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Prevalence of some zoonotic parasitic affections in sheep carcasses in a local abattoir in Cairo, Egypt

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ABSTRACT

Meat-borne zoonotic parasites raised from consumption of undercooked and/or crossly contaminated meats can infect human by direct and/or indirect ways causing many mild to serious diseases; so, in the present study, some meat-borne transmissible parasites were investigated in 5239 freshly dressed sheep carcasses in local Egyptian abattoir located at Cairo Governorate along the period of 2017-2018. Results of Post-Mortem inspection revealed the detection of *Fasciola*, *Cysticercus* and Hydatid cyst in 3.47, 1.06 and 1.83% of the total examined carcasses with total economic losses of 9306.78 L. E, 2892 L.E and 4380 LE, respectively. It is worthily noted that fascioliasis recorded the highest incidence of infection, followed by hydatidosis and cysticercosis in the examined carcasses, respectively. *Cysticercus ovis* and *C. tenuicollis* were detected in 32.14% and 67.85% with total economic losses of 714 L.E and 2178 L.E because of infected heart and liver condemnation during 2017 and 2018, respectively. Furthermore, hydatid cyst was detected in 0.47% and 1.35% of the examined lung and liver samples with total economic losses of 1188 L.E and 3192 L.E because of infected lung and liver condemnation during 2017 and 2018, respectively. Referring to the obtained results, it was obvious that parasitic infection of sheep meat and offal constrains a lot of economic losses, threatens the meat production industry and throws lights over the health importance of veterinary inspection great role in protecting human-being from be infested with zoonotic meat-borne parasites. So, magnification and great support should be given to training veterinary inspectors in slaughterhouses in Egypt.

1. INTRODUCTION

Parasitic infection of any food animals causes direct or indirect losses related to retardation of growth, body weight, immune suppression with increased infection susceptibility leading to financial losses because of partial or total condemnation of carcasses after slaughtering (Olsen *et al.*, 2015).

Zoonotic parasites can be classified into four categories, direct zoonotic parasites which infect human directly from animals and include *Entamoeba histolytica*, *Cryptosporidium parvum*, *Toxoplasma gondii* and *Trichinella spiralis*. Meta-zoonotic parasites, which include *Fasciola spp*. and *Schistosoma spp*., can infect humans from invertebrate intermediate hosts. Cyclo-zoonotic parasites have vertebrate intermediate hosts and include *Echinococcus granulosus*, *Taenia saginata* and *Taenia solium*, finally saprozoonotic parasites can infect human from soil or water and include *Ancylostoma* caninum and *Strongyloides stercoralis* (Youssef and Shoji, 2014).

Several recorded reports revealed that zoonotic transmissible foodborne parasites have been emerged as significant causes of human illness and ranged from mild discomfort to debilitation and possibly death; from which, hydatidosis (human echinococcosis) and cysticercosis (human taeniasis) are known to be one of the most important zoonotic parasitic diseases, also constitute one of the common problems of medical and veterinary public health importance (Hassanin *et al.*, 2013). In addition, fascioliasis is known globally to be an important parasitic disease of ruminants caused by hepatic fasciola fluke species, and it is one of the most neglected tropical zoonotic diseases (WHO, 2009).

Human infection occurs mainly because of consumption of undercooked infected and/or contaminated meats. Symptoms appear within 15 days after undercooked meat ingestion accompanied by mild gastroenteritis, watery diarrhea, abdominal pain, nausea, and vomiting; while may be more severe nervous and skeletal affections (Ortega and Cama, 2018).

In Egypt, detection of parasitic infection in freshly slaughtered sheep carcasses were recorded. El-Meleh (2019)

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recorded detection of hydatidosis, fascioliasis and cysticercosis in 0.44%, 0.54% and 0.54% of the examined sheep carcasses in Menoufiya Governorate during 2017. Moreover, Hassanin *et al.* (2013) detected hydatidosis in 7.57% of the examined sheep carcasses during the period of 2012-2013 in Qalubiya Governorate, which were recorded in lung and liver with the incidence of 57.1 % and 71.4%, respectively.

So, regular investigation of the incidence of parasitic infection in food animals, especially zoonotic one, is of significance; therefore, the present study aimed to detect fascioliasis, hydatidosis and cysticercosis in fresh sheep carcasses slaughtered in local abattoir in Cairo governorate during the period of 2017-2018.

