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Full Length Research Paper

Prevalence of *Eimeria* species in scavenging native chickens of Shiraz, Iran

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The present study was conducted to investigate the prevalence of *Eimeria* species in native chickens reared under semi-scavenging system and were allowed to scavenge in the yard, in crop fields near water reservoirs. We studied 200 scavenging native chickens in villages around Shiraz City in Southwest Iran. These chickens had no history of vaccination against coccidiosis and had never been given coccidiostat drugs. The chickens were submitted for post-mortem and parasitological examinations. All the villages had chickens that were positive for different *Eimeria* spp. From a total of 200 native chickens examined, 128 (64%) were infected with coccidiosis. *Eimeria tenella* was the most prevalent species (24%) followed by *Eimeria acervulina* (18%), *Eimeria necatrix* (12%), and *Eimeria maxima* (10%). Prevalences varied by management and did not vary by flock size.

Key words: *Eimeria*, native chickens, prevalence, Shiraz, Iran.

INTRODUCTION

Poultry production in Asia and especially in Iran is still distinctively divided into commercialized and village enterprise subsector, each with its peculiarities. The former comprises of strains specifically developed on the basis of primary products into parent stocks, layers, and broilers each with its specialized equipments and management approach (Nnadi and George, 2010). The latter however, consists of indigenous domestic fowls (*Gallus domesticus*) variously referred to as local or rural chickens, backyard poultry or village chickens, and or free range chickens. Native (village) chickens throughout the world, especially in Middle Eastern countries, play an important role in people nutrition due to meat and egg production (Hadipour, 2010). Native chicken production is constrained by many extrinsic factors among which malnutrition, poor management and the absence of biosecurity are outstanding. Losses have also been attributed to limited housing and veterinary care services (Nnadi and George, 2010). Coccidiosis in chickens is one of the major problems of poultry industry that is caused by protozoan parasites of genus *Eimeria*. It is consider as one of the most economically important diseases of domestic poultry that is responsible for significant economic losses to the worldwide poultry industry (McDougald, 2003; Williams, 1999). It is caused by one or several of seven *Eimeria* species infecting chickens (McDougald, 2003). These species differ in their localization in the gut and in their ability to induce morbidity and mortality (Haug et al., 2007; Morris et al., 2007). This parasitic infection occurs in the epithelial cells of the intestine, despite the advances in nutrition, chemotherapy, management and genetics. Most Eimeria species affect birds between 3 and 18 weeks of age and can cause high mortality in young chicks (McDougald, 2003). In the domestic fowl (*G. domesticus*), nine *Eimeria* species are recognized. *Eimeria brunetti*, *Eimeria maxima*, *Eimeria necatrix*, and *Eimeria tenella* are highly pathogenic, *Eimeria acervulina*, *Eimeria mitis*, and *Eimeria mivati* are rather less pathogenic, and *Eimeria praecox* and *Eimeria hagani* are regarded as the least pathogenic (Morris et al., 2007; Thebo et al., 1998; Al-Natour et al., 2002) . Coccidiosis ranks high among factors that threaten native chicken production. The authors reported that mortality due to coccidiosis is in second degree after viral diseases such as newcastle disease. Coccidiosis causes reduced growth, egg production, emaciation, and anaemia as well as mortality

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(Ruff, 1999). Bad management (such as wet litter that encourages oocyst sporulation, contaminated drinkers and feeders, bad ventilation, and high stocking density) can exacerbate the clinical signs (Graat et al., 1994). Coccidiosis can be controlled by good management including good ventilation, dry and clean litter, cleaning and decontamination of drinkers and feeders, and proper stocking density in the farm (Graat et al., 1994; Gross, 1985; Conway et al., 1993; Al-Natour et al., 2002; McDougald, 2003). Little has been published on the prevalence of *Eimeria* spp. in the native chickens of Iran, so we studied the prevalence of *Eimeria* spp. in scavenging native chickens of Shiraz, Southwestern Iran.

