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Prevalence of Coccidiosis and Identify the Potential Risk Factors in Chicken at Mitto district Silte Zone, Southern Ethiopia

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Abstract
Poultry industry in Ethiopia is facing a range of constraints including feed, improved breeds and diseases. Both in extensive and intensive production system, diseases pose serious economic impact due to high mortality and morbidity**.** The aim of this study was to estimate the prevalence of poultry coccidiosis in Mitto district. The result revealed that out of 288 household collected pooled dropping samples examined, 20.5% (n=59) were positive for eimeria oocysts. Breed based prevalence was recorded high in mixed (29.6%) and exotics (22.9%) than local chickens (12.8%) and the observed prevalence in exotic and mixed were significantly different ($p<0.05$)from local birds. Likewise, the prevalence noted across management systems i.e. 29.4% in semi-intensive and 16.1% in backyard were also significantly different ($p<0.05$). Among the six predictors considered, three of them, namely, exotic breeds flock size >10 and chicken managed in semi-intensive system were found to have the higher prevalence compared to the corresponding comparative categories. Characteristic Intestinal lesions observed in postmortem were higher (62.5%), among young and followed by adult (16.7%). The largest proportion of intestinal lesion (55.6%) was seen in exotic birds. Therefore, the present study indicates that coccidiosis is an important disease that worth attention in the study area and the growing small scale production system that use exotic breeds and their crosses must give due attention to management system in order to minimize the impact of the diseases.
Keywords: Backyard, Coccidiosis, Eimeria, Mitto, Poultry, Prevalence, Risk factors
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Introduction

The name poultry refers to all domestic birds such as chickens (domestic fowl), turkeys, ducks, geese, guinea fowls, ostriches and others, which are mainly kept for the production of meat and egg for human consumption (AH, 2009). Poultry is now by far the largest farm industry in the worldwide, accounting for more than 30% of all animal protein consumption (Permin and Pedersen, 2000). Among these, chickens are the most important species, adapted globally to various climatic conditions where human being lives and play a significant role in supplying animal origin protein to improve the nutrition of human being (Chauhan and Roy, 2007).

Poultry compose a fundamental component of agricultural and household economy in the developing world and play important role to enable the landless poor farmers move out of poverty (Gueye, 2005). Moreover, poultry in many parts of the modern world is considered the chief source of not only cheaper protein of animal origin but also of high-quality human food (Jordal et al., 2002; EARO, 2000). In Africa, village poultry contributes over 70% of poultry products and 20% of animal protein intake. In East Africa, over 80% of human population lives in rural areas and over 75% of these households keep indigenous chickens (Matawork, 2016; Kitalyi, 1998). Ethiopia has a large population of chickens estimated to be 59.5 million with indigenous, hybrid and exotic breeds of chickens representing 91%, 4.7% and 4.3%, respectively (CSA, 2017). From the total population of chicken in Ethiopia, 99 % are raised under the traditional back yard management system (Tadelle et al*.,* 2003), while 1 % is under intensive management system (Ashenafi and Eshetu 2004).

Poultry industry in Ethiopia is facing range of constraints including feed, improved breeds and diseases. Both in extensive and intensive production system, diseases pose serious economic impact due to huge mortality and morbidity (Yenesew et al., 2015; Dana et al., 2008). Among the possible infectious diseases that affect the sector, coccidiosis is the leading parasitic disease known prevail in most production facilities. Poultry coccidiosis in chicken is caused by the intracellular protozoa parasite classified under the taxonomy genus *Eimeria.* The protozoan parasite belongs to *Eimeria* family *Eimeridae* order *Eucoccidiorida* and phylum *Apicomplexa* (Singla and Gupta, 2012; Taylor et al., 2007).

There are nine identified *Eimeria* species of poultry coccidiosis only seven of them have been reported to be pathogenic (Kahn, 2008). *Emeria necatrix* (*E. necatrix*) and *Emeria tenella (E. tenella)* are the most pathogenic *Emeria* species. *Emeria arcevulina* (*E. acervulina*), *Emeria maxima* (*E. maxima*) and *Emeria mivati (E. mivati)* are common and slightly to moderately pathogenic while *Emeria brunetti* (*E. brunetti*) is uncommon but pathogenic when it does occur. *Emeria mitis* (*E. mitis*), *Emeria praecox* (*E. praecox*) and *Emeria hagani* (*E. hagani*) are relatively nonpathogenic species (Soulsby, 2002).

