

Survey of hydatidosis infection in slaughtered camel (*Camelus dromedarius*) in Tabriz area, Northwest Iran

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Abstract Hydatid Disease is the name given to the condition caused by the zoonotic tapeworm *Echinococcus granulosus*. The tapeworm spends most of its adult life in the intestine of its definitive host, namely canids and in particular the dog. The tapeworm eggs become voided in the canids' faeces and as a result of ingesting the eggs, infection passes to the intermediate host, commonly herbivores while grazing. However, humans can become accidentally infected and hydatid cysts may develop throughout the body. During April 2010–February 2014, a total 198 camels, which had been sent to the abattoir, the daily number of hydatid infected livers and lungs of camels slaughtered at Tabriz abattoir were recorded. To be sure about the validity of recorded data, observed data were collected daily. Approximately 29 (14.64 %) of camels were infected according to this survey. Age wise, the prevalence of infection in young animals (under the age of 5 years) was 4 (2.02 %), whereas in animals between 5 and 10 years and over, the prevalence of infection was 11 (5.55 %) and 14 (7.07 %) respectively. Sex wise, female animals had a higher prevalence with 17 (19.76 %) cases in camels, whereas in the males, there were 12 (10.71 %) cases in camels. There was a notable difference found in our study between male and female animals ($P < 0.05$). Infections were recorded in two visceral organs with the

Lungs having the highest prevalence in camels, and the liver had low infected in camels. The results of this study suggest that infection of camels with hydatid cyst is common in Tabriz, Iran and that this may constitute economic and health problems in the meat industry.

Keywords Prevalence · Hydatid cyst · Camel · Iran

Introduction

Hydatid disease is the name given to the condition caused by the zoonotic tapeworm *Echinococcus granulosus*. The tapeworm spends most of its adult life in the intestine of its definitive host, namely canids and in particular the dog. The tapeworm eggs become voided in the canids' faeces and as a result of ingesting the eggs, infection passes to the intermediate host, commonly herbivores while grazing. However, humans can become accidentally infected and hydatid cysts may develop throughout the body. Therefore, cystic echinococcosis (CE) or hydatidosis is a disease caused by the metacestode stage of *Echinococcus granulosus*. The disease is not apparent to farmers but is of considerable economic and public health importance (Ahmadi and Meshkekar 2011; Torgerson and Budke 2003). Hydatidosis of livestock animals results in decreasing by their production (meat, wool and milk) and thereby causes high economic loss (Umur and Kaaden 2003). Furthermore, the infected organs of the slaughtered animal are condemned. Since hydatidosis is a zoonotic disease, and it is a matter of health, concern, in many countries there are special programs to control and eradicate the disease. (Eslami and Hosseini 1998). The high incidence rate because of adult form of *E. granulosus* in dogs may be

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associated with high environmental contamination. As a result, human and mammals, who are intermediate hosts of *E. granulosus*, are under high risk of the disease. For example, a 55.7 % infection rate has been reported in Kashan (central Iran) dogs by (Arbabi and Hooshyar 2006; Eslami and Hosseini 1998). The incidence of human hydatid disease in any country is closely related to the prevalence of the disease in domestic animals and is highest where there is a large dog population and high sheep production (Khuroo 2002). Nakao et al. 2007 analysed the complete mitochondrial genome of different *Echinococcus* spp. and clarified the phylogenetic relationship within this taxonomic group. They support considering the genotypes G1 (sheep strain), G2 (Tasmanian sheep strain) and G3 (buffalo strain) as *E. granulosus sensu stricto*. The genotypes G6 (camel strain), G7 (pig strains) and G8 (cervid strain) were found to be monophyletic and were thus grouped under the species name *Echinococcus canadensis*. The G4 genotype (horse strain, *Echinococcus equinus*) and the G5 genotype (cattle strain, *Echinococcus ortleppi*) were confirmed to be good species (Nakao et al. 2007).

The molecular characterization of human and animal *Echinococcus granulosus* isolates demonstrated that the ‘camel’ strain (G6) is also equally important source of infection to humans (Magambo et al. 2006; Shahnazi et al. 2011). There is any report about prevalence of camel hydatidosis in Tabriz area. Tabriz is located in the northwest of Iran in the Azarbaijan zone. High incidences of camels hydatidosis in the west and northwest of Iran and the lack of any report about the infection rate of disease in this zone (Azarbaijan) made it imperative for us to study the hydatidosis of camels, slaughtered at Tabriz abattoir.

Materials and methods

The study was carried out in Tabriz, capital of East Azarbaijan province in northwest of Iran during April 2010–February 2014. In total, 198 camels, which had been sent to the abattoir, the daily number of hydatid infected livers and lungs of camels slaughtered at Tabriz (Northwestern Iran-Azarbaijan zone) abattoir were recorded. To be sure about the validity of recorded data, observed data were collected daily. While recording the number of infected organs, other information on the carcass, including its sex, age and species, was recorded too. Abundance and percentage of recorded data, and the relation between gender and infected organ, and the relation between species and infected organ which are presented in the results, were calculated using Chi square tests in SPSS software (Version 16).

