A retrospective survey of fasciolosis and hydatidosis in domestic ruminants based on abattoirs’ data in Bejaia province, Algeria

Abdelhanine Ayad¹, Mokhtar Benhanifia², El-Hacene Balla³, Lotfi Moussouni¹, Fatima Ait-Yahia⁴, Ahmed Benakhla⁵

Abstract
The objective of the present study was to determine the prevalence of fasciolosis and hydatidosis in slaughtered domestic ruminants based on records from different communal abattoirs in Bejaia province. All daily records for cattle, sheep and goats were used in the current investigation. Each animal carcass was inspected at least by one veterinarian. The data were collected from January 2009 to December 2016. The prevalences of fasciolosis (2.83%) and hydatidosis (2.49%) in cattle were significantly higher than in sheep (0.13% and 2.24%, respectively) and goats (0.12% and 1.82%, respectively) ($P \leq 0.05$). In cattle, fasciolosis peaked in January, and then gradually decreased from March to September, while in sheep and goats fasciolosis was present at constant rates all around the year (Fig. 3). Regarding the rate of hydatidosis, the monthly prevalence did not vary significantly in cattle, sheep and goats except in October, when a high rate was recorded in cattle. In conclusion, the findings of the present abattoir study have provided baseline data for monitoring of domestic ruminant fasciolosis and hydatidosis in Bejaia province. However, we suggest that these parasitic diseases should be investigated further at the farms in order to determine the risk factors such as animal ages and breeds, and develop economic strategies for disease control at the farms.

Key words: fasciolosis, hydatidosis, abattoirs, Bejaia province

Introduction

Many parasites affecting livestock such as *Fasciola hepatica* and *Echinococcus granulosus* are well known in domestic ruminants, especially for their considerable economic losses and public health problems in several countries (Yihar et al., 2015). In fact, fasciolosis, a disease caused by *F. gigantica* and *F. hepatica*, has been reported to be among the major constraints to ruminant production in different countries in Africa (Mochankana and Robertson, 2016). Hydatidosis is caused by the ingestion of *E. granulosus* ova in different organs and tissues (Eckert and Deplazes, 2004). Economic losses arise not only from the condemnation of infected viscera, but also from reduction in yield and quality of meat, milk, wool, hide value, birth rate, and fecundity (Torgerson, 2003). These parasitic diseases are considered to be highly endemic in all countries of the Mediterranean region, especially in North Africa including Algeria, where it poses a major public health problem despite the attempts to control slaughtering practices.

It is essential to have information on the status of parasitic diseases with regards to their magnitude of occurrence and negative economic impact from different parts of the country in order to establish appropriate strategies for prevention and control. In recent years, the livestock sector has significantly increased in Algeria. According to the Ministry of Agriculture and Rural Development, it is reported that the population of domestic ruminants exceeds 34 million. However, there is very little epidemiological data published regarding fasciolosis and hydatidosis in Algeria, especially in Bejaia province. Thus, the objective of the present study was to determine the prevalence of fasciolosis and hydatidosis based on the records from different local slaughterhouses in Bejaia province from 2009 to 2016.

Material and methods

The study was carried out in the Province of Bejaia, Algeria (36°43’N, 5°04’E). The study region presents an area of 326,826 square kilometers (km²) with a population of 43,000; 115,000; 44,000 of cattle, sheep and goat heads, respectively. The average monthly rainfall is 70 mm, and the environmental temperature during the period of study ranged from 4.3 to 31.4 °C.

The data were obtained from different municipal abattoirs inspected by the Provinicial Veterinary Inspection (Bejaia province) from January 2009 to December...
Each animal carcass was inspected by at least one veterinarian. Daily records of infected cattle, sheep and goats were used as sources of data. The records were based on routine meat inspection (visual examination, palpation and incision of the organs). To diagnose fasciolosis infection, the appearance of the liver and bile ducts was examined by making multiple cuts and sub-cuts about 1 cm thick to check for the presence of fasciolosis. Fasciolosis was judged based on the liver enlargement with bumpy, raised and/or depressed areas, dark blue to black discolorations and hardness in consistence. Regarding hydatidosis, the carcasses were examined for the presence of one or more small cysts in the internal organs, especially on the liver surface.

All the data were recorded and calculated in Microsoft Excel 2007. The retrospective data were analyzed using Statview software (Version 4.55). The prevalence of fasciolosis and hydatidosis was calculated as the number of animals infected divided by the total slaughtered animals, and was expressed in percentage. The overall prevalence for each animal species was calculated from the data collected over an 8 year period (2009-2016). Seasonal prevalence was examined by pooling respective monthly condemnation data over an 8 year period. The slaughtered animals and infection averages were compared using the independent samples \( t \)-test at 95% confidence interval. The values were considered statistically significant when the \( P \)-value was \( < 0.05 \).

### Results

The number of animals with fasciolosis and hydatidosis out of all slaughtered animals (cattle, sheep and goats) in different municipal abattoirs of Bejaia province are summarized in Table 1. There were significant differences \( (P \leq 0.05) \) between the mean numbers of animals slaughtered per year from 2009 to 2016. The prevalences of fasciolosis and hydatidosis in cattle during the survey period (2009-2016) were significantly higher than in sheep and goats \( (P \leq 0.05) \).

