

## ARTICLE

# STUDY ON PREVALENCE OF COCCIDIOSIS IN POULTRY IN FOUR AREAS OF SISTAN

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## ABSTRACT

Coccidiosis is one of the most important and common diseases that affect poultry, it results in a great economic loss all over the world. A study was conducted to determine the prevalence of poultry coccidiosis and to assess its relationship with different risk factors in different regions in Sistan. **Objective:** The present research aimed to determine the frequency and diversity of *Eimeria* species in native poultry of different areas of Sistan. **Method:** Flotation and McMaster counting techniques were used for qualitative and quantitative studies, respectively. 2792 fecal samples were collected from Zabol, Hirmand, Adimi, and Zahak regions in Sistan by random cluster sampling and then tested based on flotation technique. The study involved questionnaire survey, fecal examination and identification of coccidial species based on their morphology and sporulation time. **Results:** 5 species of *Eimeria* including *Eimeria acervulina* (35.23%), *Eimeria maxima* (20.70%), *Eimeria brunetti* (19%), *Eimeria necatrix* (15.23%), and *Eimeria tenella* (4.76%) were observed. *Eimeria acervulina* (35.23%) and *Eimeria tenella* (4.76%), respectively, had the highest and lowest infection rates in domestic poultry in four parts of Sistan. In addition, *Eimeria maxima* (20.70%) and *Eimeria brunetti* (19%) ranked second and third, respectively. **Discussion:** the present study showed that presence of coccidiosis of poultry in the study area and appropriate strategies have to be designed to reduce the effect of the disease.

## INTRODUCTION

The traditional poultry production system in Sistan is characterized by minimum inputs from the owners, usually kept in small numbers and fed leftovers including occasional grain feed and household wastes. Coccidiosis is an important parasitic disease that induces great economic loss particularly in poultry industry all over the world [9]. It is caused by different species of the genus, *Eimeria*. In domesticated chickens, at least nine species of have been recognised [8] The infection occurs through ingestion of feed or water contaminated with sporulated oocysts [1]. The place of parasite establishment and the severity of injuries, shape and size, evolution of parasite inside the body, symptoms of the disease and mortality rate are not the same in different species.

Coccidiosis causes large economic losses that are unique in their kind. This disease annually causes financial damages of approximately 60 to 120 million dollars around world. In addition, large costs are annually spent on medication, treatment, and prevention of coccidiosis.

The use of anti-coccidian drugs is considered a necessity in any country. The most important issue about coccidiosis is the selection appropriate drug for its treatment. Different methods such as vaccination, medication, genetic modification, and nutrition improvement are used for combating this disease. However, medication is usually associated by some disadvantages such as high cost of drugs, drug resistance, weakening of the immune system, cellular poisoning, and reduced production efficiency.

Coccidiosis transfer between the hosts is done through the oocyst shedding. Coccidia parasite multiplies in the intestine and causes tissue irritations and bleeding in the gastrointestinal tract [9]. On the other hand, due to the proliferation of the protozoon in the tissues of the digestive system, intake of nutrients and their absorption will face difficulty. With the expansion of injuries, other infections such as intestinal inflammation caused by bacteria may occur. The present study aims to determine the prevalence of coccidiosis among poultry in four areas of Sistan (Zabol, Hirmand, Adimi, and Zahak), compare the histopathological changes caused by coccidiosis in these areas, determine the relationship between infection with coccidiosis and habitat of domestic poultry, and determine the percentage of infected poultry with coccidiosis in different seasons using laboratory methods.

## METHODS

This survey was carried out in Zabol, Zahak, Adimi and Hirmand County which are located in Sistan and Baluchestan province are located in east of Iran and are bordered with Afghanistan country. Of the 2792 fecal samples were collected from Zabol, Hirmand, Adimi, and Zahak regions in Sistan by random cluster sampling. The faecal samples were collected directly from the rectum and put in plastic bottles from each chicken and brought to the laboratory of parasitology in faculty of veterinary at university of Zabol for examination. During sampling age, breed and sex were recorded. The presence of fecal oocysts was determined using the concentration by flotation (Eslami and Ranjbar Bahadori, 2004). The presence of fecal oocysts was determined using the concentration by flotation method. The principle of this method allowed the eggs to float to the surface of the solution of higher specific gravity, which concentrates at the top and leaves debris lower down. The higher the specific gravity of the solution, the more the eggs of different types will float. One gram of fecal sample was weighed using a top loader balance. Put into a beaker and mixed with saturated Sodium Chloride solution. Then it was thoroughly mixed and strained using 100 mesh sieves into another beaker. The filtrate substances of fecal samples were placed in test tube stands. Then each tube was filled to the brim with saturated Sodium Chloride solution. After that,

### KEY WORDS

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cover slip was placed on test tube surface and was left to stay for 15 minutes and then they are gently lifted. The cover slips were placed on microscope slides and viewed under the microscope by using ×40 objective lens [4].

