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Parasitology

Studies on Ovine Coccidiosis in Menoof District, Menoufia, Egypt

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ABSTRACT

Ovine coccidiosis is an enteric protozoal disease caused by obligatory intracellular *Eimeria spp.* (Family: Eimeridae) and cause severe economic losses in sheep industry. The present studywas conducted in Menoof district, Menoufia, Egypt from January to December 2019 to determine the prevalence of sheep coccidiosis and to identify the recovered *Eimeria spp.* Faeces of 610 randomly selected sheep were collected directly from rectum and subjected to parasitological examination (floatation technique). The results revealed that *Eimeria spp.* were detected in 33.3 % (203 out of 610). The prevalence was significantly influenced by season, age and sex of the examined sheep. Six *Eimeria species* were identified: *Eimeria parva* 78 (38.4%), *Eimeria ahasta* 30 (14.8%), *Eimeria granulosa* 29 (14.3%), *Eimeria pallida* 43 (21.2%), *Eimeria fauri* 10 (4.9%) and *Eimeria crandalis* 13 (6.4%). This is the first report of ovine coccidiosis in Menoufia, Egypt. Further studies as molecular diagnosis is required to easily discriminate different *Eimeria species* infecting sheep.

Keywords: *Eimeria species, Epidemiology, floatation technique, Prevalence*

INTRODUCTION

Ovine coccidiosis is a serious economic disease (Chartiera and Paraud 2012), caused by genus *Eimeria* in the intestines (small and large) of animals and affects mainly on small ages (Taylor and Catchpole, 1994; Platzer *et al*., 2005; Khan *et al*., 2011; Chartiera and Paraud 2012).

In Egypt, the incidence of ovine coccidiosis was reported in different localities, for example, in kaloubia (El-Akabawy, 1993 and Boshra, 1994), in Sharkia (Nasr *et al*., 2008), in Red sea (Mahran, 2009), in Sinai (Abouzeid *et al*., 2010), in Behera province (Bkheet et al., (2010), in Kafr-Elsheikh (Sultan *et al*., 2016), in Assuit (Mahmoud *et al*., 2018), in Suez (Mohamaden *et al*., 2018) and in Dakahlia (El-Alfy *et al*., 2020).

Coccidiosis in sheep may be clinical or subclinical (Lagares, 2008). Clinical coccidiosis determined by presence of diarrhea which can be bloody in adult animals (Foreyt, 1990) while in lambs and kids characterized by watery diarrhea, mucous in the form of clumps and may be changes in the feacal matter color to brown or yellow (Koudela and Bokiva, 1998), results in severe economic losses for producers because of medical treatment costs, adverse effect on performance, growth and sometimes lamb mortalities (Reeg *et al*., 2005; and Elmadawy and Elkhaiat, 2014). The subclinical coccidiosis causes intestinal function impairment, which decrease the animal's growth (Deniz, 2009) and lowers its performance (Taylor *et al*., 2011).

In sheep, coccidiosis causes high economic losses in Egypt (Gadelhaq *et al*., 2015) and different parts of the world due to its high prevalence (Levine 1985; Bakunzi *et al*., 2010 and Majeed *et al*., 2015), decreased productivity, low growth and costs of treatment. (Kaya, 2004).

Eimeria spp. are host specific (McDougald, 1979), single or mixed infection may occur, of them, *E. crandallis* and *E. ovinoidalis* are highly pathogenic (Gregory *et al*. 1989). Several *Eimeria species* as *Eimeria ahsata, Eimeria crandallis, Eimeria bakuensis, Eimeria granulosa, Eimeria faurei, Eimeria marsica, Eimeria parva, Eimeria pallida, Eimeria intricata, Eimeria ovinoidalis and Eimeria webybridgensis* were identified and reported in Egypt.(El-Alfy *et al*., 2020).There is no previous study on ovine coccidiosis in Menoufia province; therefore, we conducted this study to determine the prevalence of ovine coccidiosis in Menoufia governorate, Egypt and its associated risk factors.

MATERIALS AND METHODS

Study period and area

The study was carried out all over one year extended from January to December 2019 at different four localities of Menoof district (Gizi, Tamali, Sinsaft and Barhim), Menoufia governorate, Egypt to determine the prevalence of *Eimeria* spp. infecting sheep.

Animal samples

A total number of 610 of feacal samples were collected directly from rectum of the examined sheep, once weekly from the examined locality and transported as soon as possible to Parasitology Lab, Faculty of Veterinary Medicine, University of Sadat City, Menoufia, Egypt. The examined sheep were divided into 4 groups according their age by months: Group 1 (< 6months), Group 2 (6-12months), Group 3 (12-24months) and Group 4 (>24months). Samples were labeled with all data (age, sex, species, locality and date of collection).

Floatation technique

Faeces were examined microscopically by floatation technique using saturated sodium chloride solution according to MAFF (1986) and Urquhart et al., (1996).Positive samples were subjected to sporulation of their *Eimeria* oocysts.

Sporulation of recovered Eimeria oocyst

Positive samples were mixed with 20x their volume of 2.5% w/v an aqueous potassium dichromate solution, put in Petri dishes thin layers to allow oocysts to initiate sporulation process at room temperature (24 ċ to 33 ċ) for 7-10 days as previously recorded (Harper and Penzhorn, 1999). After sporulation, samples were stored at 4^{o}c to keeping oocysts integrity (Duszynski and Wilber, 1997). The dichromate solution was centrifuged to retrieve the concentrate oocysts is at 300 g for 10 min and discarded the supernatant (Harper and Penzhorn, 1999).

Identification of the recovered Eimeria spp. oocysts:

Measurements were made with an ocular eyepiece, calibrated with a micrometer, under a 40 x objective. The identification of the recovered *Eimeria spp.* were conducted by measurements of diameter of non-sporulated and sporulated oocysts, their shape and color, sporocyst size and presence or absence of micropyle according to (MAFF,1986; Urquhart *et al*., 1996 and Soulsby, 1986)**.**

Statistical analysis

Statistical analysis was performed by Chi square test.

RESULTS

The Morphological description and measurements of the recovered Eimeria spp. oocysts:

Morphological descriptions and measurements of the recovered *Eimeria spp.* oocysts were recorded and displayed as in (Fig. 1, 2, 3).

E. ahasta was pinkish yellow, oval shape, smooth wall and dome shape polar cap over micropyle and its size ranged 31.7 x21.4 µm.

E. fauri, micropyle was distinct with no polar cap, had transparent wall to brownish yellow to salmon pink, its size was 30.8x19.8 µm (25-33 µm x18-24 µm).

E. granulosa had distinct micropyle with micropyle cap and transparent, brownish to yellowish in colour, oval shape, its size was 26x18.8 µm (20-35 x17-25µm).

E. crandalis was double wall ellipsoidal, its size was 23.8x17.6 µm (20-28 x15-22 µm), and neither micropyle nor polar cap is detected.

E. pallida was ellipsoidal, micropyle is imperceptible and no micro-cap and its size ranged 15.3x12.9µm (12-20 x8-15 µm).

E. parva was spherical, 16.5 x 15.7µm (12-22 x10-18 µm), and without micropyle or polar cap.

Infection rate of Eimeria spp.

The infection rate with *Eimeria spp*. in the examined sheep was 33.3%(203 out of 610). Sheep coccidiosis was significantly affected by season (χ^2 = 43.13*** (P<0.0001)). The highest infection rate was in autumn (51.5%), followed by summer (31.3%), while the lowest

infection rate was in winter season (16%), (Table 1).

The results as showing in (Table 2) recorded the infection rate of *Eimeria spp*. In four localities of Menoof district, Menoufia province, Egypt. The infection rate was the highest in Gizi (39.6%), followed by Sinsaft (25.4%) and the lowest infection rate was in Tamali (23.6%). Locality of examined sheep affected significantly on the prevalence of *Eimeria spp*. in sheep (χ^2 = 14.72** (P<0.002)).

The prevalence of *Eimeria spp*. among various age groups was presented in (Table 3). Also, Age had a significant effect in infection of sheep with *Eimeria spp*.(χ^2 = 43.58*** (P<0.0001)). The highest infection rate is recorded in age group ranged from 6 to 12 months (60%) followed by older age group ranged from 12-24 months (42.3%) and those less than 6 months (29.6%) , while the lowest infection rate is recorded in sheep aged more than 24 months (18%) (Table 3).

Table (4) showed the prevalence of *Eimeria spp*. in both sexes of the examined sheep. Out of 173 examined males, 41 males were infected with coccidiosis with an infection rate of (25.4%). Females recorded higher infection rates (162 / 437; 37.07%) than males.

Table (1) Seasonal prevalence of *ovine coccidiosis* in sheep in Menoof District.

Season	No. examined sheep	No. infected sheep	% of infection
Winter	119	19	16
Spring	144	41	28.5
Summer	179	56	31.3
Autumn	169	87	51.5
Total	610	203	33.3
Chi-square	χ^2 = 43.13*** (P<0.0001)		

Table (2) prevalence of *ovine coccidiosis* in sheep in different localities of Menoof District.

Locality	No. examined	No. infected	% of infection
Gizi	197	78	39.6
Tamali	123	29	23.6
Sinsaft	126	32	25.4
Barhim	164	64	39.02
Total	610	203	33.3
Chi-square	χ^2 = 14.72** (P<0.002)		

Table (3) the relationship between the prevalence of *Eimeria spp.* and age of the examined sheep.

Age	No. examined	No. infected	% of infection
1st group <6 m*	368	109	29.6
2nd group 6-12 m	90	54	60
3rd group 12-24 m	52	22	42.3
4th group >24 m	100	18	18
Total	610	203	33.3
Chi-square	χ^2 = 43.58*** (P<0.0001)		

* <6 m = less than 6 months.

Table (4) Prevalence of ovine coccidiosis by sex

Sex	No. examined	No. infected	% of infection
Male	173	41	25.4
Female	437	162	37.07
Total	610	203	33.3
Chi-square	χ^2 = 9.98** (P<0.002)		

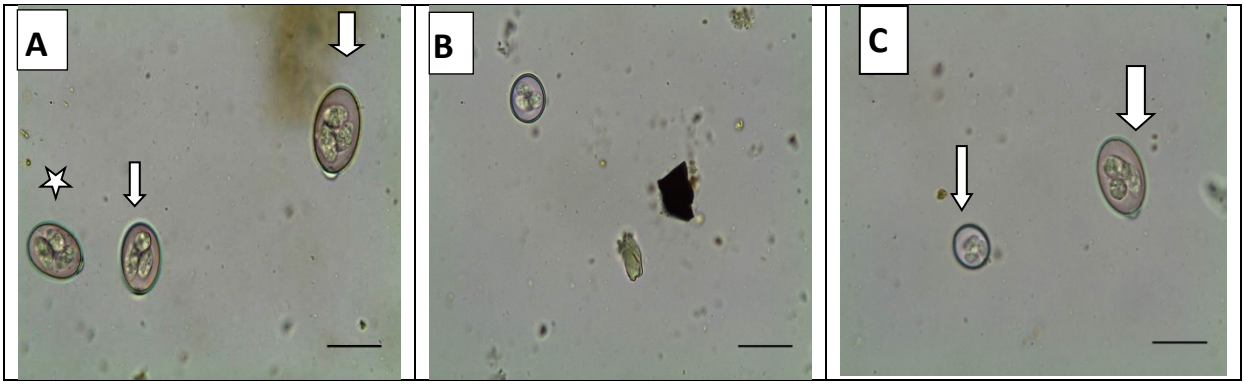

Fig.1,*Eimeria spp*. oocysts, A: *Eimeria ahasta sporulated oocyst (thick arrow), E.crandalis sporulated oocyst (thin arrow)*and *E. granulosa sporulated oocyst (star);* B:*E.parva sporulated oocyst;*C:*Eimeria ahasta sporulated oocyst (thick arrow), E. pallida sporulated oocyst (thin arrow)*. Scale bar =50 µm

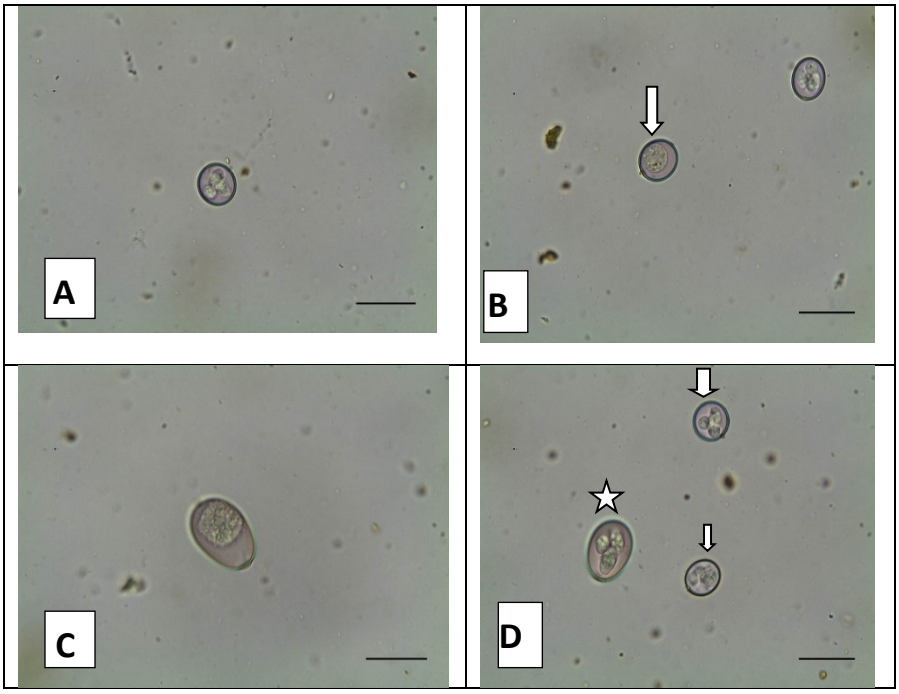

Fig. 2, *Eimeria spp*. oocysts, A:*E. pallid*a sporulated oocyst; B:*E. parva sporulated oocyst* (thick arrow), E*: pallid*a non sporulated oocyst (thin arrow); C:*E. faurei* non sporulated oocyst; D: *E. parva* (thick arrow), E. *pallid*a (thin arrow) and *E. fauri sporulated oocyst (star).* Scale bar = 50 µm

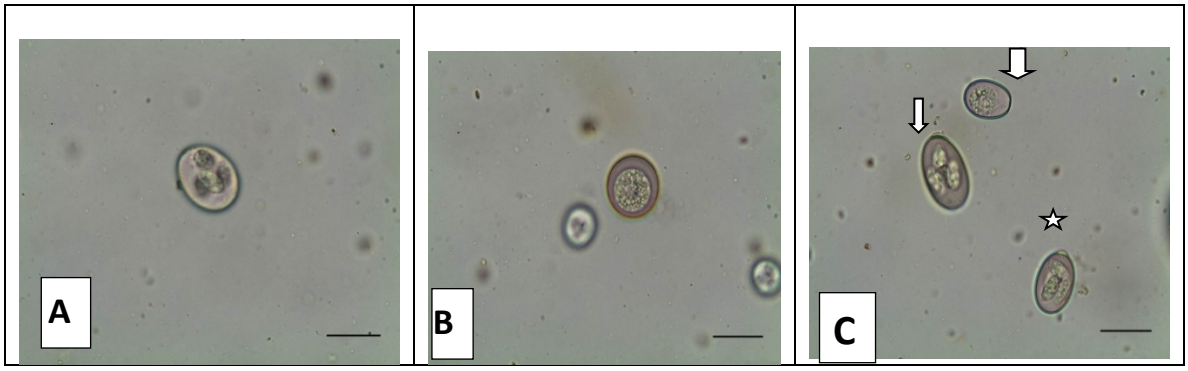

Fig. 3,*Eimeria spp*. oocysts, A:*E. crandalis* sporulated oocyst; B:*E. crandalis* non sporulatedoocyst; C:*E. crandalis (tthick arrow), E. ahasta (thin arrow)*and *E. granulosa (star).*Scale bar =50 µm

DISCUSSION

The present study was carried out on 610 sheep to determine the prevalence of ovine coccidiosis in Menoof district, Menoufia, Egypt and associated risk factors. In present study, prevalence of *Eimeria spp.* in sheep was 33.3% and this rate was lower than (Ramadan *et al*., 2018) in Kaloubia governorate and (El-Alfy *et al*., 2020) in Dakahlia governorate, Egypt).

In our study, female sheep recorded higher infection rate with coccidiosis than males. This finding agrees with (Khan *et al*., 2011) who reported that females are more

susceptible to coccidial infection than males. Also, (Yakhchali and Golami, 2008) founded that sex affects the infection rate of ovine coccidiosis. On the other hand, our finding disagrees with (Lakew and Seyoum, 2016; Daugschies and Najdrowski, 2005; Yakhchali and Rezaei, 2010 and Craig *et al*., 2007). This may be due to some factors related to sex, such as pregnancy and lactation in females make ewes to be more susceptible to infection with coccidia (Heidari *et al*., 2014).

Although all age-groups were infected, 6-12 months aged sheep had the highest prevalence and similar finding had been reported by (Arslan *et al*., 1999) in Turkey but, disagreed with (Adefolabi and Chiejina, 1987) in Southeastern Nigeria, and in Europe (Platzer *et al*., 2005).

The identification of species of *Eimeria* in sheep is based on the morphological characteristics of the unsporulated and sporulated occysts as shape, color, size, and absence or presence of micropyle and micropylar cap (Eckert *et al.*, 1995; Levine, 1985; Levine and Ivens, 1986; Gardiner *et al.*, 1988).

Six *Eimeria spp*. were recovered in the current study. The recovered *Eimeria spp*. in the present study were *Eimeria parva, E. ahsata*, *E. granulosa*, *E. pallida*, *E. faurei* and *E. crandalis*. These ovine *Eimeria sp*p. were previously recorded from Egypt by (Ghanem and Abd El-Raof, 2005; Abou-El-Naga, 2010; Ramadan *et al*. 2018; El-Alfy *et al*., 2020). The morphological description and measurements of oocysts of recovered *Eimeria spp*. were reported and theses were similar to (Soulsby 1986; Ramadan *et al*., 2018 and El-Alfy *et al*., 2020).

CONCLUSION

Ovine coccidiosis was significantly affected by season, sex and age of examined sheep. Further studies should be performed on large scale to determine ovine coccidiosis risk factors.

REFERENCES

Abouzeid, N., Selim, A., El-Hady, K. (2010). Prevalence of gastrointestinal parasites infections in sheep in the Zoo garden and Sinai district and study the efficacy of anthelmintic drug in the treatment of these parasites. J. American Sci.; 6(11): 544- 551.

Abou-El-Naga, T. (2010). Prevalence of some parasitic diseases causing diarrhoea in small ruminants in northwest coastal area. In: Proceedings of the 3rd animal wealth research conference in the Middle East and North Africa, pp 14–24.

Adefolabi, T.K. and Chiejina, S. (1987). The faecal coccidial oocyst output of adult small ruminants in Nigeria. Nigerian Veterinary Journal, 16:1-6.

Arslan, M.O., Umur, S. and Kara, M. (1999). The prevalence of coccidian species in sheep in Kars province of Turkey. Tropical Animal Health and Production, 31: 161-165.

Bakunzi FR, Thwane SN, Motsei LE, Dzoma BM.2010. Diversity and seasonal occurrence of *Eimeria* species in a mixed flock of communally reared sheep and goats in Mafikeng in the North West Province, South Africa. J S Afr Vet Assoc.; 81(3):148–150.

Bkheet, A.A., Fadly, R.S., Elhoffy, H.R. (2010). Studies on some bacterial and parasitic causes of lamb diarrhea in Behaira province and the subsequent biochemical changes. Assuit Vet. Med. J. 56 (127).

Boshra, M.A. (1994). Some Studies on Coccodiosis in Sheep. M.V. Sc. Faculty Vet. Med. Benha Branch, Zag. Univ.

Chartier C and Paraud C. (2012): Coccidiosis due to Eimeria in sheep and goats, a review. Small Rumin Res,(2012) ; 103(1): 84-92.

Craig BH, Pilkington JG, Kruuk LEB, Pemberton J.M., (2007) Epidemiology of parasitic protozoan infections in Soay sheep (Ovis aries L.) on St Kilda. Parasitology 134:9–21

Daugschies A, and Najdrowski M., (2005). Eimeriosis in cattle: current understanding. J Vet Med B; 52: 417-427.

Deniz A., (2009). Coccidiose ovina: revisão bibliográfica. Albéitar; 3: 4-11.

Duszynski D.W., Wilber P.G., (1997) A guideline for the preparation of species descriptions in the Eimeriidae. J Parasitol 83:333–336

Ecker, T. J.; Braun R.; Shirley M.W. and Coudert P., (1995) Guidelines on techniques in coccidiosis research. COST 89/820. European Commission, DGXII, pp 103–117

El-Akabawy, L.M.I.,(1993) Studies on Coccidia species infecting Sheep in Kalubia Governorate. Ph. D. Faculty Vet. Med. Benha Branch, Zag. Univ.

El-Alfy, E., Ibrahim A., Yara A., Moustafa A,,Salah A., (2020). Prevalence of Eimeria species in sheep (*Ovis aries*) from

Dakahlia governorate, Egypt.Journal of Parasitic Diseases . 44: 559–573.

Elmadawy, R. S. and Elkhaiat, H. M. (2014) Efficacy of Clindamycin, Yeast (*Saccharomyces cerevisiae*) and *Clidamycin-Saccharomyces cerevisiae* Combination versus Toltrazuril on Experimentally Induced Coccidiosis in Lambs. IJANS. ISSN (P). 2319-4014; ISSN (E) 2319-4022. Vol.3, Issue 5.99-110.

Foreyt, W.J. (1990) Coccidiosis and cryptosporidiosis in sheep and goats. Vet. Clin. North Am. Food Anim. Pract. 6:655-670.

Gadelhaq S.M.; Arafa W.M. and Aboelhadid S.M.,(2015) Molecularcharacterization of eimeriaspecies naturally infecting Egyptian Baldi chickens. Iran J Parasitol2015;10(1):87–95.

Gardiner,.CH., Fayer, R. and Dubey, J.P. (1998) An atlas of protozoan parasites in animal tissues, 2nd edn. Armed Forces Institute of Pathology, Washington DC, pp 1–84.

Ghanem M.M. and Abd El-Raof YM (2005) Clinical and Haemato- Biochemical studies on lamb coccidiosis and changes following amprolium and sulphadimthoxine therapy. Benha Vet Med J 16:286–299

Gregory, M.W., Catchpole, J., Nolan, A. and Herbert, N., (1989). Ovine coccidiosis: Studies on the pathogenicity of *Eimeria ovinoidalis*, and *E. crandallis* in conventionally reared lambs, including possible effects of passive immunity. Deutsche Tierartzliche Wochenschrift, 96: 287-292.

Harper, C. K. and Penzhorn, B.L., (1999) Occurrence and diversity of coccidia in indigenous, Saanen and crossbred goats in South Africa. Veterinary Parasitology, 82: 1-9.

Heidari, H.; Sadeghi-Dehkordi Z.; Moayedi, R. and Gharekhani, J. (2014) Occurrence and diversity of *Eimeria species* in cattle in Hamedan province, Iran. Vet Med 2014; 59: 271-275.

Kaya, G., (2004) Prevalence of *Eimeria species* in lambs in Antakya Province. Turk J Vet Anim Sci 28:687–692.

Khan, M.N.; Rehman, T. ; Iqbal, Z.; Sajid; M.S.; Ahmad, M. and Riaz, M. (2011) Prevalence and associated risk factors of Eimeria in sheep of Punjab, Pakistan. World Acad Sci Eng Technol 5:334–338.

Koudela, B. and Bokiva, A. (1998) Coccidiosis in goats in the Czech Republic. Vet. Parasitol. 76:261-67.

Lagares, A.F.B.F (2008) Parasites de pequenos ruminantes na regiao da cova da Bara (Dissertacao). Lisboa. Faculdade de Medicma Veterinaria Universidade Tecnica de Lisboa.

Lakew, K. and Seyoum, Z., (2016). Ovine coccidiosis: prevalence and associated risk factors in and around Addis-Zemen, Northwest Ethiopia. Turk J Vet Anim Sci., 40: 645-650

Levine, N. D., (1985). Veterinary Protozoology, First Edition. Iowa State University Press, Ames, IA, USA, 414p.

Levine, N. D. and Ivens, V., (1986). The Coccidian Parasites (Protozoa, Apicomplexa) of Artiodactyla. Illinois Biological Monograph 55. Illinois University Press, Chicago, IL, USA.

MAFF, (1986) Manual of Veterinary Parasitological Techniques. Technical Bulletin No. 18, Her Majesty's Stationary Office, London, UK, Pp 67-74.

Mahmoud, H.Y.A.H.; Ali, A.O.; Ali, R.H. and Ahmed, A.E. (2018) Evaluation of Clinical status and Treatment Trails in sheep and goats infested with Eimeria species. Assuit Vet. Med. J. 64, (156):123 – 128.

Mahran, O. M. (2009) Prevalence and significance of gastrointestinal parasites in Desert sheep in the triangular area (Shalatin-AbuRamaid- Halaeeb) Red sea Governorate, Egypt and Trails of treatment. Assuit Vet. Med. J., 55(120).

Majeed, Q.A.; Alazemi, M.S.; Henedi, A.A. and Tahrani, L., (2015) Study on parasites from farm animals in Kuwait. J Egypt Soc Parasitol 45:71–74

McDougald, L.R., (1979) Attempted cross-transmission of coccidian between sheep and goats and description of *Eimeria ovinoidalis* sp. n. J Protozool 26:109–113

Mohamaden, W.I.; Sallam, N.H. and Abouelhassan, E.M. (2018) Prevalence of Eimeria species among sheep and goats in Suez Governorate, Egypt. Int. J. Vet. Sci. Med.

Nasr, S.S.M.E.; Fayek, S.A.; Azazy, O.M.E. and Amer, O. H.,(2008) Studies on Protozoa of small Ruminants in Sharkia Province. Ph. D. Vet. Med. Sci. Zag. Univ.

Platzer, B.; Prosi, H.; Cieslicki, M. and Joachim, A. (2005) Epidemiology of Eimeria infection in an Austrian milking sheep flock and control with Diclazuril. Veterinary Parasitology, 129: 1-9.

Ramadan, M.Y.; Elmadway, R.S.; Lashin, A. I. and ELdiarby, A. S., (2018). Prevalence of Eimeria Species in Sheep with a Special Reference to Vaccinated Pregnant Ewes for Maternal Immunity for the First Time. Benha Veterinary Medical Journal..34 (3):218-231.

Reeg, K.J.; Gauly, M.; Bauer, C.; Mertens; C., Erhardt. G. and Zahner H. (2005) Coccidial infections in housed lambs: Oocyst excretion, antibody levels and genetic influences on the infection. Vet Parasitol 2005; 127(3-4): 209-219.

Soulsby, E. J. L., (1986) Helminths, Arthropods and Protozoa of Domesticated Animals. Seventh Edition. Balliere Tindall London,UK.

Sultan, K., Elmonir, W. and Hegaz, Y.,(2016) Gastrointestinal parasites of sheep in Kafrelsheikh governorate, Egypt. Prevalence, control and public health implications. Beni-Suef Uni. J. Bas. Appl. Sci. 5: 79-84.

Taylor, M.A. and Catchpole, J., (1994) Coccidiosis of ruminants: a review.Applied Parasitology, 35: 73 – 86.

Taylor, M.A., Marshall, R.N.; Marshall, J.A.; Catchpole, J., and Bartram D. (2011) Dose-response effects of diclazuril against pathogenic species of ovine coccidia and the development of protective immunity. Vet Parasitol 2011; 178(1-2): 48-57.

Urquhart, G.M.; Armour, J.; Duncan, A.M. and Jennings, F.W., (1996) Veterinary Parasitology. 4th ed. Glasgow, UK: Blackwell Science.

Yakhchali, M. and Golami, E., (2008) Eimeria infection (Coccidia: Eimeriidae) in sheep of different age groups in Sanandaj city, Iran. Veterinarski arhiv 78:57–64

Yakhchali, M. and Rezaei, A.A., (2010) The prevalence and intensity of Eimeria spp. infection in sheep of Malayer suburb, Iran. Arch Razi Inst 65:27–32.