers mainly in urban and peri-urban areas.

The livestock sub sector has great potential for meeting domestic demands and generating surplus for export (Musinga *et al*; 2010). The livestock population was estimated to be 11.7 million heads of cattle, 12.5 million goats and 12.1 million sheep (FAO/WFP, 2013). This places South Sudan's national herd as the 7th largest in Africa (Musinga *et al*., 2010) worth an estimated 7 billion SSP, approximately 15 % of the GDP in 2010. According to ICPALD (2013), livestock products off take rate in South Sudan including hides and skins was 4.214 billion SSP ($1.429 billion).

Leather and semi-processed hides and skins constituted major export product of some countries injecting foreign currency during the last decades (Theo, 2003). However, a considerable portion of pre-slaughter defects of skin are directly related to skin disease or secondary damage that occurs when the animal scratches itself to relieve the itching associated with skin diseases (Kassa *et al.,* 1998).

Cattle are affected by various skin problems, some of which are easily cured while others are more complicated with zoonotic importance. Skin diseases such as dermatophilosis, lumpy skin disease, ectoparasites, photosensitization and warts have been reported in several countries (Yacob *et al*; 2008; Tewodros *et al*, 2012; Berhanu D and Wolemeskel, M.1999; Chalachew, 2001).

Skin diseases are accountable for significant and varied socio-economic impacts. Apart from quality degradation of hides and skins, they induce associated economic losses such as reduction of meat, milk yield, losses due to culling and occasional mortalities related with the cost of treatment and prevention of the diseases (Yacob *et al;* 2008; Salih *et al.,* 2015).In addition, some skin diseases such as ring worm and Sarcoptic mange are potential zoonosis (Quinn *et al*., 2014; McDaniel et al., 2014).

Although the occurrence of skin diseases in South Sudan cannot be under estimated, yet there is seldomly any research or reports as reference. For this reason, to design future national intervention programme, knowledge of the potential major skin diseases of indigenous cattle in various regions of South Sudan is necessary. Therefore, the objectives of the present study are to identify and determine prevalence of major skin diseases in Bahr el Ghazal region of South Sudan and find the extent of

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pastoralists' knowledge, attitudes and practices toward skin diseases of cattle in the region.

MATERIALS AND METHODS

Study area

Bahr el Ghazal region consists of major towns of Wau, Aweil, Rumbek, Tonj and Warrap.It borders the Central Africa Republic to the west and Sudan to the north west and south west with Democratic Republic of Congo. It is an area of swamps and ironstone plateau inhabited by Luo, Dinka and Fartit ethnic groups living on subsistence farming and cattle herding. It has an area of 210,785.57 km^2 with a population of 4,296,600 dispersed in 20 persons per km^2.

The study was conducted in Wau town which lies at latitude 7° 42′ 10.30″ N, longitude 27° 59′ 43.08″ E and 441 meters above sea level. Aweil town that lies at latitude 8 46 02 N, longitude 27° 23′ 59″ E and 476 m above sea level and Tonj town which lies at latitude 7° 26′ 75″N, longitude 28° 67′ 90″ E. Average annual rainfall in these towns were 1098 mm, 858 mm and 1057 mm for Wau, Aweil and Tonj respectively.

Study design

A cross sectional study was conducted from October to February. A total of 620 indigenous Zebu cattle were randomly selected in each area (three areas=1820 animals) and subjected individually to visual inspection, palpation and specimen collection for laboratory investigations. Cases of wart, photosensitization, wounds and ecto-parasites and lumpy skin disease were diagnosed based on their clinical manifestation and gross pathological lesions as described by Radostitis *et al.,* (2000) and Thomson, (1988). Cases suspected of dermatophilosis, scabs, pus and exudates were collected and Gram stained smears were directly examined under microscope. Skin scraping were collected and preserved in 10% formalin for suspected cases of mange, 10% KOH added to the sample and examined as described by Soulsby (1982) and Urquhart *et al., (*1967).

A structured Questionnaire and direct interview was conducted on 60 purposefully selected pastoralists to assess knowledge, attitudes and practices of pastoralists towards major skin diseases occurring in the region.

Animals involved in this study were handled based on the ethical standard of the University of Bahr el Ghazal (pending senate approval). Oral consent of the animal owners was obtained before start of the study. Owners were also informed about the purpose and the method of the study.

