Study on poultry coccidiosis in and around Ambo town, West Shewa zone, Ethiopia

Firaol Tamiru\textsuperscript{a},*, Askale Gizaw\textsuperscript{a}, Dagmawit Atalel\textsuperscript{b}, Solomon Shiferaw\textsuperscript{b}, Alemnesh Woldeyes\textsuperscript{b}, Dinka Ayana\textsuperscript{c}, Waktole Terfa\textsuperscript{a}

\textsuperscript{a} Department of Veterinary Laboratory Technology, College of Agriculture and Veterinary Sciences, Ambo University, P.O. Box 19, Ambo, Ethiopia
\textsuperscript{b} National Animal Health Diagnostic and Investigation Center, P.O. Box 04, Sebeta, Ethiopia
\textsuperscript{c} Department of Pathology and Parasitology, College of Veterinary Medicine and Agriculture, Addis Ababa University, P.O. Box 34, Debre-zeit, Ethiopia

Abstract

A cross sectional study was conducted from July to November, 2013 to determine the prevalence of coccidiosis, to identify species of \textit{Eimeria} and to assess potential risk factors in and around Ambo town, Ethiopia. The study involved ante- and post-mortem examination, mucosal scraping examination using floatation technique, gross and histopathological examination and identification of \textit{Eimeria} species. Out of 390 examined chickens, 18.7\% (73/390) harbored different \textit{Eimeria} species. Five \textit{Eimeria} species, \textit{Eimeria tenella}, \textit{Eimeria necatrix}, \textit{Eimeria brunetti}, \textit{Eimeria maxima} and \textit{Eimeria acervulina} with the prevalence rate of 62.2\%, 18.29\%, 10.98\%, 6.09\% and 2.43\%, respectively were identified 82 times from positive chickens. \textit{Eimeria tenella} was the predominant species while \textit{Eimeria maxima} and \textit{Eimeria acervulina} were the least prevalent species. There was no statistical significant difference between age ($\chi^2=0.921$, $p>0.05$), breed ($\chi^2=0.16$, $p>0.05$), sex ($\chi^2=3.609$, $p>0.05$) and management system ($\chi^2=2.245$, $p>0.05$) groups. In conclusion, the present study showed that coccidiosis is an important disease of poultry in the study area. Thus, awareness creation, implementation of appropriate management system, economic effects and further studies on molecular characterization and drug sensitivity of the \textit{Eimeria} species in the study area were recommended.

Corresponding Author:
Tamiru F.
Lecturer
Email: tfiraol@gmail.com

Gizaw A.
Assistant Lecturer, M.Sc student

Atalel D.
Lecturer

Shiferaw S.
Lecturer

Woldeyes A.
Researcher

Ayana D.
Associate Professor

Terfa W.
Assistant Professor

1. Introduction

1.1. Background

Poultry production offers an opportunity to feed the fast growing human population and to provide income for resource poor farmers (CSA, 2004). Moreover, poultry in many parts of the modern
world is considered as the chief source of cheaper protein of animal origin and high quality human food (Jordal et al., 2002). Even though poultry sector is the fastest growing among the animal production activities, it has been adversely affected by a variety of constraints (FAO, 1998). Among the constraints, poultry diseases continue to play the major central role in hampering its development (FAO, 1998; Rushton et al., 1999). From the infectious diseases of poultry, coccidiosis is the major parasitic disease (Charlton, 2006; Conway and Mckenzie, 2007).

Poultry coccidiosis is an economically important disease in chicken caused by the intracellular protozoa parasite of *Eimeria* species in the genus *Eimeria*, family *Eimeriidae*, order *Eucoccidiorida* and phylum *Apicomplexa* (Taylor et al., 2007). Infection by coccidia in sufficient number to produce clinical manifestations of disease is called coccidiosis (Charlton, 2006; Conway and Mckenzie, 2007). Though nine species of *Eimeria* (*Eimeria tenella* (E. tenella), *Eimeria necatrix* (E. necatrix), *Eimeria arcevulina* (E. acervulina), *Eimeria maxima* (E. maxima), *Eimeria mivati* (E. mivati), *Eimeria brunetti* (E. brunetti), *Eimeria mitis* (E. mitis), *Eimeria praecox* (E. praecox) and *Eimeria hagani* (E. hagani)) (Soulsby, 1982; Lillehoj and Trout, 1993) have been identified as causative agents of poultry coccidiosis, only seven of them (except *E. mivati* and *E. hagani*) have been reported to be pathogenic (Kahn, 2008). The occurrence of clinical coccidiosis is directly related to the number of sporulated oocysts ingested by a bird at one time, the pathogenicity of the *Eimeria* species, the age of the infected chicken and the management system (Reid, 1990).

