

## Prevalence and Economic Significance of Cystic Echinococcosis among the Slaughtered Animals in Elazig

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**Abstract:** Cystic echinococcosis is a widespread zoonosis that causes disease and weakness in animals and humans and in the most serious cases, death of the host. Nowadays, it is also re-emerging as an important public health issue. This study aimed to investigate the prevalence of Cystic Echinococcosis (CE) in slaughtered butchery animals in Elazig and determine its effects on economic losses, between 2002 and 2007. The data, which obtained from the records of Provincial Directorate of Agriculture in 6 different private and public slaughterhouses in Elazig, were retrospectively investigated. The prevalence of CE in slaughtered sheep, goat and cattle during this 6 years period were found between 3.43-6.60, 0.55-2.18 and 0.94-4.16%, respectively. The CE infection was significantly higher in lung (1.87%) compared to liver (1.42%) and heart (0.06%). We calculated economic loss due to the discarded organs, which is infected with CE, as 192,457 US dollars. The amount of economic loss appears to gradually increase and CE prevalence in the butchery animals slaughtered in our province seems to have not decreased compared to the previous years despite the all official effort to prevent this infection.

**Key words:** Cystic echinococcosis, sheep, goat, cattle, economic loss

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### INTRODUCTION

Cystic Echinococcosis (CE) is a widespread zoonosis caused by *Echinococcus granulosus*. The adult worm lives in the small intestine of a carnivore (definitive host). The intermediate larval stage develops in the internal organs of many mammal species (including humans) which acquire the infection through accidental ingestion of the tapeworm eggs. Intermediate hosts are ungulates, mainly sheep and cattle (Eckert and Deplazes, 2004; Carmena *et al.*, 2008). *Echinococcus* infection causes disease and weakness in animals and humans and in the most serious cases, death of the host. Nowadays, it is also re-emerging as an important public health issue (Jenkins *et al.*, 2005).

The disease causes very important economic losses with the costs of medical treatment and morbidity for human cases and losses in animal productivity (Azlaf and Dakkak, 2006; Torgerson, 2003). It is recently reported that the annual CE-associated global economic losses is at least over US\$ 2 billion (Budke *et al.*, 2006).

The disease has a worldwide distribution and its prevalence changes between different regions due to different climate and geographical features, development level of the region and stockbreeding conditions. It has been previously reported in many reviewed article that is

exists endemic regions in Mediterranean countries, North and East Africa, Western and Central Asia, China, South America, Australia and even in Europe (Seimenis *et al.*, 2006; Jenkins *et al.*, 2005; Buishi *et al.*, 2005; Torgerson *et al.*, 2006). CE is also highly endemic in the Levant countries and *E. granulosus* is highly prevalent in Iran, Turkey, Iraq, Morocco, Tunisia and Libya (Altintas, 2003; Sadjjadi, 2006).

In Turkey, the prevalence of *E. granulosus* infection in dogs is reported between 0.32-40% and also varies widely with geographical location (Altintas, 2003). The prevalence of CE has ranged from 11.2-50.7% in domestic animals (Altintas, 2003). In Elazig region, stock-breeding is a significant occupation for living, being common in especially rural areas with a low socioeconomic level. Common occurrence of CE in both humans and animals in our province has been formerly reported in previous studies by Kaplan and Kuk (2002) and Bülbüller *et al.* (2006).

The main objectives of this research were to investigate the prevalence and size of the consequent economic loss caused by CE in cattle, sheep and goats slaughtered in 6 different private and public slaughterhouses in central Elazig and its districts. In addition, we also indented to investigate the efficiency of CE control strategies applied by Provincial Directorate of Agriculture.

## MATERIALS AND METHODS

The number of animals slaughtered in Elazig between the years of 2002-2007 and the distribution of animals infected with CE according to years and animal species was examined. The data were obtained from the records of all private and public slaughterhouses in central Elazig and its districts, which are under the control of the Provincial Directorate of Agriculture and retrospectively investigated. The data were recorded by a veterinary working in their slaughterhouses and them performing a careful by visual inspection, palpation for CE, especially liver and lungs of the slaughtered animals.

The calculation of the economic losses due to the discarded infected organs were based on institutional wholesale prices: e.g., sheep and goat livers were calculated as over 3.33 US dollars, cattle liver, which weighs 7.5 kg in average, over 4 US dollars  $\text{kg}^{-1}$ .

