

Prevalence of Lice and Fleas in Backyard Chickens of Bishoftu Town, Ethiopia

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Abstract: A cross sectional study was undertaken from December 2014 up to April 2015 to determine the prevalence of lice and fleas and identify different species of ectoparasites infesting backyard chickens of Bishoftu town as well as to assess the effect of host related risk factors. Samples were randomly taken from 140 backyard chickens and Age, sex and breed of the study population was simultaneously recorded. Lice and fleas were collected from different parts of the body including shank scraping and identified with stereomicroscopy or light microscopy. An overall 123(87.86%) prevalence was recorded and four species of ectoparasites under two orders (Phthiraptera (lice) and Siphonaptera (flea) were identified, of these 77(62.6%), 26 (21.1%) and 20 (16.3%) of them were infested by only lice, flea and both lice and flea species respectively. Among this, three species of lice, *Menacanthus stramineus* (33.57%), *Menopon gallinae* (20.71%) and *Cuclotogaster heterographa* (15%) and one species of flea, *Echidnophaga gallinacean* (32.86%) were identified. Among the potential predisposing factors assessed breed was found significantly associated with the level of infestation ($P=0.004$). Higher prevalence rate was recorded in exotic breed (89%) than local one (82.18%). However, age and sex were not found significantly associated with the level of infestation ($P>0.05$). In conclusion, the study revealed that lice and fleas are highly prevalent in the study backyard chickens. Therefore, efforts should have to be geared towards the improvement of health and management practices through better awareness creation among poultry households and strategic control schemes should be implemented to alleviate the problems in order to affirm the contribution of poultry in food security and further detailed study should be recommended.

Key words: Backyard • Bishoftu • Chickens • Ectoparasites • Flea • Lice

INTRODUCTION

Poultry production is one of the economically important agricultural activities in Ethiopia. In tropical countries, chickens (*Gallus domesticus*) are considered as the most important poultry species [1]. The most dominant chicken types reared in Ethiopia are local ecotypes, which show a large variation in body position, plumage color, comb type and productivity [2]. According to CSA [3] estimate, the total population of chicken in Ethiopia is about 51.35 million comprising cocks, cockerels, pullets, laying hens, non-laying hens and chickens. Of which, (96.83%), (2.37%) and (0.8%) are indigenous, hybrid and exotic chicken breeds respectively. From the total population of the chicken in Ethiopia, 99% are raised under the traditional backyard management system [4].

Poultry play an important economic, nutritional and socio-cultural role in the livelihoods of poor rural households in many developing countries, including Ethiopia, where scavenging poultry are an integrated part of the smallholder production systems and play a significant role in poverty alleviation [5] by means of income generation and household food security [6,7]. It occupies a unique position in terms of high quality protein food contribution to rural smallholder farming families in Africa and particularly in Ethiopia [1, 4]. These sector is the fastest growth and are easily accessible, even to the poorest house hold or those with a lack of able bodied workers, as they require minimal land, labor or financial inputs [8, 9].

Despite the presence of large number of chickens in Ethiopia, contribution to the national economy or benefit exploited from domestic chicken is very limited due to

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disease and nutritional limitation [10]. Among the disease of poultry, parasites play an important role in reducing the total poultry production potential of a country [11]. Where studies have been conducted, parasitic diseases and in particular ectoparasites have been identified as the major impediment to chicken health worldwide owing to the direct and indirect losses they cause [12,13]. They can affect bird health directly by causing irritation discomfort, tissue damage, blood loss, toxicosis, allergies and dermatitis, which in turn alleviate quality and quantities of meat and egg production. In addition, they act as mechanical or biological vectors transmitting number of pathogens [14, 15]. Ectoparasites, such as lice and fleas, live on domestic chickens. Both have long been recognized as a cause of dermatitis and skin damage on all classes of poultry [16].

