



# Meat Condemnations and Economic Importance in the Northern and Southern Egyptian Abattoirs

EMAN SAYED MOHAMMED<sup>1</sup>, MOHAMED ABDELFATTAH MAKY<sup>2\*</sup>

<sup>1</sup>Parasitology Department, Faculty of Veterinary Medicine, South Valley University, 83522, Qena, Egypt; <sup>2</sup>Food Hygiene and Control Department, Faculty of Veterinary Medicine, South Valley University, 83522, Qena, Egypt.

**Abstract** | Food animals are important sources of protein of high quality and essential nutrients. However, a large number of carcasses and offals are condemned in slaughterhouse as a result of various diseases. An abattoir study was performed at two uninvestigated regions in Egypt for two years (2017-2018) in order to identify the chief causes of meat condemnation and the subsequent economic loss. A retrospective survey was carried out on the North and South of Egypt, The northern region was represented by Alexandria abattoir and owing to the full lack of information in the Southern region it was represented by two abattoirs; Qena and Aswan abattoirs. Ante-mortem and post-mortem examinations were carried out and the findings of inspections were recorded and analyzed. Moreover, the financial loss was determined. Out of 167812 animals were slaughtered in the three abattoirs, 68 (0.04%) animals were totally condemned. In addition to, 3198 (1.9%) lungs, 1447 (0.86%) hearts, 4290 (2.55%) livers, 535 (0.31%) heads, 291 (0.17%) kidneys and 765 (0.45%) spleens were condemned. This work revealed that the economic loss due to meat condemnation in three slaughterhouses was 4529010 Egyptian pound (383063 USD). The main causes of meat condemnation were tuberculosis, icterus, parasitic cyst, pneumonia, hydronephrosis and fascioliasis. The incidence of meat rejection and financial loss in the Aswan slaughterhouse was significantly high. The revenue damage caused by meat condemnations was high in comparison to the amount of local income. The findings of the current work highlighted the necessity for the development of an effective control program for the causes of meat condemnation in Egypt.

**Keywords** | Abattoir, Economic loss, Inspection, Meat condemnations

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\***Correspondence** | Mohamed Abdelfattah Maky, Department of Food Hygiene and Control, Faculty of Veterinary Medicine, South Valley University, 83522, Qena, Egypt; **Email:** mohamedmekky@vet.svu.edu.eg

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## INTRODUCTION

The human community is rapidly multiplying in various countries all over the world. However, the rate of multiplication is above the multiplication rate of food animals, particularly in developing areas (Steinfeld *et al.*, 2006). The produced meat from food animals is the major source of high-quality protein and precious food throughout the world. The chief source of red meat is cattle, camel, sheep and goat. However, certain affections caused by parasites, bacteria and viruses restrict the production of meat (Bin Kabir *et al.*, 2010; Fekadu *et al.*, 2012). These illnesses resulting in huge losses ranging from the morality

of livestock, decrease the weight and condemnation of meat at slaughterhouses.

Parasitic diseases have a critical effect on human and livestock in developing nations (Abdulhameed *et al.*, 2018). Cysticercosis, dicrocoeliasis, hydatidosis and fascioliasis are major parasitic diseases that have a considerable effect on human health and the safety of meat (Aminzare *et al.*, 2018; Pezeshki *et al.*, 2018). Bovine Cysticercosis can be transmitted to man through the ingestion of infected meat with *Cysticercus bovis*, while animals are responsible for completing the life cycle in case of hydatidosis and fascioliasis (Youssef and Uga, 2014). Moreover, bovine

cysticercosis is responsible for the condemnation of the carcass in heavy infected cases. In addition, food animals are able to harbor large number of pathogenic bacteria; these bacteria can be transferred to human during preparation, handling and consumption of infected meat as well as condemnation of meat at slaughterhouse (Fromsa and Jobre, 2012).

Therefore, meat inspection is a useful tool in the detection of animal diseases and in preventing the spread of diseased meat that could harm consumers. Data generated by the inspection of live and slaughtered food animals are valuable epidemiological information for disease assessment and determining the efficacy of the preventive and therapeutic intervention.

Egypt has a great animal population in Africa with approximately 9.5 million heads and 484 abattoirs as reported by the ministry of agriculture and land reclamation in 2019. Slaughterhouses played a crucial role in distinguishing the meat with different affections and thus preventing their marketing to consumers (Alton et al., 2010). There are inadequate data about various illness-causing meat condemnations and their financial loss in Egyptian abattoirs, particularly in southern Egypt. Hence, the aims of this work were to identify the causes of meat condemnations in three Egyptian abattoirs in 2017 and 2018, one abattoir in northern Egypt (Alexandria), while two abattoirs (Qena and Aswan) represented Southern Egypt. In addition to the financial loss due to meat condemnation was estimated. The findings of this study might contribute to establishing a suitable policy for the banning and monitoring of animal diseases in Egypt particularly in southern Egypt.

