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Studies on Epidemiological Survey of Mange Infestation of Small Ruminant in Ogbomoso Areas of Oyo State, Nigeria

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Abstract: This study assessed the prevalence of mange in small ruminants in five local government areas (LGAs) of Ogbomoso, Oyo State. Two types of mites, *Sarcoptis scabiei var. ovis* and *Sarcoptis scabiei var. caprae* were found to be infesting sheep and goats respectively. The mites infestation of goats in all the local governments was 29.62% while that of sheep was 23.68%. The infestation of West African Dwarf goats was highest in Orire LGA with 7.71% while that of sheep was highest in Ogo-Oluwa (8.75%). The infested group however had significantly ($P<0.05$) higher WBC count than the non-infested group. Hb ($P<0.05$), RBC ($P<0.05$) and WBC ($P<0.05$) estimates differed significantly with species.Older animals had significantly ($P<0.01$) higher estimates for erythrocytic values than younger animals.The influence of LGAs on WBC was not significant while erythrocytic values varied significantly ($P<0.001$) with sampling. There existed significant ($P<0.01$) difference between non-infested and infested animals in terms of total protein,sodium and potassium.Infested animals had significantly ($P<0.01$) lower estimates for total serum protein and sodium than non-infested animals. The non-infested animals had higher ($P<0.05$) estimate for potassium than the infested group while chloride was not significantly affected by health status, sheep had higher ($P<0.05$) estimate than goats. It can be concluded that the prevalence of mange mite infestation varied in the LGAs considered.

Key words: Mites · Sheep · Goats · Erythrocytic values · Health status

INTRODUCTION

Mange has posed a serious economic problem in small ruminant animal production. It is a contagious skin disease, reducing the meat quality of ruminant by causing skin damage characterized by marked hyperkeratosis with lesions usually starting on the head and neck, weight loss, irritation and death in severe cases [1]

In goats, Sarcoptis scabiei var caprae is responsible for a generalized skin condition [2] while Sarcoptis scabiei var ovis is for sheep [3]. The problem is even worse in the coastal areas of West Africa, which is humid and favors high prevalence of the disease. Physiological parameters assess the effect of parasite infection and the effectiveness of anti-parasitic treatment in animals [4].

The mange mites which affect small ruminants in sub-Saharan African include Sarcoptes scabiei, Psoroptes caprae, Psoroptes cuniculi, Psoroptes communis, Chorioptes texanus, Demodex spp and rarely Notoedres cati [3].

They are responsible for great economic losses due to damaged skin and wool, anaemia, poor physical condition, decreased milk and meat production and suboptimal lambing and growth rates [5]. The mange mites produce a number of local and generalized disease conditions and diseased animals become more prone to other bacterial and viral infections [3].

To implement effective control strategy against the external parasites, good epidemiological knowledge on distribution is of paramount importance, hence the need to investigate the incidence of mange and therefore, this study focuses on epidemiological survey of mange in small ruminant of Ogbomoso areas of Oyo State, Nigeria.

MATERIALS AND METHODS

Location of Study: This study was carried out in five local government areas of Ogbomoso, Oyo State, Nigeria. It lies on longitude 8°15 North East ward from Ibadan, capital of Oyo state. The altitude is between 800-600mm above sea

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level and the mean annual temperature is about 27°C while that of annual rainfall is 1247mm. The vegetation of the study area is derived savanna [6]. There are five local governments in Ogbomoso area. These are Ogbomoso North, Ogbomoso South, Orire, Ogo-Oluwa and Surulere. The number of villages sampled was proportional to the total number of villages present in each Local Government Area

Population survey of WAD sheep and goats was carried out during the rainy season from March to October, 2012 since previous study indicated that mange infestation occur mainly during the early- and late-rainy seasons [7]. Prior to the survey, pre- visit arrangements were made in order to sensitize the farmers and get the animals tethered at various locations. Various households were also visited to count animals. Total number of sheep and goats following head counts were recorded. The number of males and females were also noted and the age estimated by dentition [8]. The animals surveyed in the study areas were kept on free range and minimal housing provided to serve as shelter. They were fed with kitchen wastes, cassava peels or corn chaff in the morning before being left to roam the surroundings to forage for grasses and browse plants.

Examination of Animals and Parasitological Procedure: The animals sampled were clinically inspected for presence of mange lesions on the different parts of the body such as head, face, neck, breast and tail. During the examination, an average of 10 min was spent on suspected cases based on presence of lesions, depending on severity of infestation. From animals showing signs of scales, crusts, alopecia and itching, about 2.5cm^2 area of skin scrapings of the affected lesions was carried out and placed in sample bottles according to the method described by [5]. The samples were preserved in 10% formalin and dispatched to laboratory for confirmatory examination. About 20 ml of 10% KOH solution was added to each sample. The scrapings were macerated or teased with a mounted needle and centrifuged at 1,500 rpm for 5 min. The sediments were examined under the microscope for the identification of the causal agent.

