



Echinococcus granulosus case study in Al Ajailat Abattoir in Al Ajailat city, Libya

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Abstract

Echinococcosis or hydatid disease is a zoonotic parasitic disease resulting from an animal being infected by the *Echinococcus* species causes a significant economic losses due to decreased milk and meat production. This study was conducted in Al Ajailat city Abattoir from September 2017 to July 2018. The organs of animals from specific species (sheep, goats, cattle and camels) were incised to study the presence of the Hydatid cyst. The finding showed that, the overall infection rate of 4.1% in sheep, 1.3% in goats, 6.3% in cattle and 0% in camels. The increase in prevalence with age of the animals was statistically significant in all examined species. Moreover, examined infection in female sheep was higher than in the male sheep. Furthermore, Liver had higher hydatid cysts than lungs in sheep, goat and cattle. The prevalence in camels were 0% and this is due to may camels are grazing in desert and semi-desert land where dogs are rarely found.

Keywords: Echinococcosis, Prevalence, Hydatid cyst, Al-Ajailat Abattoir, Libya.

Introduction:

Cystic Echinococcosis (CE) is one of the most important zoonotic parasitic diseases caused by the larval stage of *Echinococcus granulosus* [1]. The adult form of this parasite lives in the intestine of the dogs as the definitive hosts, whereas the intermediate hosts are humans and livestock. A human becomes infective through consumption of vegetables and food contaminated with parasite eggs [2]. CE is one of the most highly parasitic zoonotic diseases and is caused by the larval metacestode stage of *Echinococcus granulosus*. This disease affects both humans and livestock, in particular herbivores such as sheep, goats, cattle, camels and horses, as intermediate hosts [3]. CE is considered to be a re-emerging zoonosis disease and is highly endemic



in several countries around the world. It has been reported as an important public health problem in many Arabic countries such as Libya, Tunisia, Morocco, Egypt, Algeria, and Jordan [4].

The definitive host of genus *Echinococcus* is always carnivorous including wild and domestic dogs, wolves, hyenas, and other canids. Dogs are particularly important in zoonotic transmission due to their close relationship with humans and grazing animals where dogs are used to guard herds [5]. The adult worms are carried by dogs and live in the small intestine. Dogs and other definitive hosts will shed the eggs of *Echinococcus granulosus* via their faeces [6]. The herbivores or “intermediate hosts” often become infected after an ingestion of food contaminated with the faeces of carnivores containing the eggs of the adult worm *E. granulosus*. According to [7] the eggs of *E. granulosus sensu lato* can survive for several months in grazing land, fomites and gardens and survive best under moist conditions or in moderate temperatures. The eggs will also survive for short periods of time when they are exposed to direct sunlight and high temperature.

After an ingestion of eggs via the intermediate host, the eggs hatch in the small intestine, the larvae are released rapidly, and penetrate the intestinal wall. They are carried in lymphatic or circulatory system to the target organ, and develop there as metacestode in many different organs causing a disease is known as Hydatidosis [8]. The cysts are often found in the liver and lung, about 70% and 20% respectively. The occurrence of CE in other organs such as the brain, heart, spleen, kidney, and bone is very rare and the development of the cysts is usually slower [8]. When domestic dogs are the definitive hosts they usually become infected when they feed on the viscera of intermediate host which contains cysts (metacestodes). The cysts will develop into adult tapeworms within four to seven weeks in the small intestine of the animal and produce eggs which are shed in the faeces of the dogs. The eggs of *Echinococcus* have an adhesive coat which can easily adhere to an animal’s hair and other objects, therefore insects and birds can play an important role in facilitating the mechanism of infection [9].



Many studies have principally confirmed that there are ten strains of *E granulosus* split as G1-G10, clearly identified by using several molecular techniques which easily allow the classification of mitochondria and DNA for each strain of *E granulosus* [10]. The sheep strain G1 is the most frequent strain related with human CE and appears to be widely distributed in all continents. The highest rates of infection are recorded in communities involved in extensive sheep farming and several epidemiological studies have proven that this strain is the most significant infecting humans. This explains its presence in areas which have high a prevalence of human CE such as North Africa, Western Asia, and South America [8]. According to [3] G4 horse strain appears to infect exclusively equines as intermediate hosts and no human cases have been reported. Additionally, the G9 Poland swine strain has been reported only to affect human cases in Poland; besides, G8 and G10 cervid strains have been found in North America, generally in Canada and some northern U.S. states, as well as in Eurasia.

Currently, Echinococcosis is on the list of neglected zoonosis subgroups and has been reported by World Health Organization in its 2008-2015 strategic plan for the control of neglected tropical diseases [11]. In fact, CE appears as an increasing public health and socio-economic concern in many areas of the world and is currently considered an endemic zoonosis in the Mediterranean region. Also the prevalence of CE is high especially in sheep-raising areas of Europe, other Mediterranean countries, Australia, Africa, Asia, and South and Central America [12].

According to the Centre for Food Security and Public Health (CFSPH) of Iowa (2005), the prevalence of infection is increasing and is common in dogs and livestock, with more than 30% of dogs and up to 80-100% of sheep and cattle infected in some severely affected and uncontrolled areas. However, the incidence in several endemic regions is much lower. In addition the prevalence among wildlife is also high in some areas. In some parts of Australia for example, the prevalence among dingoes is up to 100% and more than 60% of some wild life intermediate hosts are infected with *E. granulosus* G1 strain, while the G2 strain has been found in Tasmania. Many studies have confirmed that sheep are crucial intermediate hosts for the G1 and G2 strains,



however the G1 strain can also occur in other livestock including camels, cattle, goats, yak, horses and water buffalo, as well as in some wildlife intermediate hosts including wild boar [7].

Echinococcus granulosus has a worldwide geographical distribution and can be found in all continents with the exception of few countries such as Iceland, Denmark, New Zealand, Tasmania, and Ireland. The highest prevalence of *E granulosus* has been recorded in the Mediterranean region, parts of Europe, Australia, South America, and China. Other hyper endemic areas are North African countries such as Tunisia, Libya, Algeria and Morocco, in addition to East Africa [4]. CE infection has re-emerged in certain parts of the world where it was once believed to be controlled, including Eastern Europe and Central Asia.

CE is considered an endemic disease in Libya and represents a potential threat to animals and humans due to the lack of knowledge about the parasite and its mechanism of transmission. The lack of surveillance also plays a vital role in the spreading of the disease [13]. Several reports have been published indicating that CE is endemic in human beings and animals in Libya and has been spread especially in eastern and northern parts of the country. The most common strain that is found in Libya is G1 sheep strain [14].

The main definitive host of *E. granulosus* in Libya is the domestic dog, especially in rural areas where up to 60% of dogs are infected. The rate of infection is lower in urban areas where 31% of stray dogs and 10% of pet dogs are infected [15]. There is no confirmed data on the incidence in human populations available so far, however the incidence of CE in eastern Libya was estimated to be 4.2 cases/100,000, with significantly higher rates in females [16]. In 1999 ultrasound examination and serology conducted in northern coastal areas in Libya showed the prevalence rate of CE in humans was 1.6% [15].

In addition to other factors, geography and surveillance play an important role in the spread of the disease in the area due to the fact that smuggling of animals from neighbouring countries is very common in Libya, and there is inadequate knowledge



about patterns of the life cycle of the parasite. Among these populations the Libyan authorities recognise that smuggling of infected animals from neighbouring countries, combined with a lack of surveillance and knowledge about the parasite increases the incidence of the disease among animal and human populations. The supply of animal products does not meet demand due to climatic conditions, inadequate planning of research into animal production and limited feed resources [1].

CE is one of the most highly endemic diseases in humans and animals in Libya and is regarded as a major concern in the country, especially in the animal industry. As a result of this reason, this study was conducted and the main objective was to find the prevalence of the hydatid cysts in liver, lung, heart, spleen, kidney and the mesentery of each slaughtered animal in Al Ajailat Abattoir, Libya.

Materials and Methods:

Study Area:

This study was carried out in Al Ajailat city Abattoir about 90 km west of Tripoli in the western area of Libya. The human population in Al Ajailat city is about 165,000. The total population of sheep and goats are about 190,000 and 140,000 respectively, and there are almost 30,000 cattle and around 5,000 camels. Al Ajailat city is surrounded by pasture and agricultural land which makes it a fertile land for grazing.

Sample collection and Preparation:

Samples were collected between September 2017 and July 2018. A total of 4797 sheep, 3827 goat, 111 cattle and 135 camel. A total of two human surgically removed and pathologically confirmed hydatid cysts were collected from Al Ajailat city Abattoir and stored in 70% ethanol at -20°C until use. The data was collected by the veterinarian at the Veterinary Centre in Al Ajailat. Incised organs were examined closely to determine the presence of the cysts in liver, lung, heart, spleen, kidney and the mesentery of each slaughtered animal in the mentioned abattoir.



Results:

The results of this study were summarized in table (1) showed the prevalence of hydatid cysts in slaughtered animals from Al Ajailat city Abattoir, table (2) showed the prevalence of hydatid cysts in slaughtered animals according to sexes, table (3) showed the prevalence of hydatid cysts in slaughtered animals according to age, and table (4) showed the Hydatid cysts in liver and lungs of sheep, goats, cattle and camels.