2. MATERIAL AND METHODS

2.1. Area of study:

the study was carried out in a public abattoir located in Cairo Governorate, Egypt.

2.2. Study design:

the study was conducted through active survey by daily routine work in the slaughterhouse along the period from 2017 to 2018.

2.3. Animals included in the study:

5239 sheep carcasses were examined in the scope of the current study during the full length of the study period.

2.4. Procedures applied for detection of parasitic lesions in slaughtered animals:

Routine meat inspection of the slaughtered animal was carried out by a well-trained veterinarian meat inspector which assigned by the Egyptian Veterinary Organization. The routine PM of apparently healthy animals was carried out according to the method recommended by FSIS/USDA (2019) including head region, different lymph nodes, pluck, and different internal organs. In details, head region was examined for the healthy status of lymph nodes, masseter muscles, and tongue without making exploratory incisions; pluck (esophagus, lung and heart) were examined apparently health status by naked eyes, palpation of lung tissue, and deep incisions in cardia muscle; liver was examined by visual inspection followed by palpation then finally by diagonal longitudinal incision or more through the bile ducts if necessary; finally, diaphragm examination has been performing after removal of the peritoneum, it is examined as additional inspection in case of cyesticercus by making multiple thin cross sections in its muscles. Moreover, prefemoral, prescapular, renal and mediastinal lymph nodes were incised and explored for its normal texture and color.

2.5. Prevalence calculation:

Prevalence calculation was conducted according to Thrusfield (2007) as follows:

2.5.1 The prevalence of the parasitic diseases:

The prevalence of different parasites among examined animals was estimated by dividing the number of infected animals for each disease (animals with condemned organs or carcasses) by the total number of slaughtered animals then multiplies by 100.

2.5.2 Estimation of economic loss due to parasitic infection:

It was calculated by weighing of condemned carcasses and organs by digital balance and multiplies it by current price in market according to Table (1).

Table 1 Price of meat and offal/kg during the investigation period.

	2017 price (LE) / Kg	2018 price (LE) / Kg
Sheep meat and heart	85	110
Offal (Liver, lung, tongue, rumen, pancreas, spleen, intestine)	60	90

N.B. the price of meat and offal/kg according to the Egyptian General Authority for Veterinary Services

Economic losses = weight of condemned organ × current price per Egyptian pound.

3. RESULTS

Referring to the obtained results in Table (2), out of 2729 and 2510 examined sheep carcasses, 5.86 % and 4.74% of the examined carcasses were recorded to have different parasitic infections in 2017 and 2018, respectively to reveal that 2017 reports recorded higher prevalence of parasitic infections than 2018 recorded cases.

Table 2 Prevalence of parasitic infection in the examined sheep carcasses.

Year	Number of the examined carcasses	Positive affected carcasses	
		No.	%
2017	2729	160	5.86
2018	2510	119	4.74
Total	5239	279	5.32

Referring to the incidence of fasciola infection in the examined sheep carcasses as recorded in Table (3) and Fig. (1), 2017 recorded higher infection rates than 2018 with incidences of 4.6 % and 2.2 % of the examined sheep carcasses, respectively.

Table 3 Prevalence of Fascioliasis in the examined sheep carcasses

Year	Positive affected carcasses		
	No_1	No_2.	%
2017	2729	126	4.6
2018	2510	56	2.2
Total	5239	182	3.47

No_1: Number of the examined carcasses

No_2: Number of the positive fasciola affected carcasses.

%: prevalence of fasciola.

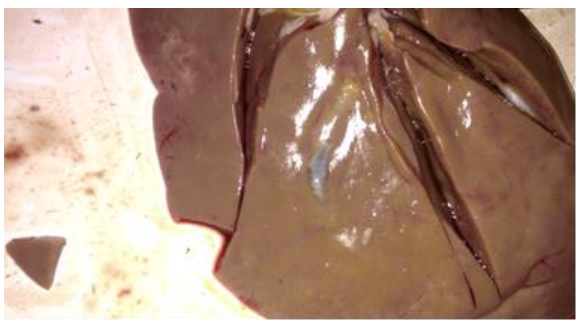

Figure 1 Sheep liver show Fasciola migratory tracts in liver tissues

Annual financial assessment of condemned liver due to fascioliasis in the examined carcasses was recorded in Table (4), 5778.78 and 3528 L.E. were the values of economic loss because of affected liver condemnation during 2017 and

2018, respectively, with total losses of 9306.78 Egyptian pounds.