Data analysis

The obtained data were inserted in to Microsoft Excel 2010 and analyzed using STATA (version 7) software. Descriptive statistics and proportions were used to assess prevalence of skin diseases among herd in the study areas and different demographic categories of the animals.

RESULTS

Herd structure in the study areas

In the randomly selected herd during cross sectional study, cows presented the largest population (44.6%) followed by heifers (34.8%) in the region (Table 1. Figure. 1). Bulls and calves were less represented (8.6% and 11.9%).

Table 1: Herd demographic characteristics

State	Wau	Aweil	Tonj	∑X	Mean±SD
Cows	335	284	219	829 (44.6%)	276.3±63
Bulls	45	63	53	161 (8.6%)	53.6±9.0
Heifers	160	210	278	648 (34.8%)	216±59.2
Calves	80	63	79	222 (11.9%)	74±9.5
∑X	620	620	620	1860	
Mean	155	155	155		155±108.4

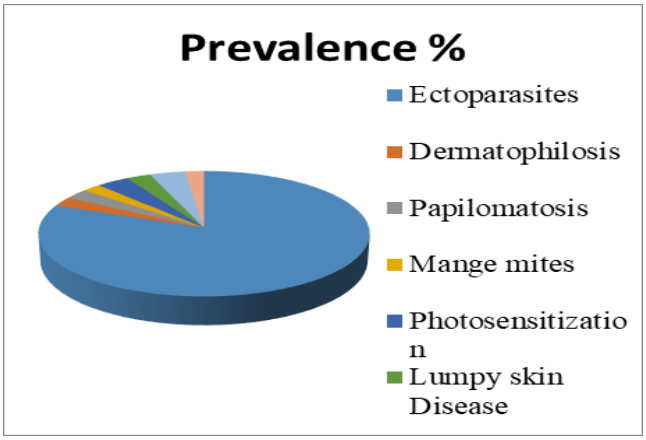

Figure 1: Overall mean prevalence of skin diseases

Prevalence of major skin diseases in Bahr el Ghazal

In this three-month cross sectional study, major skin diseases identified in the region were ecto-parasites, Papilomatosis (Wart), Dermatophilosis, mange mites, photosensitization, cutaneous myiasis, lumpy skin disease and wounds.

Over all mean prevalence rate of major skin diseases in Bahr el Ghazal region was 4.3% (Table 2). Overall mean prevalence rate as per individual disease in the region was as shown in Figure (1). Ecto-parasites presented the highest prevalence (27.8%) in the region.

Comparing prevalence according to study areas, Tonj state was found to carry the highest prevalence rates (38.7%, 6.6%, 3.5% and 4.8%) of ecto-parasitic infestation, Dermatophilosis, lumpy skin disease and

cutaneous myiasis infection respectively (Table 2., Figure 2).

In Wau state, high prevalence rates of photosensitization (5%) and occurrence of wounds (2.9%) for various reasons were recorded than in other states. Aweil state presented the highest prevalence rates of 3.5% and 2.6% for Papilomatosis and mange mites, respectively (Figure 2).

Table 2: Prevalence of major skin diseases as per the study area

Skin Disease	Area	Number Infected	Prevalence %
Ecto-parasites	Wau	123	20
	Aweil	154	25
	Tonj	240	39
∑X		517	
Mean±SD		172.3±61	27.8
Papilomatosis	Wau	14	2.3
	Aweil	22	3.5
	Tonj	18	2.9
∑X		54	
Mean±SD		18±4.0	0.9
Dermatophilosis	Wau	23	3.7
	Aweil	12	1.9
	Tonj	41	6.6
∑X		76	
Mean±SD		25.3±4.6	0.8
Mange	Wau	09	1.5
	Aweil	16	2.6
	Tonj	12	1.9
∑X		37	6.0
Mean±SD		12.3±3.5	0.7
Photosensitization	Wau	31	5.0
	Aweil	12	1.9
	Tonj	21	3.4
∑X		64	
Mean±SD		21.3±9.5	1.2
Lumpy skin disease	Wau	11	1.8
	Aweil	17	2.7
	Tonj	22	3.5
∑X		50	
Mean±SD		16.6±5.5	0.9
Cutaneous Myiasis	Wau	19	3.0
	Aweil	22	3.5
	Tonj	30	4.8
∑X		71	
Mean±SD		23.7±5.7	1.3
Wounds	Wau	18	2.9
	Aweil	09	1.5
	Tonj	14	2.3
∑X		41	
Mean±SD		13.6±4.5	0.7

Prevalence of major skin diseases as per demographic characteristics

The overall mean prevalence rate (32±0.9 % and 30.5±13.0) of skin diseases in Bahr el Ghazal region occurred among calves and heifers respectively (Table 3. Figure 3).

