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Carpological Epidemiology of Chicken Coccidiosis in and Around Gondar Town, North West Ethiopia

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ABSTRACT

A cross sectional study was conducted from November 2017 up to April 2018 in and around Gondar town to estimate the prevalence of chicken coccidiosis and to identify the associated risk factors. Fecal sample from a total of 408 chickens, were taken (using simple random sampling technique) and flotation method was employed to harvest coccidial oocysts. The result indicated that out of 408 Chickens, 99(24.3%) of the chickens were found positive. The prevalence was found highly statistically significant (P<0.05) across age groups, in which 43.6%<5 Month old chickens and14.9% in chickens of greater or equals to five months old. A statistically significant difference (P<0.05) in prevalence of coccidiosis was also noted across management of chickens with the prevalence of 30.6% in intensive and 19.6% in semi intensive management of chickens respectively. There was no statistically significant difference (P<0.05) on the prevalence between male (29.2%) and female (21.8%) chickens. The effect of Breed on the disease prevalence was assessed and relatively high prevalence was recorded in local chickens (25.9%) than exotic chickens (21.7%) but not significant (P>0.05). In addition to this, no statistically significant difference (P>0.05) among the housing types with the prevalence of 25.2% in Floor and 21.5% in Backyard . In conclusion, as the current study showed that coccidiosis is an important disease of chicken and it indicates appropriate control strategies need to be designed in order to reduce the impact of chicken Coccidiosis in the study area.

Keywords: *Chicken, Coccidiosis , Coprological , Gondar, Prevalence*

INTRODUCTION

The world 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 per annum (Gueye, 2005).In Africa, village poultry contributes over 70% of poultry products and 20% of animal protein intake. In East Africa, over 80% of human population live in rural areas and over 75% of these households keep indigenous chickens and Ethiopia is not exceptional from this situation (Kitalyi,1998).Ethiopia has large population of chickens estimated to be 48.89 million accounted to be 60% of the total chicken population of East Africa, playing significant role in human nutrition, and as source of income, with native chickens of non descriptive breed, hybrid of chickens and exotic breed of chickens mainly kept in urban and peril-urban areas representing 96.6%, 0.55% and 2.8%, respectively (CSA, 2011).

Chicken production in Ethiopia is categorized into traditional, small and large-scale orientated sectors, which is based on the objective of the producer, the type of inputs used, and the number and types of chickens kept. The rural chicken sector constitutes about 99% of the total chicken population and managed under the traditional village poultry production systems (Tadelle et al., 2003: Alemu 1995). One of the main constraints for the development of commercial chicken production is development of disease conditions, which can have devastating effects particularly on intensive production. Indeed, commercial chicken consist of exotic birds selected for their capacities in producing eggs and meat; and because of this selection, these animal are much more susceptible to diseases than the traditional backyard poultry (CIRAD, 2005).

The total national egg and Chicken meat production is estimated to be 78000 and 72300 metric tons respectively, of which local birds, kept under the traditional systems of

production, contribute 98.5% and 99.2% (EARO, 2000).But due to the higher prevalence of the disease coccidiosis coupled with other factors like sub-optimal management, lack of supplementary feed ,and low genetic potential, our country is still getting less esthetic value from chicken production and productivity. Poultry coccidian are strictly host-specific, not only host but also they are site specific means that the different species parasitize specific parts of the intestine and the disease is caused by the intracellular protozoa parasite of Eimeria species in the genus Eimeria family Eimeridae order Eucoccidiorida and phylum Apicomplexa (Taylor et al., 2007, Radiostitis et al., 2007, Singla and Gupta, 2012).

The occurrence and severity of clinical coccidiosis is directly related to the number of oocysts ingested by Chicken at one time, the pathogenicity of the Eimeria species, the age of the infected chicken and the management system (Allen and Fetterer, 2002). Researchers previously conducted in Ethiopia have identified mainly several species of Eimeria which includes E. tenella, E. necatrix, E.maxima, E. acervulina and E. mitis (Methusela, 2001). E. tenella and E necatrix are the most pathogenic species. E. acervulina, E. maxima and E. mivati are common and slightly to moderately pathogenic (Awaise, 2012).

