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Prevalence of Cystic Echinococcosis in Slaughtered Cattle in Afyonkarahisar

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SUMMARY: This study was carried out in 1001 cattle that were slaughtered in 3 abattoirs in the Afyonkarahisar district of western Turkey. Abattoirs were visited twice a week and internal organs of the cattle were examined for cystic echinococcosis (CE). The number of organs discarded because of CE was recorded. CE was found in 295 (29.47%) out of 1001 cattle studied. CE was found in 113 (44.31%) out of 255 cows and 182 (24.39%) out of 746 bulls. This difference was statistically significant ($p<0.001$). CE was observed only in liver of 130 (44.06%) cattle, only in lungs of 91 (30.85%); only in hearts of 2 (0.68%) and only in the kidney of 1 (0.34%); in both livers and lungs of 70 (23.73%), and in both hearts and lungs of 1 (0.34%). Also, the rate of CE was significantly higher in cows than bulls in terms of organ predilection ($p<0.001$). Forty three livers were completely discarded along with half of 18 livers, a quarter of 37 livers and the remaining livers in various degrees. Forty four lungs were completely destroyed along with half of 13and a quarter of 21 whereas 3 hearts and one kidney were completely destroyed. The fertility rate of cysts was found to be 5.42%. In this study the prevalence of CE in cattle in Afyonkarahisar district has been documented and possible economic losses due to CE were emphasized.

Keywords: Cystic echinococcosis, cattle, prevalence

Afyonkarahisar'da Kesilen Sığırlarda Kistik Ekinokokkozis'in Prevalansı

ÖZET: Bu çalışma, Afyonkarahisar'da yetiştirilen ve 3 değişik mezbahada kesilen 1001 adet sığır üzerinde yapılmıştır. Araştırma, mezbahalara haftada 2 kez gidilerek sığırların iç organları kistik ekinokokkozis yönünden incelenmesi ve enfekte organların imha kayıtlarının tutulmasıyla yapılmıştır. Çalışmada, 1001 tane sığırın 295 (%29,47)'inde Kistik Ekinokokkozis'e rastlanmıştır. Muayene edilen 255 dişi sığırın 113 (%44,31) tanesinde, 746 erkek sığırın 182 (%24,39) tanesinde Kistik Ekinokokkozis teşhis edilmiştir. Dişi hayvanlarda bu enfeksiyonun görülme oranının erkek hayvanlara göre daha yüksek olduğu belirlendi ($t= -5.704$; $P<0.001$). Genel olarak 130 (%44,06) sığırın sadece karaciğerinde, 91 (%30,85) sığırın sadece akciğerinde, 2 (%0,68) sığırın sadece kalbinde, bir sığırın sadece böbreğinde, 70 (%23,73) sığırın karaciğer ve akciğerinde, bir (%0,34) sığırın da kalp ve akciğerinde kistlere rastlandı. Dişi ve erkek sığırlar arasındaki karaciğer, akciğer ve karaciğer+akciğer'de Kistik Ekinokokkozis görülme oranları ayrı ayrı değerlendirildiğinde dişi sığırlarda görülme oranı erkek sığırlara göre daha fazladır ($t= -8,58$; $P<0.001$). Kistik Ekinokokkozis tespit edilen 43 tane karaciğer tüm olarak, 18 karaciğerin yarısı, 37 karaciğerin dörtte biri ve diğer enfekte karaciğerler de çeşitli derecelerde kısmen imha edildi. 44 tane akciğer tüm olarak, 13 akciğerin yarısı ve 21 akciğerin de dörtte biri; 3 tane kalp ve 1 tane böbrek imha edildi. Kistlerin fertilite oranı %5,42 olarak tespit edildi. Bu çalışmada, Afyonkarahisar'da sığırlarda Kistik Ekinokokkozis'in yaygınlığı belirlendi ve hastalıktan kaynaklanan ekonomik kayba dikkat çekildi.

Anahtar Kelimeler: Kistik Ekinokokkozis, sığır, prevalans

INTRODUCTION

Cystic echinococcosis (CE) is a zoonotic disease caused by larval stage of the tape worm, genus Echinococcus. Its adult forms are seen in carnivores. Although CE was frequently observed in human and animals worldwide, however, its occurence is mainly in underdeveloped and developing countries. (1, 5, 12, 19, 31).

