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Prevalence of Tissue Parasites in Cattle and Buffaloes Slaughtered in El-Minia Governorate Abattoirs, Egypt

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Abstract:

The present study was conducted to determine the prevalence of meat borne parasitic infection in 170 animals (120 cattle and 50 buffaloes) slaughtered in El-Minia Governorate abattoirs, during the period from June 2017 to May 2018. The obtained data were statistically analyzed by SPSS software using ANOVA test at 95% confidence level ($P \leq 0.05$). The study revealed the overall prevalence in cattle was 35%, the incidence of *Fasciola* spp. (23.3%), *Cysticercus bovis* (6.6%), *Sarcocyst spp.* (0%) and hydatid cyst (5%). On the other hand, total prevalence in buffaloes was 52%, which include *Fasciola* spp., (30%), *C. bovis* (6%), *Sarcocyst spp*. (12%), and *Hydatid cyst* (4%). Older cattle and buffaloes were more susceptible than young ($P \leq 0.05$). The seasonal prevalence rate of infection with *Fasciola spp.* and hydatid cyst was highest in Autumn at ($P \leq 0.05$). The predilection site of *C. bovis* was significantly highest in the heart of cattle and buffaloes 75% and 100% respectively ($P \leq 0.05$). *Hydatid cyst* mainly present in the lung and liver of cattle and buffalo 6% and 2% respectively. While *Sarcocystis spp.* in buffaloes were significantly higher in esophagus 50%. It can be concluded that parasitic infection among beef production livestock has its hazardous zoonotic significance causing serious economic losses.

Keywords: Fasciola, Hydatid, Cysticercus, Sarcocystis, Cattle, Buffalo.

INTRODUCTION

Food animals have been used in Egypt as the main source of both milk and meat (Borai *et al.,* 2013). Parasitic infestation is of economic and public health importance (Iqbal *et al.,* 2014; Iqbal and Ashraf, 2017); the most obvious economic losses usually caused by the condemnation of the viscera and sometimes all carcasses and reduce the meat, wool and milk production (Hassanin *et al.,* 2013).

There are so many important zoonotic parasitic diseases such as Fascioliasis, *Cysticercosis bovis*, Sarcoystosis and hydatidosis, etc. (Schwabe, 1984). Fascioliasis cause great economic losses to the livestock industries due to actual liver condemnation at slaughter, and the disease is affecting the general immune status of the animal (Soliman, 2008).

Cysticerci cause important economic losses due to condemnation of meat (Cabaret *et al.,* 2002), and there are several recent studies done in Egypt (Adelaziz *et al.,* 2019). The Sarcocystis species are obligatory intracellular parasites (Dubey *et al.,* 1989). *Sarcosystis spp.* are a zoonotic parasitic protozoa of cattle worldwide (Fayer, 2004), through ingestion of raw or undercooked beef and pork containing viable sarcocystis of *S. hominis* and *S. suihominis*, respectively, resulted mostly asymptomatic human intestinal Sarcocystosis (Dyab *et al.,* 2003).

Hydatidosis is one of the major parasitic problems of domestic animals and zoonotic diseases that cause considerable economic losses and public health problems worldwide (Eckert and Deplazes, 2004; Abdel-Aziz and El-Meghanawy, 2016), they act like tumors that can disrupt the function of the organ where they are found, cause poor growth, reduced production of milk and meat, and rejection of organs at meat inspection (Dyab *et al.*, 2017). Therefore the present investigation was conducted to study the prevalence of meat borne parasitic infection among slaughtered bovine in El-Minia Governorate, in relation to age, seasonal variations and affected organs.

MATERIALS AND METHODS

Sample collection

Samples were collected from slaughterhouses in El-Minia Governorate (Egypt) at routine postmortem exam, during the period from June 2017 to May 2018, of 170 slaughtered animals (120 cattle and 50 buffaloes), muscle, liver, lung samples were preserved in 10% formalin transferred to laboratory of meat hygiene and parasitology department for further investigations for macroscopic and microscopic examination and stored at -20°C till use.

Identification of parasitic infestation

Hydatid cysts from lung, and liver were examined after removal from its adjacent tissues carefully for shape which was described by the naked eye **(**Hassanin *et al.,* 2013; Abdel-Aziz, and El-Meghanawy, 2016). For detection of *Cysticercus bovis*, examination of the surface and substance of the tongue, heart and skeletal muscles, then 3- incisions through examined organs for presence of cysticercus (Hassanin *et al.,* 2013). The viable cysticerci were carefully removed from the connective tissue capsule, compressed between two glass slides and examined (Gracey *et al.,* 1999). Detection of Sarcocyst by small pieces of fresh muscle were prepared by muscle squash method and examined microscopically for detection of sarcocysts (Abdel-Hafeez *et al.,* 2015; Abdel Aziz *et al.,* 2017).

Statistical analysis

The obtained data were subjected to analysis of variance (ANOVA). Duncan's multiple range test was used to determine differences among means and difference was considered 95% significant at (P value ≤ 0.05). (Fleiss, 1981).

RESULTS

Results of the present cross-sectional prospective study in (table 1), and (figure 1a-g) revealed that, the overall prevalence of parasitic infestation of tissue parasites at local abattoir of El Minia governorate was 35% in examined cattle carcass, and 52% in buffaloes carcass, and several parasites were obtained such as; *Fasciola spp.*, with the highest incidence 30% in buffaloes and 23.3% in cattle carcass than the infestation with *Cysticercus bovis* with incidence of 6% and 6.6% in buffaloes and cattle respectively. *Sarcocystis spp*. was 12% in examined buffaloes but it was absent in cattle carcass, the lowest incidence value was Hydatid cyst with 4% in buffaloes and 5% in cattle at 95% significance at (P value of 0.009), and confidence interval (CI 0.012-0.002).

Regarding the localisation of parasites in different examined tissues, *Fasciola spp.* was mainly found in liver and nothing else. *Cysticercus bovis* was mostly concentrated in cardiac muscle with an incidence of 66.6% in buffaloes, and 62.5% in cattle. *Hydatid cyst* was most abundant in liver with an incidence of 66.6% in cattle and 100% in buffaloes. *Sarcocystis spp.* was absent in cattle, but in buffaloes, it was highly concentrated in cardiac muscle at 95% significance (P. value 0.032), and confidence interval (CI 0.038-0.017).

For age groups in relation to parasitic infestation, younger animals were highly infested than old animals in all recovered parasite species in both cattle, and buffaloes except hydatid cyst; *Fasciola spp.,* was significantly higher in older animals than young as 45% in buffaloes and 50% in cattle; *Cysticercus bovis* was significantly higher in young animals than older as 33.3% in buffaloes and 15% in cattle, *Sarcocystis spp.,* was significantly higher in young animals than older as 33.3% in buffaloes, for hydatid cyst; it was significantly higher in older animals than young as 10% in buffaloes and cattle each at 95% significance (P value of 0.016), and confidence interval (CI 0.049-0.011).

Finally for seasonal distribution of the recovered parasites, the highest incidence for *Fasciola spp* was in Spring 30% for buffaloes, and Autumn 40% for cattle, but for *Cysticercus bovis*, the highest incidence was 16.6% in buffaloes and 13.3% in cattle during Summer. The highest incidence of hydatid cyst was in Autumn 15.3% for buffaloes, and 12% for cattle. *Sarcocystis spp.* was only found in buffaloes and highest incidence was in Autumn 15.3% at 95% significance (P value 0.023), and confidence interval (CI 0.037-0.091).

Table 1. Prevalence and incidence of different tissue parasites of cattle and buffaloes slaughtered at EL Minia governorate.

Parameters			Total examined cattle carcasses (120)		Total examined buffalo carcasses (50)		S.E	(P. value ≤0.05)	C.I. (95 % significance)
			No. inf.	%	No. inf.	%			
Parasites	*Fasciola spp.*		28	23.3	15	30	0.034	0.009*	0.012-0.002
	C. bovis		8	6.6	3	6			
	Sarcocyst		0	0	6	12			
	Hydatid cyst		6	5	2	4			
	Total		42	**35**	26	**52**			
	Fasciola spp.	Liver	28	23.3	15/15	100	0.034	0.032*	0.038-0.017
	C. bovis	Cardiac	5/8	62.5	2/3	66.6			
		Tongue	1/8	12.5	0	0			
		Masseter	1/8	12.5	1/3	33.3			
		Shoulder	1/8	12.5	0	0			

