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Epidemiological Study on Fascioliasis in Animals and Human in New Valley Governorate and Evaluation of Risk Factors

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ABSTRACT:
Fascioliasis is an important worldwide zoonotic parasitic disease. In Egypt, fascioliasis in humans and animals is endemic and causes both clinical and epidemiological health problems. The purpose of this study was to assess the influence of related risk factors in two regions of the New Valley Governorate, Egypt, as well as the prevalence of fascioliasis in humans and farm animals based on fecal examination. The fecal sedimentation technique was used to look for Fasciola eggs in the fecal samples. Between December 2022 and June 2023, 180 human stool samples and 370 animal fecal samples (300 cattle, 70 sheep) were collected. Depending on coprological examination, the prevalence of fascioliasis was 0 % (0/180) in human and 1.6% (6 out of 370) in animals, sheep showed higher infection 2.9% (2 out of 70) than cattle 1.3% (4 out of 300) with non-significant association between infection and species, age range, sex of animals, locality, and time of infection. In conclusion, even though human fascioliasis was not found in this investigation, the animal fascioliasis existence can pose a risk to public health. Thus, it's critical to implement policies that will minimize the chance that animals in the governorate of New Valley may become infected with Fasciola.

KEYWORDS: Fascioliasis, Human, Animal prevalence, coprological examination, New valley governorate.

1. NTRODUCTION

Fascioliasis is a saprometazonotic parasitic disease caused by digenetic parasite (trematode) belonging to the genus Fasciola. Genus Fasciola which divided into 2 species: Fasciola Gigantica and Fasciola Hepatica. Fasciola hepatica is the most common Fasciola species that have a global distribution while Fasciola gigantica constricted to Africa and Asia. Fasciola infects ruminants, equids, camelids, and swine, human can also be inadvertent [1, 2].

World Health Organization (WHO) stated that fascioliasis is a neglected zoonotic disease [3, 4]. In 2007, WHO estimated that there were 17 million fascioliasis-infected people and 180 million people at risk worldwide. According to WHO estimates, there are 180 million persons at risk and 17 million infected with human fascioliasis worldwide. There are records of human fascioliasis from more than 75 nations worldwide. There have been reports of higher rates of human fascioliasis prevalence in the Andean highlands of Peru, Bolivia, Egypt's Nile delta, the Caspian Sea region, and Asia [5, 6]. Fascioliasis has two distinct hosts: the intermediate and definitive hosts. While ruminants are the final hosts for the sexual stage of the Fasciola life cycle, freshwater snails serve as the intermediate hosts for the development of the asexual stage. Fasciolaiasis is transmitted to humans and animals in the same way through the ingestion of infected freshwater plants, particularly watercress, that contain encysted metacercariae. Because humans are accidentally infected after consuming infective metacercaria, they often do not contribute to the Fasciola life cycle. Additionally, Fasciola are poorly adapted to humans and occasionally fail to develop into mature adult worms and do not lay eggs [6, 7]. In the final host, Eggs drop with faeces on the pasture and embryonated in water to form ciliated miracidium, which penetrate aquatic snail hosts (Lymnaea snails) and form cercaria that leave the snail to form

metacercaria which are infective for humans and other definitive hosts. Final hosts become infected after ingestion of aquatic plants contain encysted metacercaria [4, 8]. Immunological, molecular, and parasitological methods have all been used to diagnose fascioliasis. The gold standard for diagnosing fascioliasis is the identification of eggs through fecal testing, despite numerous attempts to diagnose the disease using genetic approaches. Due to intermittent egg shedding in feces, numerous stool samples may be required for microscopic inspection to prevent false negative results. Additionally, evaluating multiple sections of the fecal sample is important because the discharge of parasite eggs may not be uniform. The most accurate test performed in endemic regions is microscopic examination of stool [9, 5, 3, 6]. There are insufficient documented data on Fascioliasis in Animals and Humans and risk factors for the disease in new valley governorate, Egypt. Therefore, this study was aimed to investigate the prevalence of fascioliasis in animals and humans in New Valley Governorate as measured by fecal examination.

