

Incidence of hydatidosis in slaughtered livestock at Mosul, Iraq

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Abstract

A study on the occurrence and seasonal incidence of hydatid cysts of sheep, goats and cattle was carried out during 2008 and 2009 by weekly regular visits to Mosul abattoir and other areas i.e. outside abattoir. All slaughtered livestock were of local breed, of both sexes, originated from various areas of Mosul and were of different ages having non descriptive features. Visual inspection and palpation of the lesions were followed in this study. Of 4800 sheep, 960 goats and 720 cattle were examined, 96 sheep, five goats and four cattle were found to harbour the cysts representing infection rate of 2%, 0.52% and 0.55%, respectively. The lowest seasonal incidence was observed in winter for sheep (3.16%) and goats (1.25%). The lowest level of incidence was 0.16% for sheep and 0% for goats was noticed in summer. However, in cattle no infection was taken place in winter and autumn but 1.11% infection rate was equally seen in summer and spring. The preponderant site of cyst was the liver in sheep (46.8%) and goats (40%). In cattle the commonest location of the cyst was the lung (50%) followed by mixed site of liver and lung (25%) and liver (25%). The results indicated that only fertile cysts were present in the sheep representing 83.33% of fertility percentage. The number of cysts in the infected organs ranged between 1-16, 1-6 and 1- 10 for sheep, goats and cattle, respectively. It can be concluded that only sheep play a major role in dissemination of hydatidosis. However, being anthroozoonotic, potential risk may be increased due to incorrect disposal of infected offal with unhygienic slaughter protocols.

Keywords: Hydatid cyst; Incidence; Ruminants; Mosul abattoir; Offal.

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حدوث داء الأكياس المائية في الحيوانات المذبوحة في الموصل، العراق

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الخلاصة

تم دراسة انتشار الإصابة بالأكياس المائية والحدوث الموسمي في الأغنام والماعز والأبقار خلال السنتين المتتاليتين ٢٠٠٨ و ٢٠٠٩ بزيارات أسبوعية منتظمة إلى مجزرة الموصل وأماكن الذبح خارج المجزرة. إن الحيوانات المذبوحة من السلالات المحلية ومن مناطق مختلفة لمحافظة نينوى ومن كلا الجنسين وبأعمار مختلفة وغير موصفة. استخدم الفحص البصري مع الجس باليد للكشف عن أفات الأكياس المائية. تبين من فحص ٤٨٠٠ رأساً من الأغنام و ٩٦٠ رأساً من الماعز و ٧٢٠ من الأبقار وجود الأكياس المائية في ٩٦ من الأغنام وخمس حيوانات من الماعز وأربعة رؤوس من الأبقار وبنسب مئوية ٢% و ٠,٥٢% و ٠,٥٥% على التوالي. وجد أعلى حدوث موسمي في فصل الشتاء في كل من الأغنام بنسبة ٣,١٦% والماعز بنسبة ١,٢٥%. أما أقل حدوث موسمي للأغنام فكان ٠,١٦% وصفر% للماعز في موسم الصيف. في الأبقار لم تلاحظ الإصابة في فصلي الشتاء والخريف وكانت نسبة الإصابة متشابهة في موسمي الصيف والربيع. لوحظ أن الكبد أكثر الأعضاء احتواءً على الأكياس وبنسبة ٤٦,٨% في الأغنام و ٤٠% في الماعز بينما كانت الرئة الأكثر في الأبقار وبنسبة ٥٠% يليها الإصابة المشتركة للكبد والرئة وبنسبة ٢٥% والكبد لوحده وبنسبة ٢٥% أيضاً. أشارت النتائج وجود الأكياس الخصبية في الأغنام فقط وكانت الأكياس المستحصلة في كل من الماعز والأبقار عقيمة وكانت النسبة المئوية للأكياس الخصبية في الأغنام ٨٣,٣٣%، تراوح أعداد الأكياس في الأعضاء المصابة ما بين ١-١٦ و ١-٦ و ١-١٠ في كل من الأغنام والماعز والأبقار، على

