

Epidemiological study of cystic echinococcosis in Man and slaughtered Animals in Erbil province, Kurdistan Regional-Iraq.

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Abstract:

The present study included the percent of infection with hydatid cystic disease (HCD) in human and slaughtered animals in Erbil province, Kurdistan-Iraq. For humans a statistical analysis of documents, 149 cases have been recorded due to cystic echinococcosis, and treated surgically in private and governorate hospitals in Erbil province. Among total of 17598 patients admitted to the surgical department, 0.846 % of which were found to be infected with cystic echinococcosis, and about 6.3 /100,000 persons among Erbil population. The results of this study showed that the number and rate of infection in rural was 82 (55.03%) higher than in urban 67 (44.97%). According to the occupations of patients, housewives were highly infected than others, and among different organs involved, liver was higher infected 83 (55.7%), and then lungs 30 (20,1%). In comparison to age groups, the highest rate of infection was found among the age group 41-50 years 29 (19,46%). During the examination of 1090 sheep, 360 cows and 240 goats, their infection rates was 121 (11.1%), 28 (7.77%) and 4 (1.66%) infected with cystic echinococcosis, respectively. The livers of these infected animals had the highest involvement, and as follow as: 50.4% in sheep, 75% in cows and 25 % in goats. The percent of fertile cysts in infected animals were: sheep (94.11%), cows (80.64%), and goats (91.66%). The viability of protoscolices were as follow: in sheep (92±3.256 in liver and 85±2.350 in lungs), cows (78±4.23 in liver and 70±3.15± in lungs) and goats 90±2.15 in liver and 86±2.25 in lungs). The economic losses due to cystic echinococcosis of 149 patients treated surgically was approximately 372,500,000 ID or 298,000 US\$ and in slaughtered animals the losses of 153 animals infected were 1579000 ID or 1338 US\$.

Introduction:

Hydatid Cystic Disease (HCD), or cystic echinococcosis, is one of the most important problems, for public health, economic losses and zoonotic diseases in many parts of the world (1). It has for many years been a manifestation of parasitic infection which can potentially lead even to death (2). The stray dogs, as a definitive host, of the adult *E. granulosus*, play the most important role in spread of infection, in the Middle-East countries, via contamination of the environment with its eggs. On the other hand, sheep, goats, cattle, camels, buffaloes, pigs and donkeys plays as suitable intermediate hosts, have been repeated its infections with hydatid cysts in Iraq, Iran, Jordan, Lebanon, Syria, Kuwait, and Saudi Arabia (3,4). Hydatidosis in Iraq is caused by *Echinococcus granulosus* which is hyper endemic (3,5), and considered to be one of the most serious helminthes diseases with important socio-economic problem in so far as it affects both man and his livestock, and the cost was measured previously in Iraq as million dollars (6). In human, its effect, includes economic cost of treatment and cost of lost wages and production during the time of disease, treatment and convalescence added to that the human loss in morbidity and mortality (7, 8). In livestock its effect is by destruction of some animal viscera or the whole carcass, when heavily infected, the ill animal will produce less milk, wool and meat. It is most common in area where sheep/dog cycle operates and is notified in all Iraqi provinces and territories (6, 7). The present study conducted for getting a new data about cystic echinococcosis in man and slaughtered animals in Erbil province the capital of Kurdistan Iraq.

Materials and Methods

The Study Area

The present study carried out in a total area nearly 15.345 km² in Erbil province. This sheep-raising area located at an average altitude of 36.2 degree north and 44 degree south. The population of the area is approximately 1,400,000 inhabitants (9). The slaughterhouse located outside the city. Also there are some unsupervised home slaughtering inside and outside the city which is small places or markets are not specialized for animal slaughter and it done without government permission and without veterinary inspection by some butchers, that they sell the meat in their markets.