Prevalence rates of ecto-parasites (79.3% and 64.3%), were higher among calves and heifers respectively. In addition, Papilomatosis (Wart), cutaneous myiasis, and

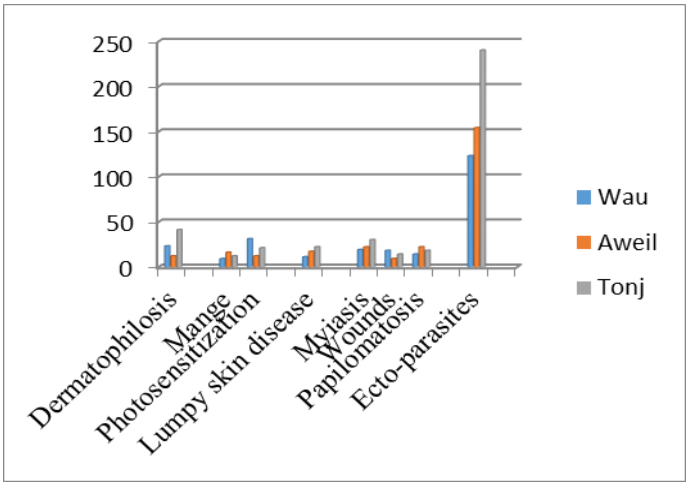

Figure 2: Prevalence according to study areas

photosensitization and lumpy skin diseases were observed in high prevalence rates of 1.2%, 2.2%, 1.5% and 1.7% respectively in cows. However, Dermatophilosis was only recorded in high prevalence (1.5%) among heifers.

Knowledge, attitudes and practices of pastoralists towards skin diseases

The response of 60 purposefully selected pastoralists revealed that, 88.3% of the pastoralists knew some of major skin diseases infecting local cattle in Bahr el Ghazal region (Table 4). However, 65% of them did not know the zoonotic aspects of some of the diseases.

71.7% of the pastoralists, ranked cattle skin diseases low or not important in comparison with other diseases with high mortality rate and economic losses. Only 53.3% accepted skin diseases to have impact on hides and skins marketing.

Among the pastoralists, 71.7% used traditional herbs for treatment of skin diseases and a few, 18.3% and 10% of them resorted to Veterinary medicines and other means such as tar and river clay for treating animals' skin diseases. Majority of the 53.3% of the livestock owners in the region were not practising any sort of preventive measures against the prevalent skin diseases.

DISCUSSION

Herd structure

The study population, 1860 heads of Nilotic Zebu cattle were selected from the 6,785,329 estimated population of cattle in Bahr el Ghazal region

(MARF&FAO, 2014). In the study population of cows represent the highest (44.6%) proportion than that of bulls (8.6%). This concur with similar proportion of 44% cows and 6% bulls reported by Akpa *et al.*, (2012). The 8.6 % proportion of bulls in this study is much lower than the 44.9 to 49.1% reported by Mukasa-Mugerwa, (1981) in Ethiopia and De Leeuw and Wilson, (1987) in Mali but matched with that of Lesnoff *et al.*, (2002) in Ethiopia highland. This difference depends on the agricultural activities practised in the area where bulls are key traction animals of plough oxen to supply draught power.

Table 3: Overall mean prevalence rates of skin diseases as per demographic characteristics of animals

Disease	Cows (n=829)	%	Bulls (n=161)	%	Heifers (n=648)	%	Calves (n=222)	%
Ecto-parasites	59	27.7	98	50	157	64.3	203	79.3
Papilomatosis	23	1.2	08	0.4	14	0.8	09	0.5
Dermatophilosis	15	0.8	21	1.1	28	1.5	12	0.7
Mange	09	0.5	11	0.6	07	0.4	10	0.5
Photosensitization	28	1.5	12	0.7	18	1.0	06	0.3
Lumpy skin Disease	32	1.7	16	0.9	02	0.1	0	0
Cutaneous Myiasis	41	2.2	12	0.6	14	0.8	04	0.2
Wounds	06	0.3	18	1.0	04	0.2	12	0.7
∑X	213		196		244		256	
Mean±SD	26.6±17.6	4.5	24.5±19.0	6.9	30.5±13.0	8.6	32±0.9	10.3