Organ		Esophagus	0	0	0	0			
	Hydatid cyst	Lungs	2/6	33.3	0	0			
		Liver	4/6	66.6	2/2	100			
	Sarcocyst spp	Heart	0	0	2/6	33.3			
		Tongue	0	0	1/6	16.7			
		Masseter	0	0	0	0			
		Shoulder	0	0	0	0			
		Esophagus	0	0	3/6	50			
Age	*Fasciola spp.*	Young < 2 y.	8/80	10	6/30	20	0.056	0.016*	0.049-0.011
		Old > 2 y.	20/40	50	9/20	45			
	C. bovis	Young < 2 y.	6/80	15	1/30	33.3			
		Old > 2 y.	2/40	2.5	2/20	10			
	Hydatid cyst	Young < 2 y.	2/80	2.5	0/30	0			
		Old > 2 y.	4/40	10	2/20	10			
	Sarcocyst spp	Young < 2 y.	0/80	0	1/30	33.3			
		Old > 2 y.	0/40	0	5/20	25			
Season	*Fasciola spp.*	Summer	0/30	10	1/12	8	0.002	0.023*	0.037-0.091
		Autumn	10/25	40	8/13	61.5			
		Winter	7/35	20	3/15	20			
		Spring	8/30	26.6	3/10	30			
	C. bovis	Summer	4/30	13.3	2/12	16.6			
		Autumn	1/25	4	0/13	0			
		Winter	1/35	2.8	0/15	0			
		Spring	2/30	6.6	1/10	10			
	Hydatid cyst	Summer	1/30	3.33	0/12	0			
		Autumn	3/25	12	2/13	15.3			
		Winter	2/35	5.7	0/15	0			
		Spring	0/30	0	0/10	0			
	Sarcocyst spp	Summer	0/30	0	1/12	8.3			
		Autumn	0/25	0	2/13	15.3			
		Winter	0/35	0	1/15	6.6			
		Spring	0/30	0	2/10	20			

*significant at 95% confidence level (p value ≤0.05), S.E: standard error; C.I.: confidence interval

		(a) Macroscopic examination of *C.bovis* in the heart muscle.X5
		(b) Macroscopic examination of *C.bovis* in tongue muscle of cattle and buffalo.X5

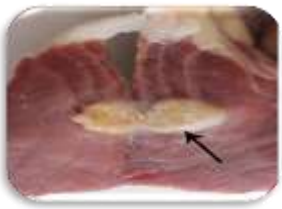
<table>
<tr><td>  </td><td>  </td><td>(c) C. bovis in masseter muscle of cattle. X5</td></tr>
<tr><td>  </td><td colspan="2">(d) Microscopic examination of C. bovis dissected from muscle tissues and stained with acetic acid alum carmine stain X10.</td></tr>
<tr><td>  </td><td>  </td><td>(e) Macroscopic examination of Fasciola sp. in the liver of cattle. X5.</td></tr>
<tr><td>  </td><td>  </td><td>(f) Macroscopic examination of Sarcocystis sp. in Oesophagus x20 (left) heart (right) , of buffaloes 5x.</td></tr>
<tr><td>  </td><td>  </td><td>(g) Macroscopic examination of Hydatid cyst in the liver of buffaloes X5 (left), in lungs (right).</td></tr>
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Fig. 1 (a-g). Different gross infestation of tissue parasites.

DISCUSSION

In developing countries, abattoirs play a major role in providing and serving as a source of information and reference center for disease prevalence (Gracey *et al.,* 1999; Muhammad *et al.,* 2015), and there are scarce data about the parasitic infestation of public health significance in El Minia governorate especially from slaughterhouses. There are several previous studies in different governorates in Egypt conducted in accordance with this study such as El-Shazly et al. (2005) in Dakahlia Governorate, Egypt, with an overall 12.31% prevalence of *Fasciola spp*., which was lower than results of present study (23.3%), in Bangladesh; Kabir et al. (2010) revealed 27.26% prevalence of *Fasciola spp.* in cattle. Ahmadi and Meshkehkar (2009) showed a higher incidence rate in Iran than the present study, and this may be due to the low awareness of farmers with prevention and control methods of these parasites, the bad habits of animal's defecation in water canals, irrigation of plants and roughages that ingested