Infection may end up either with clinical and subclinical forms. The most problematic disease in the

poultry industry worldwide is coccidiosis, mainly due to subclinical forms of diseases that interfere with body weight and feed conversion. It is estimated that 95.6-98.1% the economic losses in the commercial broiler industry are caused by coccidiosis (Bera et al., 2010). The disease seriously impairs the growth and feed utilization of infected birds resulting in loss of productivity. The agent infects the epithelial lining of the intestine of poultry throughout the world. Infection by coccidia in sufficient number to produce clinical manifestations of disease is called coccidiosis (Conway and Mckenzie, 2007).

The clinical form of the disease manifests through prominent signs of mortality, morbidity, diarrhea or bloody feces, dehydration, lowered feed intake, weight loss, paleness, huddling, ruffled feathers, and depression (Taylor et al., 2007; Julie, 1999). The chicken affected with coccidia become tired and weak, young birds often have blood in the faces after 4-5 days, later their eyes are closed and their wings hang down and many birds die (Julie, 1999).The disease is endemic in most of the tropical and subtropical regions where ecological and management conditions favor an all-year round development and propagation of the causal agent (Obasi et al., 2006). In Ethiopia, coccidiosis is endemic in different regions and affects poultry production seriously (Gari, et al., 2008; Safari et al., 2004; Mathusela, 2001; FAO, 1995).

According to the available reports in the country, the mortality following severe outbreak have been noted to be devastating and incidence rates as high as 80% was also reported in another study conducted in Ethiopia (Gari et al., 2008). Coccidiosis contributes to 8.4% and 11.86% losses in profit in large and small-scale farms, respectively (Kinunghi et al., 2004; Safari et al., 2004). The estimated mean financial losses due to coccidiosis were as 898.8 and 5,301.8 Birr per farm in small- and large-scale farms, respectively (Kinunghi et al., 2004).

Despite several researches have been undertaken on poultry coccidiosis in different parts of the country, information's at flock level in traditional production system is scant. Chicken population is relatively high comparing to other livestock's in Siltie Zone. The animal health workers and poultry farmers of the area have been claiming poultry coccidiosis as one of the important diseases in the zone. However, there has never been systematic investigation on the prevalence and predisposing factors of coccidiosis apart from anecdotal reports popping up here and there. Therefore, this study was planned with the objective of assessing the flock level poultry coccidiosis and farmers perception at Mitto district with the following specific objective:-

- To estimate the prevalence of poultry coccidiosis at flock level in back yard and semi-intensive production system in the study area.
- To identify the associated risk factors with coccidiosis.
- To assess knowledge and perceptions of the local farmers on coccidiosis in back yard poultry management system.

Material and methods

Study area

The study was conducted in Mitto district, Siltie Zone, South Nation Nationalities and Peoples Regional State. Mitto is located about 250 km southeast of Addis Ababa and 30 km from Werabe, the capital town of Silte Zone. The area has two agroecological zones, locally called Kola 31.6% and Woynadega 68.4%, which means lowland and mid-highland respectively (MWAO, 2013). The annual average minimum and maximum temperature range from 21-26 °C, respectively, and the average annual rainfall ranges from 700-900 mm (NMA, 2013). The vegetation type of Mitto woreda is mostly shrub lands, such as *Acacia Abicinica*, *Cordea Africana,* and larger trees limited in spatial cover (MAWAO, 2012 E.C). Most parts of the woodland are replaced with cultivated land, for this reason, 98% of the population was engaged in rain-fed agriculture.

The study area covers a total of 178.01Km^2, and the land is largely used for agriculture. The land under cultivation accounts for nearly 83.48 % of the woredas' total area (MAWAO, 2012 E.C). Bush, shrub, and grassland are often intermixed with intensively and moderately cultivated land in the buffer zone between the lowland and midlands, especially in the northeast part of the woreda. The area has three distinct seasons; namely main big rainy season (Mehir season) (June to September); dry season (Bega season) (January to March); small rainy season (Belg season) (October to December) (MAWAO, 2013; NMA, 2013).

Target and study population

The prevailing poultry farming system in *Siltie* zone was considered as a target population. The district mitto was intentionally considered as study population from statistical and relative dominance of the poultry farming practice in the area. With the growing practice of poultry extension there are a number of exotic breeds and their local cross managed in backyard and semi-intensive farming system. All the available breeds and age groups meant for egg and meat production in the study area were part of the study.