World-wide losses to poultry industry due to coccidiosis have been estimated about 800 million $ annually (Mohmad and Hidayatullah, 2013). The major reasons for the economic loss include loss of egg and meat production, veterinary drugs and inputs, managements and litter costs (Gari et al., 2008). Coccidiosis still continues to be one of the most economically important, but still wide spread diseases of chicken in-spite of advances made in prevention and control through immunodilution , chemotherapy, management, nutrition and genetic improvement (Graat et al., 1996: Pangasa and Singla, 2007).

Coccidiosis is endemic in Ethiopia, causing great economic losses, particularly in young growing birds in all production system (Julie, 2005). Quantitative losses due to coccidiosis in Ethiopia are not well documented, but some report shows that coccidiosis contributes to 8.4% and 11.86% loss in profit in large and small scale farms, respectively (Methusela et al., 2004). Apart from causing disease and losses, sub-clinical infections (mild infections without showing symptoms) cause reduced feed conversion. Since feed expenses form some 70% of the cost of producing broiler chickens, the economic impact of coccidiosis can be immense (Jordan et al., 2002: Vegad, 2004).

In Ethiopia, even if Chicken coccidiosis have been studied by several researchers in different parts of the country, the disease is still continued being a major constraint in chicken production which needs further research and investigations. In addition traditional means of keeping chickens in the study areas are conducive for the occurrence and dissemination of coccidia infection. Beyond this, the prevalence of chicken coccidiosis vary greatly from place to place depending on the relative importance of associated risk factors in collaboration with insufficiency of well documented epidemiological information about the disease (there is little information regarding the prevalence of coccidiosis and their impact on chicken production in the study area).On the other hand, knowing the current situation of the disease in the study area could be important for all possible actions including its control and prevention despite of other measures that have been taken. Therefore, the objectives of this study were: to estimate the prevalence of chicken coccidiosis in and around Gondar town and to identify the underlining associated risk factors of coccidiosis in the study area.

Materials And Methods

Study Area

The study was conducted in Gondar city and surrounding selected villages which is located 728 km North West of the capital city, Addis Ababa. The city situated in 12°36'N 37°28'E latitude and 12.6°N 37.467°E longitude. The study area is characterized with an average temperature of 20°C and an average annual rainfall of 1800 mm. Being a highland area, the study area is spread on different mountains, slopes and in valleys and has three small rivers, many streams and a lake. The city has a population of 186,077 (Rama swamy and Sharma, 2011).According to Office of Agriculture and Rural Development, the livestock population in the area comprises

of cattle (8,202), goat (22,590), sheep (2,695), horse (1,065), donkey (9,001) and unknown numbers of chickens are found (CSA, 2008).In this study areas peoples practice Chicken production by using different rearing system like cage, floor and backyard production system which is currently become popular and deep litter.