1.2 Justification of study
Coccidiosis remains one of the major disease problems of poultry in spite of advances made in prevention and control through chemotherapy, management and nutrition (Graat et al., 1996). Although several researches have been undertaken in Ethiopia, it is still a major problem demanding detailed investigation (Amare et al., 2012a) and prevalent disease in and around Ambo town (Oljira et al., 2012) where poultry sector is more important for poor families in terms of nutritional value and cash income generation than other animals. In addition, poultry raising system is now becoming more intensified than the past.

1.3 Objectives of study
The study was conducted to determine the prevalence of the disease, identify responsible *Eimeria* species, and assess potential risk factors in and around Ambo town.

2. Methods

2.1 Ethical statement
The study was conducted on chicken bought from local market and poultry farms. The project was approved to be conducted by Research, Knowledge and Technology Transfer Office of Ambo University, Ethiopia with a project code AUCAVLB-06/12. The permission to conduct the research on the chickens was obtained from Institutional Animals Ethics Committee (IAEC), Ambo University (reference number: RKTT/194/13). Owners of the chickens were verbally informed about purpose of the study. Participation to give information on age of the chicken and management system was entirely voluntary and that all data would be kept securely. Verbal informed consent was obtained prior to collection of data.

2.2 Study area
The study was conducted from July to November, 2013 in and around Ambo town, West Shewa zone, Ethiopia. Ambo town is the administrative center of West Shewa zone and Ambo district, and located at a latitude and longitude of 8°59′N 37°51′E 8,983′N 37.85′E and an elevation of 2101 meters above sea level and 114 Km west of Addis Ababa, capital of Oromia region and Ethiopia. The agro-ecology of the study area is 23% highland, 60% midland, and 17% lowland. It has an annual rainfall and temperature ranging from 800 – 1000 mm and 20–29°C, respectively. The livestock population of the district includes 145371 cattle, 50152 sheep, 27026 goats, 105794 chickens, 9088 horses, 2914 donkeys and 256 mules (ATMA, 2010).

Both local and exotic breeds chicken are raised in the area. Traditional chicken production system is still the most dominant even though there are some initiations for introduction of exotic chicken in urban and peri-urban areas of the zone. Local breeds are reared under extensive farming system where as exotic breeds of egg laying type is mostly under semi-intensive and very few exotic breeds are under extensive farming system.

2.3 Study design and animals
A cross sectional study was conducted on a total of 390 chickens randomly bought from market and selected semi-intensive farms. Local and exotic (Rhodes Island Red (RIR) breeds from both sexes were included. Information on the breed and management system was obtained from the owners. Age of the chickens was determined by information from owners, observing color of the shank and growth of the spur and categorized as young (less than 12 weeks of age) and adult (greater than 12 weeks of age). Observational assessment was made at the same time to assess management practices in
semi-intensive poultry farms. Then, the chickens were transported to Ambo University, Department of Veterinary Laboratory Technology laboratory for examination.

2.4 Ante-mortem examination
Each purchased chicken were kept overnight in the laboratory for at least 18 hours in separate box and a clean plastic wrap. Fecal samples were collected and examined from each bird separately, and ante-mortem condition of individual chicken had been checked.

2.5 Postmortem examination
Then, the chickens were killed by neck dislocation and slaughtered following procedures of Zander and Mallinson (1978). The intestinal tract was opened with sharp ended stainless steel scissor, and examined thoroughly for gross pathological changes before and after opening. The observed gross pathological changes were recorded and sampled for histopathological examination.

2.6 Parasitological examination
Intestinal mucosal scrapings were collected from all organs (five sites) of the intestine of each chicken separately into a petridish and examined using flotation technique (Bowman, 2003). Positive samples were further examined for species identification. Positive samples were cultured for sporulation time determination at room temperature (18-22°C) according to procedures of Conway and McKenzie (2007). The suspension was examined by hemocytometer chamber every 3 hours and the sporulation time was considered when 90% of the oocysts sporulate.