Study design

A cross sectional study design was conducted from February 2021 to April 2021 to estimate the flock level prevalence of coccidiosis and identify the risk factors in backyard chicken production. In this study a

combination of purposive and random sampling technique was used. Accordingly, district and *kebeles* were purposely selected while villages were random. In selected village households were also selected randomly. From selected household, pooled fresh chicken dropping were collected from birds' house. A semi-structured questionnaire was also used to get data about owners' knowledge and perception of coccidiosis and its management. Besides there were a case serious study that focus on sick and dead chicken for pathological and fecal examination. The questionnaire used had been presented before launching the survey proper. The data collected included management practice, type of breeds kept, flock size, feeding, housing, coccidiosis and occurrence pattern, knowledge, perception and practice on coccidiosis and its management.

Sample size determination

In this survey households were the sampling units and fecal samples was collected from each house hold to estimate the prevalence at flock level. To this end a predetermined parameters, i.e. expected prevalence of coccidiosis in backyard chicken is 21.4% (Temesigen et al., 2018) Confidence level of 95% and 5% absolute precision was considered (Thrusfield, 2018).

Sample size was determined according to formula stated as follow:

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

Where; n = required sample size
P exp= expected prevalence
d = desired absolute precision

Using the expected prevalence stated above the minimum required sample size was 258 households; however, 288 households were sampled in the survey.

Sampling techniques

This survey was conducted following multistage sampling techniques that picked district and *kebeles* purposely, but villages and households randomly. In selected district, a list of nonadjacent villages was prepared with the help of agriculture extension workers and 10% of them were picked randomly. In selected villages again a list of households was prepared with the help of the same extension workers and village representatives. From this second sampling frame, a minimum of 10% of households were randomly selected to represent poultry flocks. Pooled dropping samples were collected from each house hold/flock and questionnaire interview was administered to the owner. In each village dead and or sick birds were collected whenever available.

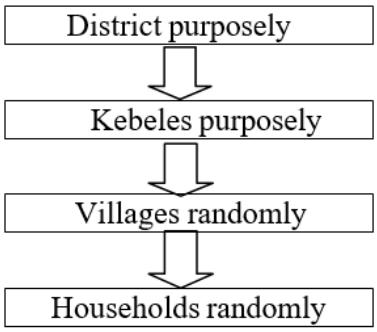

Figure 3: Schematic representation of sampling method

Coprological examination

Each pooled dropping sample was collected in separate clean vial, packed well and then taken to Wolaita Sodo Regional Veterinary Laboratory. Each fecal sample was blended by mortar and pistol, and then floatation technique using sodium chloride solution were applied to harvest oocyst (Bowman and Georgis, 2003). Briefly, 3g of dropping sample was added in the beaker with 40ml flotation fluid. The mixture was strained through a metallic sieve in to test tube and then the test tube placed in test tube rack. Then after, the cover slips was placed top of the tube, making sure no air bubbles are present and allow to stand for 20 minutes. Eventually, the cover slip was removed, place on the slide and examined under the microscope starting with lower magnification power (10x and 40x).

Post mortem examination

Post mortem examination was conducted on clinically sick and dead chickens. The intestinal tract was opened with scissor, extending from the duodenum to the rectum including both cecal pouches. The gastrointestinal tract

was grossly examined carefully. The intestinal portions were divided into four sections, duodenum and jejunum (upper part), ileum (middle part), distal ileum and rectum (lower part) and cecal pouches. The intestinal wall of different sites was examined for thickening, petechiae, coagulative necrosis, reddening, whitish spots, cecal cores, or bleeding. Then the finding of gross pathological lesions in each section was recorded.

Data analysis and management

Data collected from the study areas were entered into MS excel spread sheet 2010 program to create data base and it was filtered, coded and recorded and then analyzed by using STATA version 14 (Stata Corp. College station, Texas). Both descriptive and analytical statistics were made. For descriptive purpose estimate of flock level prevalence with associated confidence interval and frequency of observation were summarized and presented in table. Analytically, unconditional association of predictors with corresponding Coprological finding was assessed using univariable logistic regression. Predictors with liberal p value ($p<0.25$) were considered for multivariable logistic regression after multicollinearity assessment in a cross tabulation at specified gamma value between -0.6 and+ 0.6. Non collinear predictors were subjected to multivariable logistic regression and the final model was developed in backward step wise regression based on log liklihood and Wald statistics. In the course, the change of OR exceeding 20% was used as indicator for presence of confounding effect that call for control. Eventually, the model was assessed using the Hosmer and Lemeshow method for goodness of fit and the receiver operating curve (ROC) for reliability. Data from owners or attendants on knowledge, perception and practice of coccidiosis were summarized descriptively. In this analysis statistical significance was set at $p < 0.05$.