However, the economic loss due to low yield could not be calculated as it was not possible to reach the related data. Furthermore, no information could be attained on the number of animals with more than one infected organ, due to the way of presentation of the data.

## RESULTS AND DISCUSSION

The CE prevalence in cattle, sheep and goats slaughtered between the years of 2002-2007 in six slaughterhouses in Elazig were found between 3.43-6.60% in sheep, 0.55-2.18% in goats and 0.94-4.16% in cattle (Table 1). The total number of sheep, goats and cattle slaughtered in 6 years were 130.038, 118.946 and 182.316, while the total number of animals infected with CE were 5.326 (4.09%), 1.460 (1.22%) and 5.662 (3.10%), respectively. Whereas, a total of 367.930 animals were slaughtered in the last 6 years, 6.909 (1.87%) animals had CE in lungs, 5.256 (1.42%) animals in liver and 253 (0.06%) animals in the heart. Table 1 presents the distribution of the organ locations for CE in the animals slaughtered in the last 6 years in Elazig according to years and animal species.

The total economic loss was calculated as approximately 192.457 US dollars: 22.597 US dollars due to the 6.786 CE-infected sheep and goat livers discarded and 169.860 US dollars due to 5.662 infected cattle liver (42.465 kg) discarded.

Cystic echinococcosis is a serious zoonosis with economic impact and its public health importance and CE is currently re-emerging some countries. It is showed that the failure of CE control campaigns concluded high prevalence as is in the former Soviet Union and the emergence of the New Independent States (Buishi *et al.*,

2005; Torgerson *et al.*, 2006). The prevalence of CE must determine for not only these aspects, but also for guide CE control campaigns and great value in the field of preventive medicine.

This study employed slaughter survey to establish the prevalence of CE in intermediate hosts in Elazig region. The CE infection rate shows huge differences among the countries all around the world, e.g., 0-100% in sheep, 0-48% in goats and 0-80% in cattle (Carmena *et al.*, 2008; Haridy *et al.*, 2006; Torgerson *et al.*, 2006; Sadjjadi, 2006; Zhenghuan *et al.*, 2008; Nonga and Karimuribo, 2009). CE incidence in livestock animals had been reported that ranged 0.47-89% in sheep and 7-80% in cattle in the Americas, 6.1-81.2% in sheep 0.5-45% in cattle and 8-25.2% in goats in Central Asia and 2-72.1% cattle, 12.5-100% sheep, 3-48% goats in China (Moro and Schantz, 2006; Torgerson *et al.*, 2006; Zhenghuan *et al.*, 2008). In the Mediterranean Region the CE prevalence is 0-86.9% in sheep 0-16% in goats and 0.3-28.34% in cattle and in the Middle East and Arabic North Africa the CE prevalence is 1.7-33.4% in sheep 0-29.5% in goats 0.95-42% in cattle (Seimenis *et al.*, 2006; Sadjjadi, 2006).

The data reported in Turkey between the years of 2000-2006, also showed markedly different values concerning CE infections; e.g., 3.1-30.76% in sheep, 3.2-35.7% in cattle and 3.6-22.1% in goat (Umur, 2003; Acioz *et al.*, 2008; Kose and Sevimli, 2008; Hakverdi *et al.*, 2008; Esatgil and Tuzer, 2007). In a study performed in Elazig region between 1998-2000, CE prevalence found to be 5.02% in sheep, 3.60% in goats and 4.94% in cattle (Kaplan and Kuk, 2002). These previously reported results were not markedly different compared the result of this present study. This result points that CE prevalence in the slaughtered animals in our province seems to have not decreased compared to the previous years despite the all official effort to prevent this infection.

Lungs and livers were the most condemned organs of animals slaughtered in Elazig during this study period. Between 1998 and 2000, similar findings were also reported by Kaplan and Kuk (2002). These shows that the liver and lungs are the most common sites of CE infection and the reason may be due to the fact that the liver and lungs posses the first great capillaries sites encountered by the migrating *Echinococcus* oncosphere (Eckert and Deplazes, 2004).

