Prevalence of coccidiosis in broiler chickens in District Dera Ismail Khan, Pakistan

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Abstract

Coccidiosis is a protozoal, highly infectious, fatal and the most prevalent poultry disease, which is caused by species of Eimeria. It results in massive destruction of intestinal epithelium leading to bloody diarrhea, poor weight gain, low FCR and high mortality. The present research is designed to identify the prevalence of coccidiosis in broiler chickens in district Dera Ismail Khan, Pakistan. The study was conducted from November 2015 to April 2016 and 300 gut samples were examined and overall prevalence found was 44%. One hundred fecal samples from different broiler farms were also investigated during the same period. The prevalence of coccidiosis infection among adult broiler chickens was 41.51% and among young broiler chickens was 65.96%. Four species of Eimeria; E. tenella (24.24%), E. maxima (31.06%), E. mitis (31.82%) and E. necatrix (12.88%) were observed. The prevalence of Eimeria infections was highest in the month of April (71.83%) while lowest during December (25.71%). The prevalence of coccidiosis was higher at the farms where the management practices (sanitation and medication) were not satisfactory particularly litter moisture. A strong correlation was found between the prevalence of coccidiosis and age of the chickens. The differences were attributed to the managerial and environmental conditions especially due to climate change.

Keywords: Poultry, Coccidiosis, Prevalence, Eimeria, FCR

1. Introduction

Poultry, the domesticated species of birds including chicken, geese, duck and guinea fowl are reared for meat and egg purpose. Poultry industry is a flourishing domain of livestock which contributes 2% in national GDP of Pakistan. It is playing main role in the stability of mutton and beef prices. Commercial poultry in Pakistan was started in 1963 (Mohsin et al., 2008[18]). Commercial poultry farming is one of the most flourishing industries in the world and it provides the cheapest source of animal proteins to human beings (Ahmad et al., 2011)[9]. However, it has been prone to threats including viral, bacterial and parasitic diseases involving GIT system of the birds (Hafez, 2011)[11]. Among these enteric parasitic diseases, coccidiosis is the main hindrance in the development of poultry sector around the globe. Epidemiological research had established the economical great importance of coccidiosis like a main parasitic infection of poultry in Pakistan (Ayaz et al., 2003[8], Ullah et al., 2014[21]). Different Eimeria species causing avian coccidiosis include E. mitis, E. brunettia, E. tenella, E. acervulina, E. maxima and E. necatrix (Ayaz et al., 2003[8], Shah et al., 2009[20]). For chemoprophylaxis of coccidiosis, anticoccidial drugs have been used as feed additives to overcome the disease, but complications have been started by emerging drug resistance and hazardous effects of such drugs on bird’s health (Abbas et al., 2011)[11].
Attenuated vaccines have also been developed although these are expensive to be produced. Alternative strategies being sought for safer and effective control of Eimeria are use of botanicals and herbals. These are natural products and consist of new therapeutic ingredients against which resistance has not accomplished yet (Abbas et al., 2012) [2]

This study mainly aimed to get information about the different epidemiological aspects of Eimeria species in Dera Ismail Khan which has been among the less privileged areas of Pakistan.

2. Material and Methods
2.1 Study area
The study has been designed to determine the prevalence of coccidiosis in broiler chickens in district Dera Ismail Khan, Pakistan. The city has 175 meters of elevation from the sea. It is plain and arid area lying on the west bank of River Indus. The fecal samples were collected in the months from November 2015 to April 2016.

2.2 Sample collection and size estimation
Two stage cluster sampling was done taking union councils as primary units and poultry farms as secondary units. Sample size was estimated by formula as described by Thursfield (2005) [23]. For this purpose, 48 union councils of district Dera Ismail Khan were screened. Both primary and secondary units were selected randomly by random number table. A total of 300 gut samples of broiler chickens were collected from different poultry farms in district Dera Ismail Khan.

2.3 Development of questionnaire
A questionnaire was designed for collecting information regarding potential risk factors associated positively or negatively with prevalence of parasitism in poultry. Information regarding age, sex, area, season and management practices like watering methods, feeding methods, nature of litter, frequency of change of litter etc, was collected through predesigned questionnaire using close and open ended questions. Birds of age 3-4 weeks were ranked as young while birds of age 6 weeks and above were considered as adults.