by animals, infected water contaminated with the encysted metacercaria. In the present study we reported fascioliasis incriminated in 23-30% in total liver condemnation in cattle and buffaloes at abattoirs of El-Minia governorate, this was in agreement with Maqbool et al. (2002) in Pakistan, who reported 25.6% of slaughtered cattle infected with *Fasciola spp.,* but it was higher than reported by Kabir et al. (2010) in Bangladesh who recorded 10% prevalence in buffaloes. Furthermore, this difference might be attributed to the favorable ecological factors for the intermediate host and the parasite (Chanie and Begashaw, 2012).

According to this study, the infection with bovine fascioliasis was higher among aged slaughtered cattle and buffaloes above 2 years than those below 2 years. Kabir et al. (2010) found the prevalence of fascioliasis in cattle was higher in aged (30.37%) than young (21.71%) buffaloes. Kuchai et al. (2011) noticed higher infection rate in young cattle (0-2 years) (40.02%) than in adult ones (28.04%) (3-8 years). In relation to seasonal variation, the highest prevalence rate of *Fasciola spp.* in cattle was found during autumn which begin to decline in spring, winter and the lowest during summer. Also in buffaloes the highest prevalence rate of *Fasciola spp.* was found during autumn which begin to decline in spring, winter and the lowest during summer. This result agrees with Maqbool et al. (2002) who reported the highest overall prevalence during autumn (47.26%) followed by spring (29.1%) and winter (20.8%). Pfukenyi and Mukaratirwa (2004) found that the pattern of distribution of *Fascioliasis* was significantly higher in cattle originating from areas of high rainfall than those of relatively low rainfall, and those slaughtered during the wet season than those slaughtered during the dry season.

The occurrence of *Cysticercus bovis* reported in cattle agrees with previous reports by Elkhtam et al. (2016) in Menofia Governorate (Egypt), who recorded 6.09% pevalence. Our finding was higher than mentioned by Hassanin et al. (2013) in Qalubia Governorate, who reported 4.23% prevalence. The obtained results are lower than those reported by Abdel-Hafeez et al. (2015) in El-Minia (Egypt), who found 20% prevalence of *C. bovis*. The occurrence of *C. bovis* among 50 buffaloes was 6% that was lower than those reported by Fahmy et al. (2015) in Kalioubia (Egypt), who found 9.07% prevalence of the parasite. In relation to age, the infection with *C. bovis* was higher among young animals below 2 years. It did not agree with that reported by Hassanin et al. (2013) in Benha (Egypt), who found that the old animals (8.12%) were more infested than young (2.25%), age correlation may be due to cumulative exposure of animals younger 2 years to the different sources of infection.

Concerning seasonal dynamics of *Cysticercus bovis* recorded among slaughtered cattle, the highest prevalence was found during summer which begins to decline in spring and autumn and the lowest during winter, in buffaloes, the highest prevalence in summer followed by spring (10%). No infection was detected in autumn and winter, these results agree with Fahmi (2014) who found the highest infection rate (19.84%) in summer, while the lowest rate (10.21%) in winter. While Abu-Elwafa and Al-Araby (2008) in Dakahlia (Egypt), who reported the highest prevalence in winter (21.7%), followed by spring (18.4%) and summer (15.65%) and the lowest during autumn season (12.45%). *C. bovis* predilection sites were mostly in cardiac muscles of cattle and buffaloes, followed by masseter muscle and tongue, these results agree with Basem et al. (2009) in Assiut (Egypt), who reported that predilection seats in cattle were heart (1.4%), tongue (0.4%) and gluteal muscle (0.2%) while in buffaloes, the heart was the predilection seat with a percentage of 0.4%. While Rabi and Jegede (2010) in Nigeria, reported that cysts were found in the tongue, diaphragm, heart, masseter and liver in a percentage of 13%, 7.6%, 7.3%, 4.1% and 0.3%, respectively. The variation in the predilection seats may be attributed to the different management practices of the animals in such areas like using the cattle

and buffaloes in the daily agricultural activities which in turn influence the distribution of the cysticercus. It is important that whatever the priority of the predilection seats we should examine the carcasses in details and not depends only on the inspection of the heart, tongue and the masseters (Basem *et al.,* 2009).