## MATERIALS AND METHODS

### STUDY AREA

The study was carried out in three Egyptian slaughterhouses where food animals were slaughtered for local consumption. One in northern Egypt, in the province of Alexandria, and two slaughterhouses in the upper of Egypt, including the province of Qena and Aswan. Alexandria is the second biggest town in Egypt after Cairo, it stretching alongside the Mediterranean Sea and having a population about 5.200.000. Qena is a province in Upper Egypt, located on the east bank of the Nile River, characterized by warm weather and with a population of approximately 230.392. Aswan is situated in southern Egypt and has the hottest summer period with a population around 290.327 (Figure 1).

### STUDY DURATION AND ANIMALS POPULATION

The work was conducted over the course of 24 months from January 2017 to December 2018. The slaughtered and inspected animals during the study were 126686, 18886

and 22240 animals in Alexandria, Qena and Aswan abattoirs, respectively. The investigated animals in Qena and Aswan were native cattle, buffalo, camel, sheep and goat. While, the Alexandria abattoir is capable of slaughtering the same species of animals with imported cattle.



**Figure 1:** Locations of the study in Egypt were indicated by blue circle. Locations of the study in Egypt were indicated by blue circle.

### STUDY METHODOLOGY

The meat inspections techniques including ante-mortem inspections as well as post-mortem inspections were carried out by meat inspectors.

### ANTE-MORTEM INSPECTION

Ante-mortem inspection was performed on the lairage. Where, animal behavior, illness marks and movements of animals were observed and noted as described by the Food and Agriculture Organization (FAO, 1994).

### POST-MORTEM INSPECTION

The post-mortem inspection was carried out (FAO, 1994). Briefly, it was performed by visual examination, palpation and incisions of lymph nodes and organs including head, heart, lungs, kidneys, spleen, liver and intestine. Lesions were diagnosed based on pathological alterations including changes in the size, colour, consistency and existence of parasites or their lesions. An additional detailed inspection was performed in some illnesses like tuberculosis and cysticercosis. The judgments were categorized as fully approved and partially approved for human consumption. While

the total condemnation decision was taken in case of generalized illness and/ or severe anomalies.

**ASSESSMENT OF FINANCIAL LOSS**

The direct economic loss in each abattoir was determined by the formula described by Khanjari et al. (2010).

$$DEL = N \times P \times W$$

DEL: Direct economic loss; N: number of condemned carcasses / and offals; P: Average price of carcasses /and offal (Kg /Egyptian pound); W: average carcasses / and offal weight (Kg).

The average price of the various carcasses and their offals was determined by their marketable cost in Alexandria, Qena and Aswancities during 2017-2018 (Table 1).

**Table 1:** Average prices of carcasses and their offals in Egypt during 2017-2018.

Item	Average weight (Kg)	Average price (Egyptian pound/ Kg)	Total price (Egyptian pound)
Cattle	200	100	20000
Buffalo	200	90	18000
Camel	312.5	80	25000
Sheep	40	125	5000
Bovine liver	6.5	100	650
Liver camel	8.5	100	850
Ovine liver	1.2	100	120
Bovine lung	4	75	300
Lung camel	5	80	400
Ovine lung	1.25	80	100
Bovine Kidneys	1.6	75	120
Kidney camel	3.5	80	280
Ovine Kidneys	1	70	70
Bovine heart	2.4	100	240
Heart camel	3.8	100	380
Ovine heart	0.5	100	50
Bovine spleen	1.2	100	120
Spleen camel	2.4	100	240
Ovine Spleen	0.5	100	50

1 USD was equal to 16 Egyptian pound.

**DATA ANALYSIS**

The data were analyzed by a Microsoft Excel spreadsheet. The Z test was used to compare the proportions and when  $p \leq 0.05$  referred to a significance.

**RESULTS AND DISCUSSION**

Abattoirs offered a significant chance to identify illness

with financial values and zoonotic significance. Alexandria, Qena and Aswan abattoirs slaughtered 126686, 18886 and 22240 animals, respectively during the duration of this study. The variation in the numbers of slaughtered animals among the studied slaughterhouses may be attributed to the difference in the population size and their different economic status. Sheep followed by cattle, buffalo, goat and lastly camel meat was the preferred form of meat for Alexandrian individuals. Cattle meat is most preferable for individuals in Qena Governorate, followed by buffalo, sheep, camel and goat. Cattle is the first choice followed by camel, sheep and finally buffalo for people who lived in the Aswan.

**CAUSES OF CONDEMNATIONS OF WHOLE CARCASSES**

Out of 126686 animals were slaughtered in Alexandria abattoir 20 (0.015%) animals were totally condemned due to various causes. Icterus was the predominate cause followed by fever, tuberculosis, ill bleeding and emaciation. Cattle, buffalo and sheep were the condemned animal species while there was no condemnation in camel and goat. All the total commended animals were native breeds, while there was not any total condemnation in the imported animals (Table 2). In Qena abattoir, out of 18886 livestock, only one sheep was completely condemned as a result of generalized tuberculosis and one cattle owing to ill bleeding (Table 3). Out of 22240 animals, 46 (0.20%) were totally condemned in Aswan abattoir. Icterus, emaciation and generalized tuberculosis were the causes of condemnation at Aswan abattoir (Table 4).

In Aswan abattoir, the proportion of whole carcass rejection was significantly higher than in those in Alexandria and Qena abattoirs ( $p < 0.05$ ).