Results

Questionnaire survey

Poultry production in the study area is free ranging by large and chickens are supplemented with occasional cereal grain. The sector left to females and kids in the most of cases. Over 85% of interviewed individuals know what coccidiosis is and pattern of occurrence with medium to high rank. Although farmers had their own local names (*jellewae*) and ways of identifying poultry diseases, the most frequent clinical manifestation they recognize (85%) on coccidiosis was diarrhea. Over 75% of the respondents stated bloody diarrhea as predominant manifestation in wet season than chalky, yellow or green diarrhea. Even if, there are access to the public and private veterinary service centers in study area only 37.1% of the respondents used anti coccidial drugs for disease management.

Occurrence of coccidiosis at flock level

Out of 288 household pooled chickens dropping samples examined, 59(20.5%) were positive for eimeria oocysts. The prevalence of coccidiosis in local, exotic and mixed breeds was recorded as 12.8%, 22.9% and 29.6% respectively in the study area. The flock level prevalence (16.1%) in back yard chicken was significantly lower than the semi intensive system (29.5%) (Table 1).

Table 1 Prevalence of flock level coccidiosis in line with attributed predictors

Variables	Category	Frequency	Prevalence (%)	95%CI	P- value
Management	Backyard	193	16.1(31/193)	0.115-0.219	
	Semi intensive	95	29.5(28/95)	0.211-0.394	0.009
Breed	Local	86	12.8(11/86)	0.718-0.928	
	Exotic	175	22.9(40/175)	0.171-0.297	0.057
	Mixed	27	29.6(8/27)	0.153-0.495	0.047
Flock category	Flock size ≤ 10	167	13.2(22/167)	0.880-0.192	
	Flock size > 10	121	30.6(37/121)	0.229-0.394	0.000
Follow up level	High	186	22.6(42/186)	0.171-0.291	
	Medium	59	20.3(12/59)	0.118-0.326	0.718
	Low	43	11.6(5/43)	0.048-0.253	0.116
Intervention therapy	Anticoccidant	107	21.5(23/107)	0.146-0.303	
	None	167	19.8(33/167)	0.143-0.265	0.728
	Human antibiotics	14	21.4(3/14)	0.067-0.507	0.995
Responsible person	Wife	164	18.9(31/164)	0.135-0.256	
	Husband	56	23.2(13/56)	0.138-0.361	0.487
	Kids	68	22.1(15/68)	0.136-0.335	0.583
Total		288	20.5(59/288)		

Univariable regression

In order to identify the potential risk factors, six variables namely, management system, breed, follow up level, intervention therapy and responsible person were considered. The unconditional associations of these potential predictors in univariable logistic regression were assessed for the respective categories. Accordingly, three predictors i.e. management system, breed and flock category were identified to have significant difference among respective categories (Table2).

Table 2 Flock level coccidiosis analysis using univariable logistic regression

Variables	Category	OR	SE	95%CI		p-value
Management	Backyard					
	Semi intens.	2.18	.65	1.2	3.9	0.009
Breed	Local					
	Exotic	2.02	.74	.9	4.1	0.057
	Mixed	2.87	1.52	1.0	8.1	0.047
Flock size	Flock siz ≤10					
	Flock siz >10	2.90	.87	1.6	5.2	0.000
Follow up level	High					
	Medium	.87	.32	.4	1.8	0.718
	Low	.45	.22	.2	1.2	0.116
Intervention therapy	Anticoccidant	.				
	Human antibiotics	.99	.68	.3	3.9	0.995
	None	.89	.27	.4	1.6	0.728
Responsible person	Wife					
	Husband	1.29	.48	.6	2.7	0.487
	Kids	1.21	.43	.6	2.4	0.583

Multivariable regression

Due to limited number of predictors in the model, all the variables in univariable logistic regression were subjected to multivariable logistic regression after multicollinearity assessment. However, breed and management/flock category were the only predictors identified to influence the prevalence of coccidiosis in the final model (Table 3).

