
SURVEY OF PODOKNEMIDOKOPTIASIS IN LOCALLY DOMESTICATED MARKET CHICKENS (*Gallus gallus domesticus*) IN MAIDUGURI, NIGERIA

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ABSTRACT

Knemidokoptic mange in domesticated chicken results from infestations with any of several species of barely macroscopic mites (Acari: Knemidokoptidae). A survey of scaly leg mites by *Knemidocoptes mutans* was carried out between April and September, 2008. A total of 4820 local chickens were examined and showed a prevalence of 43 (0.89%), out of which 31 (1.1%) were female and 12 (0.6%) were male; 38 (1.2%) were adults and 5 (0.3%) were young chickens ($p < 0.05$). Twenty (20) (46.5%) of the birds exhibited symptoms of weight loss, 8 (1.9%) had lameness, 8 (1.9%) with rough swollen legs with scaly appearance from the tibio-tarsal joint downwards and 7 (1.6%) had deformed legs ($p < 0.05$). Histopathologically scaly leg lesions were characterized by hyperkeratosis and acanthosis and tissue sections showed mites and their eggs in the deeper stratum corneum, associated with extensive mononuclear and eosinophilic infiltrations. This study suggests that *K. mutans* infestation is present in local chickens in Maiduguri, and are associated with clinicopathological changes

Keywords: *Survey, Gallus gallus domesticus, Podoknemidokoptiasis, Nigeria*

INTRODUCTION

Scaly leg, podoacariasis, podoknemidokoptiasis or tassel foot in local chickens results from infections with *Knemidocoptes mutans*, a burrowing mite that causes cutaneous lesions on their feet and legs worldwide (Pence *et al.*, 1999). These barely macroscopic mites (Acari: Knemidokoptidae) have been reported to cause localized epizootics in domesticated chickens and are economically significant ectoparasites of the tropical chicken interfering with flexion of joints leading to lameness, arthritis or loss of toes (Ogbe, *et al.*, 2004; Prescott, 2004; Morshita, 2005; Ikpeze *et al.*, 2008). The poultry industry occupies an important position in the provision of animal protein (meat and egg) to man as well as income, and in most African countries backyard poultry accounts for more than 60% of the total flock, with an asset value of more than 5.75 billion US Dollars; with Nigeria having an estimated poultry population of 140 million with backyard poultry consisting of 60% (Nnadi and George, 2010). Mekuria and Gezahegn (2010) reported a prevalence of 8.1% for *K. mutans* in WalaytaSoddo, Southern Ethiopia; Hagos and Eshetu (2005) reported 19.5% from central Ethiopia, Shanta *et al.*, (2006) reported 43% from Patuakhali Bangladesh; Swai *et al.*, (2007) reported a 2.3% from Tanga, Tanzania; Sabuni *et al.*, (2010) reported a 66.4% from Kenya; Percy *et al.*, (2012) reported a 56.67% from Zimbabwe; Banda, (2011) reported a 99% from Malawi. In Nigeria Nuala *et al.*, (2003) reported a 13.6% from Zaria in the North; Nnadi and George (2010) a

2.1% from Enugu in the Southeast and also Ikpeze *et al.*, (2008) a 19.6% from Awka, in the Southeast. The objective of this study was to identify and determine the prevalence of *K. mutans* affecting local indigenous chickens with the associated clinical symptoms, age and sex variations.

MATERIALS AND METHODS

Visits were made 3 times a week to each study site between June and September, 2008. A total of 4820 chickens made up of 1870 male and 2950 female, divided into 2180 young (0-8wks) and 2640 adults indicative (8wks) were and 2640 adults (8wks) were physically examined for clinical symptoms indicative of presence of hypertrophic dermatitis on the legs. The age of each chicken was determined subjectively based on the size of coown, length of spur and flexibility of the xiphoid cartilage and history from the farmers according to Magwisha *et al.*, (2002) and Maina, (2005). Tissue for histopathology was excised from skin lesions on the legs and feet and fixed in 10% buffered formalin for at least 24hours.; fixed tissue was then processed and embedded in paraffin; and sections were cut at 4 to 6 μ m stained with haematoxylin and eosin and mounted on glass slides. Additionally, skin scrapings and /or the entire lower leg and foot from each chicken were preserved in 70% ethanol. Skin scrapings were examined microscopically for mites by placing a drop of the suspended material in one drop of 10% KOH solution on a glass slide under a cover slip and mounted under a light microscope (x40) for identification of developmental stages and adults of mites as described by Soulsby (1982) and William (2001).

