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Prevalence and associated risk factors of parasitic gastroenteritis in small ruminants with special reference to phylogeny of Eimeria species in Elbheria and Elmenoufyia governorates, Egypt

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ABSTRACT:

Small ruminants (sheep and goats) play an important role in the Egyptian economy. Gastrointestinal parasite in sheep and goat caused huge financial losses due to reduction in productivity and health challenges globally. The present study was conducted to determine the prevalence of gastrointestinal parasites in Elbheria and Elmenoufyia governorates. Beside spotlight upon some risk factors that might affect its prevalence. The total prevalence of gastrointestinal parasitic infestation depending on the sedimentation technique is 4.92% and depending on floatation technique is 47.46%. Statistically floatation technique had the ability to detect more infested cases than sedimentation technique. There are eight types of gastrointestinal parasites that had been identified (*Eimeria spp., Trichostrongylus spp., Moneizia spp., Ostertagia spp., Haemonchus spp., Strongyloides spp., Trichuris spp., Bonostomum spp.,* and *Balantidium spp.).* There are mixed nematodes infestation that had been detected. The prevalence rate within goats (51.66%) was higher than that within sheep examined (46.47%). The female showed higher prevalence rate (ewe 40.856% & doe 58.06) than male (ram 40.29% & buck 41.93%). The animals of age range more than one year and less than 4 years have the highest infestation rate (sheep 59.07% and goat 48.38%). Animals breeds, location, season of the year and rearing system had significant correlation with infestation rates for both sheep and goats. Bahrawy sheep (34.59%) and shamy goats (64.51%) had the highest infestation rates. Ashmon had the highest infestation rate for sheep and goat (33.11%). As well as summer, and large rearing system had the highest infestation rates. Statistically species have no significant correlation with the infestation rate. Similarly, sex of the animal and age of the animal had no significant correlation with the infestation rate. Strict control measures and regular monitoring of the parasitic infestation of the small ruminants' flocks are important to keep them healthy and ensure maximum productivity. Special attention is needed during summer and within large rearing projects to ensure perfect control of gastrointestinal parasites. As well as more attentions should be put in consideration within area has the same demographic nature of Ashmon and when raising bahrawy sheep or shamy goat. Analysis of Egyptian sequences registered in the gene banks revealed that the ITS1 gene is clustered into two clades and the cytochrome c oxidase subunit I (COI) gene is clustered into three clades; Clade one is involved with different *Eimeria* species in goats from different countries, including Eimeria arloingi and Eimeria hirci in sheep and goats from Ras-Sudr, Egypt, respectively. The second clade involved *Eimeria* ahsata and *Eimeria christenseni* in sheep and goat, respectively. The third clade involved *Eimeria* zuernii in cattle from Egypt.

Key words: Sheep, Goat, Small ruminants, Parasites, Nematodes, Coccidia and Egypt.

INTRODUCTION:

Livestock plays a significant role in food production, income generation, soil quality, transportation and the overall welfare of communities, especially in developing nations. Sheep and goats are vital sources of food, livelihood and urgent financial needs. Researching livestock practices can help optimize production, enhance productivity, and improve market access, ultimately boosting the economic well-being of developing communities. Research is needed to identify climate-resilient livestock practices, develop drought-resistant breeds, and optimize feed management strategies (Taha et al., 2023).

Parasitism could be a challenge to the health and production of animal around the world resulting in significant financial losses (Majeed et al.2015). Sheep and Goats are commonly suffering from gastrointestinal parasites resulting in significant financial losses due to mortality and decreased body weight gain in infected animals (Mohamed et al, 2023). The development of GI parasitic infections is impacted by factors of host like sex, age, body conditions along with physiological status (Badaso and Addis, 2015) and parasitic factors like species of worm and intensity of the population (Tariq et al., 2015).

Gastrointestinal parasites represent a major and underestimated factor threatening the progress and successes of small ruminant production worldwide (Sultan et al., 2016). Parasitic gastroenteritis causes a destructive social and economic decline to small ruminant production (Jesse et al., 2017). This is due to the fact that small ruminants significantly contribute to human livelihood in small economies around the world (Zvinorova et al., 2016). For example, according to studies, helminth infections cost Europe alone about €1.8 billion a year, with reduced production being the main cause of the losses (Charlier et al., 2020). Helminths and coccidia are the most prevalent gastrointestinal parasites seen in small ruminants. In the tropics, *Haemonchus contortus, Trichostrongylus species, Nematodirus species, Cooperaria species, Bunostomum species, and Esophagostomum species* are the most common nematode species that affect small ruminants (Mohamed et al 2023). Variety of signs had been recorded as a result of parasitic gastroenteritis such as reduced feed intake, slow growth, anemia, diarrhea, rough hair, and poor BCS; all of them contribute to greater herd death rates. The impact of gastrointestinal parasite infection varies depending on the parasite in question, the extent of the infestation, and additional risk variables such species, age, season, and worm burden intensity (Colditz et al. 2002 and Ocaido et al., 2009).

The purpose of this study is to record the prevalence of GI parasites in sheep and goats in two provinces (Menoufyia and Elbheria) in the Nile Delta. With a trial to correlate the results with the risk factors affecting the infestation occurrence. As well as study the phylogeny of already registered Egyptian ovine and caprine Eimeria spp. within the gene bank to know the relation between them and the others from different countries and put a corner stone for further molecular studies on ruminants' Eimeria spp. The data gathered from this study may be useful in creating management plans that effectively treat GI parasite-related issues.

Materials and methods:

Study area, period and animals' data:

This study had been conducted in Menoufia province (Ashmon and Sadat) and Elbehria province (Al bostan, Al delegate, Kom hamahah and Wadi elnatroun) as example for Nile Delta provinces. The study period extended from November 2022 to September 2023. Apparently healthy and diseased sheep (n=510) and goat (n=120) had been included in this study; of different breeds, sex, age, and management system as illustrated in table (1).