2. MATERIALS AND METHODS

2.1. Study area and period

The research was carried out in the New Valley Governorate of Egypt from December 2022 to June 2023. To investigate the prevalence of fascioliasis in humans and animals, fecal samples were gathered from several farms and human stool samples were collected from private laboratories in the El-Kharga and EL-Dakhla centers in the New Valley Governorate.

2.2. Specimen collection and processing

During the study period randomly collected 370 fecal samples were randomly collected from farm animals (300 cattle and 70 sheep) from different localities in El-Kharga and EL-Dakhla in New Valley Governorate and 180 human stool samples were collected from patients from private laboratories in the same study region for examination Table 1. Using rectal gloves, fecal samples were taken from the animals' rectum. Each sample was then put in a plastic bag and sent as soon as possible to the Department of Animal Hygiene and Zoonoses Laboratory at the Faculty of Veterinary Medicine at New Valley University. For every animal, the sampling date, age, sex, and location were determined.

Table 1: Number of fecal and stool samples examined from cattle, sheep, and human in two regions of New Valley Governorate, Egypt

Samples	El Kharga	EL Dakhla	Total
Cattle	200	100	300
Sheep	60	10	70
Total	260	110	370
Human	160	20	180

2.3. Fecal examination (Sedimentation technique)

Twenty milliliters of normal saline were thoroughly mixed with ten grams of feces in a cup. Large particles were removed from the obtained suspension by filtering it through a metallic sieve. The mixture was then put into an Eppendorf tube and allowed to stand for 30 minutes at room temperature before being centrifuged for 4 minutes at 2,000 g. Following centrifugation, the supernatant was carefully drained off, a sediment drop was placed on the slide, and the sample was immediately inspected at 10 and 40× microscopic magnifications. If a sample contained one or more fluke eggs, it was considered positive [10].

2.4. Statistical analysis

The Chi-square test was used to analyze the data (X2). The P-value shows the likelihood that the event occurred by chance if the null hypothesis is true. P-values < 0.05 were considered statistically significant.

2.5. Ethical approval

The national research committee of Egypt's ethical standards was followed in all aspects of the current study's protocols, including the collecting of fecal samples from both humans and animals. All human subjects gave their permission for the collection of the stool samples, with

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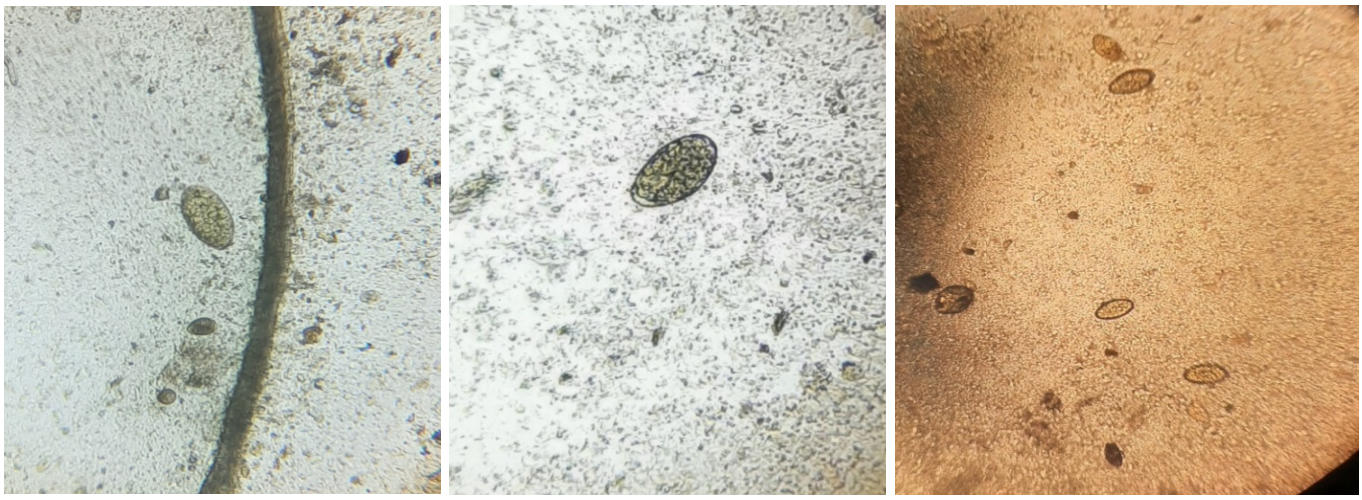

(A) (B) (C)

Figure 1: A, B and C showing fasciola eggs found in fecal samples of different animals

the agreement that any personally identifying information should not be published. Additionally, Flukes were gathered from slaughtered animals during post-mortem examination by veterinary officers. The attending vets from the abattoir gave their formal authorization as well as permission to use the flukes for research purposes.