Hospitalized Patients

A retrospective study was undertaken to determine the incidence of cystic hydatid disease (CHD) among 149 patients hospitalized in government hospitals (Hawler teaching hospital and Rizgari hospital) and private hospitals (Hawler, Soran, Zheen, Kurdistan and Rasol) hospitals in Erbil province during the period of 20 months of the study, from January 2008 till August 2009. All medical documents of patients treated surgically to remove the cysts. The general information was regarded of each patient as follows: Age, sex, occupation, residency, infected organs and address of patients where obtained. All statically analysis was performed according to the Al-Rawi (10).

Collection and Examination Of Slaughter Animals

A total of 1090 sheep, 361 cows and 237 goats were examined for presence the infection with hydatid cyst disease at slaughterhouse of Erbil city, during three months period (July, August and September 2009). All animals were adults, and each animal carcass was inspected by at least two veterinarians. During the

post-mortem examination, a through visual inspection, palpation and systematic incision of each visceral organ particularly the liver, lungs, kidneys, heart and spleen was carried out with help of veterinarians according to procedures recommended by (11). Infected organs were taken to the laboratory of the Parasitology, Biology Department College of Science Education, for farther examinations.

Examination of cysts and viability of protoscolices

Individual cysts were grossly examined for any evidence of degeneration and calcification. The cysts were randomly selected in infected organs (liver or lung) per species of slaughtered animals, for fertility studies. To reduce intra-cystic pressure, the cyst wall was punctured and drained with a needle and opened up with a scalpel and scissors. The contents were transferred into a sterile container and examined microscopically 40x for the presence of protoscolices. Cysts which contained no protoscolices as well as heavily calcified were considered as sterile cyst. The viability of protoscolices was assessed by the 0.1% aqueous eosin solution. Living protoscolices did not take up the stain; unlike the dead ones appeared red in color stained with eosin (12). The viability of protoscolices was carried out for each fertile cyst.

Results and Discussion

1- Cystic hydatidosis in man

The Results of present study indicated that the prevalence of human hydatidosis were about 6.3 person per 100,000 inhabitants nationwide and the percentage of infection was 0.846%, during the period of 20 months of study for cystic echinococcosis, 149 patients were recorded in many private and government hospitals, admitted to the surgical department, in Erbil Province, This result is more than that reported previously ten years ago by (6) in the same area (2/100000). The previous studies in Iraq has been recorded variable indices in human's morbidity with the surgical cases rate varying between (1-20) patients per 100,000 inhabitants nationwide (3, 5, 6, 14, 15, 16,17). The results of the present study is higher than that reported in Kuwait 3.6/100,000 (18); in Libya 4.2/100,000 (19) and in west bank of Palestine 3.1/100,000 (20). The incidence of the current study is lower than that recorded from Tunisia 15/100,000 (21); in Morocco 3.6-15.8/100,000 (22) and in Spain 19/100,000 (23). Table (1) shows the percentage of infection in males and females of 149 patients according to their age groups. It was found that the age group 41-50 years were 29 (19.46%) being the highest rate compared to other age groups, indicating that the peak age of incidence lay in the third decade (17,44%) and fifth decade (19,46%) of patients. The finding of this study is agreement with many previous studies (6, 14, 17, 26, 29). They found that the maximum prevalence of hydatidosis occurs among patients in the fourth decade of age (6, 14, 17, 29). While some other researchers have found high incidence in younger

patients (5, 16, 30). Children are considered to be more exposed to infection because they play with the soil or sand and having close contact with dogs, or dog feces, and since the clinical signs of hydatidosis may take 10 to 15 years or more to develop their symptoms may not be detected until much later live.

As shows in (Table 2) the percentage of infection according to their occupations was being the higher among 149 patients were the housewives 53 (34.64%), this may due to the close contact of these women with the sources of infection, such as soil or vegetables contaminated with eggs of *E. granulosus* from dog feces. Wilson 1950 (24) explained that the high incidence of hydatidosis among Arab women is due to their domesticity, resulting in greater risk of infection. The finding of our study is supported by several previous studies (5, 6) in Iraq; and (25, 26) in Iran, hence they found that the housewives were more infected with cystic hydatidosis among other occupations.