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The dog tapeworm *Echinococcus granulosus* due to CE is frequently found in Turkey and neighbouring countries (18, 21). Prevalence of *E. granulosus* in dogs various from region to region in Turkey however it ranges between 0.94% and 59% (3, 4, 11, 13, 32, 34). The high incidence because of adult form of *E. granulosus* in dogs may be associated with high environmental contamination. As a result, human and mammals, which are intermediate hosts of *E. granulosus*, are under high risk for CE. In human and mammals the prevalence of CE seems to be very high (22).

Prevalence of CE in cattle shows a great differences among the regions in Turkey. It was 21.1% in Samsun region (6),

31.8% in Ankara region (37), 39.7% in Sivas region (23), 46.4% in Erzurum (2), 19.4% (28) and 37.82% (9) in Van region, 24.65% (33) and 31.25% (15) in Kars, 11.2% in Konya (10), 8.96-16,47% in Manisa (7), 13.5% in Burdur (31) and 14.16% in Kırıkkale (36). In Baghdad, capital city of Iraq, slaughtered 26 cows out of 418 were diagnosed CE (35). It was 10.9% of 320 cows in Erbil city located in northern Iraq (26). In Shiraz, a city of Iran, CE was seen in liver (4.49%) and lungs (6.48%) in 756 slaughtered cattle (20). In Western Iran CE was seen 16.4% of 15799 cattle (8).

The fertility of hydatid cysts is one of the important factors in the epidemiology of E. granulosus. The fertility of cycts varies depending on the intermediate hosts and geographical situation. (8, 14, 17, 25, 36). The sheep strain (G1) is the predominating Echinococcus species in the Mediterranean countries and part of Great Britain (Wales) (16, 27).

CE causes a huge health problems in animals and economical disadvantages because of production loss. This losses can take the form of a reduction in live weight gain, reduced yield of milk, reductions in the fertility rates and reductions in the value of wool or other products. Also, may be the most important one, totally or partially discard of infected organs causes largest costs. Financial loss could be as high as 10% (29-31).

MATERIALS AND METHOD

Liver, lungs, spleen, heart and kidneys from a total of 1001 cattle (746 bulls and 255 cows) raised in Afyonkarahisar municipality over 1-year-old (after slaughter) were examined for the presence of CE. Three private slaughterhouse were visited twice a week. Internal organs were carefully examined by naked eye and palpation. Suspected organs on palpation were cutting and then examined. After confirming the presence of CE, organ localization of cyst formation and type of the organs were recorded. During examination by abattoir's veterinarian organs decided to be partially or completely destroyed were also recorded. These records were compared with the abattoir's destruction minutes (29, 31).

The fertility of the cyst was determined by considering the presence of protoscolices into the cyst.

Two sample t-test for proportion was used for correlation between animals (24).

RESULTS

Two hundred and ninety five (29.47%) out of 1001 cattle raised and slaughtered in Afyonkarahisar city displayed CE. The cows were 5 years old and over and the bulls were between 1,5-2 years old. CE was seen in 113 (44.31%) cows out 255 and 182 (24.39%) bulls out of 746. There was a significant difference between cows and bulls regarding the infection. Prevalence of CE was constantly higher in cows than bulls ($t=-5.704$; $p<0.001$).

Distribution of CE in infected cattle was as follows; in cows, 40 (35.4%) animals had cyst in only liver, 22 (19.47%) in only lungs, 2 (1.77%) in heart, 48(42.48%) in liver and lungs together, 1 (0.88) in heart and lungs together. In bulls, 90 (49.45%) animals possessed cyst in only liver, 69 (37.91%) in only lungs, one (0.55%) in only kidney and 22 (12.09%) in liver and lungs together. In general, CE was found in only liver as 44.06%, in lungs 30.85%, in heart 0.68%, in kidney 0.34%, in liver and lungs together 23.73% and in heart and lungs together 0.34% of 295 infected cattle (Table 1).

Prevalence of CE according to organ localization was higher in cows than bulls ($t=-8.58$; $p<0.001$). Fourtythree liver completely, half of 18 livers, a quarter of 37 livers and remaining liver at various degrees were discarded after our and veterinarian's observations. Fourtyfour lungs completely, half of 13 and a

Table 1. Distribution of CE in infected cattle according to sexes and organs.

Infected organs	Cow (n=113)		Bull (n=182)		Total (n=295)	
	Number	%	Number	%	Number	%
Liver	40	35.40	90	49.45	130	44.06
Lungs	22	19.47	69	37.91	91	30.85
Heart	2	1.77	-	-	2	0.68
Kidney	-	-	1	0.55	1	0.34
Liver + lungs	48	42.48	22	12.09	70	23.73
Heart +lungs	1	0.88	-	-	1	0.34

Table 2. The rate of organ discarded due to CE infection.