3. RESULTS

Table 2: Prevalence of Fascioliasis by fecal examination among farm animals and human in New valley governorate

Species	No of examined samples	Positive	
		No	%
Cattle	300	4	1.3
Sheep	70	2	2.9
Total	370	6	1.6
Human	180	0.0	0.0

Table 3: Prevalence of Fascioliasis by fecal examination in cattle regarding different risk factors and their statistical significance

Species		Cattle (300)			
Risk Factor		Total no.	Positive no.	Percentage	Chi-square P-value
Age	Young (0-2y)	160	2	1.3	0.018^{NS}
	Adult (>2y)	140	2	1.4	0.893
Sex	Female	110	2	1.8	0.310^{NS}
	Male	190	2	1.1	0.577
Locality	El-kharga	200	3	1.5	0.127^{NS}
	El-Dakhla	100	1	1	
Season	wet season	150	1	0.7	1.014^{NS}
	Dry season	150	3	2	

Table 4: Prevalence of Fascioliasis by fecal examination in sheep regarding different risk factors and their statistical significance

Species		sheep (70)			
Risk Factor		Total no.	Positive no.	Percentage	Chi-square P-value
Age	Young (0-2y)	45	1	2.2	0.183^{NS}
	Adult (>2y)	25	1	4	0.669
Sex	Female	34	1	2.9	0.002^{NS}
	Male	36	1	2.8	0.967
Locality	El-kharga	60	2	3.3	0.127^{NS}
	El-Dakhla	10	0	0	
Season	wet season	33	1	3	0.007^{NS}
	Dry season	37	1	2.7	

The results obtained in Table 2 and Fig. 2A indicated that the prevalence rate of fascioliasis among farm animals by fecal examination was totally1.6% (6/370) where it was in cattle 1.3% (4/300) and in sheep 2.9% (2/70). Additionally, no fasciola eggs were detected in the examined 180 human stool samples. The prevalence of fascioliasis in various animal species, age groups, sexes, location, and seasons did not show significant statistical difference (Tables 3 and 4) . According to locality, El-kharga showed a higher infection in sheep and cattle (3.3%), (1.5%) respectively. Concerning sex, female sheep and cattle show higher infection (2.9%), (1.8%) than males (2.8%), (1.1%) respectively. The occurrence of fascioliasis was higher in adult cattle > 2years (1.4%) than young cattle < 2 years (1.3%) also, adult sheep (4%)

was higher than young sheep (2.2%). The highest percentage of infection in cattle was in dry season (2%) although in sheep was in wet season (3%).

