

Prevalence of Unilocular Hydatidosis in Slaughtered Animals in Aden Governorate-Yemen

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Abstract

The prevalence of cystic echinococcosis (CE) or unilocular hydatidosis caused by *Echinococcus granulosus* was investigated in four central abattoirs in Aden Governorate, Yemen during the period from October 2008- March, 2009. An overall infection rate with hydatid cysts in carcasses of 7507 livestock (2576 sheep, 4809 goats, 117 cattle and 5 camels) was 0.7% with 1.1%, 0.5%, and 2.6% in sheep, goats and cattle respectively. None of the camels was found infected. The infection rates were greater in >two years old animals and while the infection was greater among female sheep and goats than males, only male cattle were found infected. Liver cysts were found in 59.3% of infected animals and 37% had multiple cysts involving both liver and lungs. In contrast, 3.7% of infected animals showed cysts in the lungs only. While fertile cysts were found in 78% of infected animals, sterile and calcified cysts were found in 12.7% and 9.3%, respectively.

Keyword: *Echinococcus granulosus*; cystic echinococcosis; hydatidosis; Yemen.

1. Introduction

Cystic echinococcosis (CE) or unilocular hydatidosis is an important parasitic disease that constitutes a major public health problem in many countries around the world including the Mediterranean zone (Eckert and Deplazes, 2004; Sadjjadi, 2006). Being a zoonotic disease, CE causes many health problems which threaten human life and livestock. Several human case reports and surgical resurrection of hydatid cysts from Yemeni patients have indicated that CE is endemic and of major public health problem (Al-Hureibi *et al.*, 1992; Azazy and Abdelhamid, 2000; Ghallab and Al-Sabahi, 2008; Alghoury *et al.*, 2010). The prevalence of CE in domestic livestock has not been addressed adequately in Yemen. However, the prevalence was studied in several Yemeni Provinces (Ali *et al.*, 2003 (in Arabic); Baswaid, 2007; Al-Salami, 2007). In order to understand the magnitude of the disease incidence and its transmission dynamics, further studies that determine the infection rates in various slaughtered livestock in various Yemeni Provinces is still needed. Therefore, the present study aimed to determine the prevalence of hydatidosis, types of organs affected and nature of cysts in livestock animals slaughtered in abattoirs in Aden Governorate.

2. Material and Methods

2.1. Animals samples

A total of 7576 livestock animals (2576 sheep, 4809 goats, 177 cattle and 5 camels) slaughtered in four official abattoirs in Aden Governorate, Yemen were examined for hydatid cysts during the period between October 2008-March 2009. Three visits were made to each abattoir weekly and the various organs of both male and female carcasses were carefully inspected for hydatid cysts. Animals were sex and age categorized into four age groups (<one year, 1-<2 years, 2-3 year and <3 years). The age was confirmed by a veterinarian. The organs of infected animals were sent to research laboratory at the Faculty of Science and Education-Aden University for further examination.

2.2. Laboratory work

Infected organs were processed as described by Abdel-Hafez *et al.* (1986) as follows: After washing infected organs with tap water, hydatid cysts with minimal surrounding tissue were individually separated. The hydatid fluid from each cyst was aspirated using ?? ml syringe fitted with ?? gauge needle. The cyst was opened by scissors and the remaining fluid was withdrawn using a micropipette and the total volume of hydatid fluid was measured using a graduated cylinder. The germinal layer of each cyst was transferred to a Petri dish, cut into small

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pieces and washed three times in normal saline to isolate protoscolices from underlining membrane.

The fluid was withdrawn after refining it from the parts of the germinal layer and was added to the previously collected fluid. After sedimentation of the fluid for 30 minutes, supernatant fluid was separated from sedimenting protoscolices which were tested for viability using 0.1% eosin dye. Viable protoscolices exclude the dye and active flame cells are detected under light microscopy.

2.3. Statistical analysis

Simple percentage and Chi-square test were applied for data analysis.