In this study the occurrence of hydatid cyst was low in both cattle and buffaloes; this agreed with Omer et al. (2010) in Sudan and Salem et al. (2011) in Mauritania. While the obtained results are higher than Toulah et al. (2012) in Saudi Arabia, who determined 3.63% and Fahmi (2014) in Cairo (Egypt), who showed 0.67% prevalence. These results were lower than that obtained by Dawit et al. (2013) in Ethiopia, who recorded (28.09%) occurence. In the present study, for buffaloes, the obtained results agree with Pednekar et al. (2009) in India, who reported 3.81% prevalence, while lower than (10.24%) mentioned by Beyhan and Umur (2011) in Turkey. Incidence was significantly higher in adult cattle and buffaloes above 2 years than younger animals. This agreed with Kabir et al. (2010) in Bangladesh and Ismail et al. (2016) in Sudan. While Yimer et al. (2016) in Ethiopia mentioned that there was no significant association between hydatidosis infection and age of the animals. The highest seasonal incidence rate of hydatid cyst in cattle and buffaloes was noted in autumn season, the recorded results agree with Kadir and Rasheed (2008) who found that hydatid cyst in cattle were highest in autumn (8.33%). Berhe (2009) recorded that the monthly prevalence of hydatidosis was highest (36.44%) in July and lowest (25.11%) in April. The distribution of hydatid cyst was restricted in liver and lungs only in cattle and buffaloes, as mentioned by Fahmi (2014) in Cairo (Egypt), and Ibrahim et al. (2011). Beyhan and Umur (2011) reported that the prevalence rate was 29.4% in liver, 47.06% in lungs and 23.53% in both liver and lungs. Ismail et al. (2016) reported that the lung was the most affected organ (84.6%), followed by the liver (15.4%). Variation in infection rates with this larval stage may be attributed to the endemic infection of stray dogs by adult cestodes which infect the pasture area leading to infection of animals during grazing process. The occurrence of *Sarcocystis spp*. sarcocyst reported in buffaloes was 12% and was not recorded in cattle, these results agree with Latif et al. (1999) in Iraq, who found that *Sarcocyst* among slaughtered buffaloes was 15.6% and 0.2% in cattle. While the recorded results are lower than that obtained by El-Dakhly et al. (2011) in Beni-suef (Egypt), who recorded 78.9% in buffaloes, Metwally et al. (2014) in Assiut, who found 27.7% in buffaloes, and with Abdel-Aziz et al. (2017), who detected the incidence rate of *Sarcocystis* spp. from Egyptian Water Buffaloes (*Bubalus bubalis*) in Sohag governorate, Egypt as follows, *S. buffalonis* 33.8%, *S. levinei* 14.48% and *S. fusiformis* 0.41% recognized by microscopic examination and confirmed by indirect immunofluorescence antibody technique (IFAT).

In the present study the infection rate is much higher in adult buffaloes than young animals, the obtained results agree with Huong (1999) in Vietnam, El-Dakhly et al. (2011) in Beni-Suef (Egypt), Atif (2012) in Qena (Egypt). Concerning seasonal dynamics of Sarcocyst recorded among buffaloes, the significant highest incidence was found during spring followed by autumn and the lowest during summer and winter. Atif (2012) in Qena (Egypt), recorded no significant difference between incidence of infestation all over the year, approximately all seasons equal in the incidence of infection with *Sarcocystis cysts* in buffaloes. The distribution of Sarcocyst in different organs of the examined buffaloes, were highest in esophagus then heart and the lowest in tongue, as shown by Huong (1999) in Vietnam, El-Dakhly et al. (2011) Beni-Suef (Egypt). Oryan et al. (2010) detected that the highest prevalence rate of microscopic cysts was found in masseter muscle (57.1%) followed by tongue, diaphragm, esophagus, heart, and finally, thigh muscles (30.0%).

CONCLUSION

The present work illustrated the different fauna of parasitic infestation in slaughtered cattle and buffaloes in El-Minia Governorate (Egypt), which may be of utmost benefit to future researchers in El-Minia, who are interested in the prevalence of particular parasite which may be more prevalent in one district than the other.

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CONFLICT OF INTEREST

All the authors have declared that no conflict of interest exists.

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