2.7 Histopathological examination
The intestinal tissue samples, about 3-4 cm length, were sampled and fixed in 10% neutral buffered formalin and submitted to National Animal Health Diagnostic and Investigation center (NAHDIC), Sebeta, Ethiopia. The tissue samples were dehydrated in ascending order of alcohol concentration, cleared in xylene, embedded in paraffin wax, sectioned at 4µm thickness and stained with haematoxylin and eosin (HE) staining according to procedures described by Sirak (2005). The stained samples were examined by light microscope of 10 times and 40 times objective lens magnification power.

2.8 Species identification
Species of Eimeria were identified by a combination of microscopic features of oocyst morphology (shape, size, sporulation time and color of the oocyst), the preferred location of Eimeria in the gut, the nature of induced gross lesions and histopathological finding as described by Conway and McKenzie (2007).

2.9 Data analysis
The collected data were coded and entered into Microsoft Excel and analyzed using Statistical Packages for the Social Sciences (SPSS) version 20. Descriptive statistics was used to summarize the data. Chi-square ($\chi^2$) test (Fisher’s exact for data with a frequency of less than five in cell) was used to assess statistical significance difference between categories of sex, breed, age, and management system groups in prevalence of poultry coccidiosis. P-value (p) less than 0.05 was considered as significant.

3. Results

3.1 Prevalence of coccidiosis
An overall prevalence of 18.7% (73/390) was recorded. Most of the coccidia positive chickens (90.41% or 66/73) had unapparent (subclinical) coccidial infection. The prevalence of the infection was higher in young (20.78%) than adult (16.98%), male (23.49%) than females (15.76%), local (20.75%) than exotic (14.4%) breeds chickens. In addition, it was slightly higher in chickens under extensive farming system (19.14%) than chickens under semi-intensive farming system (17.24%). There was no statistical significance difference in prevalence of the infection between categories of age ($\chi^2=0.921$, p>0.05), sex ($\chi^2=3.609$, p>0.05), breed ($\chi^2=2.245$, p>0.05) and management system ($\chi^2=0.16$, p>0.05) groups (Table 1).

3.2 Species identification
Five Eimeria species, E. tenella, E. necatrix, E. brunetti, E. maxima and E. acervulina, were identified 82 times from 73 positive chickens. Eimeria tenella was most frequently (62.2% or 51/82) identified species followed by E. necatrix (18.29% or 15/82) whereas E. acervulina was the least (2.43 or 2/82) identified one. Eimeria brunetti and E. maxima were identified 9 (10.98%) and 5 (6.09%) times, respectively. There was no statistical significance difference (p>0.05) in distribution of Eimeria species between categories of different risk factor groups (Table 2).

The Eimeria species were identified either as a single or mixed cause of infection from each positive chicken. Mixed infection cases were due to co-infection of E. tenella with one of the four species (E. necatrix, E. brunetti, E. maxima and E. acervulina) and E. brunetti with E. necatrix. Eimeria tenella (60.27%, 44/73) was the most dominant species while E. maxima and E. acervulina were the least (1.4%, 1/73 each) frequently isolated species as single infective agent. In case of mixed infection, co-infection of E. tenella with E. maxima was the prevalent (5.5%, 4/73) (Table 3).
The infection was found to be commonly caused by a single *Eimeria* species (87.67% or 64/73). Statistically, there was no significant difference in prevalence of the coccidial infection either as an infection caused by a single or mixed species of *Eimeria* in age, sex, breed and management system groups (Table 4).

### 3.3 Pathological findings

The identified *Eimeria* species caused different gross and microscopic pathological changes in different intestinal parts. Transverse whitish band on the loop of duodenum; ballooned intestine, secretions filled with mucus and blood, thickened intestinal wall and petechial haemorrhage in mid-intestine; reddish striping necrotic white spots in lower intestinal parts; and haemorrhage, and clotted and unclotted blood in caecal pouch were the observed gross pathological findings (Figure 1).

Histopathologically, severe damage was more observed in the cecum and large intestine than other intestinal parts. The epithelial cells of the cecum were highly invaded with the developmental stages of *E. tenella* schizonts and gametes that their morphology was almost disappeared. The lesion in the large intestine due to *E. brunetti* consisted cryptal and absorptive epithelial cell destruction (Figure 2). Few numbers of schizonts were observed in duodenum, jejunum and ileum. Sloughing of villi and infiltration of large number of inflammatory cells were evident in all organs.