3. Results

An overall infection rate with hydatid cysts in carcasses of 7507 livestock (2576 sheep, 4809 goats, 117 cattle and 5 camels) was 0.7%. CE was detected in 28 (1.1%) sheep, 23(0.5%) goats, and 3 (2.6%) cattle. None of the five camels was found infected (Table 1).

Hydatid cyst was recorded in both sexes in sheep and goats, but females showed higher infection rates than males at 2.7% and 0.4% in sheep and 1.5% and 0.2% in goats respectively. Most of the cattle slaughtered were males and none of the three female cattle that were slaughtered were infected (Table 1).

Table 1. CE infection rates in various livestock slaughtered in four central abattoirs in Aden Governorate, Yemen (2008/2009 survey).

Animal type	No. examined			No. infected			Infection Rate (%)		
	M	F	Both	M	F	Both	M	F	Both
Sheep	1803	773	2576	7	21	28	0.4	2.7	1.1
Goats	3900	909	4809	9	14	23	0.2	1.5	0.5
Cattle	114	3*	117	3	0	3	2.6	0.0	2.6
Camels*	4	1	5	0	0	0	0.0	0.0	0.0
All	5821	1686	7505	19	35	54	0.3	2.1	0.7

*Numbers are too low to draw any conclusions.

Sheep, goats whose ages were 2-3 years showed higher infection rates than younger ages, but animals older than 3 years were negative for hydatid cysts. In contrast, hydatid cysts were detected only in cattle over 2 years old (Table 2).

Table 2. CE infection rates among different age group of livestock animals slaughtered in central abattoirs in Aden Governorate-Yemen (2008/2009 survey).

Age group (Yrs)	Sheep		Goats		Cattle	
	No. examined	No. & (%) infected	No. examined	No. & (%) infected	No. examined	No. & (%) infected
<1	151	2 (1.3)	705	0 (0.0)	7	0 (0.0)
1-<2	1285	3 (0.2)	1899	6 (0.3)	88	0 (0.0)
2-3	1116	23 (2.1)	2135	17 (0.8)	14	2 (14.3)
>3	24	0 (0.0)	70	0 (0.0)	8	1 (12.5)
All	2576	28 (1.1)	4809	23 (0.5)	117	3 (2.6)

Most of the infected sheep, goats and cattle had cysts in the liver and over one third of them showed multiple infections in both liver and lungs (Table 3). None of the infected sheep had cysts in the lungs only although 42.9% of the infected sheep had multiple infections in both liver and lungs. In cattle one of the three infected bulls had cysts in the lungs only. In goats only one (4.3%) of the infected animals had hydatid cysts in the lungs only (Table 3).

Table 3. Organ distribution of hydatid cysts found in livestock animals slaughtered in central abattoirs in Aden Governorate-Yemen (2008/2009 survey).

Animal Type	No. & (%) of infected animals having hydatid cysts in following organs		
	Liver	Lung	Both
Sheep	16 (57.1)	0 (0.0)	12 (42.9)
Goats	14 (60.9)	1 (4.3)	8 (34.8)
Cattle	2 (66.7)	1 (33.3)	0 (0.0)
All	32 (59.3)	2 (3.7)	20 (37.0)

While most of the cysts found in sheep and goats were fertile (82 % and 83.3% respectively), all cysts in cattle were found to be sterile. Sterile and calcified cysts accounted for 6.2% and 11.1% of cysts collected from sheep and 10% and 6.7% of cysts from goats respectively (Table 4).

Table 4. Number and type of hydatid cysts found in livestock animals slaughtered in central abattoirs in Aden Governorate, Yemen (2008/2009 survey).

