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Lice infestation in village chicken and management practices of keepers in Ilorin, North Central Nigeria

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Abstract

Indigenous poultry production is an essential means of sustaining livelihoods in many parts of sub-Saharan Africa where chicken meat augments dietary needs. However, ectoparasites bedevil its wellbeing. Therefore, this study was designed to document local management practices adopted for ectoparasite control among keepers. A cross-sectional epidemiological survey was carried out using pretested questionnaires to obtain bio-data of keepers and information on management practices. Both body and housing of chickens were combed for ectoparasites and preserved. The specimens were processed following standard parasitological methods and subsequently identified using entomological keys. Descriptive statistics and cross tabulations were employed to process data with statistical significance set at $p<0.05$. A total of 3,164 birds from 284 keepers (male 69(24.3%), female 215(75.7%)) were examined out of which 1,125 birds (38.7%) were infested ($p<0.05$). Among the keepers, 61.6% were gainfully employed, 8.8% were farmers and 29.6% solely depended on poultry for sustenance. The species identified include *Menacanthus stramineus* 297(52.9%), *Menopon gallinae* 132(23.5%), *Lipeurus caponis* 88(15.7) and *Gonoides gigas* 44(7.8%). Two hundred and eighty two (99.3%) keepers had prior knowledge of ectoparasites ($p<0.05$), 178(62.7%) identified itching as a prominent symptom of infestation and 270(95.1%) adopted local treatment methods. Local treatment methods (91.0% agreed to its reliability) includes; hot ash (42.6%), lime leaves (17.3%) and *Azadairactha indica* leaves (15.5%). The prevalence of these lice species is an attestation to its ubiquity in our locality and the identified management practices suggests immense understanding of its potential constraints to the overall welfare of chicken.

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1. Introduction

Poultry production is a vital arm of livestock industry as it provides source of meat and egg for the ever growing human population (Angyiereyiri et al., 2015). In developed and developing countries, it is on a massive scale with a large number of different poultry species reared every year. In Nigeria, commercial poultry production is a thriving business enterprise providing a reasonable source of income for its rearers, especially during festive seasons. Peridomestic, free range, local, village or backyard poultry production involving the rearing of indigenous domestic fowls (*Gallus domesticus*) is also not uncommon as they serve household needs and constitute about 85% of Nigeria's poultry production (Ikpeze et al., 2008a; Nnadi and George, 2010). It is characterized by poor management interventions, feed supplementation, housing, predation and disease control. These setbacks are underlying factors for disease outbreaks and parasite infestation which at times culminate in high bird mortality (Ogada et al., 2016).

Ectoparasites are of great economic importance and constitute a major constraint in indigenous chicken production system (Sychra et al., 2011). Some of the ectoparasites which have been reported in

chicken are mites, lice, fleas and ticks; notable among them are lice and mites, which are most common and widely spread (Ikpeze et al., 2008a; Ogada et al., 2016). A number of morbidities associated with indigenous chicken are as a result of direct consequences of ectoparasite infestation and may include anaemia, local dermatitis, intense irritation leading to discomfort and weight loss due to inability to eat (Zaria et al., 1996; Bhat et al., 2014). In addition, they impact on body fitness, egg production and hatchability, ability to fly, male courtship behaviour, and long term survival of their host (Sychra et al., 2011). The bite of *Argas* species and *Ixodes brunneus* have been linked with tick paralysis; a motor paralysis of voluntary muscles in chicken (Adelusi et al., 2015). Most ectoparasites are vectors/intermediate host for different microbes causing diseases such as fowl pox, pasteurellosis, Newcastle disease, and in some cases Chlamydia (Arends, 2003; Nnadi and George, 2010).

Ectoparasites hide in poor-hygiene poultry houses hence, the high prevalence of infestation in indigenous chicken production could be attributed to poor husbandry and lack of ectoparasite control measures, as chickens are known to roam around homesteads in a bid to scavenge for food leading to spread of ectoparasites when they come into contact with infested birds (Mungube et al., 2008; Sabuni et al., 2010). Recommended control measures for poultry keepers to curb ectoparasitism during outbreaks include good management practices and/or chemical control methods such as dusting, spraying and fumigation of the poultry using selected acaricides, larvicides and fumigants (Mirzaei et al., 2016).