### Discussion

#### 4.1 Prevalence

Most of the sampled chickens had subclinical coccidial infections. This may call for concern, since the economic implication of coccidiosis is largely associated with the subclinical form of the disease as it has negative effect on the performance of infected poultry (Haug et al., 2008). Impaired feed conversion, among the major constraints, comprises about 70% of the cost of producing commercial chickens (McDougald, 2003).

Overall prevalence rate of 18.7% (73/390) recorded in the present study is comparable to 20.57% prevalence rate reported in the same study area previously (Oljira et al., 2012). Similar findings of 25.8% (Ashenafi et al., 2004), 22.3% (Amare et al., 2012a) and 23.1% (Alemayehu et al., 2012) were reported from other areas of Ethiopia. These findings indicate endemic status of the poultry coccidiosis in Ethiopia. However, higher prevalence rate of 80% (Alamargot, 1987 and 71.1% (Dinka and Tolossa, 2012) were reported. The difference between various studies might be attributed to application of preventive measures, use of anti-coccidial drugs, management system and season of study.

The higher prevalence of infection in young (20.78%) than adult (16.98%) chickens in the current study is consistent with reports of 52.9% and 36.7% in Nigeria (Muazu et al., 2008) and 60.16% and 37% in Pakistan (Bachaya et al., 2012) in young and adults, respectively. The lower prevalence in adult chickens may be related to the effect of immunological status acquired from previous exposure (Williams, 2001) and the disease is usually more observed in young than adult chickens (Fanatico, 2006).
However, higher prevalence was reported in adults (35.3%) than growers (22.3%) in Kombolcha, Ethiopia (Amare et al., 2012a). This discrepancy may come from the management differences of the poultry used in these different studies. It was observed that there was no statistically significant difference in the prevalence of coccidiosis between the categories of age groups. Thus, the opportunity of the chickens to pick-up large numbers of sporulated oocyst might be equal in both young and adult chickens.

The prevalence of coccidial infection was slightly higher in local breed than exotic breed. However, (Oljira et al., 2012) reported higher prevalence in exotic breeds (25.10%) than local breeds (12.41%) in the same study area. According to (Tylor et al., 2007), the occurrence of coccidiosis is affected by the type of chicken reared and breeds sensitivities.
### Table 1: Prevalence of coccidiosis in different risk factors

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>№ of poultry examined</th>
<th>№ of positive</th>
<th>Prevalence (%)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>178</td>
<td>37</td>
<td>20.78</td>
<td>0.921</td>
<td>0.337</td>
</tr>
<tr>
<td>Adult</td>
<td>212</td>
<td>36</td>
<td>16.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>149</td>
<td>35</td>
<td>23.49</td>
<td>3.609</td>
<td>0.057</td>
</tr>
<tr>
<td>Female</td>
<td>241</td>
<td>38</td>
<td>15.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>265</td>
<td>55</td>
<td>20.75</td>
<td>2.245</td>
<td>0.133</td>
</tr>
<tr>
<td>RIR</td>
<td>125</td>
<td>18</td>
<td>14.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensive</td>
<td>303</td>
<td>58</td>
<td>19.14</td>
<td>0.16</td>
<td>0.689</td>
</tr>
<tr>
<td>Semi-intensive</td>
<td>87</td>
<td>15</td>
<td>17.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>390</td>
<td>73</td>
<td>18.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Frequency of *Eimeria* species identification from examined chicken in different category of risk factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Frequency of <em>Eimeria</em> species (%) identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>E. tenella 44 (60.27) E. necatrix 11 (15.06) E. brunette 7 (9.6) E. maxima 1 (1.4) E. acervulina 1 (1.4) E. tenella + E. brunette 1 (1.4) E. tenella + E. necatrix 2 (2.7) E. tenella + E. maxima 4 (5.5) E. tenella + E. acervulina 1 (1.4) E. necatrix + E. brunette 1 (1.4) Total 73 (100)</td>
</tr>
</tbody>
</table>