4. DISCUSSION

Fascioliasis is a global parasitic disease and poses a serious threat to human health and cattle production in endemic areas. The finding of eggs in feces is typically used to determine the prevalence rates of fascioliasis in humans and animals [11, 12]. According to fecal inspection, the overall fascioliasis prevalence rate in farm animals in the New Valley governorate was 1.6% (6 out of 370) in the current study. This finding is almost in line with [13] findings, which indicated that the overall prevalence of fascioliasis in Ghana was 2.8%.On the other hand, higher occurrences of fascioliasis have been recorded by [14], who found that fascioliasis was more common in Sharkia province, located in Egypt's Eastern Nile Delta, with a rate of 27.4% (74/270). Additionally, [15] discovered that in Kisumu County, Kenya, the overall incidence of animal *Fasciola* parasites was 30.9% (180/582). Therefore, the accurate elimination of snails by covering the drains and canals with water pollution control measures may be the reason for the low prevalence of fascioliasis among farm animals in the new valley governorate. In this study, sheep were more often infected with fascioliasis (2.9%) than cattle (1.3%) with a non-significant association at $p<0.05$ Fig. 2a. These findings were inconsistent with those of [13], who reported that in Ghana the positive rates of fascioliasis were 3.2% and 4.6% among sheep and cattle respectively. In contrast, fasciola eggs were not discovered in the fecal samples of sheep or cattle in the study area of [16, 17]. The prevalence of fascioliasis in cattle was reported to be 31.14%, 27.0%, 25%, 21%, 33.6%, and 45.8% in the studies by [18, 19, 20, 14, 15, 21] , respectively, despite the fact that our results were lower than those studies. Furthermore, compared to [22, 15], who reported that the prevalence of fascioliasis among sheep was 45.4% in Western Ethiopia and 35.6% in Kenya, respectively, the computed percentages in our study among sheep were lower. Fascioloasis infections are more common in sheep than in cattle, which may be explained by the immune responses to infections differing in sheep and cattle as well as the changes in grazing patterns between species. Regarding associated risk factors for infected cattle, as shown in Table 3,there no statistically significant correlation was found between infection and factors such as species, age group, sex, location, or season. The results of studies conducted by [23, 24, 19, 14, 15, 21], were consistent with this finding, as they did not find any significant correlation between infection and animal sex, age, or season. As shown in Fig. 2c , adult cattle older than two years old had a higher infection rate (1.4%). The observed result matched with [20] who found that the prevalence of fascioliasis in adult cattle was higher (18.4%) as compared to young ones (10.4%) while [25] documented the greatest prevalence in (<2 age group). In terms of sex Fig. 4a, females exhibit greater infection rates of 1.1% compared to males of 1.8%. Several investigations, such as those conducted by [26, 27, 28, 29], have also confirmed this finding. Alternatively, according to reports from others [19, 20, 25], male cattle had the highest infection rate of fascioliasis. Moreover,Fig. 2 b showed that cattle in El-kharga more infected (1.5%) than in El-Dakhla (1%). These findings are consistent with a study by El [14] that found the highest prevalence of fascioliasis in the El-Sharkia governorate of Egypt in Zagazig, followed by Belbeis and Abo-Hammad. Fig. 4b displayed the seasonal prevalence, with the dry season having a greater prevalence of 2% and the wet season of 0.7%. This finding agreed with [30] who stressed that in Bangladesh the maximum cattle fascioliasis prevalence was in summer season (72.44%) and the lowest in winter season (58.55%). It was discovered that there was no statistically significant correlation between the locality and the prevalence of fascioliasis in sheep in the New

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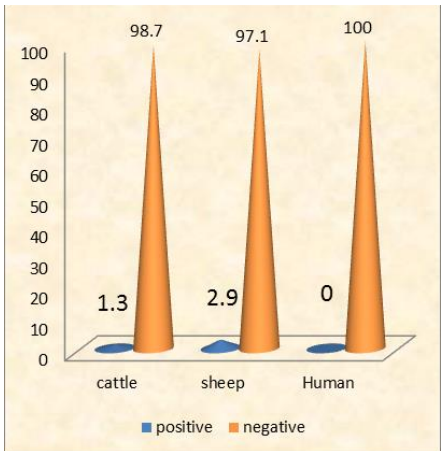
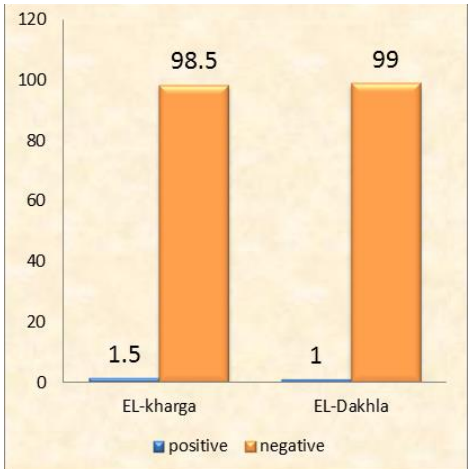
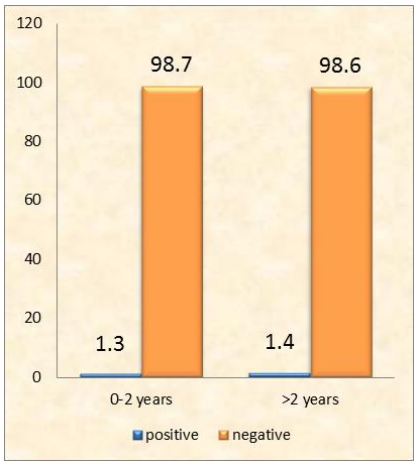