<table>
<thead>
<tr>
<th></th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number slaughtered</td>
<td>157,690</td>
<td>148,713</td>
<td>126,903</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>1,643 ± 455</td>
<td>1,549 ± 971</td>
<td>1,322 ± 612</td>
</tr>
<tr>
<td>Min-Max</td>
<td>623-2,870</td>
<td>566-7,155</td>
<td>131-3,162</td>
</tr>
<tr>
<td>Infected animals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasciola infection</td>
<td>4,462 (2.83%)</td>
<td>190 (0.13%)</td>
<td>149 (0.12%)</td>
</tr>
<tr>
<td>95% confidence interval</td>
<td>2.09-3.6%</td>
<td>0.03-0.17%</td>
<td>0.04-0.21%</td>
</tr>
<tr>
<td>Echinococcus infection</td>
<td>3,918 (2.49%)</td>
<td>3,334 (2.24%)</td>
<td>2,316 (1.82%)</td>
</tr>
<tr>
<td>95% confidence interval</td>
<td>2.14-2.85%</td>
<td>2.1-3.49%</td>
<td>0.68-2.42%</td>
</tr>
</tbody>
</table>

Values with different superscripts in the same raw are significantly different \( (P \leq 0.05) \).

In cattle, fasciolosis was high during the first two years, and then gradually decreased \( (P < 0.05) \), while it was constant for sheep and goats over the study period (Fig. 1). Likewise, hydatidosis was significantly \( (P < 0.05) \) high during the first years, gradually decreased, and then increased slightly for all species in the last years \( (P < 0.05) \) (Fig. 2). In cattle, fasciolosis was high in January and gradually decreased from March to September, while in sheep and goats it was constant throughout the year \( (P > 0.05) \) (Fig. 3). Regarding the rate of hydatidosis, the monthly prevalence showed fluctuations in cattle, sheep and goats. In cattle, high rates were recorded in October \( (P > 0.05) \) (Fig. 4).

The seasonal variation in the prevalence of infected animals due to *F. hepatica* and *E. granulosus* is shown in Table 2. The prevalence rates for *E. granulosus* in cattle and goats were slightly higher in the rainy season than in the dry season. However, such difference was not statistically significant. However, significantly \( (P < 0.05) \) higher number of fasciolosis cases in goats was recorded during the rainy season \( (0.05\%) \) in comparison to the dry season \( (0.17\%) \).
Table 2. Seasonal prevalence rates (%) of fasciolosis and hydatidosis in animals slaughtered between 2009 - 2016 in Bejaia province

<table>
<thead>
<tr>
<th>Season</th>
<th>Species</th>
<th>Number slaughtered</th>
<th>Number of infected animals by Fasciola(%)</th>
<th>Number of infected animals by Echinococcus (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain</td>
<td>Cattle</td>
<td>68291</td>
<td>2149 (3.15%)</td>
<td>1810 (2.65%)</td>
</tr>
<tr>
<td></td>
<td>Sheep</td>
<td>60641</td>
<td>94 (0.15%)</td>
<td>2101 (3.46%)</td>
</tr>
<tr>
<td></td>
<td>Goats</td>
<td>55342</td>
<td>28 (0.05%)a</td>
<td>1034 (1.87%)</td>
</tr>
<tr>
<td>Dry</td>
<td>Cattle</td>
<td>89399</td>
<td>2313 (3.61%)</td>
<td>2108 (2.36%)</td>
</tr>
<tr>
<td></td>
<td>Sheep</td>
<td>88072</td>
<td>96 (0.11%)b</td>
<td>2233 (2.54%)</td>
</tr>
<tr>
<td></td>
<td>Goats</td>
<td>71561</td>
<td>121 (0.17%)b</td>
<td>1282 (1.79%)</td>
</tr>
</tbody>
</table>

a,b Values with different superscripts in the same species between rain and dry season are significantly different (P ≤ 0.05)

Discussion and conclusions

The results of this survey revealed that fasciolosis and hydatidosis were present in domestic ruminants in the different municipal abattoirs of Bejaia province. However, the prevalence of infected animals was moderately low, especially for fasciolosis in sheep and goats. It seems that cattle are probably more in contact with infected pastures compared to sheep and goats, which could explain the high fasciolosis infection rate in cattle. Although the abattoirs’ surveys have many constraints, establishing this kind of parasitic diseases’ database is necessary to design control strategies (Khoramian et al., 2014).