In the current study, it is clear that there was no condemnation during the ante-mortem inspection, whereas all condemnations occurred as a result of diseases detected during post-mortem inspection. The obtained results were comparable with Tembo and Nonga (2015) who found that 0.05% of the animals slaughtered in Dodoma, Tanzania were completed commended as a result of tuberculosis, icterus and cysticercosis. The reasons for full carcass condemnation in the current work were almost identical to those recorded in Ethiopia (Mummed and Webb, 2015).

**PARTIAL CONDEMNATION OF THE CARCASS**

Localized affections of quarters of food animals with tuberculosis were the main cause of partial condemnation. Two cases of tuberculosis affection were detected at Alexandria abattoir (0.001%) as illustrated in Table 2. While at Qena abattoir one cattle and two buffalo (0.015%) (Table 3). Concerning Aswan abattoir, one case

in cattle and 9 cases in camel carcass (0.044%) (Table 4) were identified.

**Table 2:** Causes of condemnation of slaughtered animals in Alexandria slaughterhouse during 2017 and 2018.

Cause	2017		2018										Total n=126686
	Cattle	Buffalo	Camel	Sheep	Goat	Cattle	Buffalo	Camel	Sheep	Goat			
	Nativen=15733	Import- ed n=340	n=10809	n=16	n=27363	n=46	Native n=24891	Import- ed n=69	n=13936	n=4	n=33393	n=86	
Generalized tuberculosis	1 (0.006%)	0 (0%)	0	0	0	0	1 (0.004%)	0	1 (0.007%)	0	0	0	3 (0.002%)
Tuberculosis in quarter	1 (0.006%)	0	0	0	0	0	1 (0.004%)	0	0	0	0	0	2 (0.001%)
Fever	0 (0%)	0	0	0	0	0	1 (0.004%)	0	1 (0.007%)	0	1 (0.002%)	0	3 (0.002%)
Icterus	3 (0.01%)	0	1 (0.009%)	0	0	0	3 (0.01%)	0	1 (0.007%)	0	4 (0.01%)	0	12 (0.009%)
Ill bleeding	0	0	0	0	0	0	0	0	1 (0.007%)	0	0	0	1 (0.0007%)
Emaciation	1 (0.006%)	0	0	0	0	0	0	0	0	0	0	0	1 (0.0007%)
<b>Lung</b>													
Tuberculosis	67 (0.42%)	8 (2.35%)	77 (0.71%)	0	0	0	104 (0.41%)	5 (7.24%)	109 (0.78%)	0	0	0	370 (0.29%)
Congestion	39 (0.24%)	10 (2.94%)	38 (0.35%)	0	182 (0.66%)	0	80 (0.32%)	3 (4.34%)	54 (0.38%)	0	258 (0.77%)	0	664 (0.52%)
Parasitic cyst	3 (0.01%) <i>C. bovis</i>	3 (0.88%) <i>C. bovis</i>	12 (0.11%) Hydatid cyst	0	155 (0.56%) <i>C. ovis</i>	0	6 (0.02%) <i>C. bovis</i>	0	10 (0.07%) Hydatid cyst	0	210 (0.62%) <i>C. ovis</i>	0	399 (0.31%)
Pneumonia	27 (0.17%)	5 (1.47%)	7 (0.64%)	0	141 (0.51%)	0	56 (0.22%)	0	14 (0.10%)	0	253 (0.75%)	0	503 (0.39%)
<b>Heart</b>													
Cysticercus	65 (0.41%) <i>C. bovis</i>	1 (0.29%) <i>C. bovis</i>	4 (0.03%) <i>C. bovis</i>	0	205 (0.74%) <i>C. ovis</i>	0	4 (0.01%) <i>C. bovis</i>	0	0	0	52 (0.15%) <i>C. ovis</i>	0	331 (0.26%)
Traumatic pericarditis	7 (0.04%)	0	24 (0.22%)	0	44 (0.16%)	0	17 (0.06%)	0	32 (0.22%)	0	62 (0.18%)	0	186 (0.14%)
<b>Liver</b>													
Tuberculosis	15 (0.09%)	4 (1.17%)	28 (0.25%)	0	0	0	32 (0.12%)	0	44 (0.31%)	0	0	0	123 (0.09%)
Cysticercus	3 (0.19%) <i>C. bovis</i>	0	4 (0.037%) <i>C. bovis</i>	0	33 (0.12%) <i>C. ovis</i>	0	2 (0.008%) <i>C. bovis</i>	2 (2.89%) <i>C. bovis</i>	2 (0.01%) <i>C. bovis</i>	0	30 (0.08%) <i>C. ovis</i>	0	76 (0.05%)
Abscesses	14 (0.08%)	5 (1.47%)	12 (0.11%)	0	57 (0.20%)	0	66 (0.26%)	4 (5.79%)	27 (0.19%)	0	136 (0.40%)	0	321 (0.25%)
Fasciola	49 (0.31%)	8 (2.35%)	35 (0.32%)	0	0	0	68 (0.27%)	2 (2.89%)	53 (0.38%)	0	157 (0.47%)	0	372 (0.09%)
<b>Head</b>													
Cysticercus	23 (0.14%) <i>C. bovis</i>	1 (0.29%) <i>C. bovis</i>	4 (0.03%) <i>C. bovis</i>	0	107 (0.39%) <i>C. bovis</i>	0	4 (0.01%) <i>C. bovis</i>	0	0	0	23 (0.06%) <i>C. ovis</i>	0	162 (0.12%)
Tuberculosis	14 (0.08%)	1 (0.29%)	22 (0.20%)	0	0	0	38 (0.15%)	0	16 (0.11%)	0	0	0	91 (0.07%)
<b>Kidneys</b>													
Hydronephrosis	4 (0.02%)	0	2 (0.01%)	0	0	0	4 (0.01%)	0	0	0	0	0	10 (0.007%)
Renal fibrosis	14 (0.08%)	2 (0.58%)	32 (0.29%)	0	49 (0.17%)	0	67 (0.26%)	2 (2.89%)	44 (0.31%)	4 (100%)	64 (0.19%)	0	278 (0.21%)