Clinical examination of the animals and collection of fecal collection:

Clinical investigation had been done thoroughly for all the animals under study according to (Radostits et al. 2000); and the following findings had been recorded (coat condition, body condition, body score, and the presence of sub-mandibular edema). The animals which treated with antiparasitic drugs were excluded. In the morning the fecal samples (10-20 grams) were collected directly from the rectum of each animal using sterile disposable glove or from freshly voided faces and placed in a plastic bag or freshly voided materials were collected for fecal sample examination. The following data had been registered for each sample (date of collection, management system, health status, age, sex and identifying number) were achieved for each animal.

The samples were transferred directly at the same day of collection in an airtight box cooler with dry ice packs to the laboratory of Department of animal internal medicine and Infectious diseases, University of Sadat city, Egypt, and then examined grossly for consistency, color and the presence of adult worms (Rajarajan et al., 2017). Then stored at 4 °C for a maximum of 48 h before analysis. The laboratory samples had been examined using both flotation and sedimentation tests as qualitative analysis for the detection of different types of enteric parasites. According to Hansen and Perry, (1994); a simple sedimentation and test tube of salt saturated flotation techniques had been used.

Parasitological identification of the detected stages carried out under (10X) of compound microscope according to (Chatterjee, 1980; Soulsby, 1982 and Foreit, 1999) based on morphology of helminth eggs, cysts and trophozoites of protozoa.

To analyze the genetic diversity of Eimeria in sheep and goats, BLASTn was performed on the internal transcribed spacer 1 (ITS1) and cytochrome c oxidase subunit I (COI) genes. This step allowed for the identification and comparison of nucleotide sequences across different Eimeria species. Multiple sequence alignment (MSA) was conducted on the two genes using CLUSTAL W from MEGA11 software (Tamura et al., 2021). Following the sequence alignment, a phylogenetic analysis was performed using the neighbor-joining method in MEGA11. Phylogenetic trees utilized bootstrap values to measure the confidence level of sequence-based phylogeny on a scale of 1 to 100. The Tamura 3-parameter model was selected as the best-fit model for this analysis, enabling a robust estimation of evolutionary relationships among the identified Eimeria sequences (Tamura. 1992).

In a spreadsheet of Micro-Soft Excel® the data had been recorded, coded, and analyzed using SPSS version 23. The prevalence rate of infestation had been calculated to quantify the problems and the correlation between the studied risk factors and infestation percent had been studied using the Chi-square test. As well as t test to examine the difference between floatation and sedimentation techniques.

Results:

There are eight types of gastrointestinal parasites that had been identified depending on the presence of their eggs or cysts in the fecal samples. ***Eimeria spp., Balantidium spp., Moneizia spp., Trichostrongylus spp., Ostertagia spp., Strongyloides spp., Haemonchus spp., Bonostomum spp., and Trichuris*** as well as mixed nematodes had been detected. Table (2) and fig (1). ***Eimeria spp.***, is the most prevalent parasites among sheep and goat (36.78%), followed by **mixed nematodes infestation** at percent of (25.75%), ***Trichostrongylus spp.*** (18.39%), ***Moneizia spp.,*** (10.03%), ***Ostertagia spp.,*** (3.67%), ***Haemonchus spp.,*** (2.34%), ***Strongyloides spp.,*** (2%), ***Trichuris spp.***, (0.33%), ***Bonostomum spp.,*** (0.33%) and ***Balantidium spp.,*** (0.33%); fig (1).

Floatation and sedimentation techniques had been used and evaluated for detection of gastrointestinal parasitic infestation among sheep and goats. The total number of positive samples was 299 samples (47.46%) by floatation techniques. While number of positive samples was 31 samples (4.92%) by sedimentation technique as shown in table (3) and fig (2). Statistically there is a significant difference between the tests as t value equal =2.187 and df=18. So that all our statistical analysis will be based on the results of floatation techniques.

630 animals (510 sheep and 120 goat) had been examined for gastrointestinal parasitic infestation. The total prevalence of gastrointestinal parasitic infestation depending on the sedimentation technique is 4.92% and depending on floatation technique is 47.46%. At the species level the prevalence of gastrointestinal parasitic infestation among examined sheep was 46.47% depending on floatation technique. While among the examined goat the prevalence of gastrointestinal parasitic infestation was 51.66% depending on floatation technique. Statistical analysis showed that there no significant correlation between the prevalence rates of infestation and animal species as $Chi^2 = 1.052$ at p value <0.0001 fig (3).

Gastrointestinal parasitic infestation had been detected in both apparently healthy and diseased sheep and goat. The percentage of detection among apparently healthy sheep and goat were 45.97% and 45.91% respectively (depending on floatation technique). While the percentage of detection among diseased sheep and goat were

48% and 77.22% respectively (depending on floatation technique) fig (4).

Different clinical signs had been recorded related to gastrointestinal parasitic infestation had been recorded. These signs include soft feces, diarrhea that soiled the tail and hind limbs of animals, poor growth rate, emaciation with pale mucus membrane and easily detached coat. Temperatures are usually within normal or subnormal range.

The breeds of sheep (Chi^2 = 119.2 at p value <0.0001) and goat (Chi^2 = 39.35 at p value <0.0001) have significant correlation with the prevalence of infestation of gastrointestinal parasites (depending on floatation technique). The prevalence among sheep breeds were 34.59%, 9.70%, 6.32%, 25.31% and 24.05% for Bahrawy, Rahmany, Assafy, Usemy and Barky respectively. The prevalence among goat breeds were 30.64%, 4.8% and 64.51% for balady, barky and shamy respectively fig (5).