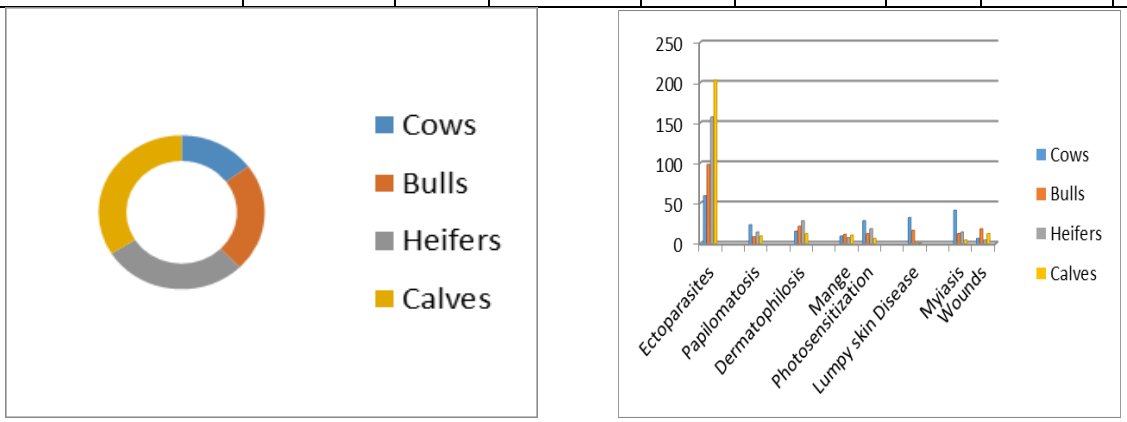

Figure 3: Overall mean prevalence rates according to demographic characteristics of animals

Table 4: Knowledge, Attitude and practices of pastoralists toward major livestock skin diseases (n=60)

Parameter	Respondents %	
Knowledge of major livestock skin diseases		
Yes	53	88.3
No	07	11.7
Knowledge of Zoonotic transmission skin Diseases		
Yes	21	35
No	39	65
Ranking of skin diseases with others		
Important	17	28.3
Not important	43	71.7
Impact of skin diseases on hide and skin marketing		
Yes	32	53.3
No	28	46.7
Treatment of skin diseases		
Medicinal	11	18.3
Herbal	43	71.7
Others	6	10.0
Preventive measures against skin diseases		
Practicing	24	40
Not practicing	32	53.3

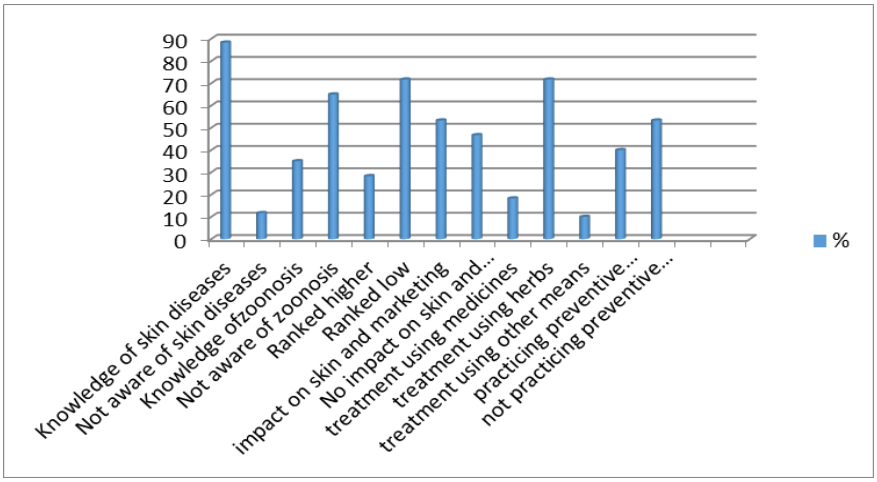

Figure 4: Pastoralists' KAPs toward skin diseases in Bahr el Ghazal region

Plate 1: Lesion of photosensitization

Plate 2: a. Wart around anus and perineal region **b.** Warts around the eyelids and medial canthus

Plate 3: Post Lumpy Skin Disease Lesions

Plate 4: Early stage of Dermatophilosis

Plate 5: Gross lesions of Cutaneous Myiasis

Prevalence of major skin diseases in the region

The major skin diseases identified in the region were similar to those identified in north Gondar zone of Amhara region of Ethiopia by Daniel and Samuel Derso, (2015) and in Hawassa in southern Ethiopia by Zekarias Fantaye and Berhanu Melake, (2018), Addise-Ambilo and Abriham-Kebede (2019) in Nigeria and by IIiyasu et *al.*, 2015.