RESULTS

The result of this study on the survey of scaly leg in locally domesticated market chicken is presented in Table 1. Out of the 4820 chickens examined, a prevalence of 0.9% , distributed amongst sex and age as 0.6% male, 1.1% female ($p<0.05$) and 0.3% young and 1.2% adult ($p<0.05$) respectively. Clinical symptoms included those of weight loss (46.5%), swollen legs (18.6%), lameness (18.6%) and deformed feet (16.3%) ($p<0.05$). There was no significant variation in prevalence rates amongst the study sites examined ($p>0.05$). Figures 1, 2, 3 and 4 describes the histopathological lesions of scaly leg showing the presence of mites and their eggs in the epidermis, and hyperkeratosis and associated mononuclear and eosinophilic infiltrations

Table 1: Prevalence of scaly leg among local chickens based on their sex, age, clinical symptoms and study site.

	No. of Chickens Examined	No (%) infected	
Overall	4820	43 (0.9)	
Sex:			
Male	1963	12 (0.6)	
		p<0.05	
Female	2857	31 (1.1)	
Age (weeks):			
Young (1-8)	1727	5(0.3)	
		p< 0.05	
Adults (>8)	3093	38(1.2)	
Clinical Symptoms:(n=43)			
Lameness		8 (18.6)	
Weight loss		20 (46.5)	
Swollen legs		8 (18.6)	p< 0.05
Deformed feet		7 (16.3)	
Study Site:			
Gidan madara	448	7(1.6)	
London ciki	380	6 (1.6)	
Custom market	1212	9 (0.7)	P>0.05
Bulunkutu	320	5(1.6)	
Monday market	2460	16 (0.7)	

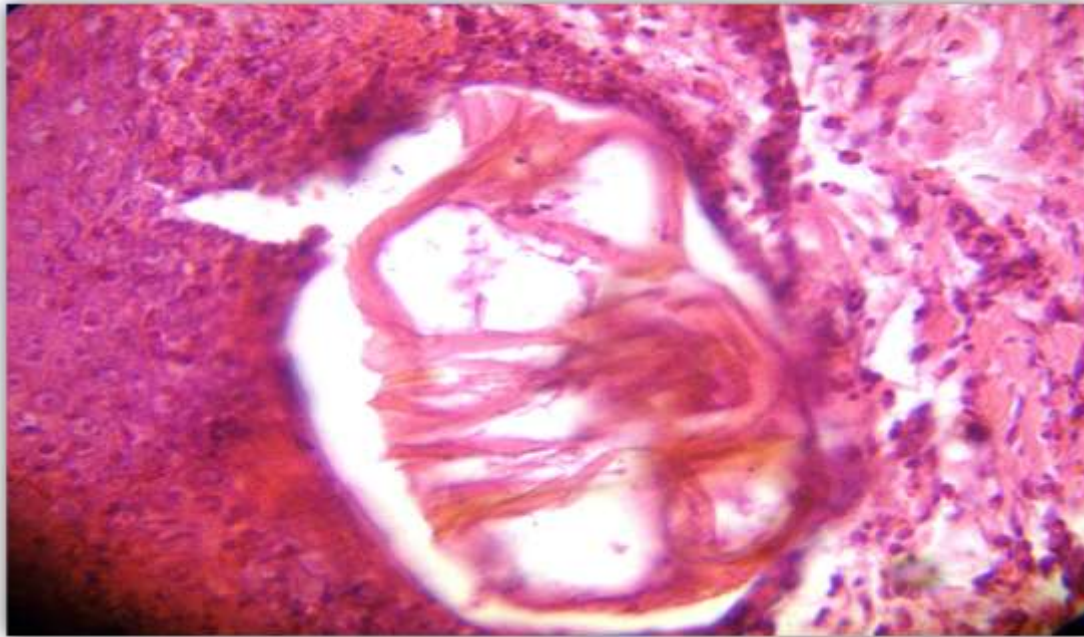


FIG1: Section of the epidermis(H&E) showing a mite (Single arrow) surrounded by mononuclear cellular infiltration(Double arrows).