Table(3) shows the percentage of cystic hydatidosis among 149 patients according to their residence, the result showed that, 82 (55.03%) were in areas around or outside the city (rural) while the others 67 (44.97%) were lived in areas inside the city (urban), This result may be due to the many factors, including poor living conditions and lack of adequate health education in rural areas and economic instability and financial restrictions in control and prevention. This result is supported by many researches, (27, 28) where they found that the infection rate in rural are higher than that in urban.

Among 149 patients infected and treated surgically, liver had the highest rate of infection, 83(55.70%) followed by 30 (20.13%) in lungs (Table 4), and the rate of infection in females 56(67.46%) was more than males 27(32.53%). This result is agreement with other researches (6, 7).

The annual incidence of human CE in Erbil the capital of Kurdistan Iraq is about 6.3/100,000 is less than that in Uruguay 12.42/100,000 (33) but still much higher than that in Wales 0.4/100,000 (34).

2- Cystic hydatidosis in slaughtered animals

In this study, an overall 1690 slaughtered animals (1090 sheep, 360 cows and 240 goats) were examined for cystic hydatidosis in Erbil province. The results showed that 121 (11.10%) of sheep, 28 (7.77%) of cows and 4 (1.66%) of goats were infected with hydatid cystic disease, Table (5). Among 121 sheep infected 61(50.41%) of which were in livers, 58 (47.93%) in lungs and 2 (1.65%) were in both livers and lungs. While in cows 21 (75%) were in livers, 5 (17.85%) in lungs and 2 (07.14%) were in both organs. In the goats the infection was 1(25%) and 2(50%) in liver and lungs respectively, and in both was 1(25%). This indicates that sheep had the highest rates of infection, while cows and goats had the lowest rates. Regarding, hydatid cyst fertility and percentage of viable protoscolices were found to be higher in sheep compared with goats and cows (Table

6). Indicating that, sheep serve as the principle intermediate host of the parasite *E.granulosus*, and thus serve as the most likely source of canine and man infection in this area of Iraq. This result is supported by many researches (6, 35, 36, 37, 38, 39). They found that sheep are high prevalence and fertility cysts of infection. However, (40) found both higher prevalence and cyst fertility in cattle and camels than in sheep. The low prevalence in goats and cattle may be due to their grazing habits and association with dogs, both of them differing from that of sheep. The observation that the liver is the predilection site in both livestock and humans is in accordance with other studies (6, 30, 41, 42) and may be explained by the liver serving as a primary barrier in the body after the penetration of the intestinal wall.

3- The Economic Losses

The economic losses were calculated by measuring the mean price of each operation of cystic hydatidosis in man which was (3,500,000 ID), hence the total cost of 149 patients will be 372,500,000 ID or 315,677 US\$, and in one year the cost was about 223,500,000 ID or 189,406 US\$. Table 7 is shows the cost and the economic losses duo to cystic echinococcosis infection in man and slaughtered animals in Erbil province. The economic losses depend upon the incidence of human CE cases per 100,000 and also to

the cost of treatment per capita. In the present study the cost of treatment per capita were 2118 US\$. For example the economic effects of one such disease, CE have recently been explored in Uruguay and Wales (31, 32), which differ considerably: Uruguay is a developing country of upper-middle income, with an annual gross domestic product (GDP) of 5,166 US\$ per capita (21), where as Wales, as part of the United Kingdom, is a wealthy, industrialized nation, with an estimated annual (GDP) of 18,130 US\$ per capita. Some countries, although not among the world's poorest, have a GDP considerable lower than that of Uruguay. Jordan, for example, is a developing country with an annual GDP estimated at only 1,182 US\$ per capita (21). The finding of present study in both humans and his livestock indicated that the hydatidosis is still the big problem in Erbil province the capital of Kurdistan Iraq. So we need proper control of condemned offal at slaughterhouse, which has a very effective way presenting the infection in dogs. The measure should be incorporated with others based on ethnological, epidemiological and socioeconomic information in developing an appropriate and effective prevention and control programmer for echinococcosis / hydatidosis in Erbil province.