Table 1: Prevalence of hydatid cysts in slaughtered animals from Al Ajailat city Abattoir

Examined animals	No. Examined	No. of infected %
Sheep	4797	197 (4.1)
Goat	3827	53 (1.3)
Cattle	111	7 (6.3)
Camels	135	0

Table 2: Prevalence of hydatid cysts in slaughtered animals according to sexes

Sex	Sheep		Goat		Cattle		Camels	
	No. exam	Infected %	No. exam	Infected %	No. exam	Infected %	No. Exam	Infected %
Male	2575	75(2.9)	2152	21(0.9)	79	2(2.5)	199	0 (0)
Female	2222	122(5.5)	1675	32 (1.9)	32	5(15.6)	16	0 (0)
Total	4797	197(4.1)	3827	53 (1.3)	111	7(6.3)	135	0 (0)

Table 3: Prevalence of hydatid cysts in slaughtered animals according to age

Age (years)	Sheep		Goat		Cattle		Camels	
	No. exam	Infected %	No. exam	Infected %	No. exam	Infected %	No. Exam	Infected %
< 1	2124	35 (1.6)	1789	0	49	0	15	0
1 – < 2	1525	49(3.2)	1110	9 (0.8)	28	0	57	0
2 – <3	559	53 (9.4)	598	15 (2.5)	15	2 (13.3)	35	0
≥ 3	589	60(10.1)	330	29 (8.7)	19	5(26.3)	28	0
Total	4797	197(4.1)	3827	53 (1.3)	111	7 (6.3)	135	0

Table 4: Hydatid cysts in liver and lungs of sheep, goats, cattle and camels

Animals	No. infected	Infected liver %	Infected lung %	Liver& Lung %
Sheep	197	97(49.2)	45 (22.8)	55 (27.9)
Goat	53	19 (35.8)	15(28.3)	19 (35.8)
Cattle	7	4 (57.1)	2(28.5)	1 (14.2)
Camels	0	0	0 (0)	0

Also from the dissecting of animals its clearly the presence of Hydatid cysts in liver (figure 1) and Hydatid cysts in lung (figure 2)



Figure (1) clearly showed the hydatid cysts that found in the liver of some animals in Al Ajailat city Abattoir



Figure (2) clearly showed the hydatid cysts that found in the lung of some animals in Al Ajailat city Abattoir



Discussion:

Hydatidosis is a zoonotic disease, and is commonly found in many areas of the world, especially in the Mediterranean region [17,18]. According to [13] hydatid cyst is an endemic disease in Libya and a varying infection rate has been recorded in different domesticated herbivores in Libya and other neighbouring countries. CE has long been considered to be one of the most important health problems throughout the Mediterranean region and has been reported extensively in Libya [19, 20]. Currently, CE control is one of WHO's initiatives in these areas [21]. Apart from the enormous economic losses caused by the infection of livestock with hydatid cysts, its human infection also poses serious health risks along with substantial morbidity and even mortality [22]. Libya is located in the hyperendemic region for CE, where significant cases of hydatid cysts are reported annually [23]. The current study clearly demonstrates that CE is spreading among farm animals, indicating that the area is contaminated with the eggs of *E. granulosus*.

In the present study the prevalence of hydatid cyst according to animal gender is higher in females compared with males. This may possibly be due to the fact that female animals are usually slaughtered at an older age and therefore may be more exposed to the disease. [16] have confirmed that female animals are more often infected than males and young livestock are less susceptible to infection than older ones.

The present study findings showed that liver is more affected compared to other organs. This are similar with studies conducted in Iran and other parts of world. According to the data and information collected in this study regarding the veterinary sector, performance and the prevalence of hydatid cysts in Libya; in particular, in Al Ajailat city, the following suggestion are made for a future plan to eradicate the *E. granulosus* and other endemic diseases in Libya. Awareness programs should be provided by government to reduce the spread of the disease - many people have no idea about the life cycle patterns of parasite, Strengthening the capacity of the veterinary services by providing adequate veterinary centres in all villages to reduce the disease, Establishing and strengthening border control programs, Controlling of stray dogs, reduction of the dog population, and registration and dosing of owned dogs, Proper disposal of infected offal of the intermediate host, Increased control and inspection in slaughterhouses, and



providing sufficient trained Veterinary crews to examine the animals slaughtered and finally, Vaccination should be made available on an ongoing basis by the Department of Animal Health.

Conclusion:

The finding of the current study showed that, the overall infection rate of 4.1% in sheep, 1.3% in goats, 6.3% in cattle and 0% in camels. The increase in prevalence with age of the animals was statistically significant in all examined species. Moreover, examined infection in female sheep was higher than in the male sheep. Furthermore, Liver had higher hydatid cysts than lungs in sheep, goat and cattle. The prevalence in camels were 0% and this is due to may camels are grazing in desert and semi-desert land where dogs are rarely found. the important role of dog-sheep life cycle in the region is recognized. Educating those who are in contact with dogs, gathering and housing stray dogs, and ongoing treatment of pet dogs can be significantly effective in controlling the disease.

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