The sporulation time of the oocysts was determined at 29-30 c using the technique described by Conway and McKenzie [4]. The sporulation time was considered when 90% of the oocysts were sporulated. The raw data were entered and managed in Microsoft Excel worksheet and descriptive statistic was utilized to summarize the data. The point prevalence was calculated for all data by dividing positive samples by total number of examined samples and multiplied by hundred. The association between the prevalence of the disease and risk factors was assessed by Chi-square, whereas student t-test was used to examine the difference in mean oocysts count between positive samples. A statically significant association between variables was considered to exist if the computed p value was less than 0.05. All statistical analyses were done using SPSS statistical software.

## RESULTS

Out of the total 2792 chickens examined, 100 (3.58%) were positive for coccidian oocysts of domestic poultry in Sistan in different seasons. The rate of infection were related to *Eimeria acervulina* with 37 oocysts per gram of fecal sample (35.23%), *Eimeria maxima* (20.70%), *Eimeria brunetti* (19%) and *Eimeria tenella* (4.76%) [Table 1].

**Table 1:** The average contamination of different species of *Eimeria* in 2792 fecal samples collected from poultry in four areas

<b>Eimeria species</b>	<b>acervulina</b>	<b>maxima</b>	<b>brunetti</b>	<b>necatrix</b>	<b>tenella</b>
Av. number of oocysts per gram of stool	37 (% 35/23)	27 (% 25/71)	20 (% 19)	16 (% 15/23)	5 (% 4/76)

In Adimi area, 557 fecal samples were collected from domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* with 10 oocysts per gram of sample and *Eimeria tenella* with 2 oocysts per gram of sample, respectively. *Eimeria maxima*, *Eimeria brunetti*, and *Eimeria necatrix* with 6, and 3 oocysts per gram of sample ranked after *Eimeria acervulina* [Table 2].

**Table 2:** The average contamination of different species of *Eimeria* in 2792 fecal samples collected from poultry in four areas of Sistan 2015 separately

<b>Eimeria species</b>	<b>acervulina</b>	<b>maxima</b>	<b>brunetti</b>	<b>necatrix</b>	<b>tenella</b>
Av. number of oocysts per gram of 557 fecal samples Adimi	10 (% 37/3)	6 (% 22/22)	6 (% 22/22)	3 (% 11/11)	2 (% 7/40)
Av. number of oocysts per gram of 1011 fecal samples Zahak	12 (% 37/41)	7 (% 24/13)	4 (% 13/79)	5 (% 17/24)	1 (% 3/44)
Av. number of oocysts per gram of 344 fecal samples Zabol	7 (% 33/33)	6 (% 28/57)	4 (% 19/04)	4 (% 19/04)	-
Av. number of oocysts per gram of 880 fecal samples Hirmand	8 (% 28/57)	8 (% 28/57)	5 (% 18/85)	5 (% 18/85)	2 (%7/14)

In Zahak, a total of 1011 stool samples were collected from the domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* (37.41%) and *Eimeria tenella* (3.44%), respectively. *Eimeria maxima* and *Eimeria necatrix* showed the highest rate of infection after *Eimeria acervulina* in this area.

In Zabol, a total of 344 fecal samples were collected from the domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* with 7 oocysts per gram of sample and *Eimeria brunetti* and *Eimeria necatrix* with 4 oocysts per gram of sample, respectively. *Eimeria maxima* had the highest rate of infection after *Eimeria acervulina* with 6 oocysts per gram of sample .

In Hirmand, 880 fecal samples were collected from the domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* (28.57%) and *Eimeria tenella* (7.14%), respectively. *Eimeria maxima* and *Eimeria necatrix* showed the highest rate of infection after *Eimeria acervulina*.

## DISCUSSIONS

In traditional poultry production system, the input required is minimal and is considered as secondary to other agricultural activities by the smallholder farmers. Housewives and children are usually responsible to undertake poultry production around the homestead. Since these social groups usually stay longer around the home, they can easily look after the chicken. The income obtained from poultry production may also be most accessible source of income during need of cash for women and youths. Thus, from this point of view, poultry production may address the social and economical problems of gender issues and improve the income source and long-term economic potential of women in the rural community.