Haematological and Biochemical Analyses of Blood Samples: Blood samples (10 ml each) were taken from the jugular vein of non-infested (60) and mange-infested (60) animals using sterile needles and syringes. Blood from each animal was placed into two different bottles (one containing EDTA while the other did not contain EDTA). Haematological indices with emphasis on packed cell volume (PCV), red blood cell count (RBC) white blood cell count (WBC), haemoglobin concentration (Hb). Serum extracted from samples into sterile plain bottles were analysed biochemically for total serum protein (TP), potassium (K^+), sodium (Na^+) and chloride (Cl^-) using standard procedures as described by [9].

Statistical Analysis: Data obtained on number of animals infested with mange were summarized as a percentage of the total number of animals sampled and analysis of variance was used to compare prevalence, effects of health status of animal (infested or non-infested), species, sex, age and location on haematological and biochemical parameters in local government areas using Microsoft excel as database for the study.

RESULTS

Two types of mites, S. scabiei var. ovis and S. scabiei var. caprae were found to be infesting sheep and goats respectively in the area under study. Mange infestation of sheep and goats occurred in all five local government areas of Ogbomoso.

The total mites infestation of goats in all the local governments was 29.62% while that of sheep infestation was 23.68%. The goats infestation was 1.25 times higher in goats than sheep although the number of goats screened were more than sheep in the study areas. The mite infestation of WAD goats was highest in Orire LGA with 7.71% and least value was recorded in Ogbomoso north while highest infestation of sheep by mites was highest in Ogo-Oluwa (8.75%) with minimum values in Ogbomoso north (1.60%) (Table 1).

The results of analysis of haematological and serum biochemical parameters (Table 2) revealed that there was no significant difference between infested and non-infested animals in terms of PCV, Hb and RBC. The infested group however had significantly ($P<0.05$) higher WBC count ($7.75\pm0.22\times10^9$/L) than the non-infested group ($6.90\pm0.17\times10^9$/L). Haemoglobin ($P<0.05$), RBC ($P<0.05$) and WBC ($P<0.05$) estimates differed significantly with species, with the indication that sheep had higher estimates for these parameters than goats. Older animals (>1 year) had significantly ($P<0.01$) higher estimates for PCV, Hb and RBC than younger (<1 year) animals. The influence of location on WBC was not

Table 1: Prevalence of sheep and goat mange infestation in five LGAs of Ogbomoso, Oyo State, Nigeria

	Goats			Sheep		
LGA	Number sampled	Number infested	Percentage infested	Number sampled	Number infested	Percentage infested
Ogbomoso North	980	44	4.49	250	04	1.60
Ogbomoso south	700	40	5.71	200	08	4.00
Orire	1160	90	7.76	750	40	5.33
Ogo-Oluwa	1000	60	6.00	800	70	8.75
Surulere	1060	60	5.66	750	30	4.00
Total	4900	240	29.62	2750	152	23.68

Table 2: Means±s.e.m of packed cell volume, haemoglobin, red blood cells and white blood cells as influenced by health status, specie, sex, age and local government areas

Parameters	Sub-class	Number	PCV (%)	Hb (g/100 ml)	RBC($\times10^{12}$/L)	WBC ($\times10^{9}$/L)
Health status	Non-infested	60	32.90±0.87	10.81±0.28	8.91±0.29	6.90±0.17^{b}
	Infested	60	32.52±1.13	10.58±0.37	8.60±0.37	7.75±0.22^{a}
Species	Goat	75	30.60±0.68	10.01±0.22^{b}	8.96±0.23^{b}	6.92±0.13^{b}
	Sheep	45	32.72±1.15	10.90±0.37^{a}	10.25±0.38^{a}	7.56±0.23^{a}
Sex	Male	54	31.27±0.98^{b}	10.05±0.32^{b}	8.62±0.32^{b}	7.15±0.19
	Female	66	33.13±0.88^{a}	11.50±0.27^{a}	9.49±0.28^{a}	7.25±0.17
Age group	>1 year	40	33.86±0.99^{a}	11.93±0.32^{a}	9.80±0.30^{a}	7.45±0.19
	<1 year	40	29.74±0.91^{b}	9.95±0.30^{b}	8.46±0.29^{b}	7.39±0.18
Local Government Areas	Ogbomoso North	20	32.04±1.05^{c}	10.31±0.34^{c}	8.09±0.35^{d}	6.90±0.21
in Ogbomoso Lands	Ogbomoso South	20	33.40±1.14^{b}	10.94±0.37^{b}	8.83±0.38^{c}	6.86±0.22
	Orire	25	35.90±2.06^{a}	11.94±0.67^{a}	7.52±0.67^{e}	7.40±0.40
	Ogo-Oluwa	25	28.97±0.97^{e}	9.02±0.31^{d}	10.12±0.32^{b}	7.35±0.19
	Surulere	30	30.28±1.98^{d}	9.90±0.64^{c}	10.70±0.65^{a}	7.74±0.39