2.4 Parasitological examination
Freshly excreted fecal samples (n=300) were collected from different union councils of Dera Ismail Khan, from Nov 2015 to April 2016 and samples collected were brought to Veterinary Research Centre Dera Ismail Khan. All gut samples were examined and gut contents were collected in the beakers separately. Contents were macerated overnight in potassium dichromate solution at 37°C. The suspension was filtered through a muslin cloth and allowed to sediment. The supernatant was discarded and the oocysts in the sediment were separated by floatation method in saturated sodium chloride solution. The isolated oocysts were washed to remove salt solution and for the identification of different species they were subjected to micrometry for the measurement of their length (Levine, 1985) [16]. For this purpose, ocular micrometer was adjusted at 400X magnification. Fifty oocysts from each positive sample were measured for the identification of Eimeria species. The different Eimeria species were identified on the basis of shape and size of sporocysts and sporozoites according to the method described by Levine, (1985) [16]. The litter samples were also collected from the farms (n=100) to ascertain the source of infection. These samples were processed for isolates of Eimeria species by the method described by Levine (1985) [16].

2.5 Data analysis
The prevalence of coccidiosis among different seasons and age groups was calculated. Furthermore, the prevalence of different Eimeria species was also calculated. Data generated was analyzed using descriptive statistics with emphasis on percentage.

3. Results and Discussion
Out of 300 gut samples examined, 44% guts were found infective (Table 1). The present study revealed moderately low prevalence rate of coccidiosis in broiler chickens in Dera Ismail Khan district as compared to the previous report (71.8%) on coccidiosis from Faisalabad district (Khan et al., 2006) [15]. This difference could be due the existence of more humid weather in district Faisalabad, Pakistan. Because, it is well known fact that humidity plays a vital role for the sporulation of the coccidial oocysts (Haug et al., 2008 [6]; Bachaya et al., 2012 [16]). In Pakistan, mostly salinomycin sodium is used as anticoccidial drug for the control of avian coccidiosis and due to its frequent use for a long time resistance could have developed (Abbas et al., 2011 [1]; Gyorke et al., 2013). The disease was observed in all 06 months (Table 1). Among different months, the maximum prevalence of coccidiosis was observed during the months of April (71.83%). This might be because of the high-level of moisture during this month of year. Figure 1 is showing the highest prevalence in April with higher relative humidity. Highest humidity in April helped sporulation of oocysts which ultimately resulted in peak prevalence during subsequent months i.e. November and October. Higher prevalence during month of April seems to be associated with higher relative humidity during this month. These results were in consonance with some of the previous reports (Khan...
et al., 2006) in which the maximum occurrence of coccidiosis was reported during these months due to high humidity. However, in contrast to the present study, (Awais et al., 2012) recorded much higher prevalence of coccidiosis in autumn season in district Faisalabad, Pakistan.

Among different species of Eimeria, E. tenella showed the highest prevalence rate (40.9%), followed by E. maxima (31.4%), E. mitis (18.2%) and E. necatrix (9.5%) in broiler chickens. These findings were in line with previous studies (Ayaz et al., 2003; Awais et al., 2012), reporting the highest prevalence of E. tenella (50%) in broiler chickens of district Faisalabad, Pakistan. Similarly, E. tenella has also been reported as the most prevalent species in Iran (Hamidinejat et al., 2010). The results obtained in the present study were also supported by studies identifying that E. maxima, E. tenella, and E. mitis from poultry litter, but Williams (1995) reported the presence of 6 species of Eimeria (e.g., E. acervulina, E. maxima, E. tenella, E. brunettte, E. mitis and E. praecox) in the litter from single flock through its first 6 weeks. It has already been reported that Eimeria species and their prevalence vary greatly within the different geographical areas (Chapman, 1997; Györke et al., 2013; Zhang et al., 2013). The prevalence of coccidiosis infection among adult broiler chickens was lower compared to young broiler chickens (Table 2). These results were in agreement with the statement of (Muazu et al., 2008) in which the prevalence of coccidiosis among adult birds was 36.7% and among young birds was 52.9%. The results obtained in the present study were also supported by (Julie., 1999) all of that ages groups of poultry are at risk to infection, however, commonly solve of itself around 42-56 days of age. The results obtained were in association with age, also supporting the findings of (Etuk et al., 2004) that young birds are very much affected by infection compared to older birds. The overall results demonstrated that the prevalence of coccidiosis in broiler chickens was higher. The reason could be that the Eimeria oocysts are common and easily disseminated within the poultry farm environment. Moreover, because of their higher reproduction potential, it is very important to keep chickens coccidiosis free, especially under current intensive rearing conditions (Chapman, 2014).