The economic losses due to CE infections in animals include reduced value of fleece, milk and meat production. The cost of CE in humans were due to medical treatment, surgical operation and were due reduced quality of life following the surgery, morbidity due to undiagnosed CE and loss of productivity for the affected people (Azlaf and Dakkak, 2006). Budke *et al.* (2006) were also

Table 1: Distribution of CE locations in the slaughtered animals in Elazig

Table 1. Distribution of locations and diagnosed animals in 2002															
Animals sp.	CE locations	Years												Total	
		2002		2003		2004		2005		2006		2007			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Sheep	Lung	71	1.43	310	3.66	210	1.59	445	1.63	592	1.74	1435	2.86	3063	2.35
	Liver	117	2.35	249	2.94	236	1.79	472	2.42	577	1.69	550	1.09	2201	1.69
	Heart	-	-	-	-	5	0.03	26	0.13	11	0.03	20	0.03	62	0.04
Goats	Lung	20	0.19	194	0.92	74	0.47	78	0.38	109	0.40	338	1.35	813	0.68
	Liver	46	0.45	188	0.90	88	0.56	34	0.16	82	0.30	208	0.83	646	0.54
	Heart	-	-	-	-	-	-	1	0.004	-	-	-	-	1	0.0008
Cattle	Lung	89	0.21	372	2.07	80	0.34	597	1.59	887	1.77	1008	2.39	3033	1.66
	Liver	147	0.34	282	1.57	133	0.56	542	1.45	643	1.29	662	1.57	2409	1.32
	Heart	-	-	2	0.01	9	0.03	13	0.03	35	0.07	131	0.31	190	0.10

reported that the annual CE-associated global economic losses is at least over US\$2 billion. In a previous study, the economic losses due to CE infections were reported as 29.099 Turkish Liras from only one slaughterhouse between 1998 and 2000 in Elazig (Kaplan and Kuk, 2002). In this study, all slaughterhouse of same province were investigated and the economic losses are calculated as 192,457 US dollars between 2002 and 2007. Thus, the economic loss appears to continue with gradual increase according to the economic loss calculated in our study. The economic losses due to CE in our region that stockbreeding is a significant occupation for living in especially rural areas with a low socioeconomic level are quite important. This amount of economical losses due to the CE is quite important for the people living Elazig region.

### CONCLUSION

Although the prevalence of CE in the butchery animals slaughtered in our province revealed no decreased compared to the previous years, the economic loss continues with a gradual increase rate. Because of the climatic and socio-cultural conditions for CE occurrence in Elazig region are suitable, it must be considered for CE control. We conclude that an efficient control strategy against CE in our region will reduce the economic losses and increase the production while improving the economic level in the stockbreeding sector.

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### REFERENCES

Altintas, N., 2003. Past to present: Echinococcosis in Turkey. *Acta Trop.*, 85: 105- 112. DOI: 10.1016/S0001-706X(02)00213-9.

- Acioz, M., A. Celiksoz, S. Ozcelik and S. Degerli, 2008. Prevalence of cyst hydatid in slaughtered cattle between April and May 2005 in Sivas. *Turkiye Parazit. Derg.*, 32: 205-207. <http://www.tparazitolderg.org/text.php?id=360>.
- Azlaf, R. and A. Dakkak, 2006. Epidemiological study of the cystic echinococcosis in Morocco. *Vet. Parasitol.*, 137: 83-93. DOI: 10.1016/j.vetpar.2006.01.003.
- Budke, C.M., P. Deplazes and P.R. Torgerson, 2006. Global socioeconomic impact of cystic echinococcosis. *Emerg. Infect. Dis.*, 12: 296-303. <http://www.cdc.gov/ncidod/EID/vol12no02/pdfs/05-0499.pdf>.
- Buishi, I., T. Walters, Z. Guildea, P. Craig and S. Palmer, 2005. Reemergence of canine Echinococcus granulosus-infection, Wales. *Emerg. Infect. Dis.*, 11: 568-571. <http://www.cdc.gov/ncidod/EID/vol11no04/pdfs/04-0178.pdf>.
- Bülbüller, N., Y.S. İlhan, C. Kirkil, A. Yeniçerioglu, R. Ayten and Z. Cetinkaya, 2006. The results of surgical treatment for hepatic hydatid cysts in an endemic area. *Turk. J. Gastroenterol.*, 17 (4): 273-278. <http://www.turkgastro.org/pdf/533.pdf>.
- Carmena, D., L.P. Sanchez-Serrano and I. Barbero-Martinez, 2008. Echinococcus granulosus Infection in Spain. *Zoonoses Public Health*, 55: 156-165. DOI: 10.1111/j.1863-2378.2007.01100.x.
- Eckert, J. and P. Deplazes, 2004. Biological, Epidemiological and Clinical Aspects of Echinococcosis, a Zoonosis of Increasing Concern. *Clin. Microbiol. Rev.*, 17: 107-135. DOI: 10.1128/CMR.17.1.107-135.2004.
- Esatgil, M.U. and E. Tuzer, 2007. Prevalence of hydatidosis in slaughtered animals in Thrace, Turkey. *Turkiye Parazit. Derg.*, 31 (1): 41-45. [http://www.tparazitolderg.org/pdf/pdf\\_TPD\\_230.pdf](http://www.tparazitolderg.org/pdf/pdf_TPD_230.pdf).
- Hakverdi, S., G. Culha, M.S. Canda, M. Yaldiz and S. Altintas, 2008. Problem of cystic echinococcosis in Hatay (in Turkish). *Turkiye Parazit. Derg.*, 32: 340-342. [http://www.tparazitolderg.org/pdf/pdf\\_TPD\\_389.pdf](http://www.tparazitolderg.org/pdf/pdf_TPD_389.pdf).