Amounts of discarded organ	Liver (n=200)		Lungs (n=162)		Heart (n=3)		Kidney (n=1)	
	Number	%	Number	%	Number	%	Number	%
1/4 <	102	51	84	51.85				
1/4	37	18.5	21	12.96	-	-	-	-
1/2	18	9.0	13	8.02	-	-	-	-
1/1	43	21.5	44	27.16	3	100	1	100

quarter of 21 were destroyed. Three heart and one kidney were completely discarded (Table 2). The fertility rate of cysts was found to be as 5.42% (16) in the 295 CE infected cattle.

DISCUSSION

A number of studies in Turkey indicated that CE is not only associated with significant financial lost but also an important threat to public health (15, 22, 31). Prevalence of infection was varied from 8.96% to 46.4% however it showed different trend within geographical regions (2, 6, 7, 9, 10, 15, 23, 28, 31, 33, 37). CE was found geographically relatively higher in Eastern Turkish cities (2, 9, 15, 23). In this study, prevalence of CE was 29.47% in 1001 cattle, raised and slaughtered, in Afyonkarahisar city boundaries.

CE showed different distribution of organ predilection in infected cattle. A study performed in a neighbouring city, Burdur, reported that in infected cattle, cysts were localized in liver (73.2%), lungs (89.1%), liver and lungs (59%) (31). It was 20% in liver, 36% in lungs and 44% in liver and lungs in Kars city (15). Cysts were localized in liver (16.68%), lungs (49.16%), liver and lungs (34.16%) in Kırıkkale (36). In Van, cysts were found in the livers of 23, the lungs of 30, the livers, lungs and spleens of 7, the liver, lungs and kidneys of one, the livers, lungs and hearts of 2 in 87 CE infected cattle (9). Studies carried out in neighbouring countries, Iraq and Iran, generated slightly different pattern. In Erbil, northern city of Iraq, cysts in infected cattle were observed in liver (45.7%), in lungs (28.6%) and in liver and lungs (25.7%) (26). In Shiraz, city of Iran, CE was diagnosed at 4.49% in liver and 6.48% in lungs of 756 slaughtered cattle (20). In Western Iran, cysts in infected cattle were observed in liver (18.4%), in lungs (63.7%) and in liver and lungs (17.8%) (8). In contrast, our study indicated that CE was found 44.06% in liver, 30.85% in lungs, 23.73% in liver and lungs, 0.68% in heart, 0.34% in kidney and 0.34% in heart and lungs. It appears that CE in Turkish cattle is seen most frequently in liver followed by lungs.

The lower prevalence (24.39%) of CE in bulls than cows (44.31%) in this study might be due to the bulls being slaughtered at a younger age.

Based on the molecular and epidemiological studies, previously identified 10 (G1 to G10) strains of Echinococcus granulosus have been proposed to be species (25). Another factor which determines the fertility rate of hydatid cysts is the type of strain (8, 17, 36). It is reported that sheep strain (G1) of E. granulosus produces fertile cysts in cattle and pigs in small numbers, and the cysts are usually sterile (17, 36). As reported, Echinococcus ortleppi (G5) is the strain which produces fertile cysts in cattle (25). Yıldız and Tunçer (36) has found the fertile cyst rate as 6,6% in Kırıkkale,Turkey. Dalimi et al. (8) reported it as 10.2% in Western Iran, where as Saeed et al. (26) have found the fertility rate as 29.8% in Northern Iraq. In the present study, the fertility rate of hydatid cysts has been found to be 5.42% in Western Turkey, where sheep breeding is common and this lower rate of fertile cysts may indicate that the cause of infections in cattle might be due to the sheep strain (G1) as it is known that its lifecycle is almost exclusively domestic, involving dogs as definitive and (predominantly) sheep as intermediate hosts (25). However further molecular studies are necessary to confirm the cause of CE in cattle in this region to reach to the final conclusion.

Several studies conducted to identify the financial losses due to CE in cattle showed that it was caused by discarded organs and decrease in production (2, 29, 30, 31, 33). Economic losses associated with CE could be as high as 10% or more (29).