The prevalence of gastrointestinal parasitic infestation among male; was 40.29% for sheep and 41.93% for goat. While the prevalence among female; was 49.86% for sheep and 58.06% for goat depending on floatation technique fig (6). Statistically there is no significant correlation between the prevalence of infestation and sex of animals as Chi^2 = 2.55 at p value <0.0001

The age of animals did not show significant correlation with the prevalence of gastrointestinal parasitic infestation as Chi^2 = 8.123 at p value <0.0001. The prevalence of infestation among sheep less than one year age was 18.14% and 59.07%; for sheep of age group (>1year<4years) and 22.78% for sheep more than 4 years of age. The prevalence of infestation among goats less than one year age was 20.96% and 48.38%; for goats of age group (>1year<4years) and 30.64% for goats more than 4 years of age fig (7).

The seasons of the years showed significant correlation with the prevalence rate of gastrointestinal parasitic infestation as Chi^2 = 36.15 at p value <0.0001. The prevalence rates among sheep were 18.56%, 3.79%, 12.65% and 64.69% for Autumn, winter, Spring and Summer respectively. And the prevalence rates among goats were 14.51%, 4.83%, 29.03% and 51.61% for Autumn, winter, Spring and Summer respectively fig (8); depending on floatation test.

The prevalence of gastrointestinal parasitic infestation showed significant correlation with rearing systems of the animals as Chi^2 = 13.39 at p value <0.0001. The prevalence rates for sheep were 9.28%, 27% and 63.71% for farmers, small rearing system and large rearing system respectively. The prevalence rates for goats were 22.58%, 33.87% and 43.54% for farmers, small rearing system and large rearing system respectively, depending on floatation technique fig (9).

Ashmon showed the highest prevalence rate of infestation for sheep and goat (33.11%), followed by Komhamada (22.74%), Wadeielnatron (16.38%), Eldligate (12.70%), Sadat city (8.69%) and Elbostan (6.35%); fig (10). Statistical analysis showed a significant correlation between the locality and the prevalence rate of infestation as Chi^2 = 167.1 at p value <0.0001 depending on floatation technique.

Using bioinformatics tools to spotlight on the molecular characters of Eimeria spp. isolated from sheep and/or goat In Egypt revealed that the phylogeny of the internal transcribed spacer 1(ITS1) gene is clustered into two clades (Figure 11). Clade one is involved with *Eimeria alabamensis* of cattle from different countries, including Buffalo calves from Egypt (Assuit). The second clade involved various species of Eimeria (*Eimeria ahsata*, *Eimeria pallida*, *Eimeria faurei*, *and Eimeria intricate*) in sheep. Additionally, the phylogeny of the cytochrome c oxidase subunit I (COI) gene is clustered into three clades (Figure 12). Clade one is involved with different Eimeria species in goats from different countries, including *Eimeria arloingi* and *Eimeria hirci* in sheep and goats from Ras-Sudr, Egypt, respectively. The second clade involved *Eimeria ahsata* and *Eimeria christenseni* in sheep and goat, respectively. The third clade involved *Eimeria zuernii* in cattle from Egypt.

Table (1): Numbers and data about the collected samples.

Item			Sheep	Goat	Total
Location	Menoufia province	Ashmoon	84	20	104
		Al Sadat city	60	0	60
		Total	144	20	164
	Elbehria province	Kom Hamadah	81	10	91
		Al Dilingate	54	14	68
		Al Bostan	64	16	80
		Wadi El Natroun	167	60	227
		Total	366	100	466
Sex	Male		115	24	139
	Female		395	96	491
Age	< 1 year		105	21	126
	>1 year and < 4years		164	41	205
	> 4 years		241	58	299
Season	Autumn		120	29	149
	Winter		8	3	11
	Spring		27	8	35
	Summer		355	80	435
Management system	Farmer		22	8	30
	Small scale system		158	39	197
	Medium scale system		330	73	403
Sheep breeds	Bahrawy		135		
	Rahmany		12		
	Assafy		8		
	Usemy		70		
	Barky		285		
Goat breeds	Balady			44	
	Barky			28	
	Shamy			48	

Table (2): types, number and percent of detected parasites in sheep and goat samples.

Parasite types	Sheep	Goat	Total	**Percent %**
Eimeria spp.	91	19	110	**36.78%**
mixed nematodes infestation	26	4	30	**25.75%**
Trichostrongylus spp.	49	6	55	**18.39%**
Moneizia spp.	9	2	11	**10.03%**
Ostertagia spp.	4	2	6	**3.67%**
Haemonchus spp	6	1	7	**2.34%**
Strongyloides spp	69	8	77	**2%**
Trichuris spp.	1	0	1	**1%**
Bonostomum spp	1	0	1	**1%**
Balantidium spp.,	0	1	1	**1%**
Total	**256**	**43**	**299**	

Table (3): number of detected gastrointestinal parasites by floatation and sedimentation techniques.

Item	**Floatation technique**	**Sedimentation technique**
Number of Total examined	**630**	**630**
Number and % of negative	**331 – 52.53%**	**599 – 95.07%**
Number and % of positive	**299 – 47.46%**	**31 – 4.92%**
Eimeria	110	5
Moneizia	30	6
Trichostrongylus	55	1
Ostertagia	11	0
Strongyloides	6	0
Haemonchus	7	0
Mixed nematode infection	77	18
Balantidium cyst	1	0
Bonostomum	1	0
Trichuris	1	1

