Vol. 10(2), pp. 49-55, February 2019
DOI: 10.5897/IJLP2018.0521
Article Number: 0012E7959852
ISSN 2141-2448

http://www.academicjournals.org/IJLP

ACADEMIC JOURNALS
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International Journal of Livestock Production

Full Length Research Paper

Major causes of chicken mortality in and around Hawassa City, Sidama Zone, Southern Ethiopia

Mishamo Sulayeman[1*], Kabech Gedeno[1], Gizachew Hailegebreal[1], Mandefrot Meaza[2]

[1]Hawassa University Faculty of Veterinary Medicine, Hawassa, Ethiopia.
[2]Wolaita Sodo University School of Veterinary Medicine, P. O. Box 138 Wolaita Sodo, Ethiopia

Received 7 September, 2018; Accepted 30 October, 2018

A cross sectional study was conducted from November 2017 to March 2018, to assess major causes of chicken mortality and identifying parasite types in and around Hawassa city, Southern Ethiopia. One hundred sixty respondents were selected using multistage sampling technique. Questionnaire and laboratory data were analyzed using STATA version 14. Among the respondents 34% kept their chicken extensively while 52 and 14% used semi-intensive and intensive chicken production system respectively. From 73% of the respondents with separate chicken house, 70% practiced house cleaning. Out of the total respondents; 23, 72 and 5% practiced scavenging, scavenging with supplement and commercial feed for their chicken respectively and 55% of them with free access to water. Only 12% practiced vaccine for the health management of their chicken and 64% dispose dead chicken anywhere in the environment but 34 and 2% bury and burn dead chicken respectively. According to respondents; disease, mismanagement, predator, cannibalism and bad weather condition were reported as major causes of chicken mortality. Out of total 64 fecal samples, 50, 4.5 and 45.5% from local, cross and exotic breeds were found parasite positive respectively. About 63.6, 18.2 and 18.2% of the parasites were detected from chicken reared under extensive, semi-intensive and intensive production system respectively. Six parasite types were mainly identified from Hawassa city and its surrounding. Therefore, chicken improvement program in and around Hawassa city should work intensively to minimize the constraints of the sector and then to increase the production and productivity of chicken.

Key words: Chicken, disease, Hawassa, management practices, mortality, parasite.

INTRODUCTION

Animal production in general and chicken production in particular plays an important socioeconomic roles in developing countries. Chicken production provides significant contribution to human food production (Kebede et al., 2017). This is being subjected to great pressure to satisfy the demand for animal protein required by the continued increase in human population (Safari et al., 2004). Additionally, it is an interesting tool to respond rapidly to poverty gaps if chickens are included in rural development strategies (Jarso, 2016).

The total chicken population of Ethiopia is estimated over 56 million, about 98% of which are kept under rural household conditions (CSA, 2014). About 96.6% representing native chicken of none descriptive breeds,

*Corresponding author. E-mail: msulayeman@gmail.com.

0.55% hybrid chicken and 2.84% exotic breeds of chickens mainly kept in urban and peri-urban areas of the country (CSA, 2014). Chicken husbandry in an intensive system is also practical in some urban and per urban areas and only represents 1% of the total population in the country however, having this huge number of chicken, their production and productivity is significantly low (Addis et al., 2014).

Chicken production sector has been adversely affected by a variety of constraints; of these chicken mortalities due to diseases play the major role of hampering its development. This is estimated to be ranging from 20 to 50%, but it may rise as high as 80% during epidemics (Addis et al., 2014). Some published information on the constraints to backyard chicken production in Ethiopia indicated that it is characterized by high mortality caused by disease, predators, and poor management and nutrition. Out of which, infectious diseases are one of the most important cause of mortality in village chicken (Jarso, 2016). Parasitism is one of the major problems which inflict heavy economic losses to the chicken in the form of retarded growth, reduced weight gain, decreased egg production, diarrhea and obstruction of intestine, poor feathers, replacement birds that take long to reach maturity, morbidity and mortality (Negash et al., 2015).

To develop successful chicken production strategy in Ethiopia as general and in and around Hawassa city as particular, comprehending the various causes of chicken mortality and identification of major parasite types are pre-conditions. However, there were gaps in previous studies dealing with causes of chicken mortality and identification of major parasite types in and around Hawassa city. This study was conducted to identify parasite types and major causes of chicken mortality, and also to provide basic information to different stakeholders to take measure on disease prevention and control.

MATERIALS AND METHODS

Description of the study area

The study was conducted in and around Hawassa city. It is the capital city of SNNPRS and located at 07°02 22 N to 38°29 16 E and an altitude of 1,690 m above sea level. The area have an average annual temperature and humidity of 22°C and 64% respectively. It is located 275 km south of Addis Ababa in Ethiopian Great Rift Valley. The total human population of the area is 399,461 (199,768 male and 199,693 female) (CSA, 2014) and the city has a total of eight sub-cities and 32 Kebeles.

Sampling method

Local, cross and exotic breeds of chicken reared under different farming systems in 8 purposively selected villages of the Hawassa city and its surrounding were included.

Study design

Questionnaire and laboratory based cross-sectional type of study was conducted in different farming systems of 160 chicken rearing households/farms from 8 kebeles of Hawassa town and its surrounding.

Sample size and sampling technique

The purposive sampling technique was used to select the sample included under this study. From the 8 sub cities 4 sub cities were randomly selected for this study. Then from the 4 sub cities 8 villages were included purposively based on the availability of chicken population in the area. These kebeles named as Alamora, Chefekoti jebessa, Daka, Dato, Fara, Hiteta, Tesso and Tullo were included in this study. Then, a formal list of household were categorized based on production system, flock size, breed and history of chicken mortality were also considered. From each kebele 20 farmers were selected for questionnaire survey based on willingness of the respondents that made a total of 160 households. In addition to questionnaire survey, 8 of the 20 households from each kebele randomly considered for parasitological fecal examination which made a total of 64 fecal samples from the study area.

Questionnaire survey

Semi-structured questionnaires were prepared and administrated to collect information on chicken production from each selected household. Before the formal interview the prepared questionnaire was tested on 2 of selected chicken rearing households from each Kebele. Then the questionnaire was improved and finally formal interview was carried out.

Fecal sample collection and isolation of parasite eggs

Fresh fecal droppings were collected from chicken houses to isolate the parasite eggs. During fecal samples collection; date, household characteristics, production system and breed of each sampled chicken was recorded. For this study a total of 64 fecal samples were collected. Twenty one from chicken reared under extensive production system, 29 from chicken reared under semi-intensive production system and 14 from chicken reared under intensive production system. Nineteen of the fecal samples were collected from local breed, 5 from cross breed and 40 from exotic breed were collected during the study period and transported to Hawassa university veterinary parasitological laboratory using coded formalin containing screw capped plastic bottles (Annex 1). Parasite eggs were isolated using fecal flotation technique (Annex 2).

Data management and analysis

Questionnaire data and fecal examination result were entered in to Microsoft-Excel spread sheet for management, and then the data was analyzed by using STATA version 11.0 for Windows (Stata Corp. College Station, TX, USA) and finally the table was constructed and the proportion of the respondents was done by using descriptive statistics. In all the analyses, confidence levels at 95% were calculated, and a $P < 0.05$ was used for statistical significance level.

Questionnaire survey result

Characteristics of respondents in the study area

In the study area proportion of female respondents was

Table 1. Characteristics of respondents in and around Hawassa town.

Variable	Category	Frequency	Proportion (%)
Sex	Male	67	42
	Female	93	58
Age	Young	72	45
	Adult	88	55
Education status	Illiterate	34	21
	Primary school	38	24
	Secondary school	45	28
	College and university	43	27

Table 2. Flock characteristics of chicken in and around Hawassa town.

Variable	Category	Frequency	Proportion (%)
Flock size	< 50	152	95
	50-500	2	1
	>500	6	4
Breed	Local	50	31
	Cross	16	10
	Exotic	94	59

higher than males and detail characteristics of the respondents (Table 1).

Flock characteristics

Dominantly respondents used small flock size of chicken. Among different types of breed reared in the study area, exotic breeds are dominant (Table 2).

Production system and housing condition

Semi-intensive type of production system was highly practiced in the study area. Separate chicken house provision and regular cleaning was provided by most respondents and practiced three feeding mechanisms in the study area. Scavenging with supplement type of feeding mechanism was the dominant one. In addition to feeding, chicken owners also practiced three categories of daily watering frequencies for their chicken as shown in Table 3.

Health management practices

Only 12% of chicken owners practiced vaccine for the disease control of their chicken. Regarding dead chicken disposal, few numbers of farmers used to bury or burn the dead chicken (Table 4).

Major causes of chicken mortality

Among the five major causes of chicken mortality, disease is identified as the primary for chicken mortality as shown in Figure 1.

Laboratory fecal examination result

Parasite identified within breed

Out of total 64 fecal sample examined, 22 were found positive for different parasite types. Six different eggs of parasitic species were isolated from different breeds of chicken, among the isolated parasitic eggs, Coccidia spp (36.4%) was dominantly detected as shown in Table 5. From the Laboratory results, chicken under extensive production system were highly parasite positive thank the others (Figure 2).

The association between risk factors and occurrence of parasitic diseases

Statistically significant association was observed between

Table 3. Chicken production system and management practice in and around Hawassa town.

Variable	Category	Frequency	Proportion (%)
Production system	Extensive	54	34
	Semi-intensive	84	52
	Intensive	22	14
Separate chicken house	No	43	27
	Yes	117	73
Feeding mechanism	Only scavenging	37	23
	Scavenging with supplement	115	72
	Commercial feed	8	5
Frequency of watering	Once/day	19	12
	Twice/day	53	33
	Free access	88	55

Table 4. Health management practices in and around Hawassa town.

Variable	Category	Frequency	Proportion (%)
Vaccination	No	141	88
	Yes	19	12
Action taken to dead chicken	Buried	54	34
	Burned	4	2
	Throw elsewhere	102	64

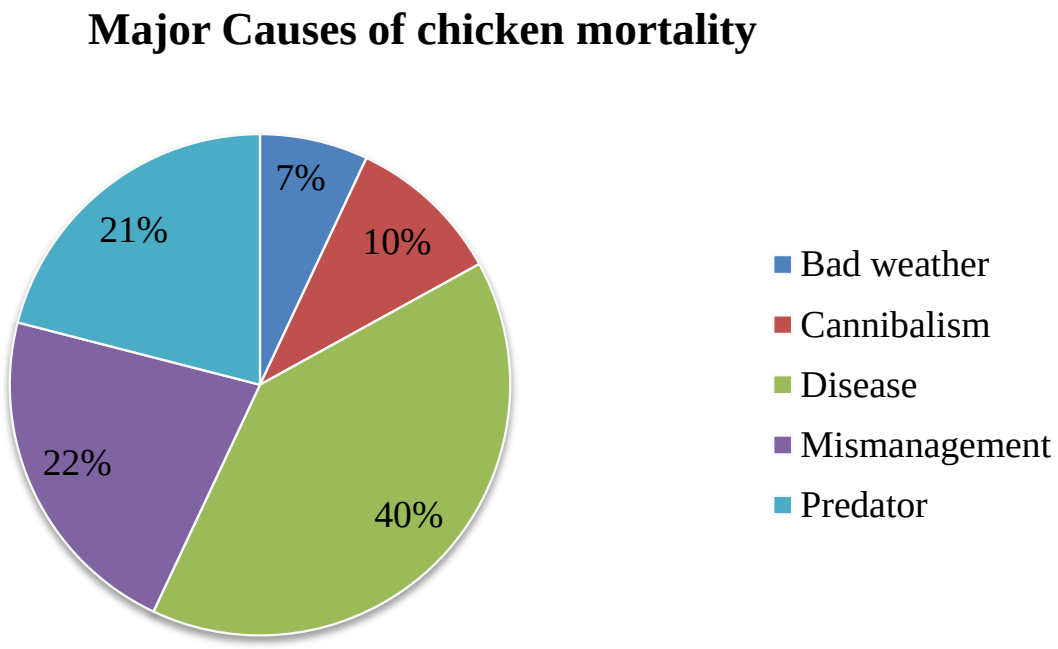

Figure 1. Major causes of chicken mortality in and around Hawassa town.

Table 5. Parasite eggs detected from different breeds of chicken.

Parasite eggs detected	Breed			Total
	Local	Cross	Exotic	
Ascaridia galli	4	0	1	5(22.7%)
Capillaria spp.	2	0	0	2(9.1%)
Coccidia spp.	1	0	7	8(36.4%)
Heterakis galinarium	1	0	1	2(9.1%)
Raillietina spp.	2	1	1	4(18.2%)
Syngamus tracheae spp.	1	0	0	1(4.5%)
Total (%)	11(50%)	1(4.5%)	10(45.5%)	22(100%)

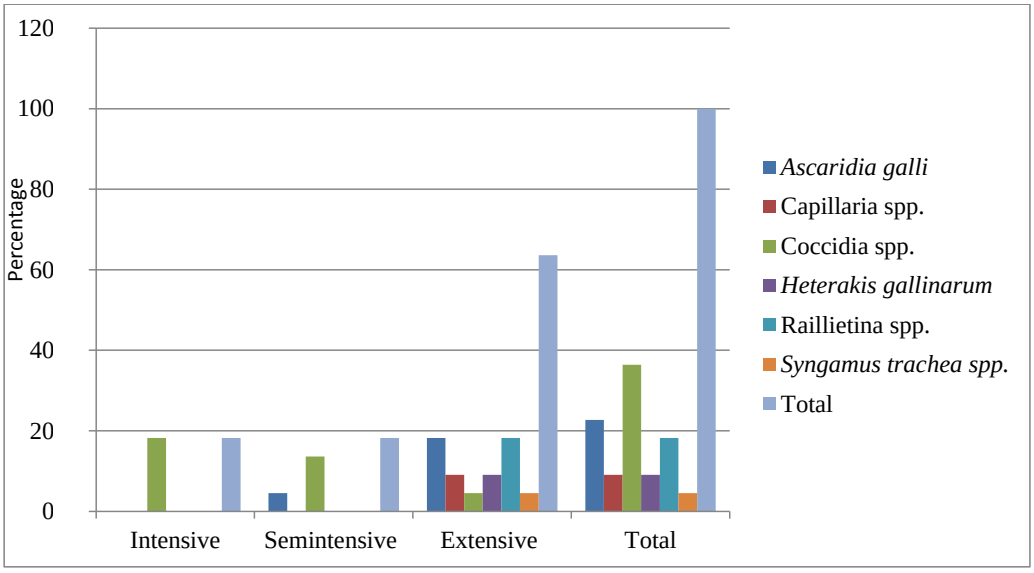

Figure 2. Occurrence of parasitic diseases under different production systems.

Table 6. The association between risk factors and the occurrence of parasitic diseases.

Risk factor	Category	Chicken examined	Positive	P-value	CI (95%)
	Cross	5	1		
	Local	19	11	0.047	0.00437-0.75803
	Exotic	40	10		
Production system	Extensive	21	14	0.329	-0.56453-0.19203
	Semi-intensive	29	4		
	Intensive	14	4		

local and exotic breed on parasitic diseases occurrence (P<0.05) (Table 6).

DISCUSSION

In the present study, the highest number of households reported small flock size of chicken. This is similar with the work of Muhammad et al. (2010) who reported highest number of households owned small flock size. This is due to the fact that small flock size is cheaper and easy to manage than large flock size. In the current study area, the highest number of households used exotic chicken breeds (59%). This report contrast with the report

of Mohamed et al. (2016) from Jigjiga Zone, reported 65% of the households used local breeds of chicken. Dessie and Ogle (2001) from central highlands of Ethiopia, reported the dominant indigenous breed with some exotic breed. Getu and Birhan (2014) from North Gondar, Ethiopia, reported all households used only pure indigenous chickens. The reason for the dominance of exotic chicken breed in the present study might be due to the availability of exotic chicken breed multiplication and distribution center in the study area.