### Table 3: Identified *Eimeria* species as single and mixed infection and their frequency

<table>
<thead>
<tr>
<th>Species of <em>Eimeria</em> as single and mixed</th>
<th>№ of positive (frequency)</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. tenella</td>
<td>44</td>
<td>60.27</td>
</tr>
<tr>
<td>E. necatrix</td>
<td>11</td>
<td>15.06</td>
</tr>
<tr>
<td>E. brunette</td>
<td>7</td>
<td>9.6</td>
</tr>
<tr>
<td>E. maxima</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>E. acervulina</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>E. tenella + E. brunette</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>E. tenella + E. necatrix</td>
<td>2</td>
<td>2.7</td>
</tr>
<tr>
<td>E. tenella + E. maxima</td>
<td>4</td>
<td>5.5</td>
</tr>
<tr>
<td>E. tenella + E. acervulina</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>E. necatrix + E. brunette</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>73</td>
<td>100</td>
</tr>
</tbody>
</table>

to the infection. Also it may be due to difference in the seasons of study and sample size of each breed between these studies. Higher prevalence was recorded in male (23.49%, 149/390) than female (15.76%, 241/390) chickens with absence of statistical significant difference. A slight equivalent finding in prevalence of the infection between male (19.38%) and female (21.43%) with statistical insignificance difference was reported from the same area (Oljira et al., 2012). The difference may be due to absence of proportionality in sample size between sex groups of the current study.

Management system was not found to cause statistical significant difference in the prevalence of the coccidiosis. The prevalence was 19.14% and 17.24% in poultry reared under extensive and semi-intensive farm system, respectively. The present finding is in line of agreement with the finding of Sharma et al. (2013), who reported that higher prevalence in extensive (53.6%) than intensive (25.55%) management systems in India. However, occurrence of the disease is higher in commercial poultry due to higher stocking densities and intensive husbandry practices (Yousuf and Tak, 2013). The difference observed may be due to poor management system, malnutrition and absence of...
Table 4: Prevalence of single and mixed infections of *Eimeria* species in different risk factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Nº of infected</th>
<th>Single infection (%)</th>
<th>Mixed infection (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>37</td>
<td>31 (48.44)</td>
<td>6 (66.67)</td>
</tr>
<tr>
<td>Adult</td>
<td>36</td>
<td>33 (51.56)</td>
<td>3 (33.33)</td>
</tr>
<tr>
<td>χ²/Fishers’exact</td>
<td></td>
<td>0.241</td>
<td>1.642</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>0.623</td>
<td>0.311</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>31 (48.44)</td>
<td>4 (44.44)</td>
</tr>
<tr>
<td>Female</td>
<td>38</td>
<td>33 (51.56)</td>
<td>5 (55.56)</td>
</tr>
<tr>
<td>χ²/Fishers’exact</td>
<td></td>
<td>3.396</td>
<td>0.152</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>0.065</td>
<td>0.737</td>
</tr>
<tr>
<td>Breed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>55</td>
<td>49 (76.56)</td>
<td>6 (66.67)</td>
</tr>
<tr>
<td>Cross</td>
<td>18</td>
<td>15 (23.44)</td>
<td>3 (33.33)</td>
</tr>
<tr>
<td>χ²/Fishers’exact</td>
<td></td>
<td>2.608</td>
<td>0.007</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>0.106</td>
<td>1.000</td>
</tr>
<tr>
<td>Management system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensive</td>
<td>58</td>
<td>51 (79.69)</td>
<td>7 (77.78)</td>
</tr>
<tr>
<td>Semi-intensive</td>
<td>15</td>
<td>13 (20.31)</td>
<td>2 (22.22)</td>
</tr>
<tr>
<td>χ²/Fishers’exact</td>
<td></td>
<td>0.176</td>
<td>0.000</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>0.675</td>
<td>1.000</td>
</tr>
<tr>
<td>Total (%)</td>
<td>73</td>
<td>64 (87.67)</td>
<td>9 (12.33)</td>
</tr>
</tbody>
</table>

anticoccidial drugs utilization in back yard chickens under extensive farming system of the current study.

4.3 Species identification

In the present study, five species of *Eimeria* were identified, namely *E. tenella, E. necatrix, E. brunetti, E. maxima* and *E. acervulina*. These species were reported in different parts of Ethiopia (Methusela et al., 2002; Ashenafi et al., 2004; 2008; Dinka and Tolossa, 2012; Amare et al., 2012b; Luu et al., 2013) and abroad, in Nigeria (Muazu et al., 2008), Iran (Hadipour et al., 2011) and Pakistan (Bachaya et al., 2012). This indicates wide spread of these *Eimeria* species in many countries (Conway and Mckenzie, 2007).

