



Prevalence of Common Food-Borne Parasitic Diseases in Slaughtered Ruminants in West Part of Iran

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HIGHLIGHTS

- Infection of liver and lung due to the hydatidosis in cattle were 3.24 and 4.41%, respectively.
- *Dicrocoelium dendriticum* was detected in 4.81% cattle and 2.33% small ruminants (both sheep and goats).
- *Fasciola* spp. was reported in 5.99 and 1.23% cattle and small ruminants, respectively.
- The prevalence rates of parasitic diseases in summer were significantly higher than winter.
- The food-borne parasites are still the serious health problems in west part of Iran.

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ABSTRACT

Background: To obtain update information on the prevalence of common food-borne parasitic diseases, this study designed to determine the prevalence of hydatidosis and liver flukes (*Fasciola* spp. and *Dicrocoelium dendriticum*) in the slaughtered cattle, sheep, and goats in Kermanshah, Iran from 2013 to 2016.

Methods: In this four-year retrospective survey, information on the prevalence of hydatidosis and liver flukes were collected as a part of routine meat inspection of Iranian Veterinary Organization using a systematically visual inspection, palpation, and incisions of visceral organs. Data were analyzed using SPSS for Windows version 16.0.

Results: The hydatidosis infection from liver and lung in cattle were 3.24% (3347/103198) and 4.41% (4553/103198), respectively; while the corresponding infections for small ruminants (both sheep and goats) were 1.48% (5556/372985) and 1.79% (6685/372985), respectively. With respect to liver flukes, 5.99% (6187/103198) and 1.23% (4625/372985) cattle and small ruminants were infected by *Fasciola* spp., respectively; also, 4.81% (4968/103198) cattle and 2.33% (8722/372985) small ruminants were infected by *D. dendriticum*. The prevalence rates of parasitic disease in summer were significantly ($p < 0.05$) higher than in winter.

Conclusion: It can be concluded that *Fasciola* spp., *D. dendriticum*, and *E. granulosus* still remain the serious human and animal health problems in west part of Iran. More strict regulatory limitations and legislations must be applied to reduce the exposure of Iranian population to the important zoonotic parasitic diseases.

Introduction

Parasitic diseases remain the most prevalent diseases of ruminant animals having public health and economic importance in many developing countries such as Iran (Shahbazi et al. 2016a). In recent years, there has been an increase in the number of reported cases of these diseases

in all herbivores especially in the Middle East countries. *Fasciola* spp., *Dicrocoelium dendriticum* as well as *Echinococcus granulosus* are considered as the major parasites of livestock animals especially in cattle, sheep, and goat (Ansari-Lari, 2005; Borji and Parandeh, 2010; Eckert and Deplazes, 2004; Khanjari et al., 2014a,b; Nguyen et al., 2009).

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Economic consequences of parasitic diseases could be due to mortality and morbidity; increased susceptibility to other infections like bacterial and viral diseases; condemnation of edible carcasses and offal such as liver, lung, and heart; reduced production of meat, milk, and wool; and cost of drugs and veterinary care (Rajakaruna and Warnakulasooriya, 2011). From viewpoint of public health significant, the parasites can cause human infectious diseases. It is obvious that the consumption of infected raw or semi-cooked meat has an important epidemiological role in the transmission of parasitic food-borne diseases. Moreover, the persistence of anti-parasitic drugs in edible tissues especially liver, kidney, and meat can treat human health (Ahmadi et al., 2015; Shahbazi et al., 2015). In many developing countries, a general lack of people education about the relationship between human and animal diseases, and also risk of consumption of infected meat and meat products are responsible for the high rates of human parasitic diseases. Owing to increasing reports about food-borne parasitic diseases, it should be considered as an emerging and widespread public health concern. In this regard, it has to be taken to account that regular and proper investigation of the food-borne parasitic diseases in the slaughtered animals is the first step in planning of the preventive programmes for hygienic risks endangering food safety (Borji and Parandeh, 2010; Getaw et al., 2010; Nonga et al., 2009).

Kermanshah, located in the west part of Iran, is one of the most important pastured livestock areas on traditional and industrial farms. The produced red meat in Kermanshah is also marketed in the other neighbour Iranian provinces and countries (e.g. Iraq). Therefore, the presence of parasites is also one of the major reasons of concern in the trade of domestic ruminants in this region. Our previous studies have shown high prevalence of some parasitic infections in cattle and its economic significance in Kermanshah from 2006 to 2013 (Shahbazi et al. 2016a, b). Abattoir surveys could estimate the prevalence of food-borne parasitic diseases because this relies on post-mortem meat inspection. Moreover, obtained data from slaughterhouses as a convenient and relatively inexpensive source of information can be efficient for estimating of the economic loss due to total or partial condemnation of carcasses and offal, where the reporting system is reliable.