- Haridy, F.M., B.B. Ibrahim, A.M. Elshazly, S.E. Awad, D.M. Sultan, G.T. El-Sherbini and T.A. Morsy, 2006. Hydatidosis granulosus in Egyptian slaughtered animals in the years 2000-2005. *J. Egypt. Soc. Parasitol.*, 36 (3): 1087-1100. PMID: 17153715.
- Jenkins, D.J., T. Romig and R.C.A. Thompson, 2005. Emergence/re-emergence of *Echinococcus* sp: A global update. *Int. J. Parasitol.*, 25: 1205-1219. DOI: 10.1016/j.ijpara.2005.07.014.
- Kaplan, M. and S. Kuk, 2002. A study on economic loss caused by cystic ecinococcosis in animals slaughtered in elazig ELET corporation slaughterhouse between 1998 and 2000 years. *Firat Med. J.*, 7: 619-622 (in Turkish). [http://www.firattip-dergisi.com/summary\\_en.php3?id=137](http://www.firattip-dergisi.com/summary_en.php3?id=137).
- Kose, M. and F.K. Sevimli, 2008. Prevalence of cystic echinococcosis in slaughtered cattle in afyonkarahisar. *Turkiye Parazitol. Derg.*, 32: 27-30. [http://www.tparazitolderg.org/pdf/pdf\\_TPD\\_316.pdf](http://www.tparazitolderg.org/pdf/pdf_TPD_316.pdf).
- Moro, P. and P.M. Schantz, 2006. Cystic echinococcosis in the Americas. *Parasitol. Int.*, 55: S181-S186. DOI: 10.1016/j.parint.2005.11.048.
- Nonga, H.E. and E.D. Karimuribo, 2009. A retrospective survey of hydatidosis in livestock in Arusha, Tanzania, based on abattoir data during 2005-2007. *Tropical of Animal Health Production* (in Press) DOI: 10.1007/s11250-009-9308-9.
- Sadjjadi, S.M., 2006. Present situation of echinococcosis in the Middle East and Arabic North Africa. *Parasitol. Int.*, 55: S197-S202. DOI: 10.1016/j.parint.2005.11.030
- Seimenis, A., D. Morelli and A. Mantovani, 2006. Zoonoses in the Mediterranean Region. *Ann. Ist. Super Sanita*, 42 (4): 437-445. <http://www.iss.it/publ/anna/2006/4/424437.pdf>.
- Torgerson, P.R., B. Oguljahan, A.E. Muminov, R.R. Karaeva, O.T. Kuttubaev, M. Aminjanov and B. Shaikenov, 2006. Present situation of cystic echinococcosis in Central Asia. *Parasitol. Int.*, 55: S207-S212. DOI: 10.1016/j.parint.2005.11.032.
- Torgerson, P.R., 2003. Economic effects of echinococcosis. *Acta Trop.*, 85: 113-118. DOI: 10.1016/S0001-706X(02)00228-0.
- Umur, S., 2003. Prevalence and economic importance of cystic echinococcosis in slaughtered ruminants in Burdur, Turkey. *J. Vet. Med. B Infect. Dis. Vet. Public Health*, 50(5): 247-252. DOI: 10.1046/j.1439-0450.2003.00667.x.
- Zhenghuan, W., W. Xiaoming and L. Xiaoqing, 2008. Echinococcosis in China, a Review of the Epidemiology of *Echinococcus* sp. *EcoHealth*, 5: 115-126. DOI: 10.1007/s10393-008-0174-0.