(a) Prevalence of fascioliasis in new valley Governorate by fecal examination in different animals and human

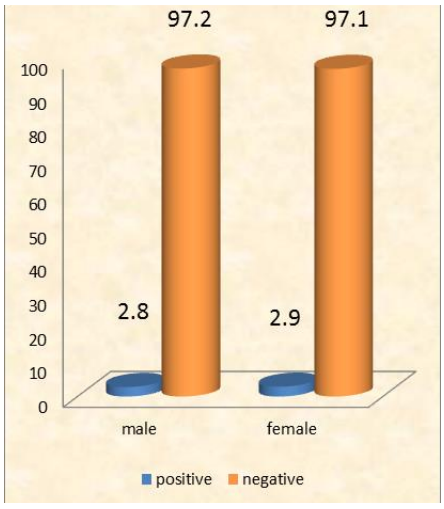


(b) Prevalence of fascioliasis in cattle by fecal examination in relation to locality

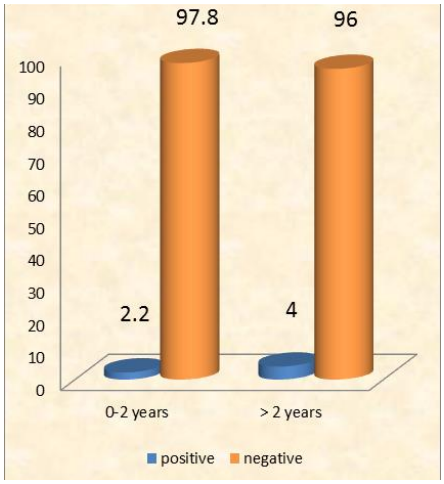


(c) Prevalence of fascioliasis in cattle by fecal examination in relation to Age

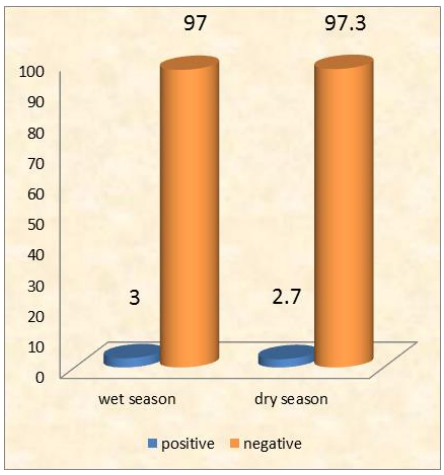
Figure 2



(a) Prevalence of fascioliasis in sheep by fecal examination in relation to Sex



(b) Prevalence of fascioliasis in sheep by fecal examination in relation to Age



(c) Prevalence of fascioliasis in sheep by fecal examination in relation to Season

Figure 3

Valley Governorate Table 4 and Fig. 4c. This result was contradicted with the acquired results of a study by [31] who noted that during their study among sheep in Behera governorate there were extremely significant difference between the infection rates in both regions. Regarding the impact of sex on the occurrence of sheep fascioliasis, it was noted that while sex did not significantly alter the incidence of fascioliasis, it was more common in females (2.9%) than in males (2.8%), shown on Table 4 and Fig. 3a. Similar findings were found by [22, 15] who showed no significant correlation between sex and fascioliasis although females had a slightly greater prevalence of fascioliasis than males. With regard to age on (Table 4 and Fig. 3b), the prevalence rate of Fasciolasis was greater in adult sheep (> 2 years) at 4% than in young sheep (0-2 years) at 2.2 %. The result in the current study was corroborated by [20] who demonstrated that adult sheep over 1.5 years had a greater prevalence rate than young ones.The analysis of the impact of season on the prevalence of fascioliasis revealed that seasonal factors did not significantly affect the disease, with the wet season having the highest infection rate 3% (Table 4 and Fig. 3c).