Furthermore, poor management similar to moist litter that helps oocyst sporulation, infected drinkers and feeders, poor ventilation and also higher stocking density could exacerbate the clinical signs (Ruff, 1993). However, good management practices including good ventilation, dry and clean litter, cleaning and decontamination of drinkers and feeders and proper stocking density in the farm can minimize the onset of coccidiosis (Abbas et al., 2011). The prevalence of coccidiosis was low on the poultry farms of progressive farmers in the study area because proper hygienic measures have been adapted between the flocks. This practice may also help to control the widely spread threat of coccidiosis. Other control measures such as attendants should change clothes between houses, preventing wild birds’ entrance in the farm premises and the rationale use of anticoccidial drugs is good way for the effective control of coccidiosis.

Table 1: Different Eimeria species identified and their percentage intensity in broiler chickens

<table>
<thead>
<tr>
<th>Months</th>
<th>No. of gut samples examined</th>
<th>Total Infected gut samples (No.)</th>
<th>Total Infected gut samples (%)</th>
<th>E. maxima</th>
<th>E. tenella</th>
<th>E. mitis</th>
<th>E. necatrix</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Nov</td>
<td>29</td>
<td>13</td>
<td>44.83</td>
<td>5</td>
<td>38.46</td>
<td>3</td>
<td>23.08</td>
</tr>
<tr>
<td>Dec</td>
<td>35</td>
<td>9</td>
<td>25.71</td>
<td>2</td>
<td>22.22</td>
<td>3</td>
<td>33.33</td>
</tr>
<tr>
<td>Jan</td>
<td>52</td>
<td>18</td>
<td>34.62</td>
<td>6</td>
<td>33.33</td>
<td>4</td>
<td>22.22</td>
</tr>
<tr>
<td>Feb</td>
<td>63</td>
<td>24</td>
<td>38.10</td>
<td>7</td>
<td>29.17</td>
<td>6</td>
<td>25.00</td>
</tr>
<tr>
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<td>50</td>
<td>17</td>
<td>34.00</td>
<td>5</td>
<td>29.41</td>
<td>4</td>
<td>23.53</td>
</tr>
<tr>
<td>April</td>
<td>71</td>
<td>51</td>
<td>71.83</td>
<td>16</td>
<td>31.37</td>
<td>12</td>
<td>23.53</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>132</td>
<td>44</td>
<td>41</td>
<td>31.06</td>
<td>32</td>
<td>24.24</td>
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</table>
Table 2: Prevalence of coccidian infection in broiler chickens of different age groups

<table>
<thead>
<tr>
<th>No. of fecal samples examined</th>
<th>Young Broiler Chicken</th>
<th>Adult Broiler Chicken</th>
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<tbody>
<tr>
<td></td>
<td>Samples examined</td>
<td>Infected</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td>5</td>
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<tr>
<td>27</td>
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<td>15</td>
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<td>5</td>
</tr>
<tr>
<td>100</td>
<td>47</td>
<td>31</td>
</tr>
</tbody>
</table>

Young (3-4 weeks) and Adult (6 weeks and above)

Fig 1: Association of meteorological factors with prevalence of coccidiosis in poultry of district Dera Ismail Khan

4. Conclusion
The poor management at the poultry farm is the main contributory factor for the onset of coccidiosis, as oocyst sporulation occurs in humid environment. Therefore, good management practices are the handy tool to minimize the occurrence and spread of coccidiosis in climate change scenario.

5. References


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