eans within a column with different small letters (a,b,c,d,e) are significantly different (P<0.05).Number of observations, PCV packed cell volume, Hb haemoglobin, RBC red blood cells, WBC white blood cells and s.e.m standard error of mean.

Table 3: Means±s.e.m of total protein, sodium, potassium and chloride as influenced health status, specie, sex, age and local government areas

Source	Sub-class	Number	TP (g/dl)	Na^{+} (mEq/l)	K^{+} (mEq/l)	Cl^{-} (mEq/l)
Health status	Non-infested	60	5.55±0.16^{a}	137.98±0.53^{a}	4.14±0.14^{a}	97.52±0.72
	Infested	60	4.65±0.20^{b}	130.92±0.92^{b}	3.66±0.18^{b}	96.25±3.26
Species	Goat	75	5.21±0.18	138.60±1.61	3.88±0.11	94.06±0.32^{b}
	Sheep	45	5.16±0.21	136.30±2.01	3.92±0.19	98.64±0.26^{a}
Sex	Male	54	5.02±0.18	136.71±1.67	3.69±0.18	94.75±1.90
	Female	66	5.25±0.16	137.18±1.49	3.88±0.16	95.02±1.72
Age group	>1 year	40	5.17±0.15	137.28±1.70	3.81±0.17	95.08±2.95
	<1 year	80	5.10±0.19	136.62±1.71	3.88±0.15	95.88±1.92
Local Government areas in	Ogbomoso North	20	5.28±0.20	136.21±1.90	3.98±0.21	95.50±1.01^{b}
Ogbomoso lands	Ogbomoso South	20	5.05±0.14	135.50±1.70	3.55±0.17	92.65±2.06^{c}
	Orire	25	5.22±0.48	137.69±3.65	3.70±0.44	92.11±2.08^{c}
	Ogo-Oluwa	25	5.14±0.20	136.75±1.81	3.65±0.17	98.52±0.92^{a}
	Surulere	30	4.85±0.40	138.79±3.50	3.88±0.42	98.55±1.01^{a}

Means within a column with different small letters (a,b,c,d) are significantly different (P<0.05)

Number of observations, TP total protein, Na^{+} sodium, K^{+} potassium, Cl^{-} chloride, s.e.m standard error of mean

significant while PCV, Hb and RBC varied significantly (P<0.001) with LGA sampled with no defined trend. There existed significant (P<0.01) difference between non-infested and infested animals in terms of total protein (5.55±0.16 vs. 4.65±0.20 g/dl), sodium (137.98±0.53 vs. 130.92±0.92 mEq/l) and potassium (4.14±0.14 vs. 3.66±0.18 mEq/l).

Table 3 showed means for total protein, sodium, potassium and chloride as influenced by health status, species, sex, age and location. Infested animals had significantly (P<0.01) lower estimates for total serum protein (4.65±0.20 g/dl) and sodium (130.92±0.92 mEq/l) than non-infested animals which had corresponding estimates of 5.55±0.16 g/dl and 137.98±0.53 mEq/l. Non-

infested animals had higher ($P<0.05$) estimate (4.14±0.14 mEq/l) for potassium than the infested group (3.66±0.18 mEq/l). While the level of chloride was not significantly affected by health status, sheep had higher ($P<0.05$) estimate (98.64±0.26 mEq/l) than goats (94.06±0.32 mEq/l).

Number of observations, TP total protein, Na^+ sodium, K^+ potassium, Cl^- chloride, s.e.m standard error of mean.

DISCUSSION

In case of mange infestation host reactions were associated with response to mites and their fecal deposits which usually occurred three weeks after the initial infestation and subsequently the reaction time becoming much shorter after repeated exposures. Initial lesions could occur anywhere on the body, often localized where the hair tends to be thin and prone to scratches/ injuries of epidermis such as head from there the infestation can spread quickly causing generalized mange. Infestations generally appeared as papular eruptions with erythema, pruritis and hair loss. With the progress of lesions affected areas become thickened, with crusts or exudates and consequently infected by secondary microbial invaders after excoriation of the skin due to scratching and rubbing [10].