A study on economic importance of CE reported that of 134 liver, 29.9% quarterly, 9% partially and 54% completely were annihilated, however 163 lungss were discarded as 20.9% (quarterly), 10.4% (partially) and 33.1% (completely) and the decreased value of carcasses because of the discarded liver and lungs as a result of CE was estimated as 1.1% (31). In this study, from 200 infected liver, 51% were at less than a quarter, 18.5% at a quarter, 9% at half, and 21.5% completely destroyed. From infected 162 lungs, 51.85% were at less than a quarter, 12.96% at a quarter, 8.02% at half and 27.16% completely discarded. In addition 3 heart and 1 kidney were completely destroyed.

In conclusion prevalence of CE in Afyonkarahisar region has been documented and its financial effect has been emphasized. It is hoped that the data generated here may contribute to the prevention programs in Turkey

REFERENCES

1. **Altıntaş N,** 2003. Past to present: echinococcosis in Turkey. *Acta* Trop, 85: 105-112.
2. **Arslan MO, Umur Ş,** 1997. Erzurum mezbahalarında kesilen koyun ve sığırlarda hidatidozun yayılışı ve ekonomik önemi. *Kafkas Univ Vet Fak Derg*, 3: 167-171.
3. **Ataş AD, Özcelik S, Saygı G,** 1997. Sivas sokak köpeklerinde görülen helmint türleri, bunların yayılışı ve halk sağlığı yönünden önemi. *Türkiye Parazitol Derg*, 3: 305-309.
4. **Aydenizöz M,** 1997. Konya yöresi köpeklerinde helmintolojik araştırmalar. *Türkiye Parazitol Derg*, 4: 429-434.
5. **Boch J, Supperer R**, 1992. *Veterinärmedizinische Parasitologie*. 3. Auflage, Verlag Paul Parey, Berlin und Hamburg.
6. **Celep A, Açıcı M, Çetindağ M, Coşkun ŞZ, Gürsoy S**, 1990. Samsun Yöresi sığırlarında helmintolojik araştırmalar. *Etlik Vet Mikrob Derg*, 6 (6): 117-130.
7. **Çenet O, Taşcı S**, 1994. Manisa Et ve Balık Kurumunda (EBK) 19986-1993 yılları arasında kesilen kasaplık hayvanlarda kesim sonrası görülen hastalıkların araştırılması. *Türkiye Parazitol Derg*, 18: 511-516.
8. **Dalimi A, Motamedi Gh, Hosseini M, Mohammadian B, Malaki H, Ghamari Z, Ghaffari Far F**, 2002. Echinococcosis/hydatidosis in Western Iran. *Vet Parasitol*, 105, 161-171.