In the past, few studies have analyzed the prevalence of ectoparasites in backyard chickens in different areas [17, 18]. Nevertheless, researchers and other stakeholders did give little attention to lice and fleas in almost all the production systems particularly, in backyard chicken farms. Hence, the current study was undertaken to determine the prevalence of lice and fleas infestation and to assess the effect of host related risk factors in backyard chickens in Bishoftu town.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted in Bishoftu town, which has 15 kebeles and located in Oromia Regional state at distance of 47 Km South East of Addis Ababa with latitude of 9°N and 40°E longitudes, with altitude of 1850m above sea level in the Central Highlands of Ethiopia. The area has an annual rainfall of 86.6mm, of which 84% is in the long rainy season (June to September). The dry season extends from October to February. The mean annual maximum and minimum temperature are 26 and 14 °c, respectively, with mean relative humidity level of 61.3% [19].

Study Population: The study was carried out on randomly selected backyard chickens of Bishoftu town of each randomly selected kebeles and households. All age groups, sex and breeds (Exotic and Local) managed under backyard management practice were included in the sample population. Poultry were selected according to their sexes, age groups and breeds as to be examined for the presence or absence of lice and fleas infestation.

Study Design: A cross sectional study was conducted on a total of 140 from December 2014 up to April 2015 to determine the prevalence of lice and fleas on backyard chickens of Bishoftu town in randomly selected kebeles using magnifying lens and stereomicroscopic examination technique. Data on the potential risk factors such as sex, age and breed related activities of each house hold were recorded and assessed. Age of the chickens were grouped according to Mekuria and Gezaheng [20] and the chickens were conveniently grouped into young for those growers up to six months of age and adult chickens for those chickens above 6 months, whereas the breeds were local and exotic.

Sampling Methods and Sample Size Determination: The sample size was determined based on the formula given by Thrusfield [21] for simple random sampling methods,

$$N = \frac{1.96^2 p_{exp}(1-p_{exp})}{d^2}$$

Where

N = required sample size

P_{exp} = expected prevalence

d = desired absolute precision

The previous ectoparasite prevalence report of Belihu *et al.* [22] on backyard poultry at the study area was 90%, this entails the expected prevalence and by using a desired absolute precision of 0.05, the total number of sample population required to undertake the study was calculated to be 140. Thus from a total of 15 kebele, eight of the kebeles were selected randomly and the chickens were selected by systematic random sampling technique from randomly selected households of each kebele.

Sampling and Examination Procedure: Those chickens selected by systematic random sampling technique were thoroughly examined wholly for the existence of lice and flea up on close visual inspection and magnifying hand lens. A representative of ectoparasites (Lice and flea) found on the body of the chicken was separately collected by using blunt thumb forceps and or skin scraping in the universal bottles containing 70% alcohol. The detail of information corresponding to each sample, the, age, sex, breed and site of infestation were collected

and registered on a separate case book. After labeling each collected skin scraping and or a parasite samples were transported to the Parasitology laboratory of Addis Ababa University College of Veterinary Medicine and Agriculture for identification purpose.

The collected parasites were further examined by light or stereomicroscope and identified according to guidelines of William [23]. Shank scraps were collected on clean petri-dish. Wet film was prepared from the scrap and 10% potassium hydroxide was used to emulsify debris and examined under light or stereomicroscope. The parasites were identified according to their morphological characteristics using entomological keys using light microscope as described by Soulsby [24]. A chicken with any of an ectoparasite was considered as positive and those with no any ectoparasite was considered as negative irrespective of the burden of infestation.

Data Analysis: The data collected during sampling and laboratory findings were entered and stored in Microsoft excel data base spread sheet before subjected to statistical analysis, the data were thoroughly screened for errors and properly coded. STATA especial edition of versions 17 software was used to perform the statistical analysis. Descriptive statistical analysis such as table was used to summarize. The prevalence of ectoparasites was calculated as the number of positive samples divided by the total number of samples examined. Pearson’s chi square and fisher’s exact test was used to evaluate the association of different variables with the prevalence of lice and flea infestation. P-value less than 0.05 (At 5% level of significance) were considered significant in all analysis.