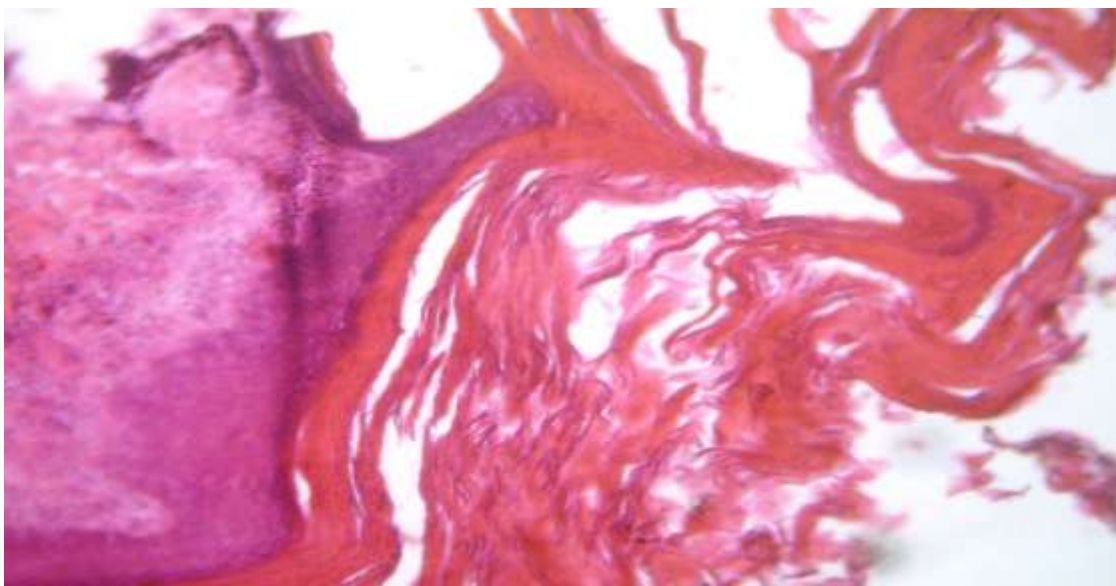


FIG 2: Section of the skin (H&E) showing extensive keratinization of the Stratum corneum (Hyperkeratosis).

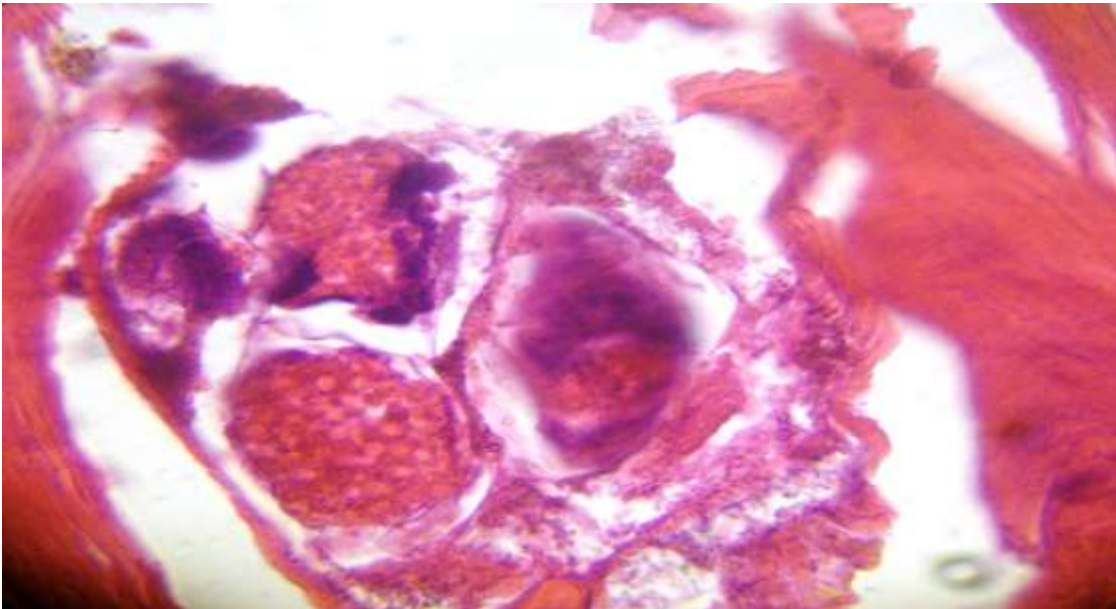


FIG 3: Section of the epidermis (H&E) showing clumps of mite eggs walled off by a membrane.