9. **Değer S, Ayaz E, Gül A, Biçek K, Erarslan E**, 2001. Van Yöresinde kesilen sığır, koyun ve keçilerde hidatidoz'un yayılışı. *Yüzüncü Yıl Üniv Sağlık Bil Derg*, 7(1-2): 37-40.
10. **Dik B, Cantoray R, Handemir E**, 1992. Konya Et ve Balık Kurumu Kombinasında kesilen küçük ve büyükbaş hayvanlarda hidatidozun yayılışı ve ekonomik önemi. *Türkiye Parazitol Derg*, 16: 91-99.
11. **Doğanay A**, 1993. Ankara köpeklerinde görülen bağırsak helmintleri, bunların yayılışı ve halk sağlığı yönünden önemi. 3. Ulusal Parazitoloji Kongresi Bildiri Özetleri.
12. **Eckert J, Deplazes P**, 2004. Biological, epidemiological and clinical aspects of echinococcosis, a zoonosis of increasing concern. *Clin Microbiol Rev*, 17(1): 107-35.
13. **Ekinci N, Özcan M, Şahin İ, Gökmerdan A, Şen A,** 1993. Kayseri yöresi köpeklerinde *E. granulosus* (Batch 1786) ve diğer parazitlerin yayılışı. *Türkiye Parazitol Derg*, 1: 83-87.
14. **Farah MO**, 1987. Infection rates, cyst fertility and larval viability of hydatid disease in camels, sheep and cattle in Gassim, Saudi Arabia. *Vet Res Commun*, 11: 493-495.
15. **Gıcık Y, Arslan MÖ, Kara M, Köse M**, 2004. Kars ilinde kesilen sığır ve koyunlarda kistik ekinokokkozis'in yaygınlığı. *Türkiye Parazitol Derg*, 28(3): 136-139.
16. **Jenkins D, Romig T, Thompson RCA**, 2005. Emergence/re-emergence of *Echinococcus* spp. - a global update. *Int J Parasitol*, 35: 1205– 19.
17. **Kamenetzky L, Canova SC, Guernera EA, Rosenvit MC**, 2000. *Echinococcus granulosus*: DNA Extraction from germinal layers allows strain determination in fertile and nonfertile hydatid cysts. *Exp Parasitol*, 95: 122-127.
18. **Maleky F, Moradkhan M**, 2000. Echinococcosis in the stray dogs of Tehran, Iran. *Ann Trop Med Parasitol*, 94(4): 329-31.
19. **McManus DP, Smyth JD**, 1986. Hydatidosis changing concepts in epidemiology and speciation. *Parasitol Today*, 2: 163-168.
20. **Mehrabani D, Oryan A, Sadjjadi SM**, 1999. Prevalence of *Echinococcus granulosus* infection in stray dogs and herbivores inShiraz, Iran. *Vet Parasitol*, 86: 217-220.
21. **Molan AL, Said LA**, 1998. Echinococcosis in Iraq: prevalence of *Echinococcus granulosus* in stray dogs in Arbil Province. *Jpn J Med Sci Biol*, 42(4): 137-41.
22. **Özçelik S**, 2001. Cystic echinococcosis in Turkey. XXth International Congress of Hydatidology, RT9, 69, June 4-8, Kusadasi-Turkey.
23. **Özçelik S, Saygı G**, 1990 Sivas mezbahasında kesilen koyun ve sığırlarda kist hidatik görülme oranları. *Türkiye Parazitol Derg*, 14: 41-44.
24. **Özdamar K**, 2001. *SPSS ile Biyoistatistik*. 4. Basım, Kaan Kitabevi, Eskişehir.
25. **Romig T, Dinkel A, Mackenstedt U**, 2006. The present situation of echinococcosis in Europe. *Parasitol Int*, 55: 187-191.
26. **Saeed I, Kapel C, Saida LA, Willingham L, Nansen P**, 2000. Epidemiology of Echinococcus granulosus in Arbil province, northern Iraq, 1990-1998. *J Helminthol*, 74: 83-88.
27. **Thompson RCA, McManus DP**, 2002.Towards a taxonomic revision of the genus *Echinococcus*. *Trends Parasitol*, 18: 452– 457.
28. **Toparlak M, Gül Y**, 1989. Van İli belediye mezbahasında kesilen hayvanlarda hidatidozun yayılışı ve ekonomik önemi. *Ankara Univ Vet Fak Derg*, 36: 129-137.
29. **Torgerson PR**, 2003. Economic effects of echinococcosis. *Acta Trop*, 85: 113-118.
30. **Torgerson PR, Carmona C, Bnifacino R**, 2000. Estimating the economic effects of cystic echinococcosis. Uruguay, a developing country with upper-middle income. *Ann Trop Med Parasitol*, 94: 703-713.
31. **Umur Ş**, 2003. Prevalence and economic importance of Cystic Echinococcosis in slaughtered ruminants in Burdur, Turkey. *J Vet Med B*, 50: 247-252.
32. **Umur Ş, Arslan MO**, 1998. Kars yöresi sokak köpeklerinde görülen helmint türlerinin yayılışı. *Türkiye Parazitol Derg*, 2: 188-193.
33. **Umur Ş, Aslantaş Ö**, 1993. Kars belediye mezbahasında kesilen ruminantlarda hidatidoz'un yayılışı ve ekonomik önemi. *Türkiye Parazitol Derg*, 17(2): 27-34.
34. **Üner A**, 1989. İzmir ve civarında köpeklerde *E.granulosus* (Batch 1786) üzerindeki araştırmalar. *Türkiye Parazitol Derg*, 13: 103-112.
35. **Wajdi N, Nasır JK**, 1983. Studies on the parasitic helminths of slaughtered animals in Iraq. *Ann Trop Med Parasitol*, 77(6): 583-585.
36. **Yıldız K., Tunçer Ç,** 2005. Kırıkkalede sığırlarda kist hidatik'in yayılışı. *Türkiye Parazitol Derg*, 29(4), 247-250.
37. **Zeybek H, Tokay A**. 1990. Ankara yöresinde evcil ve yabani Canidae'lerde *Echinococcus* türlerinin yayılışı, cyst şekillerinin ensidansı ve kontrol olanaklarının araştırılması. *Etlik Vet Mikrob Derg*, 6 (6): 1-19.