Table: 1 Prevalence of infection with hydatidosis according to age and sex in Erbil Hospitals.

Age group	No. of infected person (%)		
	Male	Female	Total
≤ 10	05 (50.00)	05 (50.00)	10 (06.71)
11-20	03 (23.07)	10 (76.92)	13 (08.72)
21-30	13 (50.00)	13 (50.00)	26 (17.44)
31-40	08 (30.76)	18 (69.23)	26 (17.44)
41-50	06 (20.68)	23 (79.31)	29 (19.46)
51-60	11 (47.82)	12 (52.17)	23 (15.43)
≥ 61	10 (45.45)	12 (54.54)	22 (14.76)
Total	56 (37.58)	93 (62.42)	149 (100)

Table2: Percentage of cystic hydatidosis in patients according to their occupations.

Type of occupation	No. of infection (%)
Doctor Assist.	01 (00.65)
Employments	04 (02.61)
Teachers	05 (03.26)
Children	10 (06.53)
Students	18 (11.76)
Workers	28 (18.30)
Retired	30 (20.31)
Housewives	53 (34.64)
Total	149 (100)

Table3: percentage of cystic hydatidosis in 149 patients according to their residence.

No. of i nfection	Urban (%)	Rural (%)
Males	26 (38.80)	29 (35.37)
Females	41 (61.20)	53 (64.63)
Total	67 (44.97)	82 (55.03)

Table: 4 Predilection sites of hydatid cysts in males and females patients admitted private and governorate hospitals in Erbil province.

Organs involvement	No. of infection (%)		
	Total	Males	Females
Liver	83 (55.70)	27 (32.53)	56 (67.46)
Lung	30 (20.13)	16 (53.33)	14 (46.66)
Kidney	20 (13.42)	08 (40.00)	12 (60.00)
Ovary	08 (05.36)	---	08 (100.00)
Brain	05 (03.35)	02 (40.00)	03 (60.00)
Abdomen	03 (02.01)	01 (33.33)	02 (66.66)
Teste	02 (01.34)	02 (100.00)	---
Muscle	02 (01.34)	01 (50.00)	01 (50.00)
Spinal cord	01 (00.67)	---	01 (100.00)

Table: 5 Prevalence of hydatid cystic disease in livers, lungs, and both in slaughtered animals in Erbil province.

Type of animals	No. of examined animals	No. of infected animals (%)	Infected organs (%)		
			Liver	Lung	Liver& Lung
Sheep	1090	121 (11.10)	61 (50.41)	58 (47.93)	02 (01.65)
Cow	360	28 (07.77)	21 (75.00)	05 (17.85)	02 (07.14)
Goat	240	04 (01.66)	01 (25.00)	02 (50.00)	01 (25.00)
Total	1690	153 (09.05)	83 (54.24)	65 (42.48)	05 (03.26)

Table: 6 Fertility of cysts and viability of protoscolices in sheep, cows and goats.

The Hosts	Fertility of cysts		Viability of protoscolices (p.s)			
	Examined cysts	Fertility of Cysts (%)	Liver		Lung	
			Examined cysts	Viable p.s mean \pm SD	Examined cysts	Viable p.s mean \pm SD
Sheep	100	94 (94.11)	50	92 \pm 3.256	44	85 \pm 2.350
Cows	50	40 (80.64)	22	78 \pm 4.230	18	70 \pm 3.150
Goats	12	11 (91.66)	07	90 \pm 2.215	04	86 \pm 2.250

Table 7: The economic losses due to the cystic echinococcosis in 149 patients and 153 slaughtered animals from Erbil province.