In the present study, *E. tenella* (62.2%) was the predominant species, followed by *E. necatrix* (18.29%). This finding is consistent with the findings of (Gari et al., 2008) and Dinka and Tolossa (2012). However, previous reports from Ethiopia (Ashenafi et al., 2004) and Iran (Nematollahi et al., 2009) revealed dominance of *E. acervulina* while *E. brunetti* was reported as the most prevalent species in Kombolcha, Ethiopia (Lobago et al., 2005). It is likely that resistance has developed to more recent anticoccidial drugs (Chapman, 2005) and very few drugs are equally efficacious against all *Eimeria* species (McDougald, 2003).

Mixed infections were encountered, which account for nine mixed infection cases in the current study. The larger proportion of mixed infection consisted of *E. tenella* which may be due to the wide spread distribution of this species in the study area. This finding agrees with reports from Tiyo district of Arsi zone (Gari et al., 2008) and Kombolcha poultry farm (Amare et al., 2012b), Ethiopia.

4.4 Pathological findings

Both gross and microscopic pathological changes observed for each species in the current study were quite similar to previous findings and descriptions (McDougald, 2003; Williams, 2005; Conway and Mckenzie, 2007; Haug et al., 2008; Amer et al., 2010). Destruction of host tissue as a result of parasite development and multiplication leads to the various clinical manifestations. Development of the various species of coccidia includes minor variations (Conway and Mckenzie, 2007).

Grossly, observed pathological lesions and changes in different intestinal parts were consistent with findings of (Ashenafi et al., 2004), and (Adamu et al., 2013), in which transverse whitish band on the loop of duodenum, ballooning, hemorrhage, mucoid-blood filled exudates, thickened intestinal wall, reddish striping, necrotic white spots, and clotted and unclotted blood were recorded. Multiplication of the parasite in the intestinal tract causes tissue damage and results in diminished feed intake and nutrient absorption, reduced body-weight gain, dehydration, blood loss, and increased susceptibility to other diseases (Davies et al., 1963; Turk, 1978; McDougald, 2003).

Histopathologically, cecum was the most severely affected organ than other intestinal parts. Severity of *E. tenella* is similar with finding of Adamu et al. (2013), in which high numbers of oocysts, schizonts and severe tissue damage in the ceca were observed. McDougald and Fitz-Coy (2008) also described second generation schizont of *E. tenella* as the most pathogenic stage and cause of excessive tissue damage, bleeding, disruption of the cecal glands and destruction of the mucosa and muscularis layer. Less severity of other species is in line of agreement with report of Adamu et al. (2013), who reported less severity of *E. brunetti* than *E. tenella*. However, (Ashenafi et al., 2004)
reported densely parasitized duodenum with \textit{E. acervulina}.

**Conclusion and Recommendation**

In conclusion, poultry coccidiosis was found as one of the important poultry disease that impairs benefit gained from the sector. There was no statistical significance difference between categories of the assessed risk factor groups in the prevalence of the identified five species of \textit{Eimeria} and the disease. Thus, awareness creation about the disease, implementation of appropriate management system for chickens under both extensive and semi-intensive farming system and molecular characterization of these species of \textit{Eimeria} including drug sensitivity of the species and their economic effects in the study area were recommended.

**Research Highlights**

The current study revealed high prevalence of coccidiosis in and around Ambo town, Ethiopia. Five species of \textit{Eimeria} responsible for coccidiosis were identified. There was no statistical significance difference between categories of risk factor groups in prevalence of coccidiosis. Pathologically, effects of \textit{Eimeria} species in different intestinal parts were observed.

**Limitations**

Molecular characterization of the \textit{Eimeria} species and detailed economic effects of the disease would have been studied if there were enough budget and facilities.

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**Authors’ contributions**

FT and WT conceived the idea and designed the study. FT, WT, AG, Dagmawit Atalel (DaA), SS and AW participated in the intensive laboratory and/or field works. FT, WK, SS and Dinka Ayana (DiA) analysed and interpreted the data, and wrote the manuscript. AW contributed a lot to histopathological examination part. All authors contributed to manuscript preparation, read and approved the final manuscript.

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