This finding contradicted the findings of [32] but was consistent with the findings of [20] who reported that the highest infection of Fasciola in sheep was recorded in January (11.25%). In general, open defecation and inadequate sanitation are associated with higher prevalence rates of human fascioliasis in endemic areas [4]. The prevalence of fascioliasis in humans was determined in this investigation by looking for *Fasciola* eggs in the stool samples that are listed on Table 2 Out of the 180 human stool samples that were analyzed, no fasciola egg was discovered. The current study's results were consistent with those of [33, 13, 15], who demonstrated that all human stool samples did not contained Fasciola. On the other hand, [34, 31, 35, 36, 37, 38] showed that according to stool examination, the prevalence of human fascioliasis was 0.30%, 5.38%, 0.62%, 0.19%, 1.8%, 0.3% respectively. In addition higher prevalence rate of human fascioliasis was recorded by [39, 40] as 24.4% and 21% respectively. In our study, no humans were infected with fascioliasis in New Valley Governorate, which may be due to the low incidence of fascioliasis in animals as a result of the effective elimination of canals and drains, as well as the decrease in the presence of snails as a result of the unsuitable climatic conditions of this governorate for the survival and distribution of snails, as the temperature is high, the humidity is low, and there is little rain.

CONCLUSION

The present study highlights the epidemiological examination of risk factors associated with the spread of fascioliasis in the animals and humans. The current study concluded that no cases of fascioliasis among humans have been reported in New Valley Governorate and that the incidence of fascioliasis is low in farm cattle and sheep. Also, our findings revealed that there no statistically significant correlation was found between the fascioliasis prevalence in animals and risk factors such as flock location, age, sex, or season.

Acknowledgments

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Competing Interests

Every author affirms that they have no competing interests.

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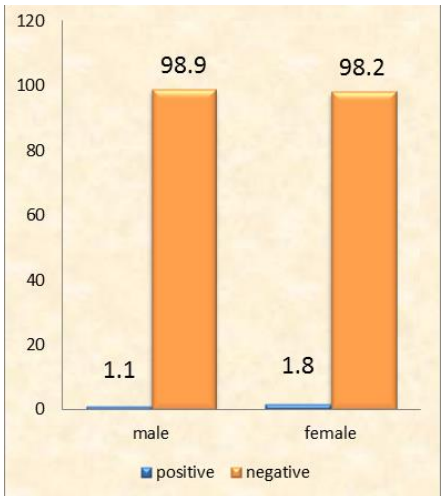
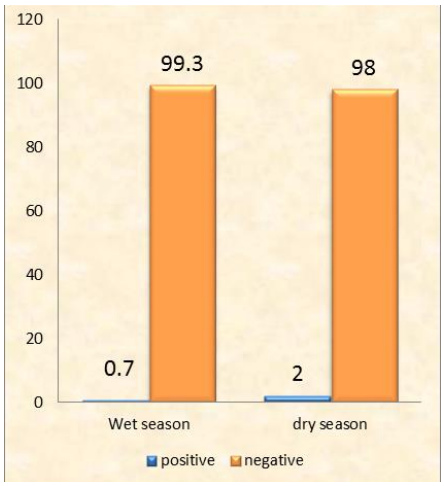
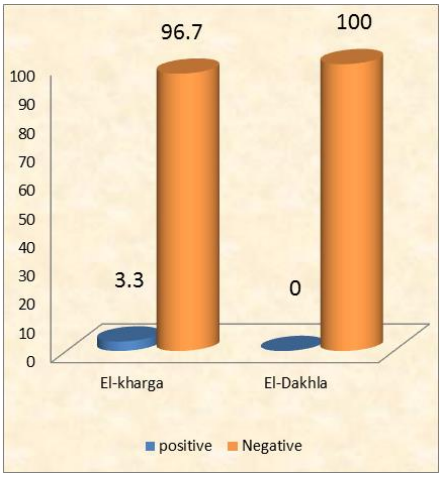


(a) Prevalence of fascioliasis in cattle by fecal examination in relation to Sex



(b) Prevalence of fascioliasis in cattle by fecal examination in relation to Season



(c) Prevalence of fascioliasis in sheep by fecal examination in relation to locality

Figure 4

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