التوالي. يستنتج من الدراسة أن الأغنام لها الدور الكبير في نقل وانتشار مرض الأكياس المائية مقارنة بالماعز والأبقار. أن كون المرض مشتركاً بين الإنسان والحيوان، لذا فإن الخطورة الكامنة قد تزداد نتيجة التخلص الخاطي للمخلفات الحيوانية المصابة، إضافة إلى الطرق غير الصحيحة في ذبح الحيوانات وكيفية التعامل مع هذه الأعضاء الحاوية على الأكياس.

Introduction

Hydatidosis is a serious helminthic cyclo zoonotic disease that possesses an important economic and public health concern in rural (1) and urban areas (2). Echinococcosis is caused by *Echinococcus granulosus* as a cestode inhabiting small intestine of the dog which acts as a definitive host (3), whereas, hydatid cysts is the larval stage of the canine tapeworm found in the internal organs of infected herbivores (4) causing high financial losses in ruminant carcasses and edible offals (5). On the contrary, *E. granulosus* exerts no injury on the final host (6). Evidently, with the probable exception of lion strain (G9) (7,8), in all hydatid cyst strains of herbivores and omnivores, dog is typical final host.

In human, hydatidosis is public health problem (9). However, man is not an obligatory agent in the completion of the life cycle (10). Peoples of different ages, sexes, occupations, socio-economic and cultural levels are semi – similarly infected indicating that such disease has indiscriminate character (9). In Iraq, animal studies and surveillances indicate that hydatidosis is enzootic (11). In the last four decades, local studies refer that infection rates of different animal species range between zero and 40% (9, 12-23). Ten years were elapsed since the last study carried out in Mosul abattoir by a local worker (23). Hence, the current work was designed to investigate the recent infection rates of hydatidosis in different livestock slaughtered at Mosul city.

Materials and Methods

To determine the incidence of hydatid disease, a survey was conducted at Mosul abattoir and other areas outside the abattoir where livestock are slaughtered during the whole years of 2008 and 2009. Weekly regular visits were carried out to the slaughterhouse throughout the two successive years. Definition of hydatid cysts was only performed at post – mortem inspections. Observation relating to laboratory or clinical investigation were not carried at anti-mortem.

At slaughter, careful examination and search of cysts were done using visual inspection and hand palpation, data included organ involved, number of cysts and species of animal infected were recorded in special form. Organs harbouring cysts were put in plastic bags and were brought to parasitology laboratory / College of Veterinary Medicine, University of Mosul. Detection of protoscolices in cyst fluid was by taking the fluid content and

centrifuging it at 3000 rpm for 5 minutes. Later the sediment was microscopically examined detection of the protoscolices, as mentioned by an author (25). Cyst intensity was carried out grossly by counting number of cysts in each infected organ. In all animals, age and sex were not classified and correlated to the characters studied.

Chi – square (X^2) test was used for statistical analysis of the results (26).

Results

The incidence of hydatid disease in all animals slaughtered at Mosul area was shown in table 1. Out of 4800 sheep, 960 goats and 720 cattle examined, 96 sheep, five goats and four cattle were found to harbour the cysts representing 2%, 0.52% and 0.55%, respectively.

The highest incidence was found in winter for sheep (3.16%) and goats (1.25%). The lowest were noticed in summer for sheep (0.16%) and goats (0.0%). In cattle, the heaviest infections were recorded in spring and summer, while no infection was found in autumn and winter.

As regards to the organ involvement, table (2) reveals that in sheep and goats, The liver was the most frequently affected organ. 46.8% and 40%, respectively. Next to the liver, is the lung with 32.3% in sheep. In cattle, the dominant organ affected was the lung 50% however, concurrent infections of both of the liver and lung were seen more in goats 40%, less in sheep (20.8%) and the least in cattle 25% (table 2). There was a significant difference ($P<0.05$) in the distribution of infected organs (liver, lung and both organs) among sheep, goat and cattle (table 2).