Abscesses	3(0.01%)	0	0	0	0	0	0	0	0	0	0	0	3(0.002%)
<b>Spleen</b>	<b>0</b>												
Enlarge-ment	64 (0.40%)	4 (1.17%)	35 (0.32%)	0	117 (0.42%)	0	158 (0.63%)	3 (4.34%)	77 (0.55%)	0	155 (0.46%)	0	613 (0.48%)
Congestion	17 (0.10%)	1 (0.29%)	12 (0.11%)	0	59 (0.21%)	0	8 (0.03%)	0	4 (0.02%)	0	51(0.15%)	0	152 (0.11%)
<b>Intestine</b>													
Tuberculosis	7 (0.04%)	0	280 (2.59%)	0	0	35 (0.14%)	0	242 (1.73%)	0	0	0	0	564 (0.44%)
Congestion	20 (0.12%)	0	24 (0.22%)	0	101 (0.36%)	0	52 (0.20%)	0	32 (0.22%)	0	122 (0.36%)	0	351 (0.27%)
Emergency slaughter	1 (0.006%)	0	1 (0.009%)	0	0	11 (0.044%)	0	4 (0.028%)	0	0	0	0	17 (0.01%)

C: Cysticercus.

**Table 3:** Causes of condemnation of slaughtered animals in Qena slaughterhouse during 2017 and 2018.

Cause	2017					2018					Total n=18886	
	Cattle n=8256	Buffalo n=653	Camel n=9	Sheep n=464	Goat n=7	Cattle n=8419	Buffalo n=569	Camel n=24	Sheep n=482	Goat n=3		
Generalized tuberculosis	0	0	0	1(0.21%)	0	0	0	0	0	0	0	1(0.005%)
Tuberculosis in quarter	0	1 (0.15%)	0	0	0	1 (0.01%)	1 (0.17%)	0	0	0	0	3 (0.01%)
Ill bleeding	0	0	0	0	0	1(0.01%)	0	0	0	0	0	1(0.005%)
Emaciation	0	0	0	0	0	0	0	0	0	0	0	0
Abscesses in muscle	2(0.02%)	0	0	1(0.21%)	0	3(0.03%)	0	0	0	0	0	6(0.03%)
<b>Lung</b>												
Tuberculosis	0	0	0	0	0	0	0	0	0	0	0	0
Congestion	0	0	0	1(0.21%)	0	0	0	0	0	0	0	1(0.005%)
Pneumonia	0	0	1(11.11%)	3(0.64%)	0	3(0.03%)	0	0	2 (0.41%)	0	0	9(0.04%)
Abscesses	0	0	0	0	0	1(0.01%)	0	1(4.16%)	1 (0.20%)	0	0	3(0.01%)
<b>Heart</b>	<b>0</b>											
Cysticercus	0	0	0	3(0.64%) <i>C. ovis</i>	0	0	0	0	0	0	0	3 (0.01%)
Traumatic pericarditis	0	0	0	0	0	0	1(0.17%)	0	0	0	0	1(0.005%)
Congestion	0	0	0	0	0	3 (0.03%)	0	0	0	0	0	3(0.01%)
<b>Liver</b>												
Fasciola	47 (0.56%)	6(0.91%)	0	2(0.43%)	0	41(0.48%)	6(1.05%)	0	1 (0.20%)	0	0	103 (0.54%)
<b>Head</b>												
Cysticercus	1(0.01%) <i>C. bovis</i>	0	0	0	0	0	0	0	0	0	0	1(0.005%)
Tuberculosis	13(0.15%)	0	0	0	0	10(0.11%)	0	0	0	0	0	23 (0.12%)
Kidney	0	0	0	0	0	0	0	0	0	0	0	0
Spleen	0	0	0	0	0	0	0	0	0	0	0	0
Intestine	0	0	0	0	0	0	0	0	0	0	0	0

Fracture and contusion	0	0	0	0	0	1(0.011%)	0	0	0	0	1(0.005%)
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**Table 4:** Causes of condemnation of slaughtered animals in Aswan slaughterhouse during 2017 and 2018.