In view of obtaining new information on the prevalence of common food-borne parasitic diseases, this study designed to determine the prevalence of hydatidosis and liver flukes (*Fasciola* spp. and *D. dendriticum*) in the slaughtered cattle, sheep, and goats in Kermanshah, Iran from 2013 to 2016.

Materials and methods

Samples

A four-year (2013 to 2016) retrospective study was conducted to determine prevalence of hydatidosis and liver flukes in the slaughtered cattle, sheep, and goats in the Kermanshah slaughterhouses. Large ruminants (cattle) as well as small ruminants (sheep and goats) from different parts of the province were transported to Kermanshah town due to its quality meat butcheries. Most of the slaughtered cattle were female Holstein×Friesian with reproductive problems and/or poor performance. Moreover, occasionally a few number of male cattle were slaughtered. Small ruminants, including goat and sheep were also slaughtered from local breeds. Totally, 476183 ruminants (103198 cattle, 339329 sheep, and 33656 goats) were included in the study.

Data collection

As a part of routine meat inspection, information on mentioned parasites was obtained using a systematically visual inspection, palpation, and incisions of visceral organs particularly the lung, liver, spleen, heart, kidneys, muscles individually by trained meat inspectors assigned by Iranian Veterinary Organization. Identification of lesions in carcasses and offal and subsequently total or partial condemnation was conducted in accordance with the national standards of the Iranian Veterinary Organization. The identification of the parasites was done by their morphological characteristics. The number of all daily parasitic lesions per organ and per species of investigated animals was recorded by slaughterhouse authorities.

Statistical analysis

Data were analyzed using SPSS for Windows version 16.0. To compare prevalence of parasitic diseases among ruminant species and also the prevalence rates between seasons for the same animal species, Chi-square test was used. Significance level was considered at $p < 0.05$.

Results

Infection of liver and lung due to the hydatidosis for cattle were 3.24% (3347/103198) as well as 4.41% (4553/103198), respectively; while the corresponding infections for small ruminants (both sheep and goats) were 1.48% (5556/372985) and 1.79% (6685/372985), respectively (Table 1). The condemnation of liver and lung due to the hydatidosis for small ruminants were 89.41% (4968/5556) as well as 92.41% (6178/6685), respectively.

Table 1: Prevalence of hydatidosis in animals slaughtered at Kermanshah slaughterhouses from 2013 to 2016

Year	Animal	Number of animals	Number of liver hydatidosis (%)	Number of lung hydatidosis (%)
2013	Cattle	22188	355 (1.59)	590 (2.65)
	Sheep	67988	873 (1.28)	1309 (1.92)
	Goat	7561	129 (1.70)	210 (2.77)
2014	Cattle	26252	381 (1.45)	376 (1.43)
	Sheep	85760	1277 (1.48)	1125 (1.31)
	Goat	9006	285 (3.16)	251 (2.78)
2015	Cattle	27881	1300 (4.66)	1734 (6.21)
	Sheep	93162	1177 (1.26)	1443 (1.54)
	Goat	9334	216 (2.31)	292 (3.12)
2016	Cattle	26877	1311 (4.87)	1853 (6.89)
	Sheep	92419	1387 (1.50)	1624 (1.75)
	Goat	7755	212 (2.73)	431 (5.55)
Total	Cattle	103198	3347 (3.24)	4553 (4.41)
	Sheep	339329	4714 (1.38)	5501 (1.62)
	Goat	33656	842 (2.50)	1184 (3.51)

Table 2: Prevalence of fasciolosis and dicrocoeliosis in animals slaughtered at Kermanshah slaughterhouses from 2013 to 2016

Year	Animal	Number of animals	Number of fasciolosis (%)	Number of dicrocoeliosis (%)
2013	Cattle	22188	1296 (5.84)	875 (3.94)
	Sheep+Goat	75549	905 (1.19)	1216 (1.60)
2014	Cattle	26252	1089 (4.14)	1010 (3.84)
	Sheep+Goat	94766	1126 (1.18)	1928 (2.03)
2015	Cattle	27881	1771 (6.35)	1483 (5.31)
	Sheep+Goat	102496	1204 (1.17)	2874 (2.80)
2016	Cattle	26877	2031 (7.55)	1600 (5.95)
	Sheep+Goat	100174	1390 (1.38)	2704 (2.69)
Total	Cattle	103198	6187 (5.99)	4968 (4.81)
	Sheep+Goat	372985	4625 (1.23)	8722 (2.33)

With respect to liver flukes, 5.99% (6187/103198) cattle and 1.23% (4625/372985) small ruminants were infected by *Fasciola* spp. Also, 4.81% (4968/103198) cattle and 2.33% (8722/372985) small ruminants were infected by *D. dendriticum* (Table 2).