Over all mean prevalence rate of major skin diseases in Bahr el Ghazal region was 4.3% (Table 2).This finding is very much lower than the findings of 15.41 % and 27.68% reported by Teshome (2016) from Adama and Gondar respectively. The observed difference among the studies could be partly explained by the difference in the geographic location, cattle management practices. The prevailing poor veterinary services, poor animal husbandry, lack of awareness on the problem, the use of

communal watering and grazing sites are common risk factors. Moreover, improper applications of medicines by non-professionals are the major reasons to induce and augment this endemic situation.

Prevalence of individual skin diseases according to the study areas, Tonj state was found to carry the highest prevalence rates of major skin diseases in the region (38.7%, 6.6%, 3.5% and 4.8%) for ecto-parasitic infestation, Dermatophilosis, lumpy skin disease and cutaneous myiasis infection respectively (Table 2., Figure 2).Reasons for this high prevalence compared to other states could be the geographic location of Tonj in the middle of Bahr el Ghazal region where animals track through from and to other states, poor veterinary services and uncontrolled rampant cattle raiding. The overall prevalence of ectoparasites in this study is lower than the finding of 73.3% by Tadesse *et al.,* (2011) from southern rangelands, 68 % by Werkineh *et al*., (2016) around Ambo town in Ethiopia and 65.5% by Islam *et al.,* (2009) from Bangladesh. However, it was higher than 27% prevalence reported from Southwest of Ethiopia by Onu and Sheferaw, (2013) and 15.41% reported by Yacob *et al*., (2008) .The disparity among the reports might be due to variation in locations, management practices and ectoparasites control practices. This could be attributed to the differences in the management practice, level of owners' awareness, ecology and climatic differences.

The highest prevalence of lumpy skin diseases in the current study occurred in Tonj state (3.5%) was higher than o.6% reported by Ayelet *et al.,* (2014), 1.04 % revealed by Werkineh *et al.,* (2016). However, the result was much lower than that revealed by Beshahwured (1991) who reported prevalence of 27.9% during an outbreak and Gari *et al.,* (2010), who reported a prevalence of 13.61% in central Ethiopia and 8.1% in different agro-climatic zones of Ethiopia. Reasons for these discrepancies may be because this study depended on post-infection lesions of the disease which usually not representative as pastoralists often cull infected cows and bulls.

The highest prevalence rate of Dermatophilosis in the region occurred in Tonj state (6.6%).This finding is higher than prevalence range of 0-4.8 % reported in Zebu cattle in different parts of Ethiopia (Berhanu and Woldemeskel, 1999; Woldemeskel, 2000; Yacob et al., 2008; Meseret and Sefinew, 2011; Teshome, 2016). However, the prevalence rate of 4.3 % in this study was lower than that of 8.7% reported by Awad *et al*., (2008) in Egypt. This low prevalence could be due to the fact that, the pathogen may have not yet established its spore in the premises or the animals were less exposed to the possible predisposing factors such as thorny bushes, pecker birds and rain.

The high prevalence of myiasis (4.8%) in Tonj than other states, mainly is due to bushy grazing areas during the period of study (Oct-Feb), when grasses and cutted trees are dry, sharp and thorny which is not the situation during rainy season. This finding disagree with that revealed by Amandeep and Devinder, (2016) in Punjab, India during June-August (41.9%) and Sept-Nov (27.8%) and Dec-Feb (6.1%). In Wau state, high prevalence rates of photosensitization (5%) and occurrence of wounds (2.9%) were recorded than in other states (Plate 1). Affected animals were new to the area as they were not acquainted with types of plants in the grazing lands and in addition farmers are not aware of photosensitization so that they direct the animals to a friendly grazing land. The high prevalence of Photosensitization situation in Wau compared to other state was due to the fact that, the study was carried out during dry season when animals experience feed scarcity inducing them to graze on abundantly available plants producing photosensitizers in many areas within and around Wau state during that season. The finding in this study was higher than that revealed (1%) by Werkineh *et al.,* (2016) and Yacob *et al.,* (2008).