Cause	2017				2018				Total n=22240	
	Cattle n=5720	Buffalo n=88	Camel n=2054	Sheep n=835	Cattle n=11214	Buffalo n=202	Camel n=574	Sheep n=1553		
Generalized tuberculosis	0	0	0	1(0.11%)	0	0	0	0	1(0.004%)	
Tuberculosis in quarter	1 (0.01%)	0	5(0.24%)	0	0	0	4(0.69%)	0	10(0.044%)	
Icterus	2(0.34%)	1(1.13%)	0	7(0.835%)	20(0.17%)	0	0	12(0.77%)	42(0.18%)	
Emaciation	0	0	0	3 (0.35%)	0	0	0	0	3(0.013%)	
Lung										
Tuberculosis	18 (0.31%)	5 (5.68%)	10 (0.48%)	0	29 (0.25%)	0	12 (2.09%)	0	74 (0.33%)	
Congestion	65 (1.13%)	15 (17.04%)	141 (6.86%)	0	198 (1.76%)	43 (21.28%)	193(33.62%)	0	655(2.94%)	
Parasitic cysts	0	0	256(12.46%)	0	65 (0.57%)	0	176(30.66%)	0	497 (2.23%)	
			Hydatid cyst		<i>C. bovis</i>		Hydatid cyst			
Pneumonia	0	0	16 (0.77%)	7(0.83%)	0	0	0	0	23(0.10%)	
Heart										
Cysticercus	376(6.57%)	0	0	55(6.58%)	361(3.21%)	0	1(0.17%)	130(8.37%)	923(4.15%)	
	<i>C. bovis</i>			<i>C. ovis</i>	<i>C. bovis</i>		<i>C. cameli</i>	<i>C. ovis</i>		
Liver										
Cysticercus	0	0	16 (0.77%)	7 (0.83%)	23(0.20%)	7	13 (2.26%)	3(0.19%)	69(0.310%)	
			<i>C. cameli</i>	<i>C. ovis</i>			<i>C. cameli</i>			
Fasciola	1302 (22.76%)	36 (40.9%)	0	168 (20.11%)	1458 (13%)	54 (26.73%)	0	208 (13.39%)	3226 (14.50%)	
Head										
Cysticercus	150(2.62%)	0	0	0	78 (0.69%)	0	0	0	228(1.02%)	
	<i>C. bovis</i>				<i>C. bovis</i>					
Tuberculosis	13 (0.22%)	0	0	0	17(0.15%)	0	0	0	30(0.134%)	
Kidney										
Hydronephrosis	186(3.25%)	4(4.54%)	72(3.50%)	20(2.39%)	217(1.93%)	10(1.93%)	19 (3.31%)	0	528 (2.37%)	
Intestinal Congestion	0	0	0	0	12(0.10%)	3(1.48%)	7(1.21%)	0	22(0.09%)	

**Table 5:** Economic loss due to meat condemnation in Alexandria, Qena and Aswan slaughterhouses during 2017-2018.

Con-demned part	Cause for condemnation	Alexandria		Qena		Aswan		Total
		Number of animals	Economic loss (Egyptian pound)	Number of animals	Economic loss (Egyptian pound)	Number of animals	Economic loss (Egyptian pound)	

Whole carcass	Generalized tuberculosis	2 cattle 1 buffalo	40000 18000	1 sheep	5000	1 sheep	5000	68000
	Fever	1 cattle 1 buffalo 1 sheep	20000 18000 5000	0	0	0	0	43000
	Icterus	6 cattle 2 buffalo 4 sheep	120000 3000 20000	0	0	22 cattle 1 buffalo 19 sheep	440000 18000 95000	696000
	Ill bleeding	1 buffalo	18000	1 cattle	18000	0	0	36000
	emaciation	1 cattle	20000	0	0	3 sheep	15000	35000
T.B in Quarter		2 cattle	10000	1 cattle 2 buffalo	5000 9000	1 cattle 9 camel	5000 56250	85250
lung	Tuberculosis	184 lungs cattle 186 lungs buffalo	55200 55800	0	0	47 lungs cattle 5 lungs buffalo 22 lungs camel	14100 1500 8800	135400
	congestion	132 lungs cattle 92 lungs buffalo 440 lungs sheep	39600 27600 44000	1 lung sheep	100	263 lungs cattle 58 lungs buffalo 334 lungs camel	78900 17400 133600	341200
	Parasitic cyst	12 lungs cattle 22 lungs buffalo 210 lungs sheep	3600 6600 21000	0	0	65 lungs cattle 432 lungs camel	19500 172800	223500
	Pneumonia	88 lungs cattle 21 lungs buffalo 394 lungs sheep	26400 6300 39400	3 lungs cattle 1 lungs camel 5lungs sheep	900 400 500	16 lungs camel 7 lungs sheep	6400 700	81000
	Abscesses	0	0	1 lung cattle 1 lung camel 1 lung sheep	300 400 100	0	0	800
	Heart	Cysticercus	70 hearts cattle 4 hearts buffalo 257 hearts sheep	16800 960 12850	3 hearts sheep	150	737 hearts cattle 1 hearts camel 185 hearts sheep	176880 380 9250
	Traumatic peri-carditis	24 hearts cattle 56 hearts buffalo 106 hearts sheep	5760 13440 5300	1 hearts buffalo	240	0	0	24740
	Congestion	0	0	3 hearts cattle	720	0	0	720
Liver	Tuberculosis	51 livers cattle 72 livers buffalos	33150 46800	0	0	0	0	79950
	Cysticercus	7 livers cattle 6 livers buffalos 63 livers sheep	4550 3900 7560	0	0	23 livers cattle 7 livers buffalo 29 livers camel 10 livers sheep	14950 4550 24650 1200	61360
	Abscesses	89 livers cattle 39 livers buffalo 193 livers sheep	57850 25350 23160	0	0	0	0	106360
	Fasciola	127 livers cattle 88 livers buffalo 157 livers sheep	82550 57200 18840	88 livers cattle 12 livers buffalo 3 livers sheep	57200 7800 360	2760 livers cattle 90 liver buffalo 376 liver sheep	1794000 58500 45120	2121570
kidneys	Hydronephrosis	8 kidneys cattle 2 kidneys buffalos	960 240	0	0	403 kidneys cattle 14 kidneys buffalo 91 kidneys camel 20 kidneys sheep	48360 1680 25480 1400	78120