Semi-intensive production system is being practiced by most respondents in this study area. This report in line with the report of Mazengia et al. (2012), reported 61.5% of respondents used semi-intensive production system and contrast with the report of Salo et al. (2016), Mohamed et al. (2016) and Addis et al. (2014), reported 90, 93.3 and 63% of households used extensive production system respectively. The dominance of semi-intensive production system in the present study area is due to high population and urbanization, housing demarcated by fence from outside area. Therefore, including chicken all individual property protected from theft and other accidents, so chicken only allowed scavenging inside the fenced area termed as semi-intensive production system.

High number of households managed their chicken in separate chicken houses and cleans regularly. This report in line with the report of Mazengia et al. (2012) and Mohamed et al. (2016) reported 81.5 and 85.4% of households used to manage their chicken in Separate chicken house respectively. While it contrasts with the report of Salo et al. (2016), 76.7% of the households have no separate chicken house. Dessie and Ogle (2001) from central highlands of Ethiopia reported (88.5%) households kept chicken inside the family dwelling at night. In the present study the higher proportion of households practiced chicken house cleaning. The major use of separate chicken house and house cleaning practiced from current study area is due to the presence of high literate population who has knowledge for better care of chicken.

Majority of the households used Scavenging with supplement feeding mechanism for their chicken. This report agree with report of Mohamed et al. (2016) who report more than 80% of the households supplement their chicken with one hand full of grain twice per day. This might be due to highest number of households practiced semi-intensive production system, chicken have no chance to forage wide area. Free access water was provided by most households for their chicken. This report contrast with report of Salo et al. (2016) who reported high number of households provided water for their chicken only once/day.

The minimum level of health management practices (12%) was observed in current study. This report is in line with the report of Addis et al. (2014) who reported only 30% of households practiced vaccine. The current report might be due to dominance of small flock size in the study area and paid less attention on chicken health management practice. Regarding biosecurity practice, small proportion of households used to bury (34%) or burn (2%) the dead chicken, while the rest throw elsewhere (64%). This report in line with report of Addis et al. (2014) who reported 82% of households throw the dead chicken elsewhere. Different reports also confirmed that dead birds not properly disposed, pose a danger to other flocks and farms and cause soil, air and water pollution. This might be due to lack of biosecurity awareness in the study area.

Five major causes of chicken mortality were reported. Among the causes, disease identified as the primary and followed by mismanagement, predator, cannibalism and bad weather condition. Jarso (2016) also reported disease as the primary cause of chicken mortality while, Tesfu (2007) stated predators as the major constraint to chicken production followed by disease. The current report may be due to improper disposal of dead chicken practiced by most chicken owners in the study area, aggravated disease as a primary major cause of chicken mortality.

Ascaridia galli (22.7%), Capillaria spp. (9.1%), Coccidia spp. (36.4%), Heterakis gallinarum (9.1%), Raillietina spp. (9.1%) and Syngamus trachea spp. (4.5%) are majorly identified parasites. Addis et al. (2014) from Bahir Dar Zuria District, Ethiopia; Awuni (2002) from Ghana; Kumer et al. (2015) from India and Solanki et al. (2015) from Gujarat, similarly reported these chicken parasites. Semi-intensive management of the chicken in the study areas is majorly contributed for the prevalence of different parasite types.

Statistically significant association was observed between breed and parasitic diseases occurrence ($P<0.05$). This report in line with the report of Gebeyeh and Yizengaw (2017) and Negash et al. (2015) from Ethiopia, reported significant association between breeds of chicken on prevalence of Coccidia infection ($P< 0.05$). The present report could be connected with the fact that local breeds of chicken dominantly reared under extensive production system could possibly get regular infection with the variety of parasites when they fed on open space environment on intermediate hosts of the parasites.

Conclusions

In conclusion chicken production plays vital role in the livelihood of households' living in and around hawassa city. Diseases were identified and accepted as the major cause for the mortality of chicken kept under the study areas. Poor disposal practices of dead chicken in the study area might be the reason for the disease to be the major cause of chicken mortality. In addition to disease; mismanagement, predator, cannibalism and bad weather

also reported as causes of chicken mortality. There should be awareness creation and training of chicken owners about biosecurity and other health management practices. Moreover, detailed studies should be carried out to investigate the disease problems prevailing in Hawassa town and its surrounding.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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