Table 4 The annual financial assessment of condemned liver due to fascioliasis in the examined sheep carcasses.

Year	Positive affected carcasses	Condemned Liver (Kg)	Value in EGP (LE)
2017	126	96.313	5778.78
2018	56	39.200	3528
Total	182	235.513	9306.78

Moreover, cysticercosis, as recorded in Table (5) and Figs. (2 and 3), was detected in 0.8% and 1.35% of the examined carcasses during 2017 and 2018, respectively. In addition, *C. ovis* and *C. tenuicollis* were detected in a total of 18 (32.14%) and 38 (67.85%) examined heart and liver samples during the period of investigation, respectively, which revealed the higher liver cysticercosis than heart affection during the study as recorded in Table (6).

Table 5 Prevalence of cysticercosis in the examined sheep carcasses

Year	No. of examined carcasses	Positive affected carcasses	%
2017	2729	22	0.80
2018	2510	34	1.35
Total	5239	56	1.06

Table 6 Prevalence of C. ovis and C. tenuicollis in the infected sheep carcasses.

Year	Total No. of positive affected carcasses	*C. ovis*		*C. tenuicollis*	
		+ve	%	+ve	%
2017	22	5	22.7	17	77.2
2018	34	13	38.2	21	61.7
Total	56	18	32.14	38	67.85

Figure 2 sheep liver affected with C. tenucollis cyst

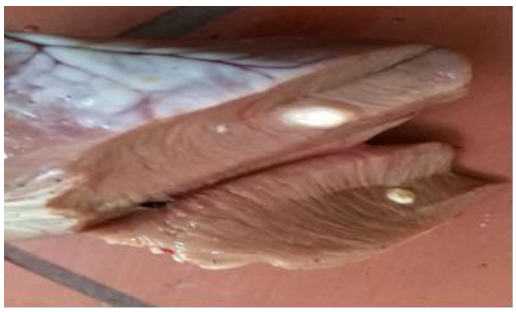

Figure 3 Sheep heart affected with C. ovis cyst

Referring to the condemned affected parts with cysticercosis as were recorded in Table (7); 714 and 2178 L.E. were the total value of economic losses after the affected hearts and liver condemnation because of *C. ovis* and *C. tenuicollis* infection during the period of investigation, respectively.

Table 7 The annual financial assessment for cysticercosis in the affected sheep carcasses.

Year	*C. ovis* positive affected carcasses	Heart (Kg)	Liver (Kg)	EGP (LE)
2017	5	1.8	0	153.0
2018	13	5.1	0	561.0
Total	18	6.9	0	714.0
Year	*C. tenucollis* positive affected carcasses	Heart (Kg)	Liver (Kg)	EGP (LE)
2017	17	0	12	720
2018	21	0	16.2	1458
Total	38	0	28.2	2178
Total economic losses	56	6.9	28.2	2892

Table (8) revealed the prevalence of hydatidosis in the examined lung and liver samples of the examined sheep carcasses. Liver samples appeared to be the prominent affected organ with the incidence of 1.35% along the investigation period. On the other hand, 0.47% of the examined lung samples appeared to be affected with hydatidosis. Furthermore, Table (9) showed that the annual economic losses for total or partial condemnation of the affected parts were 978 and 3402 L.E. due to hydatidosis during 2017 and 2018, respectively.

Table 8 Prevalence of hydatidosis in the examined sheep carcasses' lung and liver.

year	Total No. of examined carcasses	Lung No.	%	Liver No.	%
2017	2729	5	0.18	22	0.81
2018	2510	20	0.79	49	1.95
Total	5239	25	0.47	71	1.35
Total *	5239	96	1.83		

Table 9 The annual financial assessment for partial condemnation due to hydatidosis.