	Fibrosis	85 kidneys cattle	10200	0	0	0	0	28350
		76 kidneys buffalos	9120					
		4 kidneys camel	1120					
		113 kidneyssheep	7910					
	Abscesses	3 kidney cattle	360	0	0	0	0	360
Spleen	Enlargement	229 spleens cattle	27480	0	0	0	0	54520
		112 spleens buffalo	13440					
		272 spleens sheep	13600					
	Congestion	26 spleens cattle	3120	0	0	0	0	10540
16 spleens buffalo		1920						
110 spleens sheep		5500						
Total		1128490		106170		3294350		4529010

The proportion of partial carcass condemnation in Aswan abattoir was significantly higher than Alexandria and Qena abattoirs ( $p < 0.05$ ). Tuberculosis is a serious disease of Egyptian livestock and has been shown to occur in various cities. Many reports demonstrated the presence of tuberculosis in the meat, Yibar et al. (2015) showed that the prevalence of tuberculosis in the examined cattle carcasses was 1.32% in Turkey. Therefore, the strict control program is required to reduce the prevalence of tuberculosis.

### CAUSES OF CONDEMNATIONS OF LUNGS

In the current work, the most pathological affections were identified in the lungs (3198 lesions), which may be attributed to their structure and their direct connection with the external environment.

The total lung lesions in Alexandria, Qena and Aswan abattoirs were 1936 (1.52%), 13 (0.068%), 1249 (5.61%), respectively. Based on statistical analysis, a significant difference was detected between the proportions of lung lesions among three abattoirs.

Congestion (0.52%), pneumonia (0.39%), parasitic cysts (0.31%), and tuberculosis (0.29%) were the primary cause of lung condemnation at Alexandria abattoir (Table 2). Moreover, pneumonia (0.047%) and the formation of abscesses (0.015%) were identified at Qena abattoir (Table 3). In Aswan abattoir, Congestion (2.94%), parasitic cysts (2.23%) and pneumonia (0.103%) were recorded (Table 4). The parasitic cysts in Alexandria abattoir were categorized as cysticercosis in cattle and sheep while hydatid cysts were detected in buffalo. With regard to Aswan abattoir, hydatid cysts were observed in camel lungs and *Cysticercus bovis* was detected in cattle lung. The occurrence of hydatid cyst in the current work with high frequency in Aswan abattoir had a public health concern with financial importance particularly, in the rural areas where comprehensive grazing is carried out.

The obtained findings agreed with Ahmed et al. (2013) who reported that pneumonia was the major cause for lung condemnation in the inspected livestock in Ismailia

abattoir, Egypt. The proportion of lungs condemnations in Dodoma, Tanzania abattoir was 10.5%, emphysema, hydatid cyst and hemorrhage were the chief reasons for the condemnations (Tembo and Nonga, 2015). Moreover, an abattoir survey was performed in Iran, cattle were the most infected animals with hydatid cyst, followed by sheep and goats, while the most infected offals were livers followed by lungs (Ghasemian et al., 2018). Pezeshki et al. (2018) recorded that the prevalence of hydatidosis in cattle and sheep in 2015-2018 was 2.25% and 2.48%, respectively in Tehran, Iran. The diversity of hydatidosis incidence in various countries may be attributed to county location, presence of dogs and degree of animal hygiene (Azami et al., 2013). Maxwell (2005) examined 5369 cattle in Nigeria and reported that 8.5% of the total lungs were condemned. Tuberculosis, pneumonia, abscesses and parasitic infection were the main causes of condemnation. Current work has shown that lungs lesions can cause numerous diseases for humans and have a serious impact on animal production. Some stressors factors as polluted air, fatigue, overpopulation in the farms were responsible for respiratory illness.

### CAUSES OF CONDEMNATIONS OF HEARTS

The overall heart lesions in Alexandria, Qena and Aswan abattoirs were 517 (0.40%), 7 (0.037%) and 923 (4.15%), respectively. Based on statistical analysis, significance difference was detected between the proportions of heart lesions among three abattoirs.

