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SOME EPIDEMIOLOGICAL STUDIES ON PREVALENCE OF DIFFERENT EIMERIA SPECIES AFFECTING BROILERS IN EGYPT

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ABSTRACT

Coccidiosis is one of the most commonly prevalent and economically important parasitic diseases of poultry worldwide. In the present study twenty-eight broiler chicken farms from 16 to 70 days of age were examined clinically for suspected outbreaks of coccidiosis in seven governorates in Egypt. Flock history, clinical signs, dropping score and lesion score were recorded at time of examination. Fecal as well as intestinal samples (from different intestinal portions) were examined for most prevalent Eimeria spp. in broilers using direct wet smear. The obtained results revealed that, the highest mortality rate (2.49%) was recorded in Cobb breed in Dakahlia governorate while the lowest mortality (0.5%) was recorded in Avian 48 breed in Dakahlia and Damitta governorates. Higher prevalence rate (89.28%) was observed in young birds (16-42days) than growing birds (10.72%) on the (50-70 days of age). Cobb is more susceptible to infection (42.85%) than other breeds (Hubbard, Avian 48, Ross and Arbor acres). Higher prevalence of mixed infection with different Eimeria species (suspected to be *E. acervuline, E. maxima, E. necatrix and E. tenella*) was recorded in 26 out of 28 farms (92.8%) while single infection with *E. tenella* was recorded in 2 out of 28 farms (7.2%). Mean lesion score revealed that higher score in different types of chickens attributed to cecal portion 0.6-3.3 and lower score was observed in other portions 0-0.9 in jejunal portion and 0-0.6 in illiual portion.

Key words:

Eimeria, chicken, prevalence, direct examination, breed, coccidiosis, Egypt.

INTRODUCTION

Avian coccidiosis caused by infection with multiple species of genus Eimeria which is one of the most common poultry diseases causing grave losses **(Shirley *et al.,* 2007)**. Coccidiosis produced economic losses worldwide which was reported to be about 1-1.5 billion US dollars **(Banfield *et al.,* 1999)**. Other economic losses attributed to coccidiosis were expressed in

impaired feed conversion, depressed growth, downgrading at processing and mortality **(Tipu *et al.,* 2002)**. Diagnosis of Eimeria infection and differentiation of species is according to the consideration of clinical signs in the host and the morphological features of the parasite **(Yao-Chi Su, 2003)**. Chicken farms often harbor 2, or more, of these species at any given time **(McDougald *et al.,* 1986, Kučera,1990, Morris *et al.,* 2007)**, and it has been shown that individual chickens can be concurrently infected by multiple Eimeria spp. **(Long and Joyner, 1984)**. Recent data support the hypothesis that such multi-species infections may alter the pathogenicity of the Eimeria spp. infecting chickens and affect the severity of disease **(Haug *et al.,* 2008; Jenkins *et al.,* 2008)**. The objective of this study to detect most prevalent Eimeria species in broiler chickens using traditional and pathological diagnostic methodologies in different governorates in Egypt. As, accurate diagnosis play an important role in control of the disease.

MATERIAL AND METHODS

Experimental work:

Twenty-eight broiler farms in seven governorates of 16 to 70 days of age were examined clinically for suspected outbreaks of coccidiosis. House capacity, age, breed, system of housing (all examined farms have been housed by floor pen (deep litter system) were reported at time of examination. Previous medication with different anti-coccidial drugs in some farms were coxil (0.5ml\liter), amprol (1.5ml\liter), newcox (1gm\liter), pharmacox (1ml\liter) and diclazuril (0.5ml\liter) used at time of examination. Clinical signs, dropping score (0-4) and mortality % were recorded at time of examination. Lesion score (0-4) of ten dead and sacrificed broilers was recorded from each examined farm at time of examination. The mean lesion score of farm was calculated. Direct wet smears from fecal samples from each examined broiler farm were carried out. Four direct wet smears were adopted on different intestinal portions (upper, middle (jejunum and ileum) and cecal portion). Intestinal and cecal content were collected from positive samples. Collected samples were subjected for sporulation and preservation in potassium dichromate 2.5%.

Samples:

Two hundred and eighty intestinal samples from freshly dead and sacrificed birds and fecal samples were collected from the broiler farms at time of examination. Samples were used for detection of different Eimeria species oocysts, dropping scoring and lesion scoring in different intestinal compartments.

Chemicals:

Saturated sodium chloride solution (flotation fluid) was used for detection of *E.* oocysts from droppings. Potassium dichromate 2.5% was used for preservation and sporulation of *E. oocysts.*

Evaluation parameters:

Clinical signs:

Clinical coccidiosis in each house was diagnosed according to the parameters reported by **Vezey, (1970)**.

Dropping score (0-4):

It was carried out according to **Morehouse and Barron, (1970).** As (0) refers to normal dropping and (4) refers to bloody dropping.

Lesion score (0-4):

It was carried out according to **Johnson and Reid (1970)** in four different intestinal portions (upper, middle (jejunum and ileum) and cecal portion)

Detection of Eimeria developmental stages:

Birds from each farm suspected clinically for coccidiosis outbreak were subjected for direct mucosal wet smears of the upper, middle and lower portions of intestine which examined by microscopy for the presence of *Eimeria* oocysts, schizonts or merozoits, and concentration flotation techniques were applied for detection of coccidial oocysts after **Anders Permin and Jorgen, Hansen, (1997)**.

RESULTS

Flock history, clinical signs, mortalities and dropping score (0-4) were recorded at time of examination from clinically examined chicken broiler farms and illustrated in (Table 1, 2). The clinical signs were off food, depression, ruffling, huddling together, bloody dropping and deaths. The severity of clinical signs varies among examined farms at time of examination. Cobb breeds showing more clinical signs than other breeds. The highest mortality (2.49%) was recorded in Cobb breed at Dakahliya governorate while the lowest mortality (0.5%) was recorded in Avian 48 breed at Dakahliya and Damietta governorates. Dropping score was ranged from (1- 4) among examined farms at time of examination.

Lesion scoring and detection of Eimeria developmental stages:

Lesion scoring of intestinal samples of ten examined birds from each examined broiler farm is illustrated in (Table 3). Incidence of oocyst detection from different intestinal and cecal portions is illustrated in (Table 4) , Fig.(1,2).

Table (1): Flock history of the examined broiler farms reared under floor pen at the time of examination.

Governorate	Farm	House capacity	Breed	Age (days)	No of samples	Previous medication with anti-coccidial drugs
Damietta	2	45.000	Cobb	21	10	Amprol
	11	40.000	Cobb	24	10	----------
	14	32.000	Avian 48	24	10	----------
Dakahliya	1	40.000	Cobb	30	10	Coxil
	3	20.000	Cobb	32	10	Newcox
	6	39.000	Avian 48	25	10	Amprol
	10	60.000	Hubbard	27	10	----------
	12	15.000	Cobb	18	10	Amprol
	16	20.500	Cobb	16	10	----------
	20	15.000	Cobb	31	10	Diclazuril
	21	20.000	Saso	37	10	----------
	24	22.000	Hubbard	35	10	Amprol
	25	17.000	Balady	50	10	Pharmacox
	27	30.000	Balady	43	10	----------
Gharbiya	4	50.000	Cobb	18	10	Amprol
	7	38.000	Cobb	33	10	----------
	9	55.000	Ross	16	10	pharmacox
	13	35.000	Cobb	23	10	----------
	15	30.000	Hubbard	28	10	Newcox
	23	10.000	Balady	42	10	----------
	28	25.000	Balady	70	10	Amprol
Qaliubiya	5	30.000	Ross	29	10	pharmacox
Kafr – Elsheikh	8	35.500	Cobb	31	10	----------
	17	13.000	Cobb	34	10	Amprol
Sharkia	18	10.000	Arbor acres	31	10	----------
Fayoum	19	29.000	Ross	30	10	----------
	22	29.000	Saso	30	10	----------
	26	37.000	Saso	60	10	----------

Table (2): Clinical signs, dropping score (0-4), mortality % at time of examination in broiler farms under examination.

Farm	Age of broilers at time of examination (days)	Breed	Clinical signs	Dropping score (0-4)	Mortalities at time of examination	
					No.	%
1	30	Cobb	++	3	500	1.25%
2	21	Cobb	+++	4	350	0.8%
3	32	Cobb	++	3	200	1%
4	18	Cobb	+++	4	1500	3%
5	29	Ross	++	3	320	1.1%
6	25	Avian	++	2	200	0.5%
7	33	Cobb	+++	4	474	1.24%
8	31	Cobb	+++	4	412	1.16%
9	16	Ross	++	3	100	0.18%
10	27	Hubbard	++	3	435	0.73%
11	24	Cobb	+++	4	220	0.55%
12	18	Cobb	+++	4	150	1%
13	23	Cobb	++	3	600	1.7%
14	24	Avian	+	1	160	0.5%
15	28	Hubbard	+	2	420	1.4%
16	16	Cobb	+++	3	512	2.49%
17	34	Cobb	++	3	100	0.76%
18	31	Arbor acres	+++	3	150	1.5%
19	30	Ross	+++	3	300	0.9%
20	31	Cobb	+++	4	180	1.2%
21	37	Saso	++++	4	500	2.5%
22	30	Saso	+++	4	200	0.7%
23	42	Balady	+++	4	150	1.5%
24	35	Hubbard	++	3	250	1.1%
25	50	Balady	+++	4	350	2%
26	60	Saso	++	3	380	1%
27	43	Balady	++	3	130	0.43%
28	70	Balady	+++	4	600	2.4%

-Clinical signs (Vezey, 1970):

:(0): no clinical signs. (+): depression with ruffling. (++): depression, ruffling and off food.

(+++): huddling, chilling and bloody dropping. (++++): off food, bloody diarrhea and death.

-Dropping score (Morehouse and Barron, 1970).

(0): Normal droppings. (1): Purplish or brownish dropping

(2): more purplish dropping flakes of blood (3): More reddish droppings, some dropping mixed with blood.

(4): Bloody droppings, absence of normal fecal content.

Table (3): Total mean lesion score of ten examined samples from each broiler farm under examination.

Farm	Mean lesion score of each examined portion			
	Duodenal portion	Middle portion		Cecal Portion
		Jejunal Portion	Ileual Portion	
1	0.4	0.5	0.4	1.3
2	0.3	0.2	0.4	2.1
3	0.3	0.2	0.4	1.7
4	0.5	0.4	0.3	2
5	0.3	0.1	0.4	2.5
6	0	0.5	0.1	1.9
7	0.1	0.3	0.2	2
8	0.1	0.9	0.1	1.2
9	0.1	0.2	0.1	1.2
10	0.2	0.5	0.2	0.8
11	0.7	0.6	0.2	2.6
12	0.2	0.2	0.1	1.7
13	0.4	0.4	0.5	1.5
14	0.1	0.4	0.2	0.6
15	0.1	0.4	0.4	0.6
16	0.2	0.6	0.4	1.9
17	0	0.4	0.3	1.5
18	0.4	0	0.2	1.4
19	0.2	0.3	0.5	2.3
20	0.1	0.1	0.3	2.1
21	0.3	0.2	0.3	2.1
22	0	0	0	1.8
23	0	0.3	0	2.9
24	0	0	0	1.9
25	0.1	0.5	0.5	3.3
26	0.2	0.9	0.6	1.7
27	0	0.4	0	1.1
28	0.2	0.8	0	1.4

Note:

-Total mean lesion score from upper portion ranged from 0-0.5.

-Total mean lesion score from jejunal portion ranged from 0-0.9.

-Total mean lesion score from illiual portion ranged from 0-0.6.

-Total mean lesion score from cecal portion ranged from 0.6- 3.3.

Table (4): Incidence of oocyst detection from different intestinal and cecal portions.

Farm	No of samples	Fecal sample	Duodenal portion		Middle portion				Cecal portion	
					Jejunal portion		Ileual Portion			
			No.	%	No.	%	No.	%	No.	%
1	10	+	3	30%	3	30%	4	40%	7	70%
2	10	+	3	30%	1	10%	3	30%	8	80%
3	10	+	3	30%	3	30%	4	40%	9	90%
4	10	+	4	40%	3	30%	2	20%	9	90%
5	10	+	2	20%	1	10%	3	30%	9	90%
6	10	+	0	0%	4	40%	1	10%	9	90%
7	10	+	1	10%	3	30%	2	20%	8	80%
8	10	+	1	10%	6	60%	1	10%	7	70%
9	10	+	1	10%	2	20%	1	10%	6	60%
10	10	+	2	20%	4	40%	1	10%	6	60%
11	10	+	5	50%	5	50%	2	20%	10	100%
12	10	+	1	10%	2	20%	1	10%	7	70%
13	10	+	3	30%	4	40%	3	30%	7	70%
14	10	+	1	10%	3	30%	1	10%	5	50%
15	10	+	1	10%	4	40%	4	40%	4	40%
16	10	+	2	20%	6	60%	4	40%	9	90%
17	10	+	0	0%	3	30%	3	30%	9	90%
18	10	+	0	0%	0	0%	2	20%	6	60%
19	10	+	2	20%	3	30%	4	40%	9	90%
20	10	+	1	10%	1	10%	2	20%	8	80%
21	10	+	1	10%	1	10%	1	10%	9	90%
22	10	+	0	0%	0	0%	0	0%	5	50%
23	10	+	0	0%	1	10%	0	0%	9	90%
24	10	+	0	0%	0	0%	0	0%	5	50%
25	10	+	1	10%	2	20%	2	20%	10	100%
26	10	+	2	20%	4	40%	2	20%	6	60%
27	10	+	0	0%	2	20%	0	0%	4	40%
28	10	+	1	10%	3	30%	0	0%	4	40%

Note:

-Incidence of oocyst detection in upper portion of examined samples ranged from 0-50%

-Incidence of oocyst detection in jejunal portion of examined samples ranged from 0-60%

-Incidence of oocyst detection in ileual portion of examined samples ranged from 0-40%

-Incidence of oocyst detection in cecal portion of examined samples ranged from 40-100%

- (+): mean positive sample of oocyst detection.

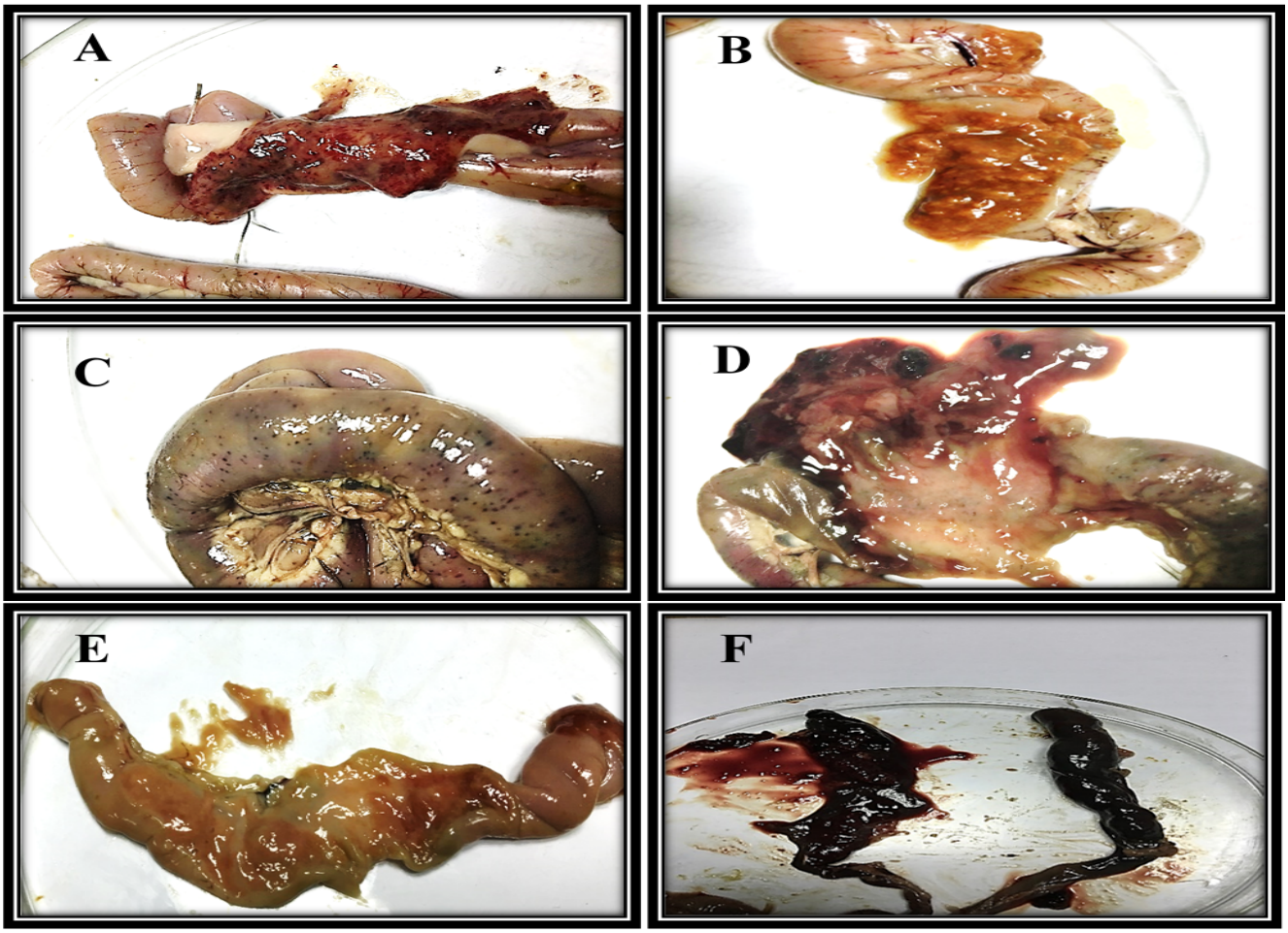

Fig.(1): A): Severely congested mucosa of upper duodenal portion with patches of hemorrhage (+4).

B): Duodenal portion with orange content and petechial hemorrhage on mucosa (+3).

C): Serosal surface of middle intestine with numerous petechial hemorrhages seen from serosa with distension of intestine with bloody content.

D): Mucosa of middle intestine with coalesce petechial hemorrhage and bloody content (+4).

E): Middle intestinal portion with petechial hemorrhage and orange content on mucosa (+3).

F): Ceca with bloody content and several coalesce hemorrhage on mucosa (+4).

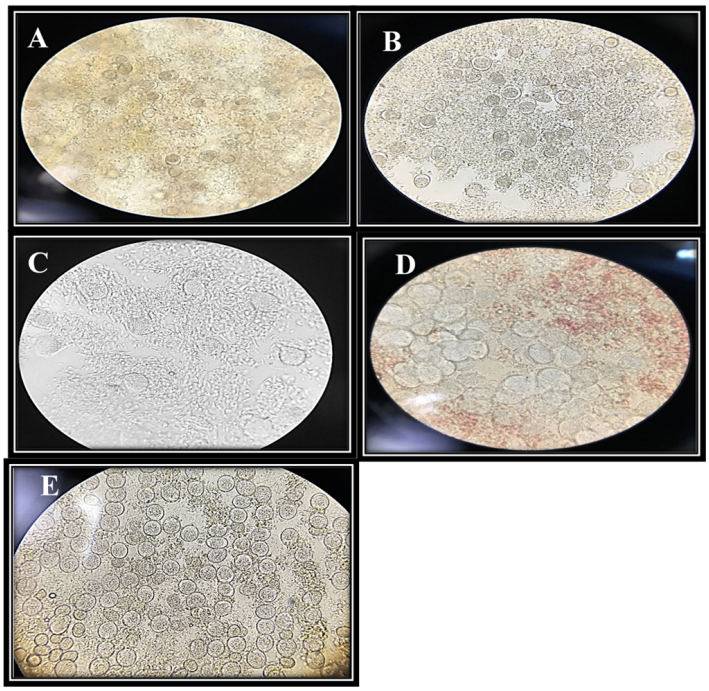

Fig. (2): A): Direct wet smear from content of duodenal portion with numerous oocyst.

B): Direct wet smear from content of middle intestine with large number of oocyst.

C): Direct wet smear from mucosa of middle intestine with large number of schizonts, merozoites and trophozoites.

D): Direct wet smear from cecal mucosa with heavy number of schizonts, merozoites and trophozoites.

E): Direct wet smear from content of cecal portion with heavy numer of oocyst.

DISCUSSION

Our results revealed that 100% of collected dropping samples were positive for Eimeria infection, 72.9% of the collected cecal samples showing cecal coccidiosis followed by 26.4% of samples showing coccidiosis in jejunal portion and 2.8% of samples showing coccidiosis respectively in both deuodenal and illeual portions. These results were near to the results reported by **(Al-Quraishy, *et al.*, 2009)** who recorded that 80% of collected cecal samples from broiler chicks in the market in Saudi Arabia showing cecal coccidiosis also as the results reported by **(khilfa ,1983)** who recorded the incidence of coccidiosis in chickens of different ages which was 84.2%. on the other hand, our results are different from the results recorded by **(Abdel-Rahman, 2003)** who reported the incidence of poultry coccidiosis was 68.8%. Among age group higher prevalence rate (89.28%) was observed in young birds (16-42days) than growing birds (10.72%) (50-70 days of age). This result agreed with **(Mokhtar and**

Yagoob, 2016) who reported that higher prevalence rates of chicken coccidiosis (47.6%) in young (2-8 weeks) than adult chickens., Also agreed with **(Sharma *et al.,* 2015)** who reported that birds of age 31-45 days showed more prevalence percentage for coccidial infection (58.86 %) and agreed with that reported by several workers **(Lobago *et al.,* 2003, Kumar *et al.,*2008,Adhikari *et al.,*2008,Nematollahi *et al.,*2009, Lawal *et al.,*2016 b)**. But this findings disagreed with the result of (**Lawal *et al.,* 2016 a)** who reported that higher prevalence rates of chicken coccidiosis were recorded in growing birds (58.9%) . Among breed susceptibility, Cobb was more susceptible to infection (42.85%) than other breeds as Balady (14.2%), Hubbard and Saso (10.71%), Avian 48 (7.14%) and Arbor Acres (3.57%). At the same time our findings agreed with data reported by **(Jang *et al.,* 2013)** who suggest that Cobb chickens may be more susceptible to necrotic enteritis and Eimeria maxima infection in the field compared with the Ross and Hubbard lines and agreed with data of **(Jatau *et al.,* 2014)** who reported that Cobb breed is more susceptible to infection than Marshal breed. The highest mortality (2.49%) was recorded in Cobb breed in Dakhliya governorates while the lowest mortality (0.5%) was recorded in Avian breed in both Dakhliya and Damietta governorates, as Cobb breed was more susceptible to coccidial infection than other breeds as discussed before. The clinical signs were off food, depression, ruffling, huddling together, bloody dropping and death.These signs differ in severity between the investigated farms according to degree of infection. Our results agreed with those recorded by (**Jatau *et al.,* 2014)** who observed very mild clinical signs after low grade of infection with *E. tenella* in all the infected birds included reduced activity, reduced feed intake, and mild diarrhea. Higher prevalence of mixed infection with different Eimeria species was reported in 26 out of 28 farm (92.8%) while single infection with *Eimeria tenella* was reported in 2 out of 28 farm (7.2%) after direct examination of intestinal samples .Our results are near the results reported by **(Gyorke *et al.,* 2013)** who found Eimeria spp. in 21 (91%) out of 23 flocks, and in 11 (92%) out of 12 farms and differ from results recorded by **(Kaboudi *et al.,* 2016)** who observed the prevalence of mixed Eimeria species in free range chickens which was 26.5% .The results of mean lesion score revealed that higher score in different types of chickens attributed to cecal portion (0.6-3.3) and lower score observed in other portions as follow (0-0.9) in jejunal portion and (0-0.6) in illiual portion. Our results agreed with **(Kaboudi *et al.,* 2016)** who reported that, the mean lesion scores were usually low (<2+) in

different intestinal portions of different types of chicken and high scores (>2+) were at ceca. While our results are different from the results recorded by **(Carvalho *et al.*,2011)** who found that using the lesion score, the most common species were *E. maxima* (46.7%), *E. acervulina* (30%), *E. tenella* (23.3%), and *E. necatrix* (10%) among broiler chickens.

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