Our findings indicated that only sheep harboured fertile cysts 83.3%, while sterile cysts were found in both goats and cattle. The sterile cysts had calcified or caseated appearances. Table (3) showed numbers of cysts in infected species. The intensity was relatively high in sheep (1-16), less in cattle (1-10) and the least in the goats (1-6 cysts). Also, table (3) refers a significant difference ($P<0.05$) in the number and fertility percentage of the cysts present in sheep, goats and cattle.

Discussion

Although helminthes of *E. granulosus* are harmless (6) and the smallest tapeworm infecting dogs (27), their metacestodes are of great public health concern especially when the cystic larval stage occurs in the organs of central nervous system or other important tissues of the body with their complicated inevitable sequel. It follows that

hydatidosis is ubiquitous disease i.e. infecting wild, feral, domestic mammals of both herbivorous and omnivores – including man – occurring in developed and developing countries of temperate, arctic and tropical climate (9). The disease exists in different geographical areas having no preference of racial or ethnic communities (28). Interestingly, Thornton and Gracey (29) in their early

edition of meat hygiene publication recorded that Lebanon Christians are affected with hydatid disease twice as frequently as Lebanon Muslims. Though hydatid cyst is not transmissible to man by consumption of flesh or offals of affected animals, it may render the meat of infected organs repugnant and unmarketable from aesthetic point of hygiene (30), leading to high economic losses.

Table 1: Incidence of hydatid cyst in different animals of Mosul abattoir slaughtered during 2007 and 2008.

Month	Sheep		Goats		Cattle		Seasonal Incidence			
	No. examined	No. Infected	No. examined	No. Infected	No. examined	No. Infected	Sheep	Goats	Cattle	
Jan.	400	16	80	2	60	0	Winter	3.16%	1.25%	0.0%
Feb.	400	16	80	1	60	0				
Mar.	400	10	80	0	60	0				
Apr.	400	8	80	0	60	1	Spring	2.83%	0.41%	1.11%
May	400	16	80	1	60	1				
Jun.	400	0	80	0	60	1	Summer	0.16%	0.0%	1.11%
Jul.	400	0	80	0	60	1				
Aug.	400	2	80	0	60	1				
Sept.	400	9	80	1	60	0	Autumn	1.83%	0.41%	0.0%
Oct.	400	10	80	0	60	0				
Nov.	400	3	80	0	60	0				
Dec.	400	6	80	0	60	0				
Total	4800	96	960	5	720	4				
Infection rate %	2%		0.52%		0.55%		0.55%			

Table 2: Distribution of cyst in different organs of examined animals.

Species	No. Infected	No. Organs Involved		
		Liver	Lung	Liver and Lung
Sheep	96 a	45 a 46.8%	31 a 32.3%	20 a 20.83%
Goats	5 b	2 a 40%	1 b 20%	2 b 40%
Cattle	4 b	1 b 25%	2 b 50%	1 b 25%

The different vertical symbol (a,b) means there is significant difference at probability of P<0.05.

Table 3: Incidence of fertile, sterile and intensity of cyst and intensity in different species of examined animals.

Species	No. Infected	Cysts		% fertility	Intensity of cysts
		Fertile	Sterile		
Sheep	96 a	80 a	16 a	83.3% a	1- 16
Goats	5 b	0 b	5 b	0% b	1- 6
Cattle	4 b	0 b	4 b	0% b	1- 10

The different vertical symbol (a,b) means there is significant difference at probability of P<0.05.

In Iraq, animal hydatid cyst disease was recorded early by Babero *et al* (14), however, the adult worm *i.e. E. granulosus* was reported earlier in the 1940s in the intestine of necropsied stray dogs (31).