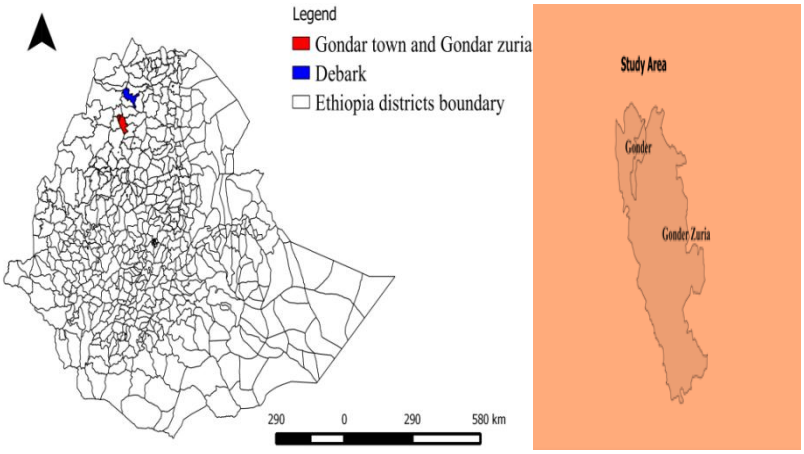

Figure1. *Map of study area*

Study Population

Amhara regional state comprises 19, 961,861 head of chickens from this the study zone account around 6,204,610 heads. The study was conducted on both local and exotic Chicken breeds available in this study area. The information regards to age, sex, breed, management and housing were recorded; short interview of owners about the management and housing type of their chicken was made. Chickens were kept under backyard and floor husbandry system. The study birds were grouped into sex (male and female), breed (local and exotic) and ages was classified as young (less than five months) and adult (greater or equals to five months (Comfort et al., 2013).

Study Design

A cross-sectional study was employed from November 2017 to April 2018 to address the objectives of the study.

Sampling Method And Sample Size Determination

The study area was selected purposively based on the number of chickens population and utilization and due to negligible studies were conducted on chicken Coccidiosis in the study area. Each chicken were selected by simple random sampling technique from their vicinity (housing, backyard or market). Upon sampling sex, age, housing, breed, management system of the bird's and origin were recorded. The required sample size was determined as described by Thrusfield (2007). The expected prevalence of chicken coccidiosis was taken from previous work of (Hadas et al., 2014) at Gondar town which was 43% and by setting 95% confidence level and 5% desired level of precision.

$$n = \frac{1.962 \times pexp(1-pexp)}{d2}$$

Where, n= the required sample size,

P exp= expected Prevalence

d= absolute precession

As a result, 377 study populations were required, but the sample size was increased to 408.

Feacal Sample Collection And Laboratory Analysis

Fresh fecal samples approximately 5-7g were collected directly from the rectum of study chickens and also from freshly deposited feacal during sample collection. The samples were placed in labeled sampling bottles and then after transported to laboratory for analysis. Following transportation of fecal sample laboratory analysis was carried out at the same day and the remaining samples were kept under 4°C and examined up on the next days. The presence of feacal oocysts was determined, using the concentration by flotation method (Bowman and Georgis., 2003)

Data Management And Analysis

All raw data generated from this study were coded and entered to Microsoft office excel data base system. The findings were analyzed

using SPSS version-20.0 computer program; and data were analyzed to find percentage and Chi-squire (x2). P-value was determined for determination of the significance. Chi-square test was also used to determine the variation in infections among different risk factors of the disease. Statistical significance was set at P < 0.05 to determine whether there are significant differences between the parameters measured between the studied variables.

Results

Out of a total of 408 chickens examined for Chicken coccidiosis, 99 (24.3%) were found positive.

Table1. *Overall Prevalence of Chicken Coccidiosis*

Total no of sample examined	No of positive	No of negative
408	99	309
Overall	24.3%	75.7%

Prevalence Of Chicken Coccidiosis On Sex Basis

The effect of sex on the disease prevalence was assessed and relatively high prevalence was recorded in male chickens (29.2%) than that of females (21.8%) as indicated in Table 2. However, the difference between sex groups was not statistically significant (P>0.05).

Prevalence Of Chicken Coccidiosis On Age Basis

There was a statistical significant difference in chicken coccidiosis between young and adult were recorded (P<0.05). Prevalence of Coccidiosis in young (43.6%) was higher than adult (14.9%) chickens.