Animal type	Total no. of cysts examined	Cyst type					
		Fertile		Sterile		Calcified	
		No.	%	No.	%	No.	%
Sheep	81	67	82.7	5	6.2	9	11.1
Goats	30	25	83.3	3	10	2	6.7
Cattle	7	0	0.0	7	100	0	0.0
All	118	92	78.0	15	12.7	11	9.3

4. Discussion

The present study revealed that CE or unilocular hydatidosis is prevalent among the main domestic animals in Aden Governorate of Yemen. Prevalence recorded here is higher than previously recorded by Ali *et al.* (2003) who studied infection rates in sheep and cattle in one abattoir only. In contrast, higher infection rates were recorded in sheep and goats (3.2% and 11%, respectively) in Hadramaut Province by Baswaid (2007). Although the infection rate in cattle was found to be significantly higher than that in sheep and goats, epidemiologically the latter animals are more significant than cattle. This is because most of the slaughtered animals in Yemen are sheep and goats and due to the fact that all cysts found in cattle were sterile. In contrast, sheep and goat cysts were mostly fertile. The role of camels in supporting the overall transmission dynamics in Aden cannot be determined from this study because the number of camels inspected was too small to draw any conclusions.

The infection rates reported in the present study fit within the framework of prevalence of CE in livestock in the Middle East including other Arab countries although much higher rates have been recorded in most other countries (Abdel-Hafez and Kamhawi, 1997; Nourian, *et al.*, 1997; Sobeih *et al.*, 1998; Saeed *et al.*, 2000; Sadjjadi, 2006; Daryani *et al.*, 2006; Haridy *et al.*, 2006; Arbabi and Hooshyar, 2006; Goz *et al.*, 2007). This difference is attributed, perhaps, to the variability in the origin of animals, mode of grazing and other environmental factors and attributes pertaining to the dog definitive host. Al-Abbassy (1980) attributed low rates of infection to different factors such as periodical destruction of dogs,

improved standards of meat inspection and overall improvement in socioeconomic conditions.

The higher infection rates in female sheep and goats compared to males can be explained to older ages of slaughtered females than males. In practice, female sheep and goats are usually maintained for longer periods than males to give offspring several times before slaughtering. In contrast, most male sheep and goats are slaughtered at young ages of six months to less than two years. In younger animals, either hydatid cysts have not developed into detectable size or are too small and easy to miss. Indeed, the present study as well as many other studies elsewhere (Al-Yaman *et al.*, 1985; Pandey *et al.*, 1988; Baswaid, 2007) has shown higher infection rates in older animals. This attributed to two factors: Firstly, higher age reflects a much longer period of exposure to infective egg stage in the pasture, and secondly, the chances of detecting cysts at meat inspection are higher in aged animals due to their bigger size. It must be stated, however, that the lack of infection in sheep and goats over 3 years of age is unexpected and thus unexplainable. As for cattle, the number of female cattle slaughtered was too small to draw any conclusion.

The present study revealed that liver was the most affected organ in infected sheep and goats, but multiple infections in both liver and lungs was found in more than one third of infected animals. No sheep showed infection in the lungs only. This indicates that the liver is the primary site for cyst development and lung involvement comes as a secondary consequence. This was primarily true for hydatidosis in goats as only one infected goat showed cysts in the lungs only.

Similar observations were made by Farah *et al.* (1984), Al-Khalidi (1998), Azlaf & Dakkak (2006), and Baswaid (2007).

The majority of cysts in sheep and goats were fertile indicating that these animals are the major intermediate hosts responsible for the perpetuation of the life cycle. This is consistent with other previous finding reported in other Middle Eastern countries (Singh and Dhar, 1988; Al-Khalidi, 1998). Cattle do not seem to be very important in transmission dynamics as all cysts removed from cattle were sterile.

In conclusion, this preliminary study indicates the existence of CE in main slaughtered livestock in Aden Province, Yemen. Further studies are needed to determine infection rates in the dog definitive host and determination of *E. granulosus* strain/s in Yemen. It is mandatory to carry out a cross sectional prevalence study in other abattoirs, especially rural ones and involving enough animals especially camels in order to understand the transmission dynamics of the disease in Yemen. Human surgical incidence and seroepidemiology in various Yemeni provinces must be determined to understand the magnitude of the disease as a problem in the country.

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