

Prevalence and identification of ectoparasites on indigenous chickens in Seharti-Samre District, Tigray, Northern Ethiopia

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Abstract

A cross sectional study was conducted from February 2014 to February 2015 to estimate the prevalence of ectoparasites and to assess risk factors in indigenous free scavenging chickens in three sub-districts of Seharti-Samre District, northern Ethiopia. Physical examination, hand picking for visible parasites, skin scraping and laboratory based identification of collected parasites were employed on systematically selected 570 indigenous chickens. An overall prevalence of 68.6% (391/570) ectoparasites with a specific prevalence of 44% (251/570), 14.4% (82/570) and 10.2% (58/570) for *Echidnophaga gallinacea*, *Argas persicus* and mixed infestations, respectively were recorded. Prevalence of *A. persicus*, *E. gallinacea* and mixed infestation showed statistically significant variation between seasons (OR=2.21, 95% CI=1.539-3.178), housing in kitchen (OR=3.33, 95% CI=2.0228-5.486) and main house (OR=3.19, 95% CI=1.910-5.304); age group of birds. The odds of ectoparasites infestation were 3.42 and 7.57 times higher for chick and adults compared with the growers. The current study indicated high prevalence of ectoparasites in backyard poultry management system in the study area. *E.gallinacea* was found to be the most prevalent ectoparasites identified followed by *A. persicus*. Designing and implementation of appropriate ectoparasite control measures seems mandatory in order to mitigate economical losses due to ectoparasite infestation.

Keywords: Backyard; Ectoparasites; Poultry; Prevalence; Sehart-samre,

Introduction

Village chicken production has a fundamental role in capital build up, poverty, malnutrition and hunger reduction among the resource poor households in developing countries. Global poultry population has been estimated to be about 16.2 billion, with 71.6% in developing countries, producing 67, 718,544 metric

tons of chicken meat and 57,861,747 metric tons of hen eggs (Gueye, 2005). Worldwide, poultry meat and egg production accounts for more than 30% of all animal protein (Permin and Pedersen, 2000). The International Food Policy Research Institute (IFPRI, 2000) has estimated that by year 2015 poultry accounted for 40% of all animal protein and they were the available asset to local populations throughout Africa and they contribute to food security, poverty alleviation and promote gender equality, particularly in rural Africa where the majority of the poor people reside. In addition to that village poultry can provide the start of the owner climbing “livestock ladders from small livestock to large livestock species production (Dolberg, 2003). This is because of their good scavenging behaviour, low input requirements for production, short generation intervals, and good adaptation to harsh environments (Besbes, 2009).

In Ethiopia, poultry production is one of the economically important agricultural activities. The recent livestock population estimates that Ethiopia has about 59.50 million poultry of which Tigray region has 5.74 million poultry (CSA, 2017). Ethiopian poultry production systems comprise both traditional and modern production systems, and contribute 98.5% of the national egg and 99.2% poultry meat production (Dessie *et al.*, 2002). More than ninety percent of the national poultry population consists of indigenous breed types (Indigenous, 90.85%; Exotic, 4.39%; Hybrid, 4.76%) (CSA, 2017).

Despite their significant roles, poultry have received little attention in almost all the production systems. Their productive performance is disproportional with their size. Although their low performance has masked their potential, the sector boosts the living standards of chicken owners and contributes to rural developments in Ethiopia. The low performance of poultry has been attributed to prevalence of diseases, particularly external parasites (Nyaile *et al.*, 2003), predators, low genetic potential, limited feed resources, and limited skill in management practices (Sonaiya, 2000; Dana *et al.*, 2010; Yemane *et al.*, 2013 ; Zewdu *et al.*, 2013).

Recently, attempts are underway to enhance the poultry productivity and optimize the contribution of chickens to the national economy despite the negative impact of pathogens. A lot of studies have been conducted on poultry health and their economic and health values. However, most of the studies have focused on viral diseases such as Newcastle disease, infectious bursal disease, fowl pox, avian influenza and Marek’s disease among other diseases (Njunga, 2003). The extension messages that were developed on parasites are also mainly focused

for endoparasites. Ectoparasites have received less attention in most reports and have been considered as side line agricultural activity (Njunga, 2003). Ectoparasites do have an effect on poultry health directly by causing irritation, discomfort, tissue damage, blood loss, toxicities, allergies and dermatitis which in turn alleviate quality and quantities of meat and egg production. They also act as mechanical or biological vectors transmitting number of pathogens (Fabiya, 1996). Hence, the aims of this study were to estimate the prevalence of ectoparasites, identify the parasitic fauna and the host related risk factors in indigenous free scavenging chickens in the study area.

Materials and methods

Study area description

The study was conducted in Seharti-Samre district of south eastern Tigray regional state, Ethiopia. Seharti-Samre is located at 36°27' E and 39°59' E longitudes, and 12°15' N and 14°57' N latitudes. The elevation of the district ranges between 1470 and 2370 meters above sea level with mean annual rain fall of 610.5 (351-870) mm (June to August, summer season) and annual average temperature of 22.5°C (15-30°C). The district has a total of 18 sub-districts possessing 65 peasant associations. The population of the district is 151,817 (75,511 male; 76,306 females). In the current study three sub-districts namely, Gijet, Metkel limat and Samre were included purposefully based on the availability of indigenous scavenging poultry population in the study area. The total households of the district are 39,004 (31,083, male headed; 7,921 female headed) among which the study sub-districts possess 4,061 (Metkel limat 1,622, Samre 1,256, Gijet 1,183). The total numbers of poultry in this District are 112,047 among which the study sub-districts possess 17,740 (Samre, 5,265, Gijet, 4,627 and Metkel limat 7,848) (Seharti-samre district annual report, 2015).

Study population and sampling procedure

The study was carried out from February 2014 to February 2015, on a total of 570 chickens managed under backyard production system by collecting data relating with ectoparasitism in the study area. The sample size was determined based on the formula given by Thrusfield (2005) for simple random sampling methods using an expected prevalence of 50% at 95% level of confidence and 5% desired precision. Accordingly, a total of 384 chickens were required

for this study. However, 570 chickens were systematically selected to increase precision.

Systematic sampling method was applied after sampling interval was determined using the formula $K=N/n$. Where: N =represents estimated total chickens for backyard farm in sampling frames; n = represents allocated sample size and K = interval of household to be sampled (Pfeiffer, 2002). Accordingly, a chick was caught and examined at every 31 household intervals. Chickens of both sexes were included in the study and they were subdivided in to chicks (aged between 1- 3 months), growers (between 3-9 months) and adults (aged greater than 9 months) (Maina, 2005). Age was determined subjectively based on the size of crown, length of spur and flexibility of the xiphoid cartilage (Magwisha *et al.*, 2002).

Collection of ectoparasites and identification

Ectoparasites were collected, preserved in labeled universal bottles using 70% alcohol and transported to parasitology laboratory in College of Veterinary Medicine, Mekelle University. Parasites were then identified against their morphological characteristics and entomological keys using light microscope (Soulsby, 1982; Walker, 1994; Wall and Shearer, 1997; Hogsette *et al* 2003; Taylor *et al.*, 2007; Richman and Koehler, 2007).

Statistical analysis

Collected data were entered into excel spread sheet of Microsoft office Excel 2010. Individual records and results of the field samples were coded and filled. The data was analysed using SPSS version 17. Descriptive statistics were employed for describing management practices. Logistic regression analysis was conducted to analyze strength of association of odd ratio (OR) at 95% confidence interval. In all analysis, p-value <0.05 was taken as statistical significance value.

Results

Prevalence of ectoparasites

An overall prevalence of ecto-parasite infestation of 68.6% (391/570) was recorded in the current study (Table 1). Among the identified parasites, flea

Echidnophagia gallinacae was found with higher prevalence (44%) followed by ticks *Argus persicus* (14.4%) and mixed infestations of both species (10.2%).

Table 1. The overall prevalence of ectoparasites in the study area

Species of ectoparasites	No. examined	No. infected	Prevalence (%)
<i>E. gallinacae</i>	570	251	44.0
<i>A. persicus</i>	570	82	14.4
<i>E. gallinacae</i> and <i>A. persicus</i>	570	58	10.2
Total	570	391	68.6

Distribution of poultry ectoparasites with respect to selected risk factors

Higher prevalence was recorded from adult and male compared to their counterpart (Table 2). The odds of ectoparasites infestation were 3.42 (AOR = 3.42; 95% CI=2.14-5.48) and 7.57 (AOR=7.57; and 95% CI= 4.57-11.48) higher for chick and adult, respectively compared with the growers. Infestation of birds living on partly isolated house, main house, kitchen and trees were 174/303(57.4%), 99/122(81.8%), 108/132(81.1%) and 10/13(76.6%), respectively. The risks of acquiring ectoparasites by poultry kept on kitchen and main houses were 3.3 (AOR=3.3; 95% CI=2.01-5.49) and 3.2 (AOR=3.2, 95% CI=1.9-5.3), respectively times more likely than chicken kept on partly isolated houses. Moreover, significantly higher burden of infestation was recorded in dry season (76.8%) compared with the rainy season (59.9%). The risk of acquiring ectoparasites during dry season was 2.21 (OR=2.21 and 95% CI=1.54-3.1) times more likely than wet season.

Table 2. Prevalence of ectoparasites on the basis of age, sex, housing and season

Variable	No. examined	No. positive (%)	Adjusted odd odd ratio	95% CI
Age				
grower	151	62 (41.1%)	1	-
chick	159	112 (70.4%)	3.4	2.14-5.48
adult	260	217 (83.5%)	7.6	4.57-11.48
Sex				
Male	159	112 (70.4%)	3.4	-
Female	151	62 (41.1%)	0.3	2.1-5.5
Housing				
Partly isolated	303	174 (57.4%)	1	-
kitchen	132	108 (81.8%)	3.3	2.03-5.49
Main house	122	99 (81.1%)	3.2	1.91-5.30
Tree	13	10 (76.9%)	2.5	0.67-9.16
Season				
Wet (Rainy)	277	166 (59.9%)	1	-
Dry	293	225 (76.8%)	2.2	1.54-3.18

Prevalence based on ectoparasites species and their site of attachment

In the present study, higher burden of *E. gallinacea* was found on comb, wattles, and eyelids while higher burden for *A. persicus* was below the wing (Table 3).

Table 3. Prevalence rates of ectoparasites species and their predilection sites

Attachment site	Distribution of ectoparasite Species		
	<i>E. gallinacea</i>	<i>A. persicus</i>	Mixed
Comb	85 (14.9%)	2 (0.4%)	3 (0.5%)
Wattle	68 (11.9%)	3 (0.5%)	1 (0.2%)
Comb, wattle & eye	91 (16%)	1 (0.2%)	23 (4%)
Beneath wing	1(0.2%)	71 (12.5%)	1 (0.2%)
Comb, Wattle	6 (1.1%)	5(0.0%)	30 (5.3%)
Total	251(44%)	82 (14.4%)	58(10.2%)

Discussion

The current study revealed that ectoparasite infestation was a common problem in the study site. The prevalence was found to be higher than previous reports such as 19.3% in Iraq (Al-Saffar and Al-Mawla, 2008). This variation could be due to difference on husbandry management, housing, community awareness, breed and drug intervention practices.

The prevalence of *E. gallinacea* in the present study was higher than what was previously reported by Mekuria and Gezahegn (2010), 16.5% in Wolayta Soddo. This discrepancy might be due to the agro-ecological variation of the study sites, community awareness in the different sites, husbandry and feeding system of the poultry production. Furthermore, the current prevalence of *A. persicus* was found to be higher than reports of 9.2% in Wolayta Soddo town in southern Ethiopia (Mekuria and Gezahegn, 2010) and 6.8% in Mosul, Iraq (Al-Saffar and Al-Mawla, 2008). Evermore, Swai *et al.* (2009) reported a very high prevalence (23.9%) of *A. persicus* in northern Tanzania. The variation could be due to difference on biosecurity, farming system and status of veterinary service. The most affected sites recorded in the current study were comb, beneath the wings, wattle and eye regions. This might be due to low distribution of feathers, soft and fleshy, and vascular favored for easy invasion by the ectoparasites. This finding was in agreement with the findings of Biu *et al* (2007) in Nigeria.

A statistically significant difference was observed in the prevalence of ectoparasites between male and female. This disagrees with Sabuni *et al* (2010) who reported that there was no significant difference in the prevalence rate of ectoparasites infestation between male (37.3%) and female (34.0%) in Kenya. This might be due to difference on management system. In the present study, highest prevalence was recorded in chicken kept in main house and kitchen. This might be due to the fact that they shared the ectoparasites from household materials, rodents, animals and humans. With regard to seasonal occurrence of the ectoparasites infestation, high infestation rate was observed in dry season (76.8%). This could be due to favorable time for multiplication of the parasites coupled with the limited community awareness to do season based strategic prevention and control approach in the area.

Conclusion

The current study indicated high prevalence of ectoparasites in backyard poultry in the study area. *E. gallinacea* was the most prevalent ectoparasite identified during this study followed by *A. persicus*. Age, housing condition and season were found to be associated with of external parasites infestation on indigenous chickens in the study area. Control of poultry ectoparasites has received little or no attention from expertise and the community themselves. Hence, strategic control approaches targeting various age groups, type of housing system and season are recommended. Furthermore, detailed studies to investigate the exact economic and public health impact of the existing ectoparasites in the study area could help to develop a sustainable strategy for their prevention and control.

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