Coccidiosis outbreak can be very severe or mild. In mild cases, despite infection, no clinical or subclinical symptoms are shown. The disease can infect poultry at any age and situation, but it can make great losses in the first week of culture. In the present study, mucosa, intestine, and cecum were used for preparation of smears. In addition, flotation method was used for determining the number of oocysts per gram of fecal sample. This method requires very high accuracy. Sistan region, with its certain geographical and climatic conditions, can be a suitable place for incidence of different parasitic diseases. Coccidian infection occurs in all ages but its clinical protests are restricted to young birds. Severity of coccidiosis in young birds depends on the number of ingested sporulated oocytes, parasite species, the immunity level, nutritional conditions of the host, and presence of other infectious diseases [9]. Since infection with coccidiosis in local poultry is often subclinical, no action is usually taken against them. This causes adverse effects such as weight loss, delayed growth, and decreased egg production.

Since the infection of local poultry of Sistan with *Eimeria* species had never been studied, the present study aimed to clarify the status of coccidiosis and determine the diversity of *Eimeria* species in local poultry of Sistan region. During this study, 2792 fecal samples were collected from domestic poultry in four cities of Sistan and Baluchestan Province in different seasons. According to the results, coccidiosis infection in domestic poultry of this region was mainly clinical and its acute form was observed less frequently. In the studied areas, 5 species of *Eimeria* including *Eimeria acervulina*, *Eimeria maxima*, *Eimeria brunetti*, *Eimeria necatrix*, and *Eimeria tenella* were observed. *Eimeria acervulina* (35.23%) and *Eimeria tenella* (4.76%), respectively, had the highest and lowest infection rates in domestic poultry in four parts of Sistan. Coccidiosis is a disease that should be always taken into account in terms of economic losses and health problems that may cause. Although Eimerial infection in poultry has been reported from different parts of the world and Iran, its distribution and species diversity are associated with the host and conditions of culture such as density, diet, ventilation, and preventive treatments. In this study, the prevalence of *Eimeria* in domestic poultry of different areas of Sistan have been reported to be 21%. This figure is significantly different from other reports in other regions of Iran such as Mashhad (38%), Golestan Province (36%), Tabriz (56%), Mahabad (42%), and Hamedan (75%). This difference in the prevalence of infection with other parts of Iran can be attributed to the conditions of culturing the domestic poultry, weather conditions of Sistan and Baluchestan Province, and humidity rate.

Many studies have been conducted on coccidiosis in Iran. Charkhkar *et al.* carried out a study in order to identify *Eimeria* species in poultry based on morphological characteristics [3]. In their research, 17 samples from five climatic zones were tested and a total of 25 *Eimeria* oocytes were identified. The highest frequencies were related to four species including *Eimeria tenella*, *Eimeria maxima*, *Eimeria acervulina*, and *Eimeria necatrix* which was consistent with our study.

In poultry farms of Tabriz, 5 species of *Eimeria* including *Eimeria tenella*, *Eimeria maxima*, *Eimeria acervulina*, *Eimeria necatrix*, and *Eimeria mitis* have been reported [5] which was consistent with our study.

In Ethiopia, a study was conducted in the case of coccidiosis in broiler chickens from November 2009 to April 2010 and four species of *Eimeria* including *Eimeria tenella*, *Eimeria acervulina*, *Eimeria necatrix*, and *Eimeria brunetti* were identified. Among these species, *Eimeria brunetti* (34.3%) and *Eimeria tenella* (5%) showed the highest and the lowest prevalence, respectively [6].

In another study conducted by Muazu *et al.* in Niger, among the 100 collected carcasses, 30 cases were infected with coccidiosis [10]. The highest prevalence was related to *Eimeria tenella* (10%) and then *Eimeria maxima*, *Eimeria acervulina*, and *Eimeria necatrix* ranked second to fourth with percentage of 9, 6, and 5, respectively.

In another study carried out by Razmi *et al.* in Iran, the highest prevalence of coccidiosis was reported from poultry aged above 6 months [12]. According to the results, *Eimeria acervulina*, *Eimeria maxima*, and *Eimeria tenella* were observed in 97%, 41%, and 12% poultry farms, respectively.

The present study provided useful results on the prevalence of coccidiosis in domestic poultry of Sistan in four areas, the effect of different seasons on infection with coccidiosis, and optimum conditions for culture of poultry in this region in order to reduce the severity of infection.

It should be noted that due to the presence of pathogenic species in domestic poultry of Sistan, periodic or strategic treatments can greatly reduce the negative side effects of this parasite such as weight loss and decreased egg production.

#### CONFLICT OF INTEREST

None

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#### FINANCIAL DISCLOSURE

None

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