Table 3 Multivariable logistic regression analysis for coccidiosis prevalence at flock level

Variables	Category	No of examined	No of Positive (%)	OR	SE	95%CI		P value
	Local	86	12.8					
Breed	Exotic	175	22.9	1.86	.70	.8	3.8	0.100
	Mixed	27	29.6	3.24	1.76	1.1	9.3	0.030
Flock size	Flock size ≤10	167	13.2					
	Flock size >10	121	30.6	1.10	.03	1.0	1.1	0.000

Postmortem examination result

In selected villages postmortem examination was carried out on 14 clinically sick and dead chickens, out of which 6 (42.9%) had coccidian oocyst in the feces recovered from intestine and pathological changes on mucosa of intestine and cecum was seen.

Table 4 Postmortem Examination Result based on age, breed and site affected category

Variables	Category	№ of examined	№ of cases	Prevalence (%)	95 %CI	
Age	Young	8	5	62.5	.2	.9
	Adult	6	1	16.7	.01	.8
Breed	Local	5	1	20	.01	.7
	Exotic	9	5	55.6	.2	.8
Intestinal segment affected	Duodenum	6	1	16.7		
	Ileum	6	2	33.3		
	Caecum	6	3	50		

Based on the age basis of Postmortem examination, high prevalence was recorded in young chickens (62.5%) than adults and based breed category high prevalence was obtained in exotic breeds (55.55%) than local chickens (20%). Out of 6 pathological lesions found in different intestinal tract dissections, 16.7% in duodenum (white spot lesions and the mucosa with hemorrhagic appearance), 33.3% in ileum (hemorrhage, reddening and

thin intestinal wall) and 50% in cecum (thickened and ballooned, clotted blood and its content mixed with blood) were recorded.

