Correlation between age of sheep and structural changes of sheep hydatid cyst

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Abstract:
BACKGROUND: Naturally, the prevalence of hydatid cyst of sheep increase with age and accompany with structural changes.

OBJECTIVES: The aim of the present study was to determine prevalence of hydatid cyst in sheep and its structure with age.

METHODS: During 2009, 786 sheep in different age groups (1 to 6 years) slaughtered at Babol abattoir, Mazanderan province were examined for hydatid cyst infection through visual examination, palpation and slicing the infected organs into pieces. The number of cysts was counted and their mean volume, diameter, and number of protoscoleces in different age groups were determined. RESULTS: Our findings showed the overall prevalence rate of infection 35.2%. There was a significant relation between age and considered parameters (p<0.01). The viability of fertile cysts was 63-85%. The majority of cysts were detected through visual examination (86.4%) and the rest by palpation (8.5%) and slicing (5.1%). Meanwhile 96% of protoscoleces were found in sheep older than 4 years of age.

CONCLUSIONS: Old sheep are less productive, higher food consumers and harbor higher number of hydatid cysts. Therefore it can be assumed that using an accurate method for detection of infected sheep in the herd, and culling and slaughterhng old infected sheep is a rather cheap and effective means to reduce the infection without losing a high proportion of sheep population.

Introduction

Hydatidosis caused by larval stage of Echinococcus granulosus is among the most important parasitic zoonoses, with considerable human health hazards and animal economic losses throughout the world (Eckert et al., 1995) and in Iran (Rokni, 2009). Synanthropic cycle involving domestic dogs as final hosts and livestock including, sheep, goats, cattle, buffalo and camels and, to a lesser extent equine and human beings, is responsible for transmission of echinococcosis hydatidosis in Iran. The prevalence and intensities of E. granulosus in farm dogs and stray dogs were reported to be 3.3% to 63.3% and 50 to 2000 worms (Eslami and Hosseini, 1998) and 33% and 1500 worms (Eslami and Mohebali, 1998) respectively. Accordingly 5.1% to 74.4% of examin-ed sheep in Iran harbored hydatid cyst in different organs (Moulazadeh Zohoor, 2004; Daryani et al., 2007). In sylvatic cycle wild carnivores (Meshgi et al., 2009; Arabi and Hooshyar, 2006) as well as wild sheep and gazelle (Eslami et al., 1981) are involved. Among the three common species of taeniid cestodes in carnivores of Iran e.g., T. hydatigena, T. multiceps and E. granulosus, the daily egg production of the two former is high, 38000 for T. hydatigena and 8500 for E. granulosus (Gemmel et al., 1990). Meanwhile each single egg of T. hydatigena and T. multiceps leads to production of one cyst containing one protoscolex (cysticercus tenuicollis) or several hundred (coenurus...
cerebralis) while *E. granulosus* compensates its low egg laying by producing a cyst from a single egg containing thousands and sometimes millions of protoscoleces. It was also shown that G1 strain of *E. granulosus*, the most common strain of *E. granulosus* in Iran, is infective to human and ruminants but not entirely to camel (Zhang et al., 1998). According to hospital reports the annual incidence of the disease in man is 0.61/100,000 inhabitants, whereas sero-prevalence study using ELISA test showed a much higher prevalence rate (1.2% to 13.8%) (Aflaki et al., 2005; Rafiei et al., 2007).

The aim of the present paper was to study the structural changes of sheep hydatid cyst in different age groups.

### Materials and Methods

During 2009, in order to determine the correlation between age and different structures of sheep hydatid cyst, a total of 786 native sheep slaughtered at Babol abattoir in Mazanderan Province in the north of Iran were examined for hydatid cyst infection. Their ages were determined through careful examination of dentition and accordingly 6 groups of 1 to 6 years of age were formed. The infected organs were searched for hydatid cyst by naked eye, palpation and slicing into pieces (1×3 cm). All cysts in each sheep were excised and counted. The external diameter of each cyst was measured and total volume of cysts was determined after aspiration. The number of protoscoleces were calculated in 1 ml of homogenized cyst fluid and their total number was estimated by extrapolation of the number found to the entire volume of each cyst. Viability of protoscoleces was determined by staining them with 1% aqueous solution of eosin. Repeated Measures ANOVA was applied on the obtained results to evaluate the effects of age on hydatid cyst structures.