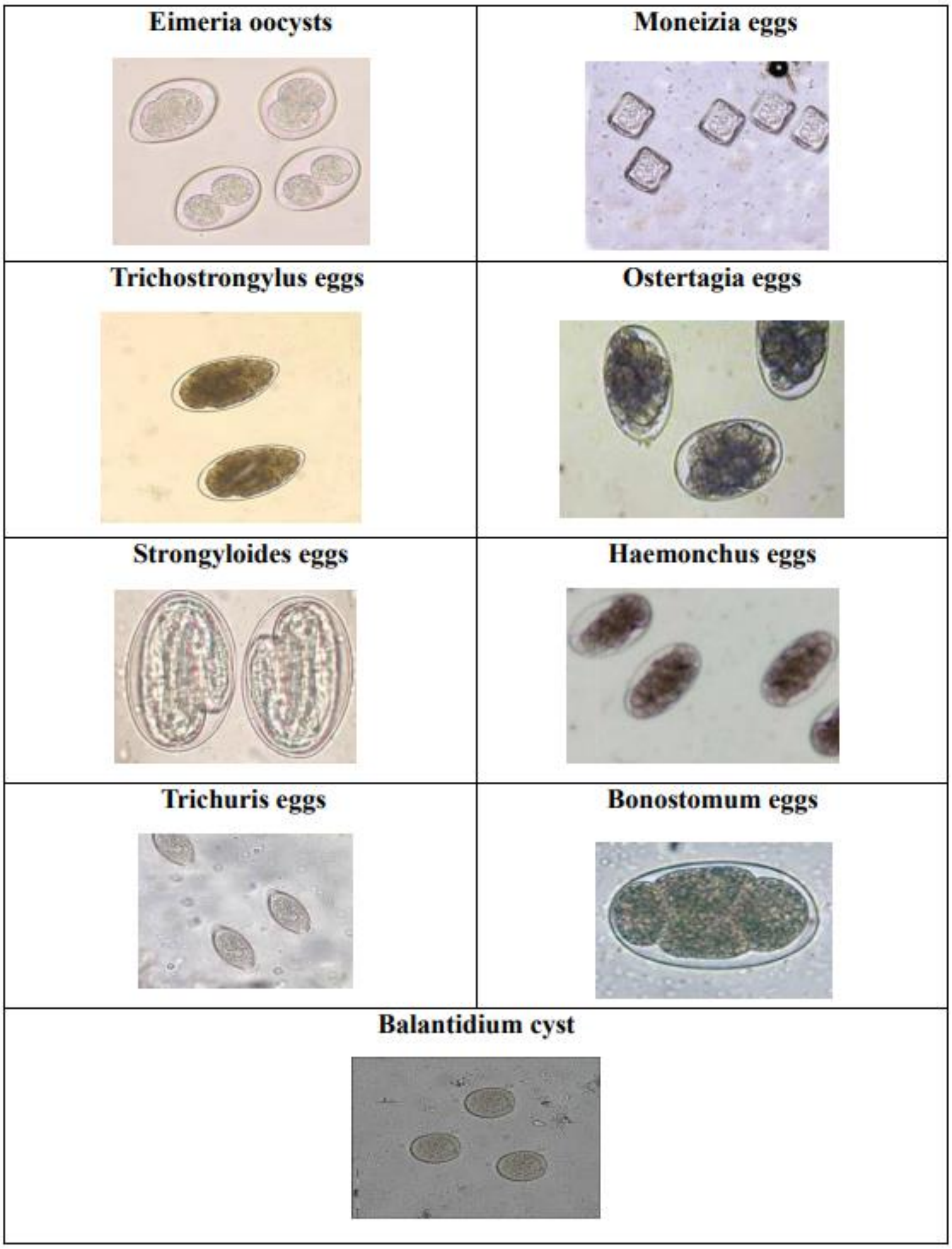


Fig (1): Eggs and cysts of detected gastrointestinal parasites.

Fig (2): number of detected parasites by floatation and sedimentation techniques.