Traumatic pericarditis and parasitic infection were the main causes of heart condemnation at Alexandria and Qena abattoir. While the parasitic infection was the only cause for condemnation of the heart at the Aswan abattoir. All parasitic cysts have been recognized in all abattoirs as cysticercosis.

Traumatic pericarditis is comparatively widespread and caused by the swallowing of foreign bodies. Ahmed et al. (2013) noted that 8% of examined heart in Ismailia abattoir, Egypt were condemned as a result of heart



adhesions and traumatic pericarditis. Comparably Jibat et al. (2008) have reported that out of 2688 animals were slaughtered at Debre Zeit, Ethiopia, 214 (7.9%) hearts were condemned as a result of pericarditis, calcification and parasitic infection.

### CAUSES OF CONDEMNATIONS OF LIVERS

The total liver lesions in Alexandria, Qena and Aswan were 892 (0.70%), 103 (0.54%) and 3295 (14.81%), respectively. Based on statistical analysis, a significant difference was observed between the proportions of livers lesions among three abattoirs.

The chief causes for condemnations of livers at Alexandria abattoir were fasciola (0.29%), abscesses (0.25%), tuberculosis (0.09%) and cysticercosis (0.05%). While at Aswan abattoir, fasciola (14.50%) and cysticercosis (0.31%) were the primary causes of liver condemnation. In addition, fasciola infection (0.54%) was the only cause for livers condemnations at Qena abattoir. Moreover, all parasitic cysts in the current study have been identified as cysticercosis in Alexandria and Aswan abattoirs.

The obtained data showed that fascioliasis is widespread in Egyptian slaughterhouses. Aminzare et al. (2018) obtained similar findings in the examined animals in Khorasan Razavi, Iran. Pezeshki et al. (2018) recorded that the prevalence of fascioliasis in cattle and sheep was 0.62% and 0.25%, respectively in a study conducted in Tehran, Iran. The incidence of fasciolosis in sheep and goats was reported in different counties, Pakistan (51.3% and 14.8%) and Saudi Arabia (0.04% and 0.00%). In Tanzania, there was a high incidence of fasciola (30%) (Nzalawahe and Komba, 2013). The high incidence of fascioliasis in the current study may be attributable to the appropriateness of climate conditions and the presence of snails. Infection with fasciola is widespread and characteristic in many African countries. Nevertheless, fascioliasis infrequently leads to death in farm animals and its impacts had led to decrease the outputs of animals and the rejection of livers in slaughterhouses (Kambarage et al., 1995).

Among 9880 cattle slaughtered in the Ismailia abattoir, 181 cattle had livers abscess and 79 cattle had hepatic cirrhosis (Ahmed et al., 2013). Moreover, fascioliasis, cirrhosis and abscesses were the reasons for liver rejection in Zaria slaughterhouse (Raji et al., 2010). A study was conducted in three slaughterhouses in South Africa showed that the major causes of liver condemnation were fascioliasis, fibrosis and abscesses formation with associated financial loss USD 4527107 (Jaja et al., 2017). Liver lesions of food animals have an adverse effect on the economy via condemnation of diseased livers at the slaughterhouse in addition to their impact on the animal gain.

### CAUSES OF CONDEMNATIONS OF HEADS

The overall head lesions at Alexandria, Qena and Aswan abattoirs were 253 (0.19%), 24 (0.12%) and 258 (1.16%). Based on statistical analysis, a significant difference was identified between the proportions of heads lesions among three abattoirs.

Cysticercosis and tuberculosis were the main causes of condemnation of heads at abattoirs in Alexandria, Qena and Aswan in the present research. The bovine heads were the predominate species that were condemned among other slaughtered species.

The causes of condemnation of head in Ethiopia were contusion, parasitic infection and abscess formation (Mummed and Webb, 2015). Moreover, Beyene and Kiko (2019) stated that the prevalence of *Cysticercus bovis* was high in shoulder muscle followed by head muscle and cardiac muscle in slaughtered cattle in Ethiopia. The prevalence of condemnations of heads of cattle in Dodoma, Tanzania was 0.004 % as a result of abscesses formation (Tembo and Nonga, 2015). It is important to state that the heads of food animals are not routinely split in Egyptian slaughterhouses and splitting is performed in suspected cases.

### CAUSES OF CONDEMNATIONS OF KIDNEYS

At Aswan abattoir, the overall kidneys lesions were 528 (2.37%) that were significantly greater than those at Alexandria abattoir 291 (0.22%). The inspected kidneys were free from all kinds of affections at Qena abattoir.

The major causes for condemnations of kidneys at Alexandria abattoir were fibrosis (0.21%) and hydronephrosis (0.008%) (Table 2). While the hydronephrosis was the only cause for kidneys condemnation at Aswan abattoir (Table 4).

Tavassoly (2003) achieved comparable findings. While, nephritis was the major cause for condemnation of 6.8% of inspected kidneys in Ethiopia (Jibat et al., 2008). Ahmed et al. (2013) reported that the kidney affections included crystals, white spots, pyelonephritis, fibrosis and hydronephrosis were identified among 9880 cattle slaughtered at Ismailia abattoir, Egypt, with an incidence of 1.01%, 0.98%, 0.52%, 0.38% and 0.23%, respectively. In Dodoma, Tanzania, the incidence of condemned kidneys was 3.8% and the chief causes for condemnations were congenial renal cysts with hydronephrosis (Tembo and Nonga, 2015).