In this study it was clearly revealed that two types of mites, S. scabiei var. ovis and S. scabiei var. caprae were the major cause of mange in sheep and goats respectively. Based on the screening of skin scrapping samples, overall prevalence of sarcoptic mange appeared to be 29.56% in WAD goats and 23.68% in sheep, there was higher prevalence of mange infection in male as compared to females [11] Young animals were more prone to infestation as compared to adult animals [12, 13]. Aatish *et al*., [14], working on prevalence of mange in sheep reared in Pakistan, reported that S. scabiei var. ovis is a fairly frequent parasite affecting only the non-woolly areas of the body. More recently, [15] observed that of the mange mites affecting sheep and goats, Sarcoptes is the most prevalent species in Ethiopia. The incidence might be associated with the dominant type of mite species in the current area of study.

The prevalence of mange infestation in the current study was 1.24 times higher in goats than sheep although the number of goats screened were more than sheep in the study areas. This is not in support to 9.17 times higher susceptibility rate in goats than in sheep [15]. The results of this study clearly revealed that goats had significantly lower WBC counts than sheep which may be responsible to susceptibility to mite infestation than sheep. It was similarly reported that there is difference in mange mite susceptibility among these two species, with goats having a higher susceptibility than sheep [14-17]. Generally, the prevalence of mange was low for the two species compared to 6% reported by [14] for sheep in Pakistan, 8.11% for goats and 0.95% for sheep in Ethiopia [15]. It is expected that mange mite infestation will be higher in ideal micro climate environment which favours the breeding and multiplication of mange mite eggs and their developmental stages [18]. Interestingly, high prevalence was recorded in the current study despite the fact that there is no strict implementation of measures that encourage effective long-term control of vector-borne diseases by the agricultural community of resource poor farmers in the area. This high level of infestation provides a state of poor herd immunity with several environmental factors that are thought to have also contributed to the observation. In line with countries where higher prevalence of mange has been reported which are similar to study area, the environment under consideration is unique in the sense that it is characterized by high temperatures averaging 34.7°C, high rainfall and relative humidity for most part of the year. The growth of lush vegetation is hindered during dry season in the study areas thereby providing low quality forages which has implication on level of balanced nutrition and hence lower resistance to infestation by parasites. Radostitis *et al*., [3] observed that sarcoptic mange mite often go hand in hand with poor feeding and general mismanagement, agreeing with previous reports by Abu-Samra *et al*., [19]. Furthermore, [20] in a study on prevalence and ectoparasites fauna of sheep and goats in Iran revealed that maximum infestation by S. scabie occurred in winter, confirming a review by Sheferaw *et al*., [21] that most outbreaks occur in cold months of the year. This could partly account for lower rate of mange infestation in the environment under consideration characterized by high temperatures.

Another striking feature of the environment under consideration is that most farmers that engage in sheep and goat farming maintain a limited number of animals ranging from five to ten, thereby limiting overcrowding, which constitutes a predisposing factor to spread of mange mites. In corroboration to this, higher prevalence of mange in lowland than highland area of Ethiopia was attributed to the existence of higher goat population in the area and higher contact of animals during shading from high-temperature stress. In the current environment, the abundance of lush vegetation including tall trees provide

good shade and protect animals from high radiation, hence minimizing the possibility of animals coming into close contact with one another for the purpose of shading. The greatest concentration of infested cases were recorded in Orire LGA (7.71%) in goats and 8.75% in sheep compared with other LGAs that had >5%. There were indications during the study that farmers did not engage the services of the state veterinary personnel. These could all be responsible for the high level of mange infestation sustained in the area, the variation being partly accounted for by varying levels of commitment of the farmers to treat infested animals. Notwithstanding, mange infestation is still a problem especially in goats and sheep in most of the LGAs studied and calls for more concerted effort to control mange in order to avoid spread since it is a contagious disease.

The observation that estimates of PCV, Hb and RBC were relatively similar in both infested and non-infested groups corroborates the findings of Chineme *et al*., [22] who observed no difference in blood parameters of sheep suffering from sarcoptic mange. The reason was attributed to the fact that the goats and sheep infestation by mites did not cause any deleterious effects on erythrocytic values, indices and increased erythrocytic fragility which may affect blood picture as reported by [9]. The current observation is likely to be due to the fact that the animals were allowed to move freely most part of the day and toxaemia elicited by mites did not have significant effect on health status of the infested animals. It is interesting to note that the infested animals had significantly higher WBC counts as expected since they protect the body against infection and also play a role in inflammation and allergic reactions. There was significant decrease in total protein, Sodium and potassium infested animal compared with non-infested animals. This may be due to Protein deficiency an indication of malnutrition, disturbed regressive hepatic functional status[23] and glomerular filtration capacity[24]. The lowered level of serum protein could also be due to loss of plasma proteins in dermatitis.

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