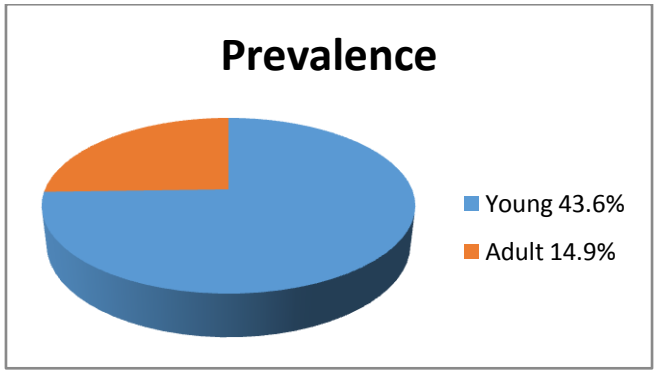

Figure2. *Age wise prevalence of Coccidiosis*

Prevalence Of Chicken Coccidiosis On Management System Basis

There was a significant difference in the prevalence of chicken coccidiosis among management systems (P<0.05), those chickens which are managed intensively were more affected (30.6%) than that of semi intensively managed chickens (19.6%).

Prevalence Of Chicken Coccidiosis On Breed Basis

Statistically significant difference on prevalence of Coccidiosis between local and exotic breeds was not recorded in this finding (p>0.05). Prevalence of Coccidiosis in the local breed was (25.9%) whereas (21.7%) in exotic Chickens.

Prevalence Of Chicken Coccidiosis On Housing Type Basis

There was no significant difference in Chicken coccidiosis between different housing types (Floor and Backyard) (p>0.05). However, prevalence of coccidiosis in chickens reared in floor (25.2%) was higher than chickens reared by backyard (21.5%) system

Table2. *Prevalence of Chicken Coccidiosis on Sex, Age, Management, Breed and Housing Basis*

Factors		Total no examined	No positive	Prevalence %	X^2	S.E.	OR	p-value
Sex	Male	137	40	29.2%	2.731	0.260	0.802	0.098
	Female	271	59	21.8%				
Age	<5 Month	133	58	43.6%	40.180	0.253	0.224	0.000
	≥5 Month	275	41	14.9%				

Management system	Semi-intensive Intensive	235 173	46 53	19.6% 30.6%	6.634	0.247	0.632	0.010
Breed	Local exotic	247 161	64 35	25.9% 21.7%	0.923	0.260	1.602	0.337
Housing	Floor Backyard	301 107	76 23	25.2% 21.5%	0.605	0.291	1.235	0.437
Total		408	99	24.3%				

DISCUSSION

Coccidiosis is known to be the most prevalent and most important disease of poultry production all over the World. In the present study 24.3% (99/408) of overall chicken coccidiosis prevalence was recorded. This finding was comparable with the findings of (Gari et al., 2008) (22.58%) and (Ashenafi et al., 2004) (25.8%) from Arsi zone Tiyo district and Addis Ababa respectively, but the current finding was higher than others records (Grema et al., 2005) (11.45%), (Gessesse, 2017) (19.3%), (Brhane and Nibret, 2016) (20.3%), (Garbi et al., 2015) (19.5%),(Yohannes et al., 2014) (19.5 %), (Abadi et al., 2012) (22.3%), (Alemayehu, 2012) (20.57%), (Oljira et al., 2012) (20.5%), (Adamu et al., 2009) (14%), from Gombe (Nigeria), Yabello, (southern Ethiopia) and Mekelle Town (Northern Ethiopia), Nekemte town, Tigray, Kombelcha, Addis Ababa, in and Around Ambo Town and Makurdi (Benuen State) respectively. The overall prevalence of this finding was lower than records of (Gharekhani et al., 2014) (31.8%), (Lunden et al., 2010) (31%), (Khan et al., 2006) (30%) and (Etuk et al., 2004) (29.3%), (Ermias and Mekonnen, 2015) (56.3%), (Migbaru and Abadi, 2015) (42.7%), (Netsanet, 2003) (38.5%), (Mwale and Masik, 2011) (41.43%) and (Hadas et al., 2014) (43%), (Hadipour et al., 2013) (64%), (Sharma et al ., 2013) (39.6%), (Hagh-Poor M, 2016) (35.5%), (Dinka and Yacob, 2016) (71.1%), (Alemargot, 1987) (80%), (Ashenafi et al., 2004) (42.2%), (McDougald, 2003) (70.95%), (Dakpogan and Salifou, 2013) (36.6%), (Jatau et al., 2012) (37.1%), (Olanrewaju and Agbor, 2014) (69%), (Agishi et al., 2016) (40.1%), and (Muazu et al., 2008) (36.6%) from Western Iran, Nigeria, Pakistan, Aback Agricultural Zone of Akwa Ibom State, Adama town, Dire Dawa area, Kombolcha, Centane district (South Africa), Gondar town, Iran, Jammu region (India), Iran (maranda city), Debrezeit, Addis Ababa, Debre birhan, Tiyo district (Arsi Zone), Benin, Zaria, Abuja, Sokoto state(Nigeria), and Vom, (Plateau State) respectively. The attributable factors for the variation in prevalence of the disease may be due to the difference in the climatic conditions, sampling periods, sample size, agro-ecological set-up (epidemiology), difference in management systems and lack of adequate information on the disease.