### Results

The overall rate of prevalence in this study was 35.24%. On the other hand, the majority of cysts (86.4%) were detected through examination of the infected organs by visual examination and the rest by palpation (8.5%) and slicing into pieces (5.1%). The viability of protoscoleces varied between 63%–85%.

The correlations between changes in different structures of hydatid cyst with age are shown in Table 1.

Data in Table 1 indicates that percentage of infection, mean abundance of cysts and mean number of
protoscoleces per infected sheep increased with age (p<0.01). Dramatic changes are noticed between the mean number of protoscoleces in sheep 1 and 6 years old (respectively 51) and 62 (29421).

In Table 2 the correlation between age and number of cysts containing protoscoleces to total number of cyst, mean and range of protoscoleces in fertile cyst, volume and the diameter of cysts containing protoscoleces.

**Discussion**

High population of sheep (55 million), high prevalence rate of sheep hydatid cyst reported from different parts of the country such as: Ardebil (74.4%) (Daryani et al., 2007), Kurdestan (51.9%) (Akhlaghizadeh et al., 2005), Hamadan (27.5%) (Arabi et al., 1998), north Khorasan (20.7%), and western Iran (11.1%) (Dalimi et al., 2002), and illegal slaughter of large number of sheep per year (approximately 4,000,000) suggests that sheep is the main and the most important intermediate host of *E.granulosus* in Iran and that it has a significant role in the epidemiology of infection. High percentage of infection in the present study (35.24%) is in contrast with other sheep breeding areas of the world such as: Kyrgyzstan (64.2%) (Torgerson et al., 2009), Turkey (50.9%) (Yilizk and Gurcan, 2003), Greece (80%) (Sotirakiet et al., 2003) and Moracco (10.85%) (Azlaf and Dakkak., 2006) as well as Iran (up to 74.4%) (Moulazadeh zohoor, 2004). According to our results, the prevalence of

**Table 1. The relation between age, % of infection, mean number of cysts and protoscoleces per sheep slaughtered at Babol abattoir.**

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>No. Sheep</th>
<th>No. infected</th>
<th>% infection</th>
<th>Mean Cyst/sheep</th>
<th>Mean Protoscoleces/sheep</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>280</td>
<td>1</td>
<td>0.35</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>105</td>
<td>38</td>
<td>36.19</td>
<td>2.2</td>
<td>51</td>
</tr>
<tr>
<td>3</td>
<td>146</td>
<td>55</td>
<td>65.90</td>
<td>2.8</td>
<td>183</td>
</tr>
<tr>
<td>4</td>
<td>129</td>
<td>85</td>
<td>65.90</td>
<td>4.25</td>
<td>1713</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>52</td>
<td>74.28</td>
<td>7.84</td>
<td>10343</td>
</tr>
<tr>
<td>6≥</td>
<td>56</td>
<td>46</td>
<td>82.14</td>
<td>12.84</td>
<td>29421</td>
</tr>
<tr>
<td>total</td>
<td>786</td>
<td>277</td>
<td>35.24</td>
<td>5.15</td>
<td>6952</td>
</tr>
</tbody>
</table>