## CAUSES OF CONDEMNATIONS OF SPLEENS

In Alexandria abattoir, 765 (0.60%) splenic lesions were observed. The lesions were classified into splenomegaly (0.48%) and congestion (0.001%) of spleens (Table 2). However, Spleens were free from any affection in Qena and Aswan abattoirs. The primary cause of splenomegaly may be due to infection with blood parasites (Gracey et al., 1999). Meanwhile, 120 cattle out of 9880 showed splenomegaly at Ismailia abattoir, Egypt (Ahmed et al., 2013). Splenomegaly, splenitis and contamination were the key reasons for the condemnation of spleen in Tanzania (Mellau et al., 2011). Nevertheless, in some cases in Turkey slaughter house, the hydatid cyst was the cause of spleen condemnation (Yibar et al., 2015).

## CAUSES OF CONDEMNATIONS OF INTESTINES

In Alexandria abattoir, the incidence of intestinal lesions was 915 (0.72%) lesions that were significantly higher than those observed in Aswan abattoir 22 (0.09%). Tuberculosis (0.44%) and congestions (0.02%) were the causes for condemnation of the intestines at Alexandria abattoirs. While the congestion was the only cause for condemnation at Aswan abattoir. However, intestines were free from pathological lesions in Qena abattoir there was no intestinal affection.

Tembo and Nonga (2015) stated that 7.3% of the examined intestine in Dodoma, Tanzania were commended, the pimply intestine was the main cause of condemnation followed by inflammation of intestinal wall and abscesses formation. While, parasitic infection and abscesses were the main causes of the condemnation of intestine in Ethiopia (Mummed and Webb, 2015).

The findings of the current work showed that there were various diseases related to condemnation of carcasses and organs at the Egyptian slaughterhouse. Among the investigated abattoirs, Aswan had the highest condemnation rate, which can be attributed to the difference in environmental circumstances, including climate temperature, humidity, animal farming and grassland nature. Meanwhile, Shahraki et al. (2018) attributed the difference in the incidence of parasitic infection to racing behavior and environmental circumstances in a study conducted in Iran.

## FINANCIAL LOSSES

An additional aim of the current work was to determine the economic losses due to meat condemnation in the three Egyptian abattoirs. The financial losses in each abattoir were calculated during 2017 – 2018 (Table 5).

The major financial loss was caused by fasciolosis, followed by icterus, pulmonary congestion, the parasitic infection of lung and heart, pulmonary tuberculosis, liver abscesses, tuberculosis affections of quarters. The total two years duration economic loss due to meat condemnation at three abattoirs was estimated as 4529010 Egyptian pound (383063 USD).

A few works have investigated the financial analysis of the disease meat-producing animals in Egypt. In a work performed by Ahmed et al. (2013), 36480 Egyptian pound was lost owing to the condemnation of organs of slaughtered cattle in Ismailia city. The financial loss in the current works was higher than the findings reported (Cadmus and Adesokan, 2009) in Nigeria, which showed a yearly economic loss of 110968 USD. Economic loss due to meat condemnation has been stated by some studies in many countries (Kebede et al., 2011; Regassa et al., 2013). These works stated that parasitic and bacterial diseases could lead to excessive financial loss as well as can harm public health. The major cause of meat condemnation at two slaughter houses in Turkey were hydatidosis, fasciolosis, tuberculosis and icterus and their direct economic loss due to organ condemnation was 16.363 USD (Yibar et al., 2015). A slaughterhouse survey was conducted in Fako slaughterhouse, Cameroon recorded that 357 bovine organs out of 1472 were condemned due to parasitic infection with a related economic loss 2505 USD (Kouam et al., 2019). Kere et al. (2019) revealed that livers and lungs were the most condemned organ in Kenya as a consequence of hydatid cyst infection with an associated financial loss 152003 USD per year. The alteration in the financial loss between various researches could be attributed to the difference in animal population, prices, and incidence of diseases.

## CONCLUSION

Finally, a large amount of money was lost owing to pathological conditions recognized in Egyptian slaughterhouses. This work revealed that tuberculosis, parasitic infection and icterus were the most prevalent affections that had the greatest influence on the Egyptian budget. It is obvious that an adequate preventive and regular application of anti-parasitic drugs and monitoring procedures are needed in Egypt particularly in Aswan province. Appropriate meat examination and hygienic discarding of condemned meat are necessary to secure the human health.

Considerations should be given the affections commonly detected at slaughterhouses. Monitoring programs at the farm should be followed to minimize the hazard

of infectious diseases and to decrease the financial losses. Moreover, the building of efficiently equipped slaughterhouses and educating of slaughterhouse personnel are critical.

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## CONFLICT OF INTERESTS

None.

## AUTHORS CONTRIBUTION

Eman Sayed Mohammed and Mohamed Abdelfattah Maky planned the study and gathered the data. Mohamed Abdelfattah Maky discussed the data and drafted the paper.

## ETHICAL CODE

The codes of Alexandria, Qena and Aswan abattoirs were C/0206010312, 270101010617, 580101010310, respectively.

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