Previous studies in Algeria reported cattle fasciolosis prevalence rates of 6.3% in Constantine (Mekroud et al., 2004), 14.6% and 27% in Jijel (Mekroud et al., 2004; Titi et al., 2014) and 52.4% in El Taref (Boucheikchoukh et al., 2012). The prevalence rate reported in the present study (2.83%) was lower than those from the previous findings in the country. Higher prevalence of fasciolosis in ruminants has also been reported from different parts of the world. Abattoir surveys in Morocco (Khallayoune et al., 1991),
Tunisia (Hammami et al., 2007), Tanzania (Mellau et al., 2010) and Zimbabwe (Pfükenyi and Mukaratiwira, 2004) reported higher prevalences. Such difference in fasciolosis prevalence might be attributable to ecological, seasonal and climatic variations (i.e. rainfall and temperature) as well as animal husbandry practices (Mochankana and Robertson, 2016). In this study, the low rate of fasciolosis observed in slaughtered sheep and goats could be attributed to many factors such as animal source, age, breeding management and hereditary resistance. These variations could be due to different parasite control practices, particularly the use of anthelmintics to improve livestock production. In this respect, it is known that the epidemiology of internal parasites infection in livestock varies depending on the prevailing climatic conditions and management practices. However, temperature and humidity constitute the crucial factors, which greatly influence the life cycle of the parasites and the transmission of endoparasites.

The observed mean overall prevalence of hydatidosis in cattle, sheep and goats (2.49%, 2.24% and 1.82%, respectively) in Bejaia province during the present study was markedly lower than that reported in many African countries. In the Mediterranean region, the prevalence is high in both humans and animals, especially in North Africa (Battelli et al., 2002). In Eastern Algeria, Bardonnet et al. (2003) and Bouchekkhouchk et al. (2012) showed the prevalences of 13.9% and 30.9% in cattle, respectively, while in another region the prevalences were also high in cattle (22.25%) and goats (33.18%) (Hamrat et al., 2011). Hydatidosis is endemic to hyperendemic in Tunisia (40%) and Morocco (22.98%) with serious public health problems, morbidity and economic losses (Lahmar et al., 2007). In Morocco, the infection rates were high in Middle Atlas in cattle (48%) and in NorthWest in cattle (37.61%) and sheep (31.65%) (Azlaf and Dakak, 2006). The prevalence was 11%, 20% and 3.4% in cattle, sheep and goats, respectively in Eastern Libya (Tashani et al., 2002). Hydatidosis prevalence rates in sheep have been reported to be 70-92.8% in Sardinia, 6.5-36.5% in Sicily, 22% in Abruzzo and 47% in Tuscany (Garippa, 2006). In Turkey, the prevalence was 13.5% in cattle, 26.6% in sheep and 22.1% in goats in the Budur region (Umur and Kaaden, 2003).

The low prevalence of hydatidosis in slaughtered domestic ruminants of Bejaia province probably indicates that the environment is less contaminated by dogs’ faeces containing embryonated eggs. This could be due to an adequate control of the infection in dogs. The lower prevalence of cystic echinococcosis in sheep and goats in this survey compared to previous studies might be due to variations in agroecology among different study sites, ages and breed of study animals, stocking rates and movements of animals, animal husbandry systems, altitude and numbers of dogs in different regions of the country as has been suggested by other researchers (Kebebe et al., 2010).

In conclusion, the findings of the present abattoir study have provided baseline data for monitoring of the ruminant fasciolosis and hydatidosis in Bejaia province (Algeria). The results demonstrated that *F. hepatica* and *E. granulosus* infections were not major problems in the studied municipal abattoirs. However, further studies must be done to determine the risk factors for the diseases in order to develop effective disease control strategies. Also, there is a need to estimate the economic losses of the liver condemmations caused by these parasites, and the public health impact of hydatidosis.

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**Conflict of interest**

The authors declare that they have no conflict of interest.

**References**


Retrospektivna studija fascioloze i hidatidoze domaćih preživara prema podacima iz klaonica u provinciji Bejaia u Alžiru

Sažetak

Cilj ovog istraživanja je odrediti prevalencu fascioloze i hidatidoze kod zaklanih domaćih preživara prema podacima iz različitih javnih klaonica u provinciji Bejaia. U istraživanju su korišteni podaci koji su za krave, ovce i koze prikupljani na dnevnoj osnovi. Svaki životnijski trupac je pregledao barem jedan veterinar. Podaci su prikupljeni u periodu od januara 2009. do decembra 2016. godine. Prevalenca fascioloze (2,83%) i hidatidoze (2,49%) kod krava je bila značajno viša nego kod ovaca (0.13% prema 2.24%) i koza (0.12% prema 1.82%) (P ≤ 0.05). Kod krava se fascioloza najčešće javlja u januaru, a onda postupno opada od marta do septembra. Kod ovaca i koza, fascioloza je prisutna u istom broju tokom cijele godine (Tabela 3). Kod hidatidoze mjesečna prevalenca se nije značajno razlikovala kod krava, ovaca i koza osim u oktobru kad se bilježi veliki broj slučajeva kod krava. Rezultati ovog istraživanja iz klaonica su pružili osnovne podatke za praćenje fascioloze i hidatidoze domaćih preživara u provinciji Bejaia. Naš je prijedlog da se ova parazitarna oboljenja nastavljaju istraživati na farmama kako bi se odredili faktori rizika kao što su dob i pasmina životinja te kako bi se razvile ekonomske strategije kontrole bolesti na farmama.

Ključne riječi: fascioloza, hidatidoza, klaonice, provincija Bejaia