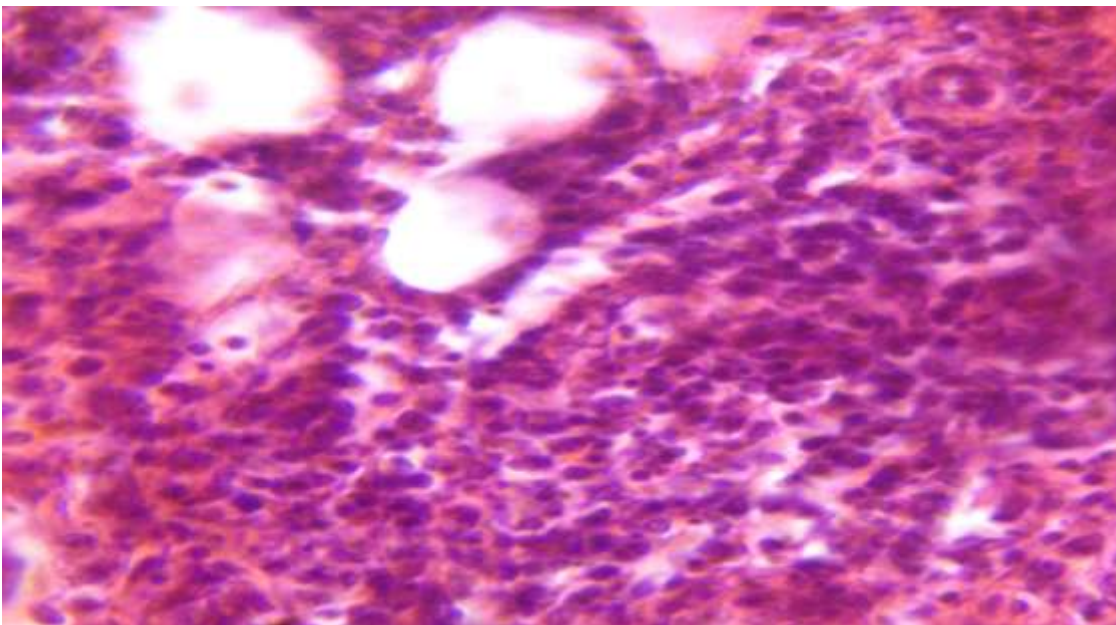


FIG 4: Section of the dermis (H&E) showing extensive mononuclear (Macrophages and Lymphocytes) and polymorphonuclear (Eosinophils) infiltrations.

DISCUSSION

The results of this study has revealed a prevalence of 0.9% for chicken scaly leg which though low as compared with findings from different parts of Nigeria (Natala *et al.*, 2003; Ogbe *et al.*, 2004; Ikpeze *et al.*, 2008; and Nnadi and George, 2010) and parts of Africa (Hagos and Eshetu, 2005; Swai *et al.*, 2007; Mekuria and Gezahegn, 2010; Sabuni *et al.*, 2010; Banda, 2011 and Percy *et al.*, 2012). These authors indicated that it is a significant disease of tropical chicken where most are scavenging, a management system associated with a significantly higher likelihood that birds are infected. As external parasites *K. mutans* are highly prevalent in backyard chicken, usually associated with poor hygienic system. This study has also revealed a significantly higher prevalence amongst female than male and adult than young chickens. By age it agrees with Schillhorn Vanveen and Klayman (1981); Hagos and Eshetu, (2005); Ikpeze *et al.*, (2008); Mekuria and Gezahegn (2010); and Sabuni *et al.*, (2010) and Banda (2011) who recorded a higher prevalence in adult than young chickens; explaining that the development of scaly leg is progressive and age dependent and is more opportunistic than infectious and clinical infestation is seen more frequently in older birds. Mite infestation showed significant ($p < 0.05$) association with age group (>6months) who are 2.8 times more likely to be infested than < 6months. Also older birds may be are exposed longer to the infected environment than young, hence a higher prevalence rate, as *K. mutans* infect chickens through contact with other infected chickens, or from the environment as they scavenge together. By sex, it agrees with Morshita (2005) and Shanta *et al.*, (2006) who observed that males were more affected than female, but contravenes that of Mekuria and Gezahegn (2010) who observed no significant difference between sex and indicated that it may be attributed to similar management systems in both sexes and the environmental stress factors of overcrowding, shortage of food, water and extremes of temperatures. Also infestation is not directly related to animal reproductive system; and some chickens may be genetically resistant. However, Shante *et al.*, (2006) agreed that male sex hormones make birds more susceptible to parasitic infection resulting to a higher mean parasitic burden. The clinical symptoms and histopathological findings observed in this study agrees with those by Schillhorn Vanveen, and Klayman (1981); Permin and Hansen, (1998); Ogbe *et al.*, (2004); Prescott, (2004) and Ikpeze *et al.*, (2008) that *K. mutans* burrow and feed on tissues (keratin) of the skin under the scales of the legs and feet leading to thickened, encrusted and unsightly appearance of legs and feet. Scaly leg is highly contagious, and in chronic cases the crusts may interfere with flexion of joints leading to lameness, swollen legs and feet, arthritis and loss of toes. Also *K. mutans* as a burrowing mite set up inflammatory reactions characterized by leg lesions of hyperkeratosis, parakeratosis and acanthosis. In conclusion, lesions of scaly leg are indicative of the progressive nature of infection and require time to develop, and therefore have been a major impediment to chicken healthy worldwide, and integrated parasite control approaches should be initiated to address the disease in chickens

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