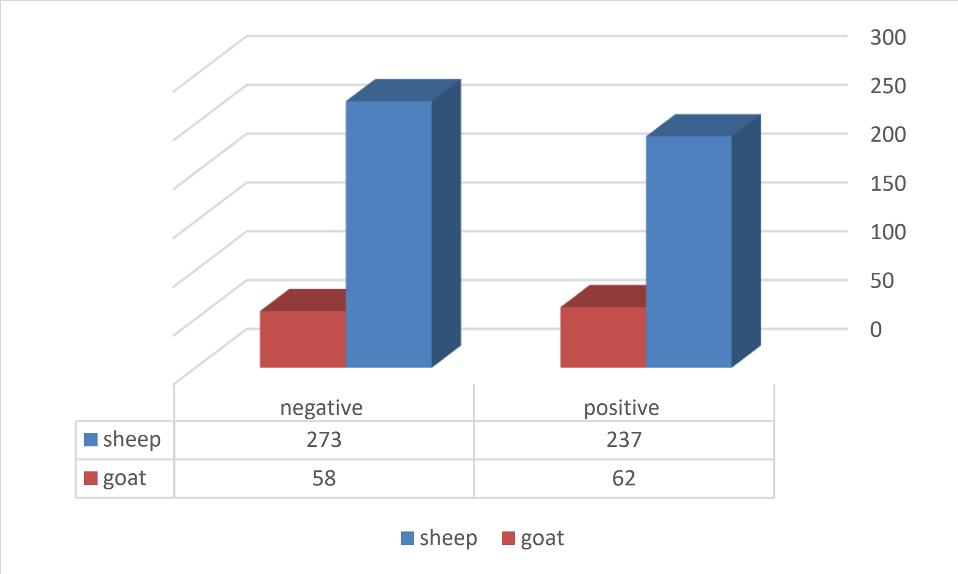


Fig (3): number of positive and negative samples in relation to animal species

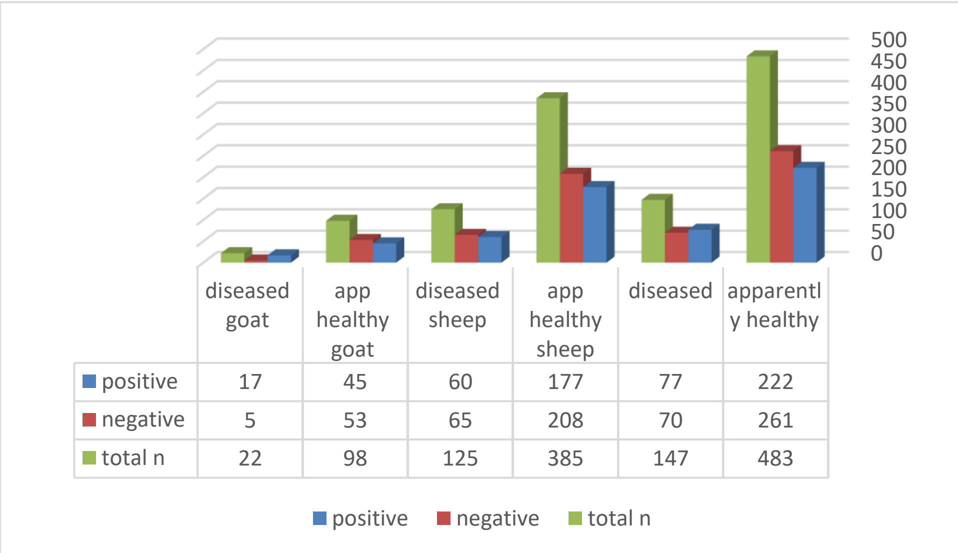


Fig (4): number of positive and negative samples in relation to health status

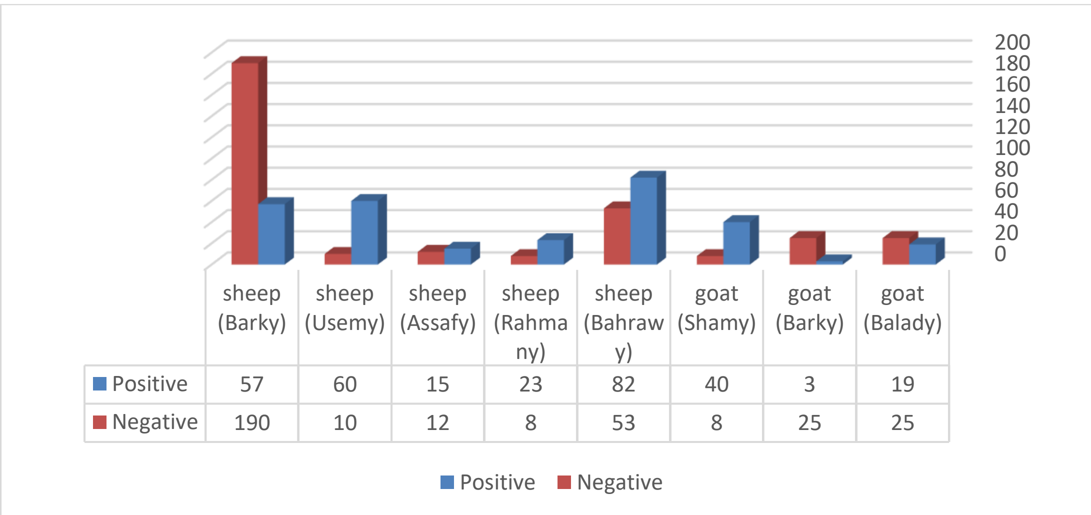


Fig (5): number of positive and negative samples in relation to animal breed

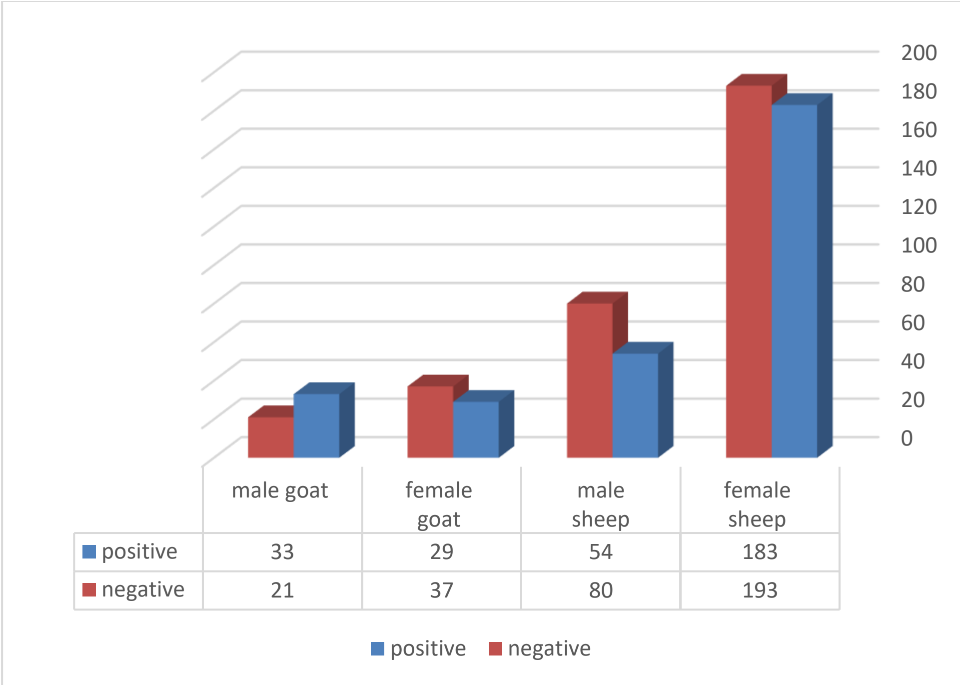


Fig (6): number of positive and negative samples in relation to animal sex

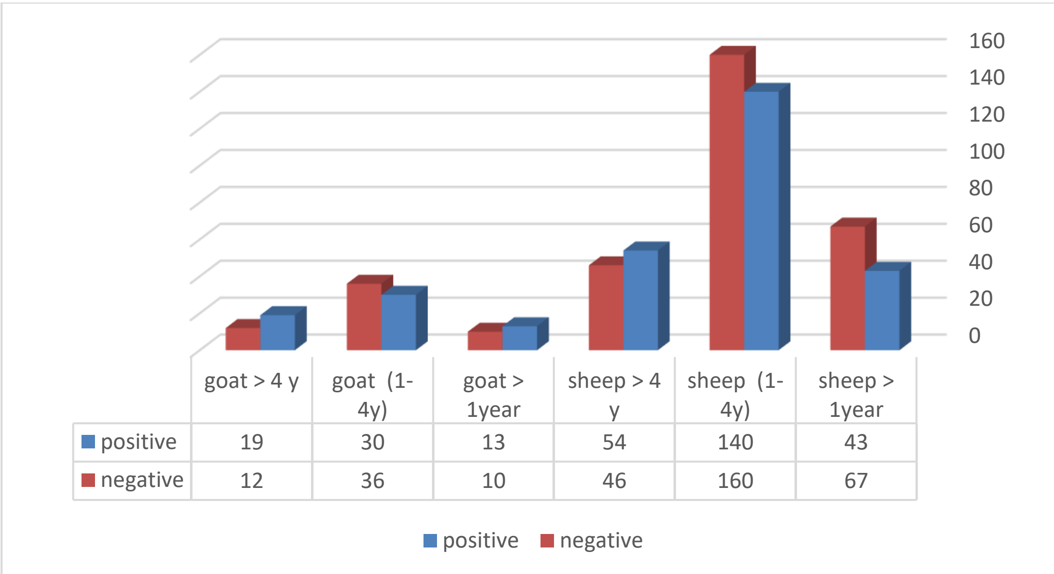
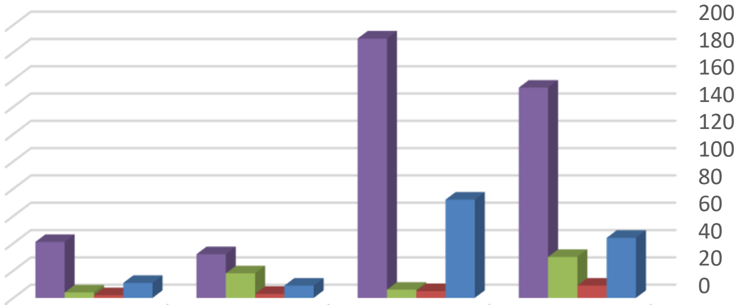


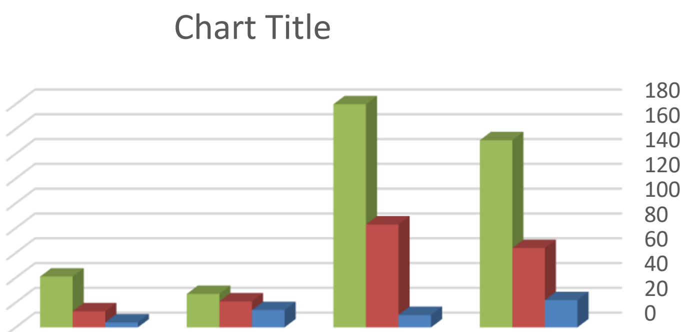
Fig (7): number of positive and negative samples in relation to animal age