The prevalence of Coccidiosis of current finding was relatively higher in male (29.2%) than female (21.8%) chicken. This finding was in concordance with the reports of (Garbi et al., 2015: Alemayehu et al., 2012: Gebretensae et al., 2014) from Eastern Wollega, Addis Ababa, and Gondar town respectively. In contrary to this finding of other researchers reported higher prevalence of Chicken coccidiosis in female as compared to male chickens (Tadesse and Jember, 2014: Thru field, 2005: Sharma, 2013: Diriba et al., 2012: Migbaru and Abadi, 2015: Oljira et al., 2012), at, Jamu region (India), woredas of easter Ethiopia, Dire Dawa and In and around Ambo Town (Western Ethiopia) respectively. In the current finding sex based statistically significant variation on the prevalence was not recorded (P>0.05). This finding was in line with the reports of (Gebretensae et al., 2014: Garbi et al., 2015: Hagh-Poor and Garedagh, 2016: Brhane and Nibrets, 2016). Absence of statistically significant difference between female and male might be due the equal chance of exposure for the coccidia infection.

This finding indicated that the prevalence of coccidiosis in young (43.6%) chickens was higher than adults (14.9%). This result agreed with the report of previous studies (Hadas et al., 2014), (Migbaru and Abadi, 2015) and (Brhane and Nibret, 2016) at Gondar Town, Dire Dawa Town and Mekelle Town respectively. However, this study is not consistent with the report of (Adisu and Endale, 2016), (Safari et al., 2004), (Oljira et al., 2012,) and (Solomon, 2006) who stated that both age group prevalence was equivalent.

In the current findings age based statistically significant variation on the prevalence was recorded (p<0.05). This finding was in line with the reports of (Migbaru and Abdi, 2015: Gebretensae et al., 2014: High-Poor and

Garedaghi, 2016: Brhane and Nibret, 2016: Bereket, 2009 and Ejegayehu, 2016). In contrary of(Addis and Endale , 2016:Solomon, 2006). The higher prevalence of chicken coccidiosis is observed in young than adult birds as former immunity is not well developed (Jordan et al., 2002). In addition the disease appears to reach climax at 5-7 weeks of age and as age exceeded 7 weeks, most birds will develop immunity and increase resistance to the disease (Bowman and Georgis, 2003). This variation between Age groups may also be due to difference in management system, no maternal derived immunity or former immunity is not well developed in young chickens.

Breed based prevalence of Coccidiosis in the current finding indicated that slightly higher in local breeds (25.9%) than that of Exotic breeds (21.7%), this difference was not statistically significant (P>0.05). This finding is in line with others report stated that breed is not significant factor for the variation in prevalence of chicken Coccidiosis like (Hadas et al., 2014), (Guale, 1997), (Solomon, 2016) and (Brhane and Nibret, 2016). However the current finding was disagree with the findings (Adisu and Endale, 2016), (Hagh-Poor and Garedaghi, 2016), (Garie et al., 2008), (Puttalakshmamma et al., 2008), (Quiroz-Casta and Dant´an-Gonz´alez, 2015), (Bereket, 2009), (Ejegayehu , 2016) and (Jallailudeen Rabana Lawa et al., 2016) who stated significant variation was recorded in different breeds of chickens. Even if insignificant variation of Coccidiosis in local and exotic breeds was reported the prevalence was slightly higher in the local breeds which may be due to, local chicken allowed to scavenge in villages without restriction and thus more likely get contact with sporulated oocysts in faeces, which are the main source of infection. Additionally there might be due to concurrent parasitosis which is common in local chickens kept under traditional management system. Also the housing and management of the study area was conducive for sporulation, transmission and survival of oocyst, therefore the occurrence of Coccidiosis was insignificantly affecting both breeds.

Housing based prevalence of Coccidiosis in the current finding indicated that slightly higher in floor (25.2%)than backyard(21.5%),this difference was not statistically significant (P>0.05). This finding is in line with the findings of (Adisu and Endale, 2016: Taylor et al., 2007). In contrary of (Agishi et al., 2016: Jallailudeen et al., 2016: Gebretensae et al., 2014) who stated significant variation was recorded in different housing system of chicken. The variation in the prevalence of the disease may be due to poor management practices such as overstocking and poor sanitary conditions, such as leaking water troughs and accumulation of faeces, malnutrition and non-use of coccidiostats as preventive measures could also be responsible for the high prevalence of coccidiosis in this study.

The prevalence of Coccidiosis of current finding was higher in intensive (30.6%) than semi intensive (19.6%) management of chickens. This result agreed with the report of (Hagh-Poor and Garedaghi, 2016: Agishi et al., 2016:Gessese, 2017). However, this study is not in consistent with the study of (Migbaru and Abdi , 2015:Solomon, 2006). In this study, it found that there was statistically significant difference with the occurrence of Chicken coccidiosis between different management system (P<0.05).This finding is in line with the findings of (Agishi et al., 2016: Gebretensae et al., 2014: Hagh-Poor and Garedaghi, 2016). But in consistent with the findings of (Adisu and Endale, 2016: Migbaru and Abadi, 2015: Solomon, 2006) who stated that significant statistical variation between management was not recorded. The variation in the prevalence of chicken coccidiosis on the management may be due to here in intensive management birds are housed throughout their life cycle with the provision of good feed concentrates, litters of sawdust, feederers and waterier for their feeding and watering. Good attention is given on their vaccination schedule throughout their lives, good disease control prevention programs, etc. However, because of the possibility of water spillage onto the litters and subsequently moisture and humidity (which is favorable condition for sporulation of oocyst) makes this system at high risk of coccidiosis. That is why it is commonly seen in this system compared with others.

Conclusions And Recommendation

Coccidiosis is known to be the most prevalent and most important disease of poultry production all over the world. It is a type of protozoan parasitic disease caused by different

Eimeria species in poultry. It is also considered as an intestinal disease affecting the small intestine and cecum.

In conclusion, despite the reduction in the prevalence of coccidiosis in the present study, coccidiosis is a major burden to chicken producers and veterinary health professionals. The result of the current study showed that different risk factors have contributed for the occurrence of chicken coccidiosis infection in the study sites and coccidiosis is still the most important parasitic disease of chicken especially in intensive management system and at younger age of birds in the study area. Therefore, maintaining recommended stocking density and avoiding raising of multiple age flocks in the same house should be practice, it is necessary to maintain good hygiene and sanitation in the farm as disinfectants are not effective against coccidian and efforts toward educating the local chicken farmers especially in villages to control coccidiosis through good management practices, and the proper use of anticiccidial drugs should be considered.

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