Year	Lung			Liver			Total EGP (LE)
	No. of infested organs	Weight (Kg)	EGP (LE)	No. of infected organs	Weight (Kg)	EGP (LE)	
2017	5	2.100	126	22	14.2	852	978
2018	20	11.8	1062	49	26.0	2340	3402
Total	25	13.9	1188	71	40.2	3192	4380

4. DISCUSSION

Fungi are one of the most common cause of diarrhea in sheep and goats; they may go unnoticed, causing economic losses and perhaps having zoonotic potential. Despite the Parasitic affections constitute a large group of infectious diseases with varying host ranges and patterns of transmission. Their distribution, prevalence and transmission patterns are affected by the influence of both human and environmental factors. The economic and public health impact of such zoonosis warrants appropriate surveillance to obtain enough information that will provide inputs in the design and implementation of control strategies. A need therefore arises to regularly re-evaluate the current status of zoonotic diseases, particularly in view of new data available as a result of surveillance activities and the application of new technologies (Komba, 2017).

In the current study, a total number of 5239 sheep carcasses were examined during the period of 2017 and 2018 for the presence of parasitic infection in local abattoir in Cairo governorate. The overall prevalence of infested slaughtered animals in this study was 5.32% (Table, 2). This record was higher than other studies record in Egypt as recorded by El-Meleh (2019) (1.51%). Among the detected parasitic infection during this study, Fascioliasis was the most prevalent followed by Hydatidosis, while the lowest was for Cysticercosis. This differs from the recorded prevalence in other studies in Egypt may be referred to differences in the period, locality and the rearing environment of the examined animals (Tas *et al.,* 2018).

Fascioliasis is a parasitic affection threatening domestic ruminants and public health (Abraham and Jude, 2014). The results given in Table (3) disagreed with those obtained by El-Shazly *et al.* (2005) (20.56%), Elmonir *et al.* (2017) (0.41%), and El-Meleh (2019) who recorded lower incidence during 2017 and 2018 to be 0.54% and 0.22% of the examined sheep carcasses, respectively. While Jean-Richard *et al.* (2014) recorded detection of fasciola in 23% of the examined sheep carcasses in South-Eastern Lake, Chad, and Amer *et al.* (2016) (14.7%). This may be explained by difference in the total number of slaughtered animals in each study.

Annual financial assessment of condemned liver due to fasciolosis in the examined carcasses was recorded in Table (4). Total losses were summed to be 9306.78 LE along the investigation period, where 2017 recorded higher losses (5778.78 L.E.) than 2018 (3528 L.E.).

The obtained results in Tables (5 and 6) revealed that the incidence of cysticercosis in the examined carcasses was more prevalent in 2018 (1.35%) than 2017 (0.8%), where *C. tenuicollis* (67.85%) was more prevalent than *C. ovis* (32.14%) in the examined liver and heart samples, respectively. In addition, annual financial assessment of condemned affected heart and liver samples was evaluated as 714 and 2178 L.E., respectively; where 2018 recorded higher losses than 2017 (Table, 7).

This result differed from those recorded by Oryan *et al.* (2012) who mentioned that only one *C. ovis* cyst was detected in the examined sheep carcasses. Gessese *et al.* (2015) recorded lower incidence of *C. ovis* detection in sheep carcasses (8.43%), Hashemnia *et al.,* (2016) (1.27%), and El-Meleh (2019) (0.54 and 0.05% during 2017 and 2018, respectively).

The results of the incidence of hydatidosis in the examined carcasses Table (8) revealed that the total hydatidosis was more observed in liver (1.35%) than the examined lung samples (0.47%). Results disagreed with those recorded by Haridy *et al.* (2006) (0.3%), Ernest *et al.* (2009) (63.8%), and Abdulhameed *et al.* (2018) who recorded that more than half of the examined sheep's liver and lung offal (54.3%) harbored cystic echinococcosis, while agreed with Hassanin *et al.* (2013) who recorded higher incidence in the examined sheep carcass samples than the other examined species.

In addition, annual financial assessment of condemned affected lung and liver samples was evaluated as 978 L.E and 3402 L.E. in 2017 and 2018, respectively; where 2018 recorded higher losses than 2017 (Table, 9).

Variation between the current data and the previous recorded results can be attributed to variation in season of collection, age of the animal, rearing environment, and type of feeding.

5. CONCLUSION

Conclusively, the detected parasitic affections and demonstrated economic losses throw lights over the importance of strict well qualified meat inspection in slaughterhouses to avoid the serious zoonotic meat-borne parasites to the consumers. Additionally, it recommended authorities of the scope to prepare qualified veterinary inspectors to safeguard the public health of the human-being. Furthermore, affected parts must be condemned in strictly isolated closed area with strict hygienic withdrawal procedures of the condemned parts.

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