RESULTS

Of the total 140 chickens examined, 123(87.86%) were found positive for ectoparasite where a highest proportion of infestation was due to louse 69.28% (97/140) followed by flea 32.85% (46/140) (Table 1). One species of flea and three species of lice were identified from the body of the chickens depending on their predilection site. Lice species identified were *Menacanthus stramineus* (33.57%) were detected from the vent, cloacae, thigh and breast, *Menopon gallinae* (20.71%) only from shaft and *Cuclotogaster hetrographus* (15%) from wattle and comb, whereas *Echidnophag agallinacea* (32.85) was the only flea recovered on the wattle and comb of the chickens (Table 1).

Among those infested chickens, mixed infestations were observed in (16.26%) (20/123) of the chickens where by flea and either one of the lice species appear together and (83.74%) (103/123) of the infested chickens were due to a single parasite species (Table 2). Thus a prevalence of (55%), (18.57%) and (14.29%) was obtained if the infestation is considered separately for flea, lice and both flea and lice respectively (Table 2).

In this study, different possible risk factors like age, sex and breed were also assessed and the result was as indicated here in table 3. Among the two age categories the highest ectoparasite prevalence was recorded in adult (89.83%) followed by young (86.41%) age group. Among the sex groups of examined chickens, a relatively higher prevalence was observed in female (88.57%) than male (87.14%). However in both age and sex group there was no statistically significant ($P > 0.05$) difference observed in the level of infestation. From the two different breed

Table 1: Lice and flea species with their predilection site and Prevalence in Backyard poultry of Bishoftu town

Parasites				No. of positive chickens (%)
Order	Species	Predilection Site	Sample size	
Sinophtera (Flea)	<i>E. agallinacea</i>	Wattle and comb	140	46 (32.86)
Phthiraptera (Lice)	<i>M. stramineus</i>	Cloacae, vent, thigh and breast	140	47 (33.57)
	<i>M. gallinae</i>	Shaft	140	29 (20.71)
	<i>C. hetrographus</i>	Wattle and comb	140	21 (15)
Total			140	123 (87.86)

Table 2: lice and flea of chicken and their prevalence in Bishoftu town

Ectoparasites	Number of chicken examined	Number of positive	Prevalence (%)
Lice	140	77	55
Flea	140	26	18.57
Both	140	20	14.29
Overall	140	123	87.86

Table 3: Prevalence of ectoparasite with regard to potential risk factors at Bishoftu town

Risk factors	Categories	Sample size	Number of positive	Prevalence (%)	95%CI	p-value
Sex	Male	70	61	87.14	76.99-93	0.796
	Female	70	62	88.57	78.71-94	
Age	Young	81	70	86.41	76.99-93	0.542
	Adult	59	53	89.83	79.16-96	
Breed	Local	90	74	82.22	72.74-89	0.004*
	Exotic	50	49	98	89.35-99	

* Statistical significance

Table 4: Prevalence, presence or absence of statistical significance difference in prevalence for each species of identified lice and flea

Risk factors	Category	No. examined	Species of flea		Species of lice		Total Result
			<i>E.gallinacea</i>	<i>M.stramineus</i>	<i>M.gallinae</i>	<i>C.hetrographa</i>	
Sex	Male	70	24(34.28%)	20(28.57%)	15(21.43%)	11(15.7%)	61(87.14%)
	Female	70	22(31.42%)	27(38.57%)	14(20%)	10(14.28%)	62(88.57%)
	χ^2 /fishers		0.1295	1.5694	0.0435	0.0560	0.070
	P-value		0.719	0.210	0.835	0.813	0.796
Age	Adult	59	15(25.42%)	18(30.50%)	17(28.81%)	10(16.94%)	53(89.83%)
	Young	81	31(38.27%)	29(35.80%)	12(14.81%)	11(13.58%)	70(86.41%)
	χ^2 /fishers		2.5541	0.4290	4.0731	0.3039	0.3722
	p-value		0.110	0.512	0.044	0.581	0.542
Breed	Local	90	27(30%)	27	17	17(18.88)	74(82.22%)
	Exotic	50	19(38%)	20	12	4(8%)	49(98%)
	χ^2 /fishers		0.9325	1.4413	0.5113	0.137	0.06
	p-value		0.334	0.230	0.475	0.066	0.004*