Wounds are more common among bulls. The occurrence of cases of wound in high prevalence in Wau was the results of more ox-ploughing using animal power for agricultural activities in which bulls are properly utilized, thus resulting in yoke gall wounds. Bulls may also incur injuries to them while rivaling over a female in estrus.

Aweil state presented the highest prevalence rates 3.5% and 2.6% of Papilomatosis and mange respectively (Fig2, Plate 2) compared to other states. The high prevalence of Wart and Mange were attributed to the poor husbandry system, ignorance of farmers of the transmission and spread of the diseases and improper use of medicines. The current study prevalence is lower than the findings of Werkineth *et al.,* (2016) who recorded 10.16% prevalence of mange mite infestation. Similar finding (10.7%) was also shown by Agumas *et al*., (2015) from Northern Ethiopia., reason for the disagreement may be associated with favorable climatic and environmental condition in the area .However, the finding in this study concurred with the prevalence of 2.38% reported in North west Ethiopia.

In the current study, bovine Papilomatosis of genitalia and eye were observed (plates 2, 2b). The prevalence in this study was lower than that 4.69% reported by Werkineth *et al.,* (2016), and Salib and Farghali (2011) in younger animals.

Prevalence of major skin diseases as per demographic characteristics of the herd in Bahr el Ghazal region

The overall mean prevalence rate of (32±0.9 % and 30.5±13.0) of skin diseases in Bahr el Ghazal region occurred among calves and heifers respectively (Table 3, Figure 3).

Prevalence rates of ecto-parasites (79.3% and 64.3%), were higher among calves and heifers respectively. The poor husbandry system, unstable immune system and poor

body conditions may be the reasons for this high prevalence rate.

Moreover, Papilomatosis (Wart), cutaneous myiasis, photosensitization and lumpy skin diseases were observed in high prevalence rates (1.2%, 2.2%, 1.5% and 1.7% respectively) in cows. However, Dermatophilosis was only recorded in high prevalence (1.5%) among heifers. The prevailing poor Veterinary service, poor husbandry system and malnutrition seen during dry season as a result of scarcity of feed materials, lack of awareness on some skin diseases, use of communal grazing sites, improper application of medicines by non-professionals, farmers undermining impact of skin diseases and therefore not vigilant in adopting treatment and preventive measures could be convincing reasons that spelt occurrence of skin diseases with high prevalence rate in cows.

Knowledge, attitudes and practices of pastoralists towards skin diseases in the region

In the current study (Table 4, Figure 4), pastoralists in the region are aware of skin diseases but not their zoonosis aspects. Since the skin diseases only damage skins with low mortality rate, they ranked them as less important compared to other diseases. For these reasons they resort to treating these diseases using traditional herbs which are free or less costly than buying medicines or pay for vaccines.

The attitude of the herders in under-ranking skin diseases and undermining the economic impacts of skin diseases may be the core factor that let them to pay less attention to prompt treatment and adaption of strict preventive measures to curtail the spread of skin diseases among the herd.

Moreover, knowledge of zoonosis of some of the skin diseases among herders in the camp is poor which is in line with the report of Boiling (1997). In the same track, poor hygienic practices in the camps, poor extension education seem to have contributed greatly in the spread of skin diseases and others among the herds and this concurred with the results obtained by Cately *et al.,* (2001).

CONCLUSION

This study identified the most important skin diseases in the region with high prevalence of ectoparasites. Young animals are more susceptible to most of the skin diseases and although the overall mean prevalence of skin diseases in the region is considerable (4.5%), variable prevalence of individual diseases were observed in different study areas. With exception of zoonotic ones, farmers were aware of most of skin diseases in the region but yet ranked them low.

RECOMMENDATIONS

Awareness creation among cattle herders about zoonosis, economic importance ,treatment, vaccination and control of skin diseases in the region; Plan for strategic campaign to control skin diseases especially those with attached economic impact and zoonosis; Similar studies required to be done in other regions of South Sudan with detailed determination of seasonal dynamics of individual skin disease and establishment of integrated tanning industry in the region would add monetary value to skin and enhance farmers attitudes toward control of skin diseases.

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