In Nigeria, various species of ectoparasites infesting both exotic and local chicken have been documented. However, the prominent ones include *Argas* species, *Haemophysallis* species (ticks); *Echidnophaga* species (fleas); *Menacanthus* species, *Lipeurus* species, *Gonoides* species, *Goniocotes* species (lice); and *Cnemidocoptes* species (mites) (Nnadozie, 1996; Ikpeze et al., 2008b; Bala et al., 2011; Ekpo et al., 2013; Audi and Asmau, 2014; Ahaotu et al., 2019).

Quite a number of studies have reported the prevalence of ectoparasites confronting local chicken production in Nigeria, but very few have addressed keeper's management practices. Therefore, the study was designed to bridge this knowledge gap and proffer better management of ectoparasites which would invariably boost village chicken production.

2. Materials and Methods

2.1 Study Area

The study was conducted in Ilorin, North Central Nigeria. The city is geographically located on longitude 4°35'E and latitude 8°35'N. The region has two distinct climatic seasons (rainy and dry season) with mean daily temperature ranging between 26.28°C and 31.95°C, and mean annual rainfall of about 1,352 mm. The rainy season starts towards the end of March and ends in October, while the dry season spans from October to February. Inhabitants are predominantly civil servants, traders and farmers with major markets such as Oja-titun, Oja-oba and Ipata located across the city. Tanke Oke-odo, Oko-Oba, Pakata, Tipper garage, Ita-Kure, Gaa-Akanbi, Oke-kura and Ile-apa areas of Ilorin were visited during the course of the study.

2.2 Study Design

A cross sectional study involving a house to house and market epidemiological survey was carried out between March and June 2018 to determine the extent of ectoparasite infestation of indigenous chicken as well as assess the management practices adopted by rearers. Verbal consent was sought from keepers after a detailed briefing on the study protocol. Well structured, pre-tested questionnaires were used to obtain information such as bio-data of breeder and chicken (sex, breed, colour, and fur texture), housing type, health status of chicken, knowledge of lice infestation and interventions adopted by keepers.

2.3 Collection of Ectoparasites

The head, comb, eyelids, wattles, neck, feathers, breast, back, wings, shafts and legs of each bird was thoroughly examined for the presence of tick, flea, louse or mite. Ectoparasite recovery was aided with a hand lens while parting the hairs or feathers and gently brushing with a fine-soft brush to avoid injuries. All recovered ectoparasites were sorted with respect to their type and predilection site. Cracks and crevices within the sleeping areas of the chickens were also examined to avoid omission of parasites with nocturnal activities. Subsequently, all recovered ectoparasites were carefully transferred into pre-labelled universal bottles containing a mixture of 70% ethanol and 5% glycerin and transported to the Department of Zoology Parasitology Laboratory, University of Ilorin for processing and species identification.

2.4 Processing of Ectoparasites

Ectoparasites were first boiled in 10% potassium hydroxide (KOH) solution for 15 minutes, dehydrated in ascending concentration of alcohol, cleared in xylene and thereafter mounted in Canada balsam. Permanent slide preparations were viewed under a high power binocular stereo microscope at x40 magnification. The species of ectoparasites were ascertained using entomological guides (Ikeme, 1976; Soulsby, 1982; Walker, 1994).

2.5 Statistical Analysis

Data was coded, entered and analyzed using SPSS (Statistical Package for Social Science) version 21.0. The analysis was carried out by running descriptive statistics and cross tabulations. Values of $P < 0.05$ were considered to be statistically significant.

3. Results

A total of 284 keepers (male 69(24.3%), female 215(75.7%) took part in this study. The average age of the chicken keepers was 47years and the ratio of male to female was 24 to 76. The population of employed village chicken keepers was 61.6%; 8.8% were farmers and 29.6% were unemployed as at the time of the survey. It was established that 40.1% and 13.7% kept poultry for subsistence and commercial reasons while 46.1% kept chicken for both purposes.

A total of 3,164 village chickens from different parts of Ilorin were examined for the presence of ectoparasites and 1,225 birds had one form of lice infestation or the other with a point prevalence of 38.7%. The association was statistically significant ($p<0.05$). Five hundred and sixty one (561) lice were recovered from the surveyed communities. The species of lice identified include *Menacanthus stramineus* 297(52.9%), *Menopon gallinae* 132(23.5%), *Lipeurus caponis* 88(15.7%) and *Gonoides gigas* 44(7.8%) (Figure 1).

The location and percentage population of different lice species recovered in village chicken is shown in (Figure 2). From the carcass of egg, two lice species were recovered, *Menopogon gallinae* (23%) and *Menacanthus stramineus* (38%); from the thigh and breast region, *Gonoides gigas* (25%), *Menopogon gallinae (*28%) and *Menacanthus stramineus* (65%); from fluff of feathers, *Gonoides gigas* (22%), *Menopogon gallinae* (57%) and *Menacanthus stramineus* (81%); from neck/back, *Menopogon gallinae* (54%) and *Menacanthus stramineus* (84%); and from the head/comb, *Lipeurus caponis* (52%) and *Menacanthus stramineus* (20%).

The distribution of ectoparasites based on the type of habitation of chicken indicated that all lice species (*G. gigas*, *M. gallinae*, *L. caponis* and *M. stramineus*) were found on chickens that perch around or dwell within households. *M. gallinae*, *L. caponis* and *M. stramineus* were found on chickens that reside in wooden sheds. However, only two species of lice, *G. gigas* (10%) and *M. stramineus* (50%) were found on chicken that lived on bare floor. In general, irrespective of the type of habitation the chicken domiciled, *M. stramineus* was generally common compared to other lice species. In wooden sheds, *L. caponis* (92%) was more common when compared to others in this group (Figure 3).

Table 1: Population characteristics of the sampled village chicken keepers

Characteristics	N (%)
Population of sampled chicken keepers	284
Average age examined (years)	46.7
Ratio of male/female examined	24.3/75.7
Average age of male examined (years)	42.3
Average age of female examined (years)	48.1
Employment status	
Employed	175 (61.6)
Farming	25 (8.8)
Unemployed	84 (29.6)
Purpose for keeping chicken	
Subsistence	114 (40.1)
Commercial	39 (13.7)
Both	131 (6.1)

Perception and knowledge of chicken keepers about ectoparasite infestation and control showed that 282(99.3%), had prior knowledge of ectoparasites in general compared to 0.7% of those who had faint knowledge. Moreover, a significantly higher number of respondents, 277(97.5%) were victims, and 6(2.1%) were informed through the media while 1(0.4%) keeper acquired knowledge of ectoparasites through research ($P<0.05$).

Of those who had knowledge of ectoparasite infestation, 178(62.7%) identified itching as a prominent symptom of infestation, 101(35.6%) chose weight loss, while 61(16.0%) were of the opinion that reduced feeding is a symptom of infestation. However, 48(16.9%) respondents attributed other unknown symptoms. As regards treatment of chicken, 270(95.1%) respondents adopted local methods for treating infested birds while 13(4.6%) keepers do not treat chickens locally (Table 2).

Amongst several local methods used for ectoparasite removal (Figure 4), hot ash (42.6%) has been frequently used, followed by ewe oronbo (lime leaf) (17.3%) and *Azadairactha indica*, commonly known as ewe kashia (15.5%). The least method used was hot water (0.4%). The frequency with which these methods were used by respondents (Figure 5a) showed that 70% used at least one of these control methods on a daily basis, while 26% and 4% used them on w eekly and monthly basis respectively.

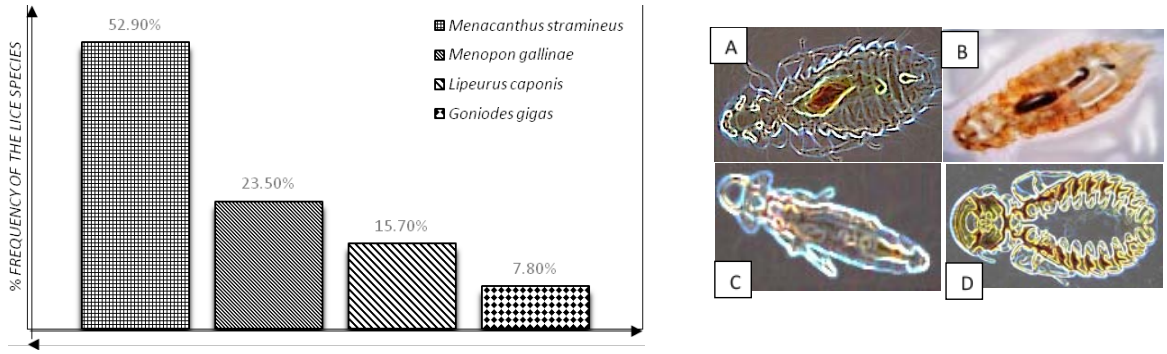


Figure 1: Common Lice species of the village chicken identified in the study area (A: *Menacanthus stramineus* B: *Menopon gallinae,* C: *Lipeurus caponis* and D: *Gonoides gigas* (Mag. X40)

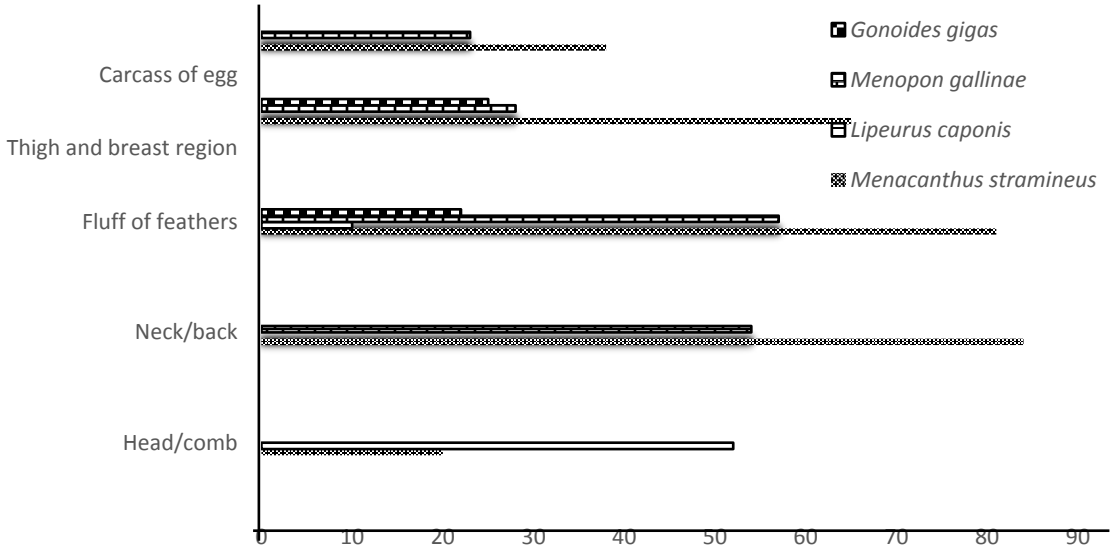


Figure 2: Location and % population of the different lice species on the village chicken body parts

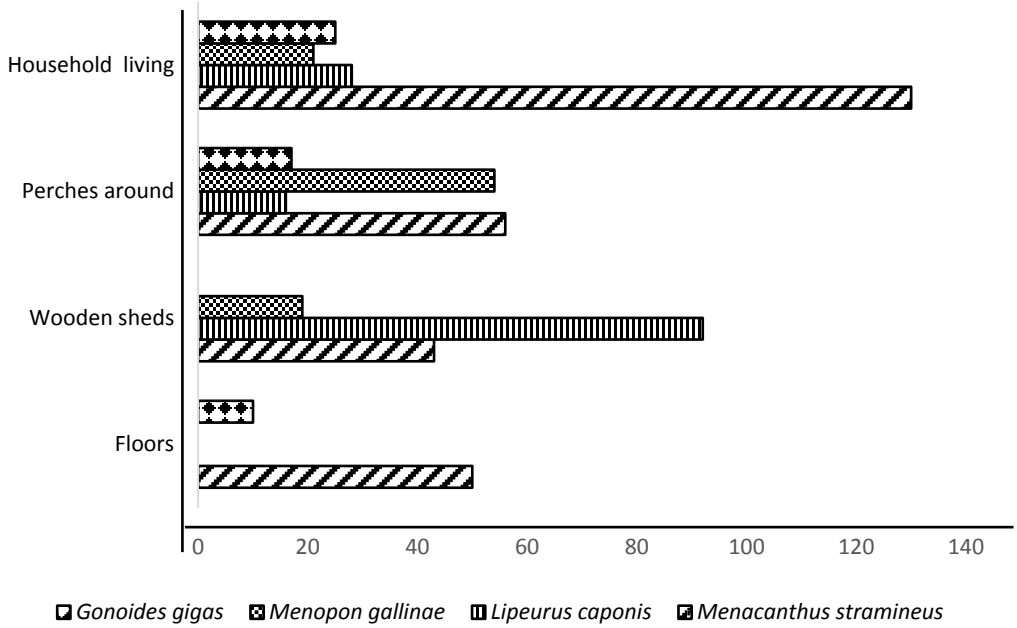


Figure 3: Population distribution of the different lice species with respect to habitation of the sampled village chicken

A high number of respondents (91%) considered the local control methods reliable, while 9% perceived it as unreliable (Figure 5b). This study also revealed that 88.7% do not use modern drugs.

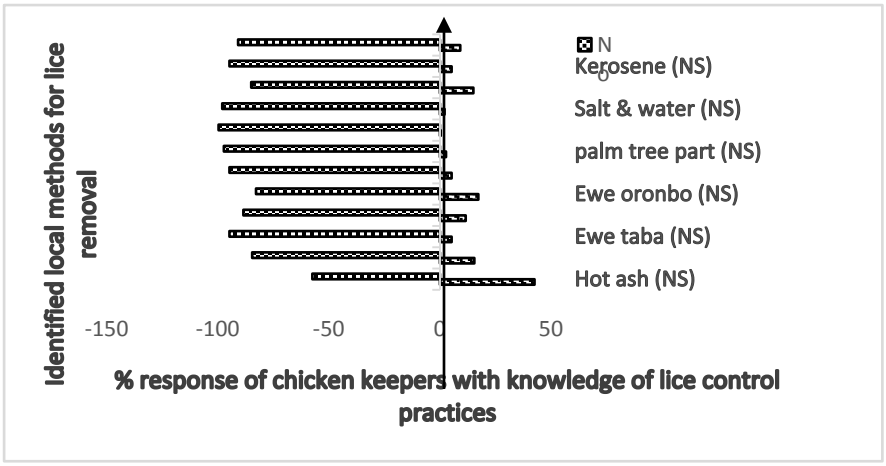
From the assessment of chicken keeper's perception of the effect(s) of ectoparasites on keepers themselves, 65.8% picked itching as the greatest effect suffered from ectoparasite infestation of their birds. However, 32.7%, 5.3% and 8.1% of keepers chose discomfort, sucking of human blood and other effects (nuisance) respectively, as resultant consequences (Figure 6).

Table 2: Perception and knowledge of the village chicken keepers about lice infestation and control

		Knowledge of chicken lice infestation (%)		
		Yes	No	p-value
Source of information				<0.001
	Media	5(1.8)	1(0.4)	
	Victim	277(97.5)	0	
	Research	0	1(0.4)	
Effect of lice infestation				0.608
Itching	*Yes*	177(62.3)	1(0.4)	
	No	105(36.9)	1(0.4)	
				0.586
Weight loss	*Yes*	100(35.2)	1(0.4)	
	No	182(64.9)	1(0.4)	
				0.616
Reduced feeding	*Yes*	61(16.0)	0	
	No	221(77.8)	2(0.7)	
				0.310
Other effects	*Yes*	47(16.5)	1(0.4)	
	No	235(82.7)	1(0.4)	
Treat infested birds locally?				0.096
	Yes	269(94.7)	1(0.4)	
	No	13(4.6)	1(0.4)	

Table 3: Knowledge of ectoparasite infestation and perceived cause and consequence by village chicken keepers

	Knowledge of chicken lice infestation (%)		
	Yes	No	p-value
Observed consequences			
Ruffled feather			0.712
Yes	18(6.3)	0	
No	264(92.9)	2(0.7)	
sluggishness			0.413
Yes	70(24.8)	1(0.4)	
No	282(99.3)	2(0.7)	
Loss of appetite			0.542
Yes	85(30.14)	1(0.4)	
No	197(69.4)	1(0.4)	
Identified causes of lice infestation			
Hatching process			0.759
Yes	171(60.2)	1(0.4)	
No	111(39.1)	1(0.4)	
Dirty Environment			0.602
Yes	92(32.4)	1(0.4)	
No	190(66.9)	1(0.4)	



Key: NS – Not significant @ p<0.05

Figure 4: Common lice control practices among village chicken keepers

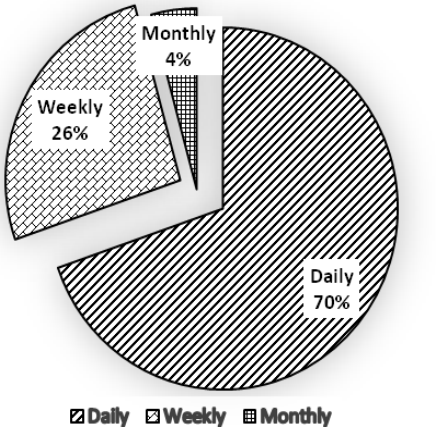


Figure 5a: Percentage frequency of lice control practices by village chicken keepers with respect to duration.

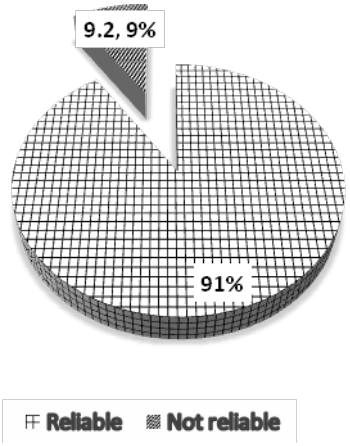


Figure 5b: Village chicken keeper's perception about established local control practices for lice.

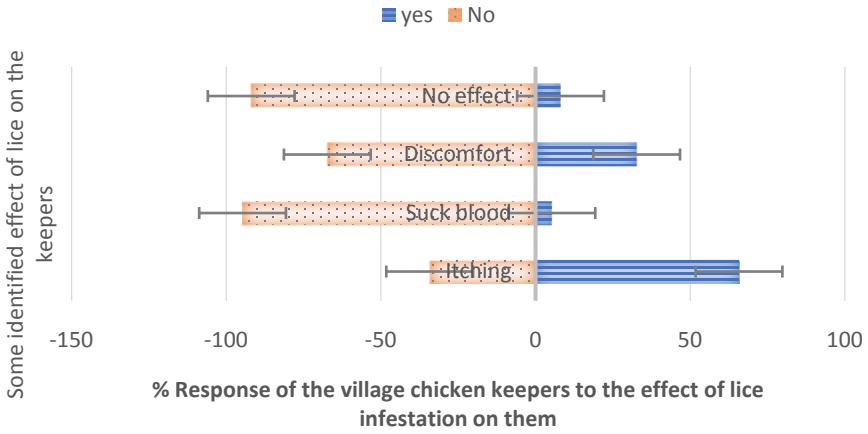


Figure 6: Village chicken keeper's perception of some identified effect of lice infestations on the keepers

The general knowledge of the causes and effects of lice infestation in chicken as perceived by keepers is shown in Table 3. Some of the identified causes of chicken infestation includes hatching process

(171(60.2%)) and dirty environment (92(32.4%)). A total of 18(6.3%), 70(24.8%) and 85(30.1%) poultry keepers were of the view that ruffled feather, sluggishness and loss of appetite respectively were observed effects of chicken infestation ($p>0.05$).

4. Discussion

Ectoparasites have been identified as one of the major impediments to poultry production worldwide. Findings from this study indicated that indigenous chicken rearing are predominantly owned by women (75.6%) who are saddled with their care and management. This is consistent with the study from northern Nigeria (El-Yuguda et al., 2007) and Botswana (Moreki and Masupu, 2001). All ectoparasites recovered from chickens were lice as opposed to several studies in which at least 3 out of the 4 major ectoparasite groups viz; lice, ticks, fleas and mites were reported (Adelusi et al., 2015; Ogada et al., 2016; Ahaotu et al., 2019). Lice are known to be the most abundant and widely spread ectoparasites affecting chickens in Nigeria (Nnadi and George, 2010; Malann et al., 2016) and most parts of the world (Firaol et al., 2014; Mirzaei et al., 2016).

Out of the 4 lice species encountered, *M. stramineus* (52.9%) was the most abundant. Epidemiological research has shown that it is the most pathogenic hematophagous species affecting birds (Prelezov and Koinarski, 2006). The high prevalence observed in this study agrees with findings from northern Nigeria (Audi and Asmau, 2014) and southern California (Murillo and Mullens, 2016). An assessment of the predilection site for each lice species showed that *M. stramineus* had preference for fluff of feathers, neck/back, and thigh and breast region while *M. gallinae* was predominantly found on fluff of feathers and neck/back. Although all lice feed on feather structures, *M. stramineus* and *M. gallinae* also feed on host tissues and blood causing irritation, feather loss and decrease in feather insulation (Murillo and Mullens, 2016).

Variations in the ectoparasite fauna in chicken is often expected due to many factors, particularly housing differences. The high number of lice species recovered from chickens that perch around as well as those in household dwellings and wooden cages as opposed to those kept on bare floor could be because housing structures provide shelter for ectoparasites and also complicate efficient cleaning of poultry houses. A similar finding was put forward by Paliy et al., (2018) where a high number of chicken mite was recovered from wooden coops.

This study also revealed that majority of poultry keepers (99.3%) had prior knowledge of ectoparasites. This is expected as 97.5% had experienced their birds being infested. Our data showed that keepers (94.7%) often adopt local methods for treatment; the most frequently used being hot ash. This may be due to the relatively low cost of the material and easy accessibility. Hot ash and other local methods employed by keepers were perceived to be very effective in treating ectoparasites, however, it cannot be ascertained if birds suffer any complication after treatment. Pyrethrin-based insecticides and diatomaceous earth are recommended safe and effective to achieve lice control (Murillo and Mullens, 2016). Itching and discomfort were prominent adverse effects of chicken infestation suffered by keepers, however, it may be intriguing to know that some keepers (5.3%) feel chicken ectoparasites suck their blood, an erroneous belief that needs to be debunked since ectoparasites are highly host specific.

Knowledge of the causes and effects of ectoparasite infestation is expedient for keepers in order to properly manage poultry systems. In this study, chicken keepers identified hatching process as a cause of lice infestation and to a lesser extent, dirty environment ($p>0.05$). Reports have shown that the majority of chicken infestations were associated with poor hygiene of chicken houses and inadequate ectoparasite control practices (Mungube et al., 2008; Sabuni et al., 2010). A higher proportion of chicken keepers do not associate decreased appetite, sluggishness and ruffled feather with ectoparasite infestation. However, it is known that ectoparasites, particularly lice feed on feather structures and host tissues which negatively impacts on host's fitness, productivity and survival.

5. Conclusions

Indigenous chicken production systems are at constant risk of ectoparasite infestation; hence the need to curtail its occurrence and spread as it portends to be a very effective tool for providing nutritional security and livelihoods for keepers. The need for periodical inspection of birds cannot be over-emphasized in order to prevent lice population from becoming problematic as well as enhance chicken productivity. A further research to ascertain the effectiveness of hot ash and other local control methods perceived to be highly effective by keepers is exigent in order to rule out any adverse consequences on the wellbeing of chickens.

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