MATERIALS AND METHODS

Study area and sampling method

The study area is located at the Southwestern Iran with semi-humid climatic condition. The average temperature of Shiraz is 16.8°C, ranging between 4.7 and 34.2°C. The study area comprised 10 villages around Shiraz. Within each village comprising of about 5 households, 2 were randomly selected for sampling. A minimum of ten birds including apparently healthy and sicky chickens were again randomly sampled per household without consideration for age or sex. A total of 200 native chickens were involved in the survey. The sampling was done between the months of May and August, 2010. Within the survey period, presurvey visits were made to the selected households for an agreement on the sampling dates and to provide them with a locally made basket for the restraint of the birds over night. During our interaction with the native chicken keepers, information regarding the dynamics of flock size, general body condition of birds and any clinical symptoms especially diarrhea were orally obtained from the poultry keepers.

Clinical, gross and parasitological examinations

After examination of selected chickens for general body condition and clinical symptoms of diarrhea, the chickens were then transported to the veterinary laboratory research center for post-mortem and parasitological examinations. The chickens were then killed and eviscerated. All viscera were examined for gross pathological changes, after which the intestinal tract was opened, extending from the duodenum to the rectum and including caeci. Scrapings were then taken from the mucosa from the upper, middle and lower intestine and caeci. Wet smears of the mucosa were prepared and examined under the microscope for the presence of oocysts. *Eimeria* spp. were identified according to the site of infection and oocyst morphology including size, shape and color after sporulation. Identification of *Eimeria* spp. involved was based on the nature of gross pathological lesions they induced, the site of infection and demonstration of the oocysts.

RESULTS

From a total of 200 native chickens examined, 128 (64%) were infected with coccidiosis. Ninety two (46%) of the 128 infected chickens, showed clinical coccidiosis with characteristic signs and lesions in the intestine and caecum, while 36 birds (18%) were positive for subclinical coccidiosis characterized by the presence of small numbers of oocysts without any sign or gross lesions (Table 1). Four pathogenic *Eimeria* species responsible for the 128 cases of coccidiosis identified included the major species *E. tenella, E. acervulina, E. necatrix* and *E. maxima. E. tenella* was the most prevalent species (24%) followed by *E. acervulina* (18%), *E. necatrix* (12%), and *E. maxima (*10%) (Table 1). The majority of the gross lesions in clinical coccidiosis cases were found in the caecum (38/92), duodenum (25/92), jejunum (18/92) and ileum (11/92), respectively. The sites and nature of gross lesions of clinical coccidiosis are shown in Table 2. The location of parasites in the intestinal tissue ranged from epithelial in the case of *E. tenella* and *E. necatrix* to subepithelial in *E. acervulina* and *E. maxima* infections.

DISCUSSION

In the present study, four *Eimeria* spp. were identified in naturally infected native chickens in villages around Shiraz. The overall prevalence of *Eimeria* spp. infection among examined native chickens was 64% (128 of 200 birds). *E. tenella* was the most prevalent species. All the villages had chickens were positive for different *Eimeria* spp. In the study conducted by Al-Natour et al. (2002) in Northern Jordan, seven *Eimeria* spp. were identified that *E. tenella* was the most prevalent species. Ruiz (1982) showed high proportion of coccidiosis in broiler farms of Cuba. Ashenafi et al. (2004) reported an overall prevalence of coccidiosis of 25.8% in scavenging chickens in three agroclimatic zones of central Ethiopia and indicated the importance of coccidiosis in poultry farming under a traditional husbandry system. Highly pathogenic species of *Eimeria* are responsible for the death of the chickens by causing haemorrhagic lesions that lead to blood loss and electrolyte imbalance (McDougald, 2003). In another study undertaken by Al-Quraishy et al. (2009) in Saudi Arabia, the prevalence of *E. tenella* was 80% among the house reared chicks while no infection was reported among the farm chicks. Heo et al. (2004) in the survey of chicken coccidiosis in slaughtered chickens found that the *E. tenella* has the highest infection rate (78%) and *E. necatrix* has the lowest infection rate (36%) among the *Eimeria* spp. The monthly prevalence of *Eimeria* infection was shown higher in July (94.4%) compared with other months and June was shown lower (57.9%). But, level of OPG was shown higher in summer season (July, August; over 40%) than that of winter season (January, February; 23.1%, 16%).

A cross- sectional survey on parasites of chickens in selected villages in the subhumid zones of South-Eastern Nigeria, the prevalence of coccidiosis was 35.5% (Nnadi and George, 2010). The survey on prevalence of coccidiosis in indigenous chicken of Kenya, showed that

Table 1. Prevalence of *Eimeria* species in the population, *n* = 200.

Total cases	Total infected cases		Clinical		Subclinical	
	No. of positive	Prevalence (%)	No. of positive	Prevalence (%)	No. of positive	Prevalence (%)
200	128	64	92	46	36	18
	E. tenella	24				
	E. acervulina	18				
	E. necatrix	12				
	E. maxima	10				

Table 2. Differentiation of *Eimeria* species in clinical coccidiosis cases based on site affected and nature of gross lesion, *n* = 92.

Site affected	Nature of gross lesion	Number of cases showing the lesion
Duodenum	White transversely oriented mucosal streaks, petechiation and thickening of the mucosa, watery content	25
Jejunum	Petechial haemorrhages with bloody contents	18
Ileum	Excess mucus secretion in the lumen, thickening of the mucosa.	11
Caecum	Petechiation, haemorrhagic caecum filled with clotted and unclotted blood.	38

27.04% of birds were infected with coccidial oocysts (Kaingu et al., 2010). The reported coccidiosis prevalence of 64% in native chickens of southwestern Iran is very high and the poor management practices by Iranian native chicken farmers might be a direct cause. The prevalence of subclinical coccidiosis in broiler-chicken farms in the Iranian municipality of Mashhad, was 38% (Razmi and Kalideri, 2000). Although the current survey was conducted in the spring and summer seasons when coccidiosis is reported to decrease due to decreased floor wetness (essential for oocyst sporulation and survivability), but due to very poor management in native chicken farms in villages around Shiraz, even in non-winter seasons the prevalence of coccidiosis is high. The higher prevalence of clinical coccidiosis cases (46%) than subclinical cases (18%) in native chickens could be due to the fact that local birds are usually allowed to scavenge in the villages without any restriction and are thus more likely to contact with infective sporulated oocysts in the faeces (which are the main source of infection) than are birds in commercial poultry farms (Ashenafi et al., 2004). Nonetheless, the occurrence of subclinical coccidiosis in local chickens may be attributed to repeated exposure to different species of *Eimeria* as chickens maintain their immunity to a species of *Eimeria* by repeated re-exposure. Immune chickens upon re-infection become carriers and eliminate oocysts into the environment for long periods. The existence of genetic variation in resistance to coccidiosis among breeds and strains has been reported (Ashenafi et al., 2004; McDougald, 2003). Thus, breed resistance might have contributed to the presence of subclinical coccidiosis in local chickens. The existence of subclinical cases of coccidiosis indicates the possibility of native chickens acting as a source of infection. Effects of coccidiosis mainly include loss of weight, retarded growth, drop in egg production, and mortality of affected chickens (McDougald, 2003; Rodriguez et al., 1997). That 80% of the surveyed farms were previously affected by coccidiosis in different seasons reflects the size of the problem. That 63% of farms had anticoccidials in the feed indicates the failure to control the disease using chemoprophylaxis under the rearing practices. This might be due to misuse of coccidiostat (dose or improper mixing in feed) or to the development of resistance of local strains of Eimeria to available compounds.

The biological characteristics of coccidia of chickens are well known and variable, and can be used in the identification of species (McDougald, 2003). Some species are easily identified on the basis of oocyst size (*E. maxima*), whereas others produce unmistakable lesions (*E. tenella, E. necatrix*). We found high prevalences of four important species of coccidia: *E. tenella, E. acervulina, E. necatrix* and *E. maxima*. These results are in agreement with reports from Ethiopia (Ashenafi et al., 2004), Jordan (Al-Natour et al., 2002), France (Williams et al., 1996), and Argentina (McDougald et al., 1997) suggesting that those species of *Eimeria* are widespread in most countries. The high prevalence of the infection in studied native chicken farms in the current

study, indicates the maintenance of oocysts in the farm environment, improper cleaning and disinfections methods in the native chicken houses and indiscriminate scavenging behaviour. We conclude that coccidiosis among native chicken farms of Iran is highly prevalent. *E. tenella* was the most prevalent species. Efforts towards educating the native chicken farmers especially in villages to control coccidiosis in through good management practices, and the proper use of anticoccidial drugs should be considered. However, to control this economically important parasitic disease of poultry, further studies need to be undertaken to devise sustainable and cost-effective prevention and control methods.

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