* Statistical significance

type of chickens considered in this study a high level of infestation was found in exotic breeds (98%) than the local ones (82.22%). Statistical analysis shows the existence of significant difference among the two breed types (P=0.004) in the level of infestation (Table 3 and Table 4).

Prevalence, presence or absence of statistical significance difference in prevalence of each species of identified ectoparasites and the risk estimate for variables are given in Table 4. Prevalence of *E. gallinacean* was slightly higher in male, young and local breed chickens. *M. stramineus* was slightly prevalent in female, young and local breed whereas *C. heterographa* was slightly prevalent in Male, young and local breed. While *M. gallinae* prevalence was slightly higher in female, young and local breed Table 4.

DISCUSSION

In this investigation a total of 140 chickens were thoroughly examined to assess the presence of ectoparasite (Lice and fleas) on the body of the chickens by using close visual inspection and magnifying hand

lens and further identification of the parasite was done by stereomicroscopic examination. Of the total 140 chickens examined, 123(87.86%) were found infested by any of poultry ectoparasite. The current finding is comparable with that of Belihu *et al.* [22] who reported 90.2% in Bishoftu, Hagos and Eshetu [11] 93.7% in central Ethiopia, Besbes [9] 78% from highland, of,93.8% from lowland and 100% from mid altitude areas of Ethiopia as well as Shanta *et al.* [25] report which was 86.6% from Bangladeshi. But lower prevalence than our finding were reported by Firaol *et al.* [26] who reported 67.95% in Ambo and Kansal and Singh [27] who reported 70% from Meerut. Even higher prevalence than our findings were also reported by Gedion [14] 100% from Dire Dawa, Ethiopia and Bala *et al.* [28] 100% from Nigeria. The prevalence discrepancy observed between the current and the previous studies might be due to the variation exist in the management system, breed, seasonal variation, agro ecological and implemented methods of the disease control and prevention [20, 29] in the study areas. The current study was undertaken during dry season (November to April) as that of Belihu *et al.* [22] while Firaol *et al.* [26] undertake the survey at rainy season (July to October).

Infested chickens were found to be attacked by one or more ectoparasite species. About 14.29% of the total examined chickens were found to be infested with more than one species while 73.57% were infested with single species. However, the current finding on mixed infestation was more less when compared with Firaol *et al.* [26] who reported 48.21% in Ambo town, Amede *et al.* [30] 70.9% in Haramaya university, Ethiopia and Al-Saffar and Al-Mawla [31] who reported 81% in Iraq. On the other hand a relatively higher prevalence (73.57%) was obtained in the current study as far as infestation with either of a single species concerned when compared to the report of Firaol *et al.* [26] which was 19.74% in Ambo town, Ethiopia, Amede *et al.* [30] 29.04% in Haramaya university intensive poultry farm, Ethiopia and Al-Saffar and Al-Mawla [31] 19% from Iraq. The observed variation in the proportion of single and mixed infestation would be attributed to the existing difference in sanitation, feeding and housing in the study area.