Table 1 Prevalence of Hydatid cyst in slaughtered camels according to infected organs

Organs	No. of infected organs (%)
Liver infected in male	2 (1.01 %)
Liver infected in female	7 (3.53 %)
Total liver infected	9 (4.54 %)
Lung infected in male	4 (2.02 %)
Lung infected in female	8 (4.04 %)
Total Lung infected	12 (6.06 %)
Lung-liver infected in male	3 (1.51 %)
Lung-liver infected in female	5 (2.52 %)
Total lung-liver infected	8 (4.04 %)
Total	29 (14.64 %)

Table 2 Prevalence of Hydatid cyst in slaughtered camels according to age

Age (years)	No. of examined camels	No. of infected camels (%)
Under 5	76	4 (2.02 %)
5–10	69	11 (5.55 %)
Above 10	53	14 (7.07 %)
Total	198	29 (14.64 %)

Results

A total of 198 camels were examined and 29 (14.64 %) was positive for Hydatid cyst. Twelve of 112 males (10.71 %) and 17 out of 86 females (19.76 %) in camels were been positive, the prevalence of the mentioned metacestode according to species, intensity rate of cysts and age are presented in tables. The infection rates according to; infected organ and age, are given in Tables 1 and 2 respectively.

Discussion

Echinococcosis is one of the most geographically widespread zoonotic diseases that occur in all inhabited continents, including sub-arctic, arctic, temperate, subtropical and tropical zones, especially in undeveloped and developing countries. The disease is endemic to hyperendemic in agricultural countries of Europe, northern, eastern and southern Africa, southern and northern America, Middle East and Asia (Arambulo Iii 1997; Budke et al. 2006; Dakkak 2010; Matossian et al. 1977; Torgerson and Budke 2003; Wen and Yang 1997). Postmortem findings have shown cysts of different diameters on the liver and lung. As the results of this study have shown, there was a low

prevalence of Hydatidosis found in camels (14.64 %) in areas such as the northwest of Iran. In a study by Moghaddas et al. (2014) conducted in different regions of Iran, the prevalence of this metacestode in camel was 30.82 %. They also determined that the cysts had a greater tendency to develop in camels lungs with (72.5 %) than in other parts of the animals (Moghaddas et al. 2014). As a result, few cysts were found in the liver with (12.6 %), or other organs, and significant ($P < 0.05$) difference was found between the prevalence of this parasite in either species. The prevalence of infection in young animals under the age of 5 years was 4 (2.02 %), whereas in animals between 5 and 10 years and over, the prevalence of infection was 11 (5.55 %) and 14 (7.07 %) respectively. As previously mentioned, infection rates increased significantly with age ($P < 0.05$) (Table 2), this age variation can be again associated with difference in exposure to infection because older livestock may have been exposed to more infective stages (Ibrahim et al. 2008). But no significant differences were found between male and female rates. In a study by Fathi et al. (2011) conducted in Iran (Kerman Province), the prevalence of this metacestode in camels was 20.73 %. The researchers found hydatid cysts in the; lung (58.06 %), liver (38.75 %) and, spleen (3.22 %) infection, respectively (Fathi et al. 2011). The low prevalence rate of the parasite in camels (14.64 %) in the present study, compared with the results of both Moghaddas et al. (2014) and Fathi et al. (2011) is significant. Contrary to the findings of Fathi et al. (2011), there was a notable difference found in our study between male and female animals. Several studies have been conducted to determine the prevalence of Hydatidosis in camels in Iran and other countries. The prevalence rate was 18.8 % in camels of Eastern Ethiopia (Woldemeskel et al. 2001), 32.85 % in camels in Saudi Arabia (Ibrahim 2010), 7.67 % in camels slaughtered of Egypt (Dyab et al. 2005) and 49.3 % in camels of China (Chai et al. 1998). In another study, 48 % of camels in Libiya were infected with hydatidosis of *E. granulosus* (Ibrahim and Craig 1998). Also The prevalence rate was 39.65 % in camel of Kuwait (Abdul-Salam and Farah 1988). Also The prevalence of 13.2 % in Khorasan Razavi (Iran), 40.86 % in shiraz (Iran), 42.8 %, in south of Iran, 8.84 % in north of khorasan (Iran), 64 % in Tehran (Iran), 70 % in Iran has been reported (Rokni 2009). Also the prevalence of 11.4 % in Iran has been reported in camels (Ahmadi 2005). The differences in the reported prevalence rates are expected matter due to several factors such as presence of very similar environmental situation in all the three areas. However other investigators found a variation in the prevalences of camel hydatidosis for different areas having different environmental and climatic conditions (Ibrahim 2010), this variation may be explained by better environmental conditions that are conducive to

the perpetuation of the parasite, (Njoroge et al. 2002; Wachira et al. 1991). Results obtained in this study confirm that hydatidosis is endemic in camels. It is recommended that, due to the light of the result obtained of hydatidosis in camels of the northwest of Iran, designing a surveillance program followed by hygienic measures can be useful in reducing the incidence rate of the disease. Program must based on making pastures safe from vagrant carnivores while prevention measures against parasitic disease such as *E. granulosus* must be implemented in flock dogs. Furthermore, the infected organs (lung and liver) of slaughtered animal in abattoirs should be destroyed to keep them out of the reach of wild carnivores. Also the results of this study suggest that infection of camels with hydatid cyst is common in Tabriz, Iran and that this may constitute economic and health problems in the meat industry.

Conflict of interest The authors declare that they have no conflict of interest.

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