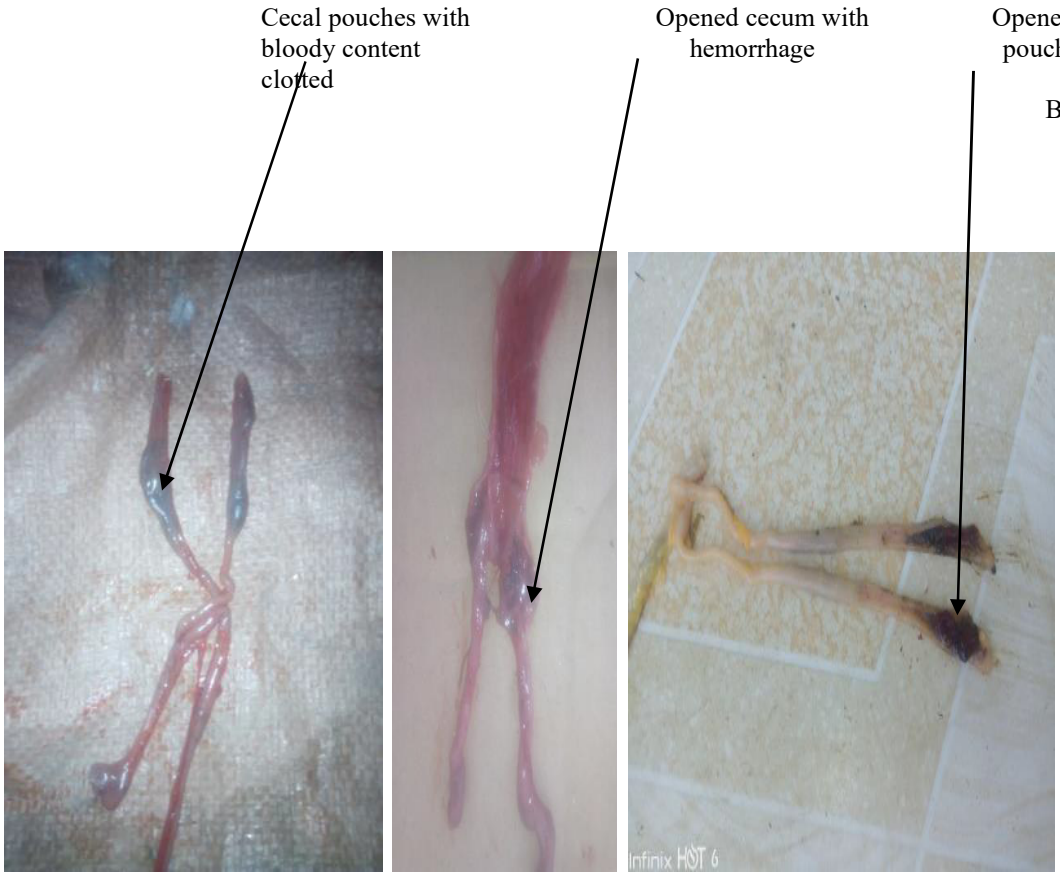

Figure 1 Gross pathological lesions in cecum

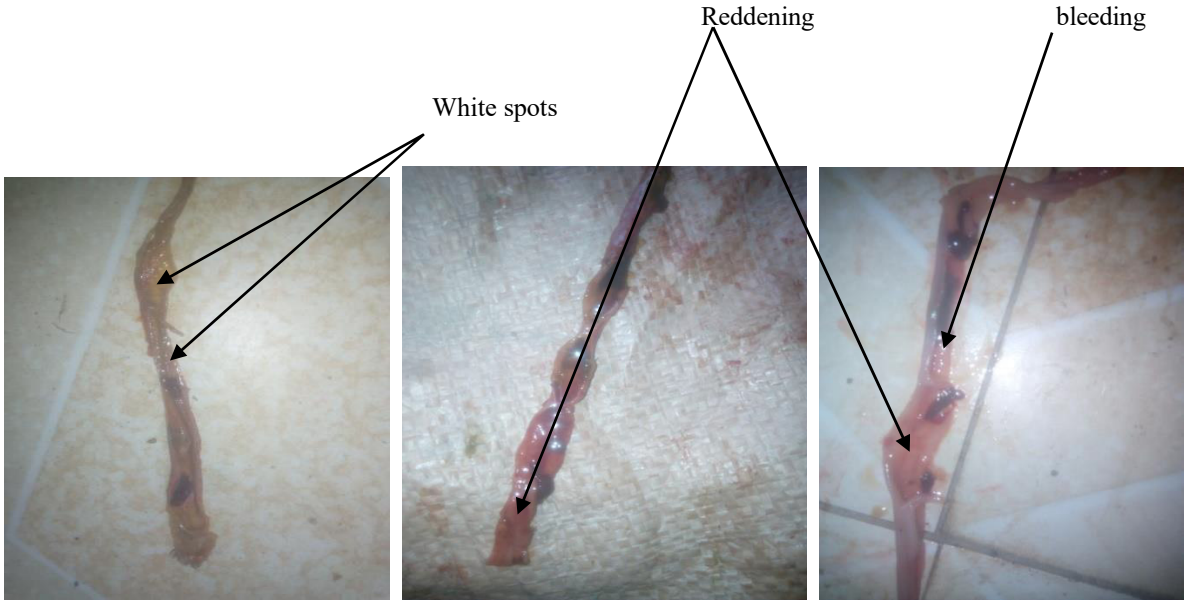

Figure 2 Gross pathological lesions in the intestine

Discussion

Coccidiosis is known to be the most prevalent and most important disease of poultry production worldwide and its prevalence and economic significance has been reviewed by different workers in different production system

(Luu et al., 2013; Gari et al., 2008; Methusela, 2001). Poultry production in the study area is free ranging by large and chickens are supplemented occasionally by cereal grain. The sector left to females and kids in the most of cases. Since these social groups usually stay longer around the home, they are easily looking after the chicken. Follow up level of coccidiosis occurrence is very important in the study area and ranked medium to high for its occurrence. Knowledge of farmers on poultry coccidiosis might not be very specific. However, they have awareness for the occurrence of the disease and they describe the disease based on the clinical sign. Most respondents stated that bloody diarrhea predominantly appeared during wet season than chalky, yellow or green diarrhea. This observation might be an indication for the more prevalence of coccidiosis in the study area.