According to the results of this study, prevalence rates of parasitic diseases in summer were significantly ($p < 0.05$) higher than in winter.

Discussion

In this survey, we found that hydatidosis is common in slaughtered animals at Kermanshah slaughterhouses that was in agreement with those reported by other authors (Dalimi et al., 2002; Kebede et al., 2009; Khanjari et al., 2014a). The reason of these findings can be due to out-pasture grazing of Iranian ruminants where *E. granulosus*

infective eggs are mostly found from the ground. Getaw et al. (2010) studied the prevalence of hydatidosis in cattle, sheep, and goat slaughtered at Central Oromia, Ethiopia from 2007 to 2008; they showed that the prevalence rates of hydatidosis were 46.8, 29.3, and 6.7% in cattle, sheep, and goats, respectively. In another study in Jordan, the prevalence rates of hydatidosis were reported in 46.5% bovine, 12.45% sheep, as well as 1.7% goats (Torgerson et al., 2001).

The average condemnation of offal of small ruminants due hydatidosis was similar with some studies reported from Iran (Ahmadi and Meshkehkar, 2011; Ansari-Lari, 2005) and also the other countries such as Saudi Arabia (Ibrahim, 2010), Ethiopia (Getaw et al., 2010; Jibat et al., 2008), Jordan (Kamhawi et al., 1995), and Iraq (Saeed et al., 2000). However, it was higher than those of reported from Greece (Theodoropoulos et al., 2002), Malaysia

(Lat-Lat et al., 2006), and Ireland (Relf et al., 2011). The variations of condemned offal of small ruminants in different studies could be attributed to weather and seasonal variations, geographical conditions, livestock husbandry, different methods used for detection of the parasites, and also national and international programs which conducted in order to control of parasitic diseases (Getaw et al., 2010; Shahbazi et al., 2016a). Our study revealed that hydatid cyst was more prevalent in the lung comparing to the liver. This finding may be due to this reason that lung has major capillaries fields encountered more frequently by *Echinococcus* oncospheres existing in blood stream (Kebede et al., 2009).

According to the current research, 5.99 and 1.23% of the cattle and small ruminants were infected by *Fasciola* spp., respectively; the corresponding rates for *D. dendriticum* were 4.81 and 2.33%, respectively. Previous studies indicated that liver flukes were prevalent in animals Iraq (Ridha and Al-Sadi, 1992), Pakistan (Khan et al., 2010), Turkey (Kara et al., 2009), and Japan (Itagaki and Tsutsumi, 1998). Moreover, numerous studies reported that fasciolosis and dicrocoeliosis were prevalent in different parts of Iran (Ansari-Lari and Moazzeni, 2006; Khanjari et al., 2014b). Based on literature, the prevalence of fasciolosis and dicrocoeliosis in different parts of Iran were ranged 2.3-5.5% and 2.5-4.8%, respectively (Shahbazi et al., 2016b). The variation of the prevalence is mainly due to the differences in environmental factors like temperature and humidity, which important factors influencing the development of the parasite from egg to miracidium (Khanjari et al., 2014b).

In agreement with our findings, it has been previously reported that the higher prevalence rate of the parasitic infection was found in summer (Ansari-Lari, 2005). The probable reason may be that in high humidity seasons favor the development of the intermediate hosts (Ridha and Al-Sadi, 1992). The similar pattern was found in previous studies (Kara et al., 2009; Khanjari et al., 2014b; Ridha and Al-Sadi, 1992). On the other hand, in the winter season, ruminants are fed always by stored grains and compound feed; despite, in summer season the animals are often fed in pastures where infective parasitic agents are prevalently distributed.

Conclusion

It can be concluded that *Fasciola* spp., *D. dendriticum*, and *E. granulosus* still remain the serious human and animal health problems in west part of Iran. Considering the results of the present study, more strict regulatory limitations and legislations must be applied to reduce the exposure of Iranian population to the important zoonotic parasitic diseases. Moreover, the identification of contributing factors and prediction of disease model can be

useful to reduce the prevalence of the diseases and the economic loss due to the condemnation of animal carcasses and offal.

Conflicts of interest

There is no conflict of interest in this study.

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