Our findings related to infection rates were much lower than those recorded in our country (*loc. cit.*). Such results are plausible, expected and acceptable. Prevalence of hydatidosis is fluctuated greatly between individual flocks, years studied, region investigated, source of animals and their levels or degrees with dog's contact, type of livestock raising, management practiced, sort of zoogeography (arid, rainy, moist or barren lands) and possibly other factors. Notably, previous surveys of hydatidosis included very small numbers of animals examined at abattoirs from different localities (16,17,24,31–35,38). Hence such figures do not reflect the real indication of the incidence among inspected livestock. Also, our results were lower than those reported in neighbouring countries. *i.e.* Jordan (35,36), Kuwait (37) and Iran (39). A characteristic feature of the current study is the small number of animals slaughtered in comparison with previous study carried out by us ten years ago.

Seasonal incidence of hydatidosis in farm animals is poorly studied. The results indicated no specific pattern of seasonal endemicity. Peak seasonal infections were slightly

noted in winter, spring and summer for sheep, goats and cattle, respectively. This case is highly related to the chance of these animals to contact with the final host acquiring the metacestode regardless time and place proposed. The authors may suggest that the species of goats may play part in their resistance to hydatidosis. This may explain the immunity of local Iraqi black breed to the disease in comparison with probable susceptibility of Masailand goat breed reported in Africa earlier by Macpherson (40).

In the current study, liver of sheep and goats were the preponderant organs of the cysts followed by lung and the mixed organs including livers and lung, while the lungs were the dominant locations of cysts in cattle. Similar findings were reported by all workers dealing with hydatid cysts studies e.g. Salih *et al* (44). That these authors postulated that liver acts as the first barrier for the oncosphere penetrating the intestinal mucosa to reach the portal circulation. Later, the embryos are carried by blood stream to all parts of body, due to their large size of oncospheres, most of them become arrested and settled in the liver. Notwithstanding, Mubarak (15) mentioned that the possible variations in the site of sinusoids in different species play a role in the distribution of the oncosphere to their final location in various organs.

The fertility rate of the cyst by no means is of great importance in epidemiological studies, not only to the possibility of fertile cysts to disseminate the disease but also to define the probable function of each species as a potential host in the spread of the infection (9). In this study, only sheep were found to harbour fertile cysts with sterile cysts were existed in both goats and cattle. These observations confirm the findings of several investigators (9,13,15,23,24,41). All local studies emphasized the higher fertility rates of sheep cysts in comparison to other domestic animals which is similar to the present study. The phenomenon of highly fertile cysts occurrence in sheep was pointed out earlier by some authors (25,42). Subsequently, Rausch (43) deduced that the most important cycle is undoubtedly that involving domestic goats and the sheep. Sterile cysts of goats or cattle may be attributed to the generative atrophy caused by body reaction against such cysts leading to caseation, calcification followed by degenerations.

The results relating to fertility rates indicated less importance of goats, but Salih *et al* (44) found that goats having fertile cyst which may act a suitable host for echinococcosis. Similarly, in Masailand of Kenya, goats harbour fertile cysts (40). This discrepancy in the obtained results can be attributed to many factors such as type of goats rearing, probable presence of infected dogs and their contact with goats, grazing practice followed in that area as well as field operations carrying out i.e. anthelmintic administration of sheep dogs. Salih *et al* (44) postulated

that *E. granulosus* has a wide adaptation of different wild, domestic and farmed intermediate hosts.

From the epidemiological point of view, it can be concluded that sheep play an important role in perpetuating and dissemination of the disease due to their high infection rates and fertility. However, reverse is correct for goats and cattle. Moreover, the large number of sheep is slaughtered in religious, social and familiar ceremonies in comparison to other animals. Also, home killing of sheep in traditional habits and festivals may increase the potential of sheep in perpetuating the disease. In view of standard of hygiene, an urgent rehabilitation of Mosul abattoir is intensely required because it is a source and focus of dissemination of infection and continuance of the parasite. However, disposal of infected offals and viscera is not correctly carried out in that abattoir.

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