**Table 2. The relation between age and different structures of fertile cysts.**

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>Ratio of fertile to non fertile cysts/sheep</th>
<th>X ± SE no. of protoscoleces per fertile cyst (range)</th>
<th>X ± SE volume of cyst containing protoscoleces (ml)</th>
<th>X ±SE diameter of cyst containing protoscoleces (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.19</td>
<td>-</td>
<td>0.26</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>1.65</td>
<td>215.0 ± 29.2 (17-700)</td>
<td>2.0 ± 0.21 (0.17-700)</td>
<td>1.28 ± 0.07 (1.17-700)</td>
</tr>
<tr>
<td>3</td>
<td>1.85</td>
<td>803.3 ± 157.3 (20-3060)</td>
<td>1.8 ± 0.20 (0.20-3060)</td>
<td>1.262007 (1.20-3060)</td>
</tr>
<tr>
<td>4</td>
<td>3.84</td>
<td>5985.2 ± 690.7 (112-13200)</td>
<td>3.1 ± 0.22 (0.112-13200)</td>
<td>1.76 ± 0.07 (1.112-13200)</td>
</tr>
<tr>
<td>5</td>
<td>3.84</td>
<td>9920.9 ± 728.7 (780-20700)</td>
<td>4.8 ± 0.24 (0.780-20700)</td>
<td>2.86 ± 0.13 (0.780-20700)</td>
</tr>
<tr>
<td>6≥</td>
<td>4.71</td>
<td>13745.4 ± 462.387 (3250-19100)</td>
<td>16.5 ± 2.29 (3250-19100)</td>
<td>3.44 ± 0.09 (3250-19100)</td>
</tr>
</tbody>
</table>
infection increased with age and has been found 0.35% to 82.14% in 1 and ≥6 year old sheep respectively. This was in agreement with other workers in Iran (0%-88.2%) (Hosseini, 1977), Azlaf and Dakak (2006) in Morocco (0%-59.15%) and, to some extent with Torgerson et al., 2009). In the latter investigation, 44.9% of 1 year old sheep harbored hydatid cyst, a finding in contrast to our results (0.35%) and other investigators (0%) and (0%-3.5%) (Hosseini, 1977; Azlaf and Dakak, 2006). On the other hand, we detected 86.4% of the cysts by visual examination, 8.5% by palpation and 5.1% through slicing infected viscera. Therefore, when recording the accurate number of the cysts is necessary, slicing the infected organs should be carried out. Torgerson et al., 2009 believe that, because of not slicing the infected organs, some cysts were missed. Very little information is available in the literature on the correlation between quantitative analysis of different structures of hydatid cyst with age of sheep. Our findings showed that significant relation exists between age of sheep and different structures of hydatid cyst, a phenomenon that shows minimal or no protective immunity in the intermediate host (Azlaf and Dakak, 2007) and continuous development of cysts (Yuksel et al., 1997). The highest mean number of protoscoleces in fertile cysts of sheep older than 6 years (13745±462.387) reported herein is in agreement with Kyrgyzstan (8192) (Torgerson et al., 2009), Turkey (12500 in liver and 5600 in the lungs) (Yildiz and Gyran, 2003) but much higher than Greece (297) (Himonas et al., 1994). The highest percentage of protoscoleces number in the present study (96%) and that of Torgerson et al., 2009 (90%) in Kyrgyzstan was found in sheep older than 4 years, and the absence of viable protoscoleces in sheep younger than 3 years old (Duerger and Gilman, 2001) shows that age is a determinant factor and old sheep are a potential and continuous source of infection in any given region where animal and human hydatidosis are a social problem. Meanwhile, to control echinococcosis hydatidosis through costly and time consuming method (Eckert et al., 1995), selective culling and slaughtering old sheep as it has been done in the former Soviet Union (Shaikenov, 2004) for hydatidosis and for some other zoonoses like brucellosis (Minas, 2006) would lead to removal of a huge amount of infected material from the system with the loss of a relatively small proportion of the sheep population (Torgerson et al., 2009).

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References


رابطه بین سن گوسفند و تغییر ساختار کیست هیداتیک

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چکیده

زمینه مطالعه: طبیعتاً میزان ألودگی گوسفندان با کیست هیداتیک با افزایش سن آنها زیادتر شده و ساختار آن تغییراتی یافت می‌شود.

هدف: در این مطالعه اثرات سن گوسفندان بر کیست هیداتیک در سن تولیدی برای تشخیص نیاز به تغییراتی در کیست هیداتیک سنجیده می‌شود.

روش‌کار: در این مطالعه، پنج گروه گوسفندان در سن تولیدی وجود داشتند که در گروههای سنی مختلف تعیین شدند. برای تعیین سن، سن گوسفندان به روش موجود در کتاب وجود داشتند. نتایج نشان داد که در گروههای سنی مختلف کیست هیداتیک در سن تولیدی برای تشخیص نیاز به تغییراتی در کیست هیداتیک سنجیده می‌شود.

نتایج: نتایج نشان داد که در گروههای سنی مختلف کیست هیداتیک در سن تولیدی برای تشخیص نیاز به تغییراتی در کیست هیداتیک سنجیده می‌شود.

واژه‌های کلیدی: رابطه بین سن گوسفند و تغییرات ساختار کیست هیداتیک.