	goat negative	goat positive	sheep negative	sheep positive
Autumn	11	9	72	44
Winter	2	3	5	9
Spring	4	18	6	30
Summer	41	32	190	154

Autumn Winter Spring Summer

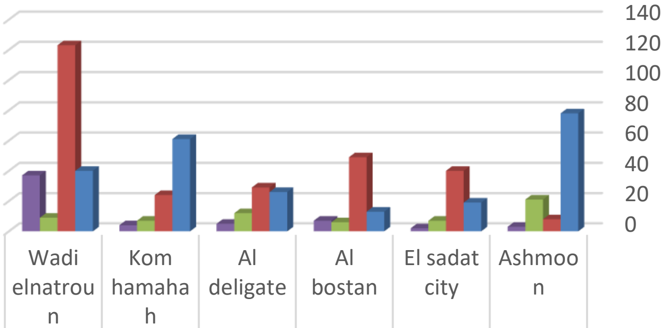
Fig (8): number of positive and negative samples in relation to season



	goat negative	goat positive	sheep negative	sheep positive
Farmer	4	14	10	22
Small system	13	21	83	64
Large system	41	27	180	151

Farmer Small system Large system

Fig (9): number of positive and negative samples in relation to rearing system



	Wadi elnatroun	Kom hamahah	Al deligate	Al bostan	El sadat city	Ashmoon
sheep positive	40	61	26	13	19	78
sheep negative	123	24	29	49	40	8
goat positive	9	7	12	6	7	21
goat negative	37	4	5	7	2	3

Fig (10): number of positive and negative samples in relation to rearing system

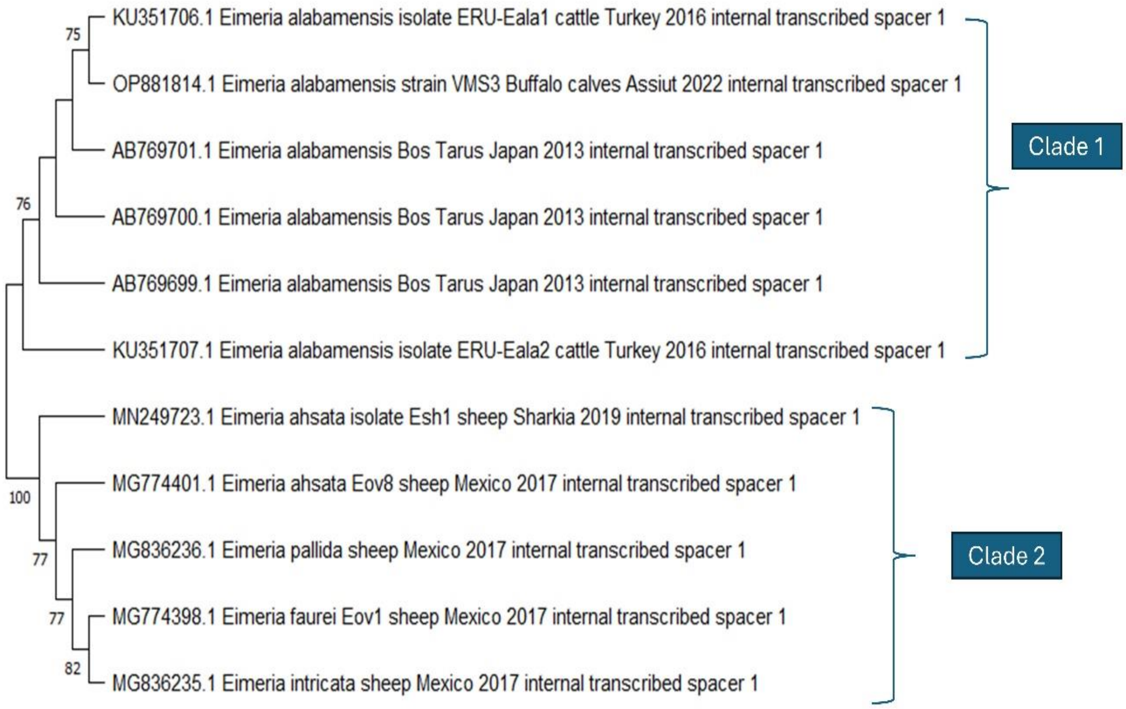


Fig. (11) The evolutionary history of the internal transcribed spacer 1 (ITS1) gene was inferred using the Neighbor-Joining method. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (100 replicates) are shown next to the branches. The evolutionary distances were computed using the Tamura 3-parameter method and are in the units of the number of base substitutions per site. This analysis involved 11 nucleotide sequences. There was a total of 379 positions in the final dataset. Evolutionary analyses were conducted in MEGA11.

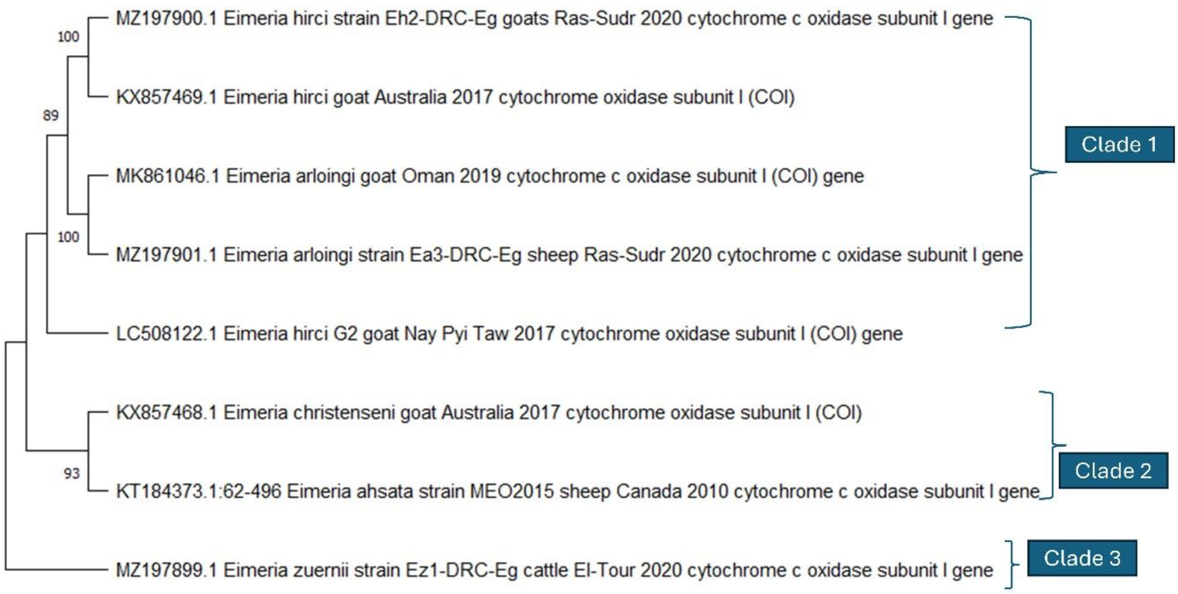


Fig. (12) The evolutionary history of cytochrome c oxidase subunit I (COI) was inferred using the Neighbor-Joining method. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (100 replicates) are shown next to the branches. The evolutionary distances were computed using the Tamura 3-parameter method and are in the units of the number of base substitutions per site. This analysis involved 8 nucleotide sequences. There was a total of 435 positions in the final dataset. Evolutionary analyses were conducted in MEGA11.

DISCUSSION

Eimeria spp., Balantidium spp., Moneizia spp., Trichostrongylus spp., Ostertagia spp., Strongyloides spp., Haemonchus spp., Bonostomum spp., and Trichuris had been detected in the examined samples. Similarly, many authors detected the same parasites but at different percentages. The difference may be due to climatic conditions differences as well difference in immune status of the animals Shwe et al., 2020. In this study *Eimeria spp*. were the most detected parasite like found by Shwe et al., 2020. While there are no trematodes detected. This is acceptable with reduction in prevalence rates of trematodes due to effective control programs Khaled et al., 2016.

The over prevalence rate of gastrointestinal parasitic infestation of small ruminants depending on coprological examination (floatation test) was 47.46%. Goats showed a higher prevalence rate (51.66%) than sheep (46.47). the difference between the two species is not significant statistically. As well as parasitic infestation had been detected in both apparently health animals (sheep 45.97% & goat 45.91%) and diseased animals (sheep 48% & goat 77.22%). Our results agreed with Mohamed et al., 2023 and Khald et al., 2016 in Egypt. But the prevalence rates were lower than that recorded by Hassan et al., 2019, Esayas 1988, Tesfalem 1989, Bayou 1992, Yoseph 1993, Genene 1994, Getachew 1998, Tefera et al., 2011, Bikila et al., 2013 and Nuraddis et al., 2014. They recorded the prevalences were 96.38%, 82.13%, 84.32%, 94.85%, 94.1%, 92.24%, 88.33%, 93.29%, 77.8% and 87.2%, respectively.

Among the examined sheep breeds, bahrawy sheep had the highest prevalence rate of infestation (34.59%). As well as shamy goat had the highest prevalence infestation rate among (61.51%) examined goat breeds. The breeds of sheep and goats showed the lowest prevalence rates were assafy sheep (6.32%) and barky goat (4.8%). Statistically there is a significant effect of breeds on the prevalence rates.

Female animals (ewe and doe) showed higher prevalence rates (49.86% & 58.06) respectively; than male animals (ram 40.29% and buck 41.91%). Although this difference between the two sex was statistically non-significant. This observation similarly recorded by E. Singh 2017, Bedada et al., 2017 and Mohamed et al., 2023. The effect of sex on the susceptibility of sheep and goat to infestation may be due to genetic and hormonal predispositions. Such as female animals exposed to many stress factors such as pregnancy and lactation Blood & Radostitis 2ooo and Mir 2013. Also most breeders keep the male animals indoor and female animals outdoor for grazing; which exposed to more infectious source than male during grazing.

The age of small ruminants has no significant effect on the prevalence rate of infestation. Although the high prevalence rates had been recorded among animals more than one year and less than four years; (59.07%; for sheep and 48.38%; for goats). The animals under one year of age showed the lowest prevalence rates of infestation (18.14% for sheep of age and 20.96%). This observation agrees with, Yadav 2006, Emiru et al., 2013, E. Singh 2017 and Mohamed et al., 2023, they also mention the insignificant effect of age on the prevalence rates and the higher prevalence within the same age group. Higher prevalence of infestation in adults may be explained by grazing on broader pasture areas that are polluted by diverse flocks and stressors such climate, extensive daily transit, and gestation; on the other hand the young animals mostly rely on milk feeding, they are less exposed to grazing and are hence less vulnerable to parasitic infections E. Singh 2017.

Statistically the seasons of the year had a significant effect on the prevalence rates among sheep and goats. This effect may be related to the presence of suitable temperature and humidity for survival and development of parasitic stages in the environment (Wang et al., 2020). Summer showed higher prevalence rates (64.69% for sheep & 51.61% for goats) than other seasons of the year. While winter showed the lowest prevalence rates (3.79% for sheep & 4.83% for goats) during the year. Similar findings were recorded by Mohamed et al., 2023, Cai W et al., 2023.

Rearing system of small ruminants had a significant correlation with the prevalence of gastrointestinal parasitic infestation. As the number of reared animals increased the prevalence rate increase. The highest prevalence rates were recorded in intensive (large system) rearing as the prevalence rates were (63.71% for sheep & 63.71% for goats). While lowest prevalence rates were recorded in small scale systems (9.28% for sheep & 22.58% for goats). Hashim &Yusof (2016); recorded similar observation in Terengganu.

This may be related to high stocking density in relation to available land area as well as poor disinfections practices within the farms.

The high prevalence rates at Ashmon and Komhamada are mainly related to geographical nature, presence of freshwater channels and weather within this agriculture area. Which provides good conditions for survival and development of infective stages of the parasites.

This study demonstrated that 19 Eimerea spp. sequences reported to the NCBI database from Egypt, whereas 12 Eimeria spp. were associated with chickens, turkeys, wild birds, quails, pigeons, and rabbits, and 3 Eimeria spp. were associated with sheep and goats. Although only three Eimeria spp. sequences from sheep and goats were reported to the NCBI database from Egypt; studies have identified up to 19 Eimeria species in sheep and goats, with *Eimeria parva* and *Eimeria ahsata* being among the most prevalent in sheep (Hassanen et al., 2020; Mohamed et al., 2022). This necessitates further molecular studies for the identification of Eimeria spp. in Egypt.

Phylogenetic analysis for the internal transcribed spacer 1 (ITS1) clustered Eimeria spp. into two clades. Clade one involved Eimeria spp. of cattle from different countries, including Buffalo calves from Egypt (Assuit). The second clade involved various species of Eimeria (*Eimeria ahsata, Eimeria pallida*, *Eimeria faurei*, and *Eimeria intricate*) in sheep. The ITS-1 regions show low intra-species and high inter-species variations in the DNA sequence (Kawahara et al., 2010). Phylogenetic analysis of the first internal transcribed spacer 1 (ITS-1) region has been shown to be useful for the distinction of Eimeria species of ruminants.

Additionally, the phylogeny of the cytochrome C oxidase subunit I (COI) gene clustered Eimeria spp. into three clades. Clade one is involved with different Eimeria species in sheep and goats from different countries, including *Eimeria arloingi* and *Eimeria hirci* in sheep and goats from Ras-Sudr, Egypt, respectively. The second clade involved *Eimeria ahsata* and *Eimeria christenseni* in sheep and goat, respectively. The third clade involved *Eimeria zuernii* in cattle from Egypt. Phylogenetic analyses based on COI sequences yielded robust support for the monophyly of individual Eimeria spp. (Ogedengbe et al., 2011). The genetic diversity of Eimeria spp. in sheep and goats in Egypt is significant, with multiple species identified across various studies. This diversity impacts the susceptibility of these animals to infections, as different species exhibit varying pathogenicity and prevalence rates (Hassanen et al., 2020; Mohamed et al., 2022).

CONCLUSION:

In conclusion, this study unequivocally demonstrated that sheep and goats in AL-Behera and EL-Menoufia governorates are afflicted with several helminth parasites, potentially leading to significant economic losses through various mechanisms. Consequently, initiatives must be undertaken to manage helminthiasis, necessitating a comprehensive understanding of these parasites, and it is anticipated that the current study will offer some assistance in this regard. The research indicated that breed, location, season and management system are significant determinants of helminth parasite prevalence. The floatation technique is more accurate and has the ability to detect more parasites than sedimentation one. More molecular and phylogenetic studies are needed with special regards to antiparasitic resistance genes among all parasites detected.

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