Type of hosts	No. of infection	Economic losses/cost of operation by Iraqi Dinars	Economic losses/cost of operation by US\$ Dollars
Human	149	372,500,000	315677
Human per one year	89.4	223,500,000	189406
Slaughtered animals	153	2,079,000	1761

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وبائية داء الاكياس العدرية في الانسان والحيوانات المذبوحة في محافظة اربيل، العراق

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الملخص

تضمنت الدراسة الحالية نسبة الاصابة بداء الاكياس العدرية في الناس وفي الحيوانات المذبوحة في مجزرة محافظة اربيل اقليم كردستان العراق. بالنسبة للانسان حللت البيانات احصائيا من السجلات المصابين، اذ تم تسجيل ١٤٩ حالة حالة اصابة تعود الى داء الاكياس العدرية من نوع احادي الفجوة والذين تم معالجتهم جراحيا في عدد من المستشفيات الحكومية والاهلية في المحافظة. من المجموع الكلي ١٧٥٩٨ للمرضى الوافدين الى قسم الجراحة في هذه المشافي. وجد وبحوالي ٦,٣ حالة لكل ١٠٠٠٠٠ شخص من مجموع سكان المحافظة كانوا مصابين بهذا المرض، وبنسبة ٨٤٦ ، ٠ %.

اظهرت نتائج الدراسة الحالية ان عدد ومعدل اصابة السكان خارج مركز المحافظة ٨٢ (٥٥,٠٣%) كانوا اعلى مقارنة بسكان ضمن مركز المحافظة. واستادا الى وظيفة المرضى المصابين، وجد ان ربات البيوت، كن اعلى نسبة اصابة مقارنة مع بقية المرضى المصابين ومن مجموع الاعضاء المختلفة المصابة ، وجد ان الكبد ٨٣(٥٥,٧%) ثم ثلثتا الرئتين ٣٠(٢٠,١%) وبالمقارنة مع الفئات العمرية الاخرى وجد ان اعلى معدل للاصابة كانت ضمن الفئة العمرية (٤١-٥٠) عاما. اما على المستوى البيطري ومن خلال فحص ١٠٩٠ من الاغنام و ٣٦٠ من الابقار و ٢٤٠ من الماعز ، وجد ان نسبة الاصابة بلغت ١١,١% ، ٧,٧٧% و ١,٦٦% و على التوالي. كما وجد ان اعداد هذه الحيوانات المصابة كانت اعلى نسبة من حيث الاصابة و كما يلي: في الاغنام ٥٠,٤% وفي الابقار ٧٥% وفي الماعز ٢٥% بينما بلغت نسبة الخصوبة في الاكياس العدرية كما يلي: ٩٤,١١% ، ٨٠,٦٤% و ٩١,٦٦% وعلى التوالي. في حين بلغت حيوية الروئيسات الاولية كما يلي: في الاغنام (٣,٢٥٦ ± ٩٢ في الكبد و ٢,٣٥٠ ± ٨٥ في الرئتين)، في الابقار (٤,٢٣٠ ± ٧٨ في الكبد و ٣,١٥٠ ± ٧٠ في الرئتين) وفي الماعز بلغت (٣,٢٥٦ ± ٩٢ في الكبد و ٢,٢٥٠ ± ٨٦ في الرئتين). بلغت الخسائر المادية من جراء اصابة ١٤٩ شخصا بداء الاكياس العدرية والمعالجة جراحيا بما يقارب ٣٧٢,٥٠٠,٠٠٠ مليون دينار عراقيا او بالدولار الامريكي ٢٩٨,٠٠٠ دولارا. وعلى مستوى البيطري بلغت الخسائر المادية من جراء اصابة ١٥٣ من الحيوانات المذبوحة حوالي ١,٥٧٩,٠٠٠ دينار عراقيا او ١٣٣٨ دولارا.