Lice (69.29%) were the most prevalent followed by flea infestation (32.86%) within this study. The current study is consistent with the report from Ambo town, Central Ethiopia, in which 57.43% lice and 44.36% flea was reported by Firaol *et al.* [26]. Similarly, highest prevalence of lice 84.3% and flea (51.3%) infestations was reported from Bishoftu, Adama and Kalit by Belihu *et al.* [22] and lice infestation (90%) was reported from Kenya [32]. This may be related to, agro ecology, which was favorable climatic condition for their development in the tropics [33].

Four species of ectoparasites, namely *E. gallinacean* (32.86%), *C. heterograha* (15%), *M. stramineus* (33.57%) and *M. gallinae* (20.71%), were identified in the present study. Most of these species were reported from different parts of Ethiopia Mekuria and Gezaheng [20], Belihu *et al.* [22] and Amede *et al.* [30] East shoa, Oromia region and Haramaya University and Wolayta sodo, Southern Ethiopia respectively. This finding is in agreement with the report of Besbes [9] and Hagos [18] in central Ethiopia, Abebe *et al.* [34] in and around Addis Ababa and Gedion [14] in Dire Dawa. This indicates widespread of these ectoparasite species in the country. The predominant ectoparasite identified during this study was *M. stramineus* (33.57%)

However this figure is lower than previous report of Hagos [18] and Belihu *et al.* [22] which was 65.5% and 71.5% respectively in central Ethiopia, However, it is higher than the reports of Firaol *et al.* [26] (20%) from Ambo and Mekuria and Gezaheng [20] (1.28%) in Wolayta sodo, Southern Ethiopia. The difference between the

current and previous findings may be due to agro ecological and ways of disease control, climatic, geographic location and prevention strategy implemented in the respective study area.

The species of lice were analyzed against the assumed risk factors age and sex, there was no statistically significant difference and the flea as well with age and sex group. This was in agreement with the report of Mekuria and Gezaheng [20] and Firaol *et al.* [26]. This is mainly due to similar management practice offered for both sex and age groups.

The prevalence of *Menopon gallinae* was higher in adult 28.81% than young group 14.81% however there was no statistical significance difference. This finding is in line with the finding of Belihu *et al.* [22] (2009) who reported 19.7% in Adama town, Ethiopia. This is due to the immune related factors of aged chickens than young.

The current finding revealed that, exotic breed chickens 98% were more prone to ectoparasite (Lice and fleas) infestation than that of local breeds 82.22% with a statistical significance difference. This is in agreement with the report of Tolossa and Tafesse [35] who reported 2.35% in Bishoftu in semi intensive farm and Bala *et al.* [28] 100% in Nigeria free ranging chickens as exotic breeds are more likely exposed for ectoparasites due to lack of environmental adaptation than local breed, while it was to the opposite with the work of Mekuria and Gezahegn [20], Belihu *et al.* [22] and Firaol *et al.* [26] who reported that local breed (87.5%), 87.46% and (87.55%) found to be more prone than exotic breed in a study carried out in Wolayta sodo, Bishoftu and Ambo town respectively. This might be due to better measures and practices related to good housing, feeding and husbandry system applied for exotic breed than local.

CONCLUSION

Ectoparasites are important constraints to poultry production sector. The current study showed that, infestation of chickens with lice and fleas was an important constraint of the study area. Backyard chickens had diverse external parasites infestation, which is known to adversely affect their health status and contribute to decreased productivity. The observed overall prevalence of lice infestation was higher than that of flea. Four species of ectoparasites were identified in which one flea (*E. gallinacean*) and three louse (*M. stramineus*, *M. gallinae* and *C. heterographas*). In this study among the potential predisposing factors assessed breed was found

important risk factors with statistical significance difference where as sex and age were not found significantly associated with the level of infestation. Therefore, depending on the above conclusion the following recommendations are forwarded:

- Application of integrated control strategy should be practiced in the area.
- Awareness creation among poultry households and regular use of acaricides treatment against ectoparasites should be practiced.
- Attention should be given for exotic breeds of chickens.
- Further detailed studies were recommended in the study area including tick and mites.

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