In this study an overall flock level prevalence of 20.5% (59/288) coccidiosis was registered. The present result is in line with the finding in other reports in and Around Ambo Town (Oljira et al., 2012) with prevalence rate of 20.5%, Addis Ababa (Alemayehu, 2012) with prevalence rate of 20.57%, Mekelle Town (Brhane and Nibret, 2016) with prevalence rate of 20.3%, Debre Tabore (Temesigen et al*.,* 2018) with prevalence rate of 21.4%, Nekemte town (Garbi et al., 2015) with prevalence rate of 19.5%, in and Around Alage atvet College (Eshetu and Nigussu, 2019) with prevalence rate of 19.5%, Yabello (Gessesse, 2017) with prevalence rate of 19.3%, Tigray (Yohannes et al., 2014) with prevalence rate of 19.5 %, Kombelcha (Abadi et al., 2012) with prevalence rate of 22.3%, Arsi zone Tiyo district (Gari et al., 2008) with prevalence rate of 22.58%, in and Around Gondar Town (Kefyalew and Hailegebrael, 2018) with prevalence rate of 24.3% and 25.8% (Ashenafi et al., 2004) in Addis Ababa. However, the present finding was significantly lower than the previously reported prevalence of 80% in Addis Ababa (Alemargot, 1987), 70.95% in Tiyo district, (Arsi Zone) (McDougald, 2003), 71.7% in Debrezeit (Dinka and Yacob, 2016), 69% in Abuja (Olanrewaju and Agbor, 2014), 65.1% in Hawassa (Muluken and Liuel, 2017) , 64% in Iran (Hadipour et al., 2013), 56.3% in Adama town (Ermias and Mekonnen, 2015), 53.6% in Gondar (Belaynew et al., 2016), 48.5% in Kombolcha (Bereket and Abdu, 2015), 43% in Gondar town (Hadas et al., 2014), 41.43% in Centane district, (South Africa) (Mwale and Masik, 2011), 42.7% in Dire Dawa area (Migbaru and Abadi, 2015), 42.2% in Gondar town (Anteneh et al., 2019), 40.6% in Bahir Dar (Abebe and Mekonnen , 2016), 40.1% in Sokoto state(Nigeria) (Agishi et al., 2016), 39.6% in Jammu region (India) (Sharma et al., 2013), 38.5% in Kombolcha (Netsanet, 2003), 37.1% in Zaria (Jatau et al., 2012), 36.6% in Vom, (Plateau State) (Muazu *et al*., 2008), 36.6% in Benin (Dakpogan and Salifou, 2013), 35.5% in Iran (maranda city) (Hagh-Poor and Garedaghi, 2016), 31% in Nigeria (Lunden et al., 2010) and 30% in Pakistan (Khan et al., 2006). This high reduction of prevalence of coccidiosis observed in the current study might be ascribed mainly due to geographical location, breed difference, the sample size and climatic conditions (Kefyalew and Hailegebrael, 2018). The present finding was slightly higher than the previously reported prevalence of 11% , 11.45%, and 14 % reported in Central Ethiopia (Lobago et al., 2003), Gombe (Nigeria) (Grema et al., 2014) and Makurdi (Benuen State) (Adam et al., 2009) respectively. The higher prevalence may be due to poor poultry management practices such as, due to the difference in the climatic conditions, sampling periods, sample size, agro-ecological set-up, difference in management systems and bio security measures (Temesigen et al*.,* 2018; Anteneh et al., 2019).

In the current findings analysis of breed in relation to coccidial infection was statistically significant ($p < 0.05$), and local breeds were found less likely to be infected (12.8%) with coccidia as compared to exotic (22.9%) and mixed (29.6%) breeds of chickens.

During this study the prevalence of coccidiosis was higher in those mixed breeds (p=0.047) than that of local and exotic chickens. It might be introducing local chickens to exotics reared under restricted space those already exist infection and/or introducing carrier birds to local or exotic flocks since the habit of farming both local and exotic breeds together in the area. Higher prevalence of coccidiosis in exotic chickens compared to local ones observed might be due to the fact that mostly the exotic chickens were reared in restricted confined place where poor poultry management practices such as weak biosecurity, overcrowding and faeces accumulation leads to higher oocyst accumulation in the floor and were likely to be most exposed to the infective stages of the organism which contaminate feeds and drinks while the local breeds of chickens were usually found roaming and scavenging around the surroundings. They may not come into contact with the infection or may not ingest the infective stages of the organism(Garbi et al., 2015; Jatau et al., 2012; Oljira et al., 2012). This finding agrees with others report stated that breed is significant factor for the variation in prevalence of chicken coccidiosis like (Hagh-Poor and Garedaghi, 2016), (Garie et al., 2008), (Puttalakshmamma et al., 2008), (QuirozCasta and Dant´an-Gonz´alez, 2015), (Ejegayehu , 2016), (Jallailudeen Rabana Lawa *et al*., 2016), (Jatau et al., 2012), (Oljira et al., 2012), (Garbi et al., 2015) and (Eshetu and Nigussu, 2019) who stated significant variation was recorded in different breeds of chickens. However the current finding was disagree with the findings (Guale, 1997), (Ashenafi et al., 2004), (Hadas et al., 2014), (Benisheikh et al., 2013), (Hadipour et al., 2013), (Solomon, 2016), (Brhane and Nibret, 2016), and (Kefyalew and Hailegebrael, 2018) stated that breed is not significant factor for the variation in prevalence of chicken coccidiosis.

Management based prevalence of coccidiosis in the current study finding indicated that, there was significant difference between the two, semi-intensive and backyard management types ($p< 0.05$). Chickens that

were managed in Semi-intensive farming system were 2.2 times more affected (29.5%) than the Backyard (16.1%) production systems. This finding is in line with the findings in Addis Ababa (Shubisa et al., 2016), in Gondar town (Hadas et al., 2013), in Makurdi, Benue State (Agishi et al., 2016), in Nigeria (Jallailudeen et al., 2016), in Gondar (Gebretensae et al., 2014) in Iran (Hagh-Poor and Garedaghi, 2016) who stated that significant statistical variation between semi-intensive and backyard management was recorded. The variation in the prevalence of chicken coccidiosis on the management may be due to higher exposure of chickens to the sporulated *eimeria* oocyst in the Semi intensive system and non-use of coccidiostats as preventive measures. It is reported that environment such as overcrowding, leaking water troughs, and accumulation of faces are factors that contributed to the high prevalence of coccidiosis (Mersha et al., 2009; Slayer and Mallison, 1995). However, the current result was disagreement with the previous report in Yabello (Adisu and Endale, 2016), Dire Dawa (Migbaru and Abadi, 2015), in and Around Ambo (Solomon, 2016) and in and Around Gondar Town (Kefyalew and Hailegebrael, 2018) who stated that significant statistical variation between management was not recorded and more prevalence was reported in backyard than semi intensive system.

In the present study, there was significant difference in poultry coccidiosis between different Flock size (Flock size ≤ 10 and Flock size > 10) ($P<0.05$). The prevalence of coccidiosis in flock size >10 (30.6%) was higher than in flock size ≤ 10 (13.2%) in study area. The higher prevalence in flock size >10 might be associated with stocking density that triggers the disease occurrence which normally was expected to be between 10-15 birds / m^2 (Hamet et al., 1982). The gross pathological examination higher prevalence of coccidiosis in young chickens (62.5%) than the adults (16.7%). This finding is in line with the findings regarding the frequency occurrence of clinical coccidiosis with respect to the age of birds (Taylor et al., 2007; Lobago et al., 2005; Methusela, 2001). The advanced dominance of chicken coccidiosis is detected in young than adult birds as previous resistance is not well established (Jordan et al., 2002).

Based on breed category of post mortem examination high prevalence was obtained in exotic breeds (55.6%) than local chickens (20%). Higher occurrence of coccidiosis in exotic chickens relative to local ones recorded could be due to the fact that the exotic chickens were reared in confinement where there is higher oocyst accumulation in the floor and were likely to be most exposed to the infective stages of the organism in floor and feeds whereas the local breeds of chickens were usually found roaming and scavenging around the surroundings. They may not come into contact with the infection or may not ingest the infective stages of the organism. This agrees with the findings of (Eshetu and Nigussu, 2019; Garbi, 2015; Jatau, 2012; Oljira, 2012) who also reported high prevalence of coccidian infection in exotic breed chickens as compared to the free-ranging local chickens. However, this finding disagrees with previous reports by (Benisheikh et al., 2013; Hadipour et al., 2013; Ashenafi et al., 2004) who reported higher coccidiosis rate in local chickens than in exotic breeds.

Conclusion

Coccidiosis is the most common encountered and important disease affecting chicken production with significant economic losses to poultry sector globally. The flock level prevalence of coccidiosis in the study area was estimated as high as 20.5%. Hence it is problem for chicken producers in the district that needs strategic attention. The infection was more frequently encountered in those chicken reared in semi-intensive management system. The prevalence of poultry coccidiosis was significantly affected by the management type, breed and flock size.

Therefore, based above conclusions, the following recommendations are forwarded:

- Educating the local chicken breeders in the study area about the importance of coccidiosis
- Avoid keeping of mixed age groups of chickens
- There is a need for expert advice and follow up in improving poultry health management through extension system to reduce the risk of coccidiosis in the district
- Further study, to identify the *Eimeria* species prevailing in the study area and to assess the economic impact of coccidiosis.

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