Echinococcosis in Kurdistan Iraq: Prevalence of Cystic Hydatidosis in Man with a Survey of E.granulosus eggs in Stray Dogs in Kalar City, Sulaymania Province, Kurdistan- Iraq.

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Abstract

The current study included two levels: - cystic echinococcosis in man and a survey of eggs of the parasites *E. granulosus* in feces of stray dogs in Kalar city sulaymania province. The statically analysis of private and governmental hospitals documents showed 56 cases of cystic echinococcosis have been treated surgically during five years' period (2013-2017). The patients who included in this study were examined by physicians and confirmed by one or more of the following methods, imaging diagnosis (CT scan, Ultrasound, and X ray), histopathology and serology. Among total of 3330 patients admitted to the surgery department of these hospitals, 56 (1, 6%) were found to be infected with cystic hydatidosis at approximately 5.6 cases per 100,000 persons and at average 11.2 cases per one year. Among total patients' involvements, house wives 22 (39.28%) were high infected and then followed by the workers and students 12(21.4%) and 11(19.64%) respectively. According to the organs patients involvement liver was highly infected 31(55.3%) and then followed by lungs 9(16.07). The age group (41-50) yrs. was 13(23.21%) highly infected than other ages, and the females (53.57%) were high infected than males (46.4%) among total patients infected. The economic loses of 56 cases treated surgically was approximately 112000$ USA$. This study is the first time talking about economic losses in this city of Iraq. The result of 60 sample feces examination of stray dogs showed that 36.6% of which were contaminated with eggs of E. granulosus. The high percentage of infection with this parasite (60%), was found at the Slaughtered animal's area, south of city center and the lowest (10%) was at Awarakan, Jutyaran & sharawan2 area, north of city center.

Keywords: **Echinococcosis in Kurdistan Iraq: cystic hydatidosis, stray dogs, Kalar City, sulaimania province.**

Introduction

Echinococcosis is a widespread zoonotic parasitic disease which has major medical and socio-economic costs for humans and also threatens livestock productivity (1, 2). Cystic echinococcosis (CE) is an important parasitic infection affect both animal and public health, especially in the Middle East and North Africa. CE is caused by *E. granulosus*. Livestock (e.g. sheep, cattle, goats, and pigs) can acquire the infection indirectly from grass and water contaminated by the eggs of *E. granulosus*, which are excreted with feces of dogs (3, 4). Human can become infected with CE accidently by ingesting the eggs of the parasite through contaminated food such as vegetables and water, or from handling feces of infected dogs, and other carnivores. Once ingested, the eggs hatch inside human's intestine, realizing oncosphere larvae, which has a capability to penetrate the gut wall and then is conveyed by blood stream to different organs, mainly the liver and lungs where they settle and develop into cysts (5, 6). Worldwide, there may be in excess of 1 million people living with CE at any one time. Many of these people will be experiencing severe clinical syndromes which are life-threatening if left untreated (3). Hydatidosis in Iraq is caused by *E. granulosus* which is hyper endemic (7), 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 (8). WHO is working towards the validation of effective cystic echinococcosis control strategies by 2020, (9). Human infection with *E. granulosus* leads to the development of one or more hydatid cysts located most often in the liver and lungs, and less frequently in the bones, kidneys, spleen, muscles, central nervous system and eyes. The asymptomatic incubation period of the disease can last many years until hydatid cysts grow to an extent that triggers clinical signs, however approximately half of all patients that receive medical treatment for infection do so within a few years of their initial infection with the parasite. Abdominal pain, nausea and vomiting are commonly seen when hydatids occur in the liver. If the lung is affected, clinical signs include chronic cough, chest pain and shortness of breath. Other signs depend on the location of the hydatid cysts and the pressure exerted on the surrounding tissues. Non-specific signs include anorexia, weight loss and weakness, (9). Infection of an intermediate host is due to accidental ingestion of tapeworm eggs passed into the environment with feces from definitive hosts. Transmission of *E. granulosus* could be due to domestic and wildlife reservoirs, and is influenced by human activities, behavior, and politics. (10). Cystic echinococcosis (CE) is a chronic and highly complex zoonotic infection of economic and public health importance on all the inhabited continents. The ubiquitous distribution is due to the presence of the predominant definitive host, the domestic dog, which harbors the cestode *E. granulosus* . Human infection results in the development of fluid- and parasite-filled cysts in the viscera, particularly the liver and lungs.(11 , 12).The aim of our study was to know and getting information for prevalence cystic echinococcosis in human population of Kalar city and to know the percentage of dogs infection which act a source of infection to man and his livestock's.

DOI: https://doi.org/10.26750/vol(6).no(1).paper8 http://journal.uor.*edu*.krd/index.php/JUR **Vol. 6, No.1, June. 2019**

Materials and Methods

1-Study Area:

Kalar city is one of Iraq cities, located on the west bank of the Sirwan (Diyala) river in sulaymania governorate. It is located east of Kifri and west of the Kermanshah, Iran. Towns of Qasri Shirin and Sarpil Zahab. The city is one of the twin towns of Rizgari-Kalar. It is an expanding urban area with the growing infrastructure and booming economy, with properties often more expensive than those with advanced countries it is divided into the neighbor hoods of Salaxa, Grdegozina, Bardasoor, Hamay Karem, Shaheedan, Gazino and Kalari-kon. (13).

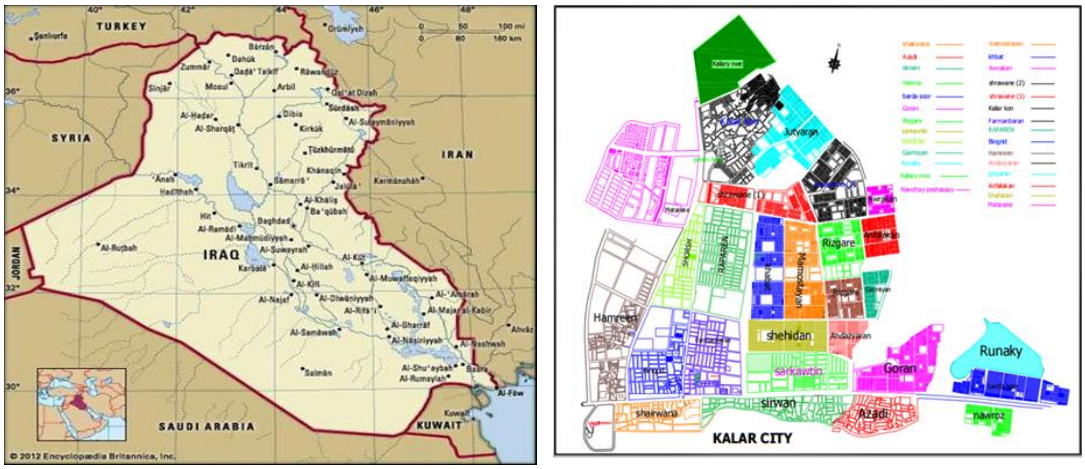

Figure 1: Iraq and Kalar City Map (13).

Kalar city *(Figure 1).* Is the administrative center of the garmyan district? It lies 140km southeast of sulymani and 30 km from the Iranian border Kalar has a population of approximately 200,000 residents. Kalar takes pride in its historical background. Several small towns are connected to Kalar administratively. Kalar is located on a large plain area embracing many historical sited related to different periods; including sites that were built in the BC, AD, and Islamic period. Shirwana citadel, pasha citadel and chrestian canals are examples of historical sites. The town is about 200-255 m above sea level (13).

2-*hospitalized patient*:

DOI: https://doi.org/10.26750/vol(6).no(1).paper8 http://journal.uor.*edu*.krd/index.php/JUR Vol. 6, No.1, June. 2019

The present study was undertaken to determine the incidence of cystic hydatid disease (CHD) among patients admitted to the government and private hospitals in Kalar city during the period extended five years from (2013-2017). All medical documents of patients treated surgically with hydatid cystic disease in all hospitals were reviewed. The general information data was regarded of each patient as follow as: The year of operation, Sex, Age, Occupation, and in addition to cyst location and type and multiple organ involvement were recorded. All patients included in this study were examined by physicians. The HC cases were confirmed by one of the following methods, imaging diagnosis (CT scan, Ultrasound, and X ray), histopathology and serology.

3-*faecal samples collection and floatation technique*

The Faecal samples were collected during the period 2018. The collected Samples dispatched as soon as possible to a laboratory in suitable containers. Each sample clearly labeled with animal identification, date and place of collection, and immