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Benefits and Widespread of External Parasites Infestation in Indigenous Chickens (Gallus Gallus Domesticus) A Study from Randomized States In Nigeria

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ABSTRACT

A cross sectional study was conducted from June 2016 to August 2018 to identify the widespread of ectoparasites in indigenous chickens and its associated economic significance in randomly States in Nigeria. A total of 1025 indigenous chickens were examined out of which 90.7% were infested with one or more ectoparasites species. Four types of ectoparasites genera were encountered in this study, 17.0% of the total chickens examined were infested with only one genus while 73.9% were infested with two or more different genera. Among the ectoparasites encountered, lice infestation (85.8%) was the most prevalent followed by mite (70.4%), flea (27.3%) and tick (6.2%) in descending order of widespread. Ten different species of ectoparasites, namely *Menopongallinae*, *Lipeuruscaponis*, *Goniodesgigas*, *Cnemidocoptes mutans*, *Dermanyssus gallinae*, *Epidermoptes* species, *Laminosioptes cysticola*, *Megninia species*, *Echidnophaga gallinacean* and *Argaspersicus* were identified in the study. *Menopongallinae* (50%) was most frequently encountered while *Megninia* species (2.7%) was least prevalent. The findings of this study showed that ectoparasites infestations were highly prevalent among indigenous chicken flocks, which may likely affect their optimum productivity. Routine prevention and control of ectoparasites should be encouraged in the study areas.

Keywords: Indigenous chickens, Ectoparasites, Infestations, Selected local government councils, States in Nigeria

INTRODUCTION

Village poultry production is an integral part of a balanced farming system; it has a unique position in the rural household economy supplying high quality protein to the family [1,2]. It also serves as a source of easily disposable petty income for the rural dwellers [3,4]. They require little labor intensity, affordable inputs and low initial investment compared to other livestock production activities [5]. It is also reported that indigenous poultry play significant roles through their contribution to the cultural and social life of rural dwellers [6,7]. Among the village poultry species, indigenous chicken in Nigeria represents a significant part of the national and the rural economy in particular [8,9].

Unfortunately, the majority of these chickens are maintained under traditional system with little or no inputs for housing, feeding or veterinary care [10]. These birds can easily be exposed to harsh environmental conditions or be infected with several types of diseases such as bacterial, viral, fungal and parasitic pathogens [11]. Among various parasitic diseases, ectoparasites infestations are of great economic importance in indigenous chicken production systems [12]. They usually consume dead cells of the skin and tissue fluids, cause heavy morbidity by sucking blood, while other causes irritation to the birds, which adversely affect their economical productivity [13,14].

Ecto-parasitism has been identified as one of the major factors that threaten scavenging indigenous chicken

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production systems in developing countries [15,16]. Mortalities due to parasitic diseases is higher than those attributed to some poultry viral infectious diseases such as Newcastle disease and fowl pox disease [17]. Common ecto-parasites of village chickens range from lice, mites, fleas and ticks [18]. Some of the ectoparasites, especially tick and mites act as vectors of poultry diseases such as pastuerellosis, fowl pox, Newcastle disease and possibly chlamydia [19].

Parasitic infection has been known to result in immunosuppression, especially in response to vaccines against some poultry diseases [20]. High losses of indigenous chickens due to diseases pose a serious threat to food security and livelihood of many rural families [21]. It is believed that understanding the nature of parasitic diseases of birds will assist in devising the appropriate measures to improve the health and utility of these birds [22]. Ectoparasites may be a considerable constraint to Nigerians efforts to achieve increased production of indigenous chickens and products to enhance food security, poverty alleviation and improvement of job creation among youths so as to meet the demand of the fast growing populace of the country. Information is available on the widespread of ectoparasites in indigenous chickens in some parts of Nigeria such as in Sokoto State northwestern Nigeria [23], in Abeokuta, Ogun State, South Western Nigeria [24], in Akwa – Anambra State, South Eastern Nigeria [25] and in Maiduguri North Eastern Nigeria [26].

At present, no routine government policy and activity is in place for routine control and prevention of indigenous chicken ectoparasites in Nigeria. Adequate control practice of ecto-parasites in rural areas is not carried out. Research on ectoparasitism of livestock has mostly been concentrated on ticks and biting flies in ruminants (cattle, sheep and goats) because of economic significance of ectoparasite borne diseases [27]. Specific objectives are to determine the prevalence of ecto-parasites in village chickens and to evaluate the economic significance of ecto-parasites infestation in Nigeria.

MATERIALS & METHODS

The study was carried out at Akwa-Ibom, Ogun, Anambra, Sokoto, Rivers, Oyo, Kano and Imo selected states in Nigeria. The randomly selected states are densely populated. The states are located within the lowland coastal plain of Nigeria. Akwa-Ibom State lies between latitudes 4°32’ and 5°33’ North and longitudes 7°35’ and 8°25’ East; Bayelsa State lies within the latitude of 4°15’and 5°23’, longitude 5°15’ and 6°45’ and longitude 05°22’ West while Kano State lies between latitude 13°N in the North and 11°N in the South and longitude 8°W in the West and 10°E in the East. The major occupations of the people are trading, public service and farming. Many do combine farming with other occupation like tailoring, masonry and transportation. A total of 1200 questionnaires were distributed among randomly selected participants in selected communities and states in Nigeria. The selected local government councils were shown in **Table 1**.

Table 1. Selected study sites.

Sn	States	Local Government Councils
1	Akwa - Ibom	Eket, Ikono and Mbo
2	Ogun	Ifo, Ikenna and Odeda
3	Anambra	Aguata, Dunukofia and Ogbaru
4	Sokoto	Bodinga, Rabah and Tureta
5	Rivers	Okrika, Eleme and Gokana
6	Oyo	Akinyele, Irepo and Iwajowa
7	Kano	Dawakin, Kiru and Tudun Wada
8	Imo	Ngor Okpala, Obowo and Orsu
9	Zamfara	Bungudu, Maradun and Zurimi
10	Ondo	Idanre, Ilaje and Owo

Fifty questionnaires were distributed per local government council and 150 distributed per town. Out of the one thousand two hundred questionnaires distributed, only seven hundred and twenty (720) were collected back for analysis. The smallholder poultry farmers responded to 700 questionnaires and the data obtained from the study was analyzed using descriptive statistics such as range, mean, frequency and percentages.

SAMPLING PROCEDURE

One thousand and twenty five village chickens which comprises of both sexes and various ages were sampled from randomly selected states and local government councils in Nigeria. Household with moderately large numbers of village chickens population and that were willing to voluntarily cooperate with the sampling procedures were randomly selected and included in the study, while some of the selected farmers were tipped with incentives before allowing the use of their birds for the sampling procedures of ectoparasites infestations. Samplings were carried out for a period of six months on weekly basis. Ectoparasites were collected from the body and skin of each bird and not from the ground in order to minimize accidental collections of other arthropods that do not actually parasitize birds. Examinations for ectoparasitic infestations were carried out early in the morning and in the evening.

PARASITOLOGICAL PROCEDURES

Investigation for ectoparasites infestation in birds were performed by carefully parting feathers horizontally against the anatomical direction of alignment so as to expose parasites and allow visual inspection of the skin and other parts of the birds' body [28]. Ectoparasites were collected from the body of the birds using the forceps-picking and feather-brushing methods [2]. The entire body of the bird was thoroughly inspected and gently brushed with a fine soft brush; special attention was paid to under the wings [2]. In the case of strong attachment and embedded ticks, the ticks were removed using chloroform by dabbing the ticks and the skin. Lice, fleas and mites were collected by dipping a brush in ethanol before combing and brushing the feather and skin of the bird onto a white blotting paper [29].The parasites collected were preserved in 70% ethanol in well labeled glass vials and other data was recorded accordingly.

ECTO-PARASITE IDENTIFICATION

Ticks, lice, fleas and mites were identified according to keys and descriptions by [30]. Ticks were examined under the light microscope and each morphological character was measured and recorded for identification. Lice, fleas and mites were heated in 5% KOH for 20 min, washed and dehydrated by treating them with ethanol, then cleared in xylene for 20 min and mounted on the light microscope.

RESULTS AND DISCUSSION

Table 2 shows the results of the prevalence ectoparasites infestation in randomly selected Local Government Councils and States in Nigeria according to study locations. Out of the thirty different study locations visited for village chicken examination in Nigeria, the following prevalent rates were encountered in descending order: Imo State (97.2%), Akwa-Ibom State (94.8%), Anambra State (94.1%), Rivers State (93.0%), Zamfara State (91.5%), Ondo State (89.0%), Sokoto State (89.9%), Ogun State (88.6%), Oyo State (86.5%) and Kano State (80.9%), respectively.

Table 2. Prevalence of ectoparasites in village chickens in randomly selected local government councils and states in Nigeria.

Study location	Number of chickens examined n=1025	Number of chickens affected	Relative prevalence (%)
Akwa-Ibom State (Eket, Ikono and Mbo)	95	91	94.8
Ogun (Ifo, Ikenna and Odeda)	105	93	68.6
Anambra (Aguata, Dunukofia and Ogbaru)	101	95	94.1
Sokoto (Bodinga, Rabah and Tureta)	99	89	89.9
Rivers (Okrika, Eleme and Gokana)	114	106	93.0
Oyo (Akinyele, Irepo and Iwajowa)	96	83	86.5

Kano (Dawakin, Kiru And Tudun Wada)	89	72	80.9
Imo (Ngor Okpala, Obowo and Orsu)	108	105	97.2
Zamfara (Bungudu, Maradun and Zurimi)	117	107	91.5
Ondo (Idanre, Ilaje and Owo)	100	89	89.0
Total	1025	930	90.7

Table 3 shows the results of the ecto-parasites infestation in randomly selected Local Government Councils and States in Nigeria. Out of the total one thousand and twenty five village chickens examined, nine hundred and thirty (90.7%) were infected with one or more types of ectoparasites, namely, lice, fleas, mites and ticks. In single infestation, 33.3% birds had lice, 1.2% had fleas, 1.7% had mites and 0.8% had ticks. Of the 930 infested birds, 17.0% had single, while 73.9% had mixed infestations. Mixed infestations of ectoparasites was encountered as follows: lice and fleas (5.1%); lice and mites (45.0%), fleas and mites (1.4%); lice, fleas and mites (17.0%), lice, mites and ticks (2.7%), lice, fleas, ticks and mites (2.7%).

Table 3. Ectoparasites encountered according to parasitic infestation (single or mixed infestations) in randomly selected Local Government Councils and States in Nigeria.

Parasitic Infestation	**Type of ectoparasite encountered**	**Number of chickens affected**	**Relative prevalence (%) (y/1025) x 100**
Single infestation	Lice	136	13.3
	Fleas	12	1.2
	Mites	17	1.7
	Ticks	8	0.8
	Lice and Fleas	52	5.1
	Lice and Mites	461	45.0
Mixed infestations	Fleas and Mites	14	1.4
	Lice, Fleas and Mites	174	17.0
	Lice, Mites and Ticks	28	2.7
	Lice, Fleas, Ticks and Mites	28	2.7
Total		930	90.7

Table 4 shows the results of the prevalence of different species of ectoparasites according to the infested anatomic site on village chickens in randomly selected Local Government Councils and states in Nigeria. Lice (85.8%) were the most prevalent ectoparasite encountered, while mites (70.4%), flea (27.3%) and ticks (6.2%) were also encountered in this study. In species specific prevalence, the prevalent rates encountered was as follows in descending order: *Menopon gallinae* (50.0%) which were seen on the feather shafts and all over the body of examined birds,

Cnemidocoptes mutans (33.9%) found around the lower limbs (non-feathered areas), *Echidnophaga gallinacean* (27.3%) around the comb, wattles, eyes and ears, *Lipeuruscaponis* (22.1%) found under the large wing feathers, *Epidermoptes species* (16.9%) found on some parts of the body, *Dermanyssus gallinae* (13.9%) found on entire body, *Goniodesgigas* (13.6%) found within body feathers, *Argaspersicus* (6.2%) found around the ventral abdominal area and beneath the wings, *Laminosioptes cysticola* (3.1%) on subcutaneous tissue and *Megninia* species (2.7%) found on the feathers (quills).

Table 4. Prevalence of different species of ectoparasites according to the infested anatomic site on village chickens in randomly selected Local Government Councils and states in Nigeria.

Types of ectoparasites	**Species of ectoparasites encountered**	**Prediction site**	**Total number of birds affected**	**Relative prevalence (%) (y/1025) x 100**
Lice	*Menopon gallinae*	Feather shafts and all over the body	513	50.0
	Lipeuruscaponis	Under the large wing Feathers	227	22.1
	Goniodesgigas	Within body feathers	139	13.6
	Cnemidocoptes mutans	Lower limbs (non feather areas)	347	33.9
	Dermanyssus gallinae	Entire body	142	13.9
Mites	*Epidermoptes* species	On the body	173	16.9
	Laminosioptes cysticola	On the subcutaneous tissue	32	3.1
	Megninia species	On feathers (quills)	28	2.7
	Echidnophaga gallinacean	Around the comb, wattles, eyes and ears	280	27.3
Tick	*Argaspersicus*	Ventral abdominal area and beneath the wings	64	6.2

The present study further revealed the occurrence of various species of ectoparasites within different external anatomical parts of village chickens following thorough body examination of each randomly sampled bird. It has been established that ectoparasites are important constraints to village chickens production system. This study has revealed varying prevalent rate of ectoparasitism in village chickens with higher prevalent rates of 97.2%, 94.8% and 94.1% encountered in Imo state, Akwa-Ibom State and Anambra State respectively while 86.5% and 80.9% prevalent rates were found in Oyo state. Four types of ectoparasites genera were encountered in this present study in all the study areas. The prevalence of ectoparasites infestation encountered in village chicken production system in this study were 85.8% lice, 70.4% mites, 27.3% flea and 6.2% ticks of different species. This finding is consistent with previous findings [31].

Ectoparasites were found on different body parts of the examined chickens. Wherever part of the birds' body ecto-parasites infest, they cause lot of irritation by their biting and sucking activities. This may distract the birds from its normal activities such as feeding; incubation of eggs and such parasites also serve as transmitters of blood parasitic diseases [29].

The observed overall prevalence rate of ectoparasites (90.7%) in village chickens from the study areas were considerably high, which indicated that ectoparasite infestation is a common problem among this class of poultry in the study areas. This high prevalence of ectoparasitism may be associated with the provision of poor housing facilities for village chickens in some of the study areas, which creates conducive environment for the breeding of the diverse parasitic arthropods.

It has been well established that ectoparasitic infestation has direct or indirect effects on the productivity of village chickens in developing countries of Africa such as Tanzania [32]; Ethiopia [33]; Ghana [2]; Zimbabwe [34]; Nigeria [35] and [36]. However, varying high prevalence rate of 91.5% [37], 86.67% [38], 83.85% [39] and 100% [35] have been reported in different studies. The difference between our findings and that of the other previous researches may be due to breed or ecotypes of birds, seasonality of infection, management/husbandry systems, agro-ecological and implemented methods of the parasitic control [40].

This study was conducted during rainy season towards early dry season of the year (August to January) while others might have conducted ectoparasites samples collection during the dry season of the year [37] or during heavy rainy [41]. Ecto-parasites infected chickens in the present study were found to harbor single or mixed infestation of ectoparasite species. Around 17.0% of the total examined chickens were found to be infested with single species of ectoparasites while 73.9% were infested with mixed ectoparasitic infestation. The mixed ectoparasitic infestation of chickens found in this study was lower than 81% ectoparasitic infestation [42] in Iran but higher than 48.21% [12] and 67.4% reported in Ethiopia [22]. However, the single infestation of 19% reported [42] was slightly higher than that of our findings. The observed variation in the proportion of single and mixed infestation in village chickens would be related to difference of implementation of management system and whether or not strategic ectoparasitic control measures were adopted in the various study areas.

Ten species of ectoparasites, namely *Menopongallinae*, *Lipeuruscaponis*, *Goniodesgigas* (lice); *Cnemidocoptes mutans*, *Dermanyssus gallinae*, *Epidermoptes species*, *Laminosioptes cysticola*, *Megninia* species (mites); *Echidnophaga gallinacean* (flea) and *Argaspersicus*(tick) were identified in the present study. This finding is consistent with other studies [34,35] which reported ten and eleven different ectoparasites respectively in village chickens during a similar study. This indicates widespread of these ectoparasite species in village chickens in most of the African countries including Nigeria. Although variations in the findings might be due to the numbers of birds examined, type of management system practice, climatic and geographic (altitudinal) difference among the various study areas. Among the identified ectoparasite species found on the examined village chickens, *Menopongallinae*was was the most frequently identified (50%) species while *Megninia* species (2.7%) was the least encountered ectoparasite species.

The prevalence of 22.1% of *Lipeuruscaponis* encountered in this study is higher than 5% reported by Bala et al. (2011) and 0.67% reported [37] but lower than 32% and 48% reported by Shanta et al. [38] respectively. Prevalence of *Goniodesgigas* (13.6%) is slightly lower than 14.5% which is reported [43] but higher than 6.5% reported by others who carried out similar study [19]. The finding of *Laminosioptescysticola* (3.1%) encountered in this study is higher than 0.4% reported by another study [34]. *Megninia* species (2.7%) encountered in this study have rarely been reported in village chickens in Nigeria but has been reported in Kenya [31]. The finding of ectoparasites of unique species in village chickens population may possibly occur where this class of birds is reared within the same environments or enclosures with other livestock species (cattle, sheep, goats, rabbits) [44,45], companion animals (cats, dogs) [46,47], wild domesticated birds (ostriches, doves, peacocks or parrots) or other domestic birds species (guinea fowl, turkeys, ducks or pigeon) especially where these animals are reared under unhygienic husbandry systems [48].

Widespread of *Echidnophaga gallinacean* (27.3%) encountered in this study is lower than 50.7%, 71.9%, 44.4% and 51.16% as reported in various studies [19,34,12,37] respectively, but higher than 9.4% and 0.89% reported in other studies [35,26]. *Argaspersicus* (6.2%) was the only

tick species of birds encountered in this study. This finding was consistent with the findings who recorded 8.8%, 4.97% and 5.2% respectively in a similar study [34]. However, a prevalence of 62.2% of *Argaspersicus*in village chickens was reported in a survey to study the ticks in domesticated birds [49]. Considering the respective findings reported in the various works, the difference might be due to the numbers of birds examined during various studies, type of management system practice, climatic and geographic (altitudinal) difference among the various study areas [50-52].

CONCLUSION

Village poultry production has formed an integral part of livestock production systems in most developing countries including Nigeria. They serve as a source of petty cash and high quality protein derived respectively from sales and consumption of poultry products (meat and eggs), yet this potential lucrative enterprise is still the most neglected in terms of management, husbandry practice and particularly veterinary health care, especially in rural communities where majority of the village chickens are reared. Generally, the finding of the present study clearly indicated that ectoparasites infestations are highly prevalent in scavenging village chickens production and management system which is associated with inadequate hygienic system, poor husbandry and management, lack of strategic ectoparasites control practices.

In most villages chicken production system, the economic importance of ectoparasites and the havoc caused by heavy infestation are generally overlooked by farmers. This may be reflected by low productivity and increased loss of the birds especially during period favorable to breeding of the parasites. Poor housing facilities can create hiding places for the parasite and this may jeopardize effort made towards control and treatment. It is assumed that arthropods in poultry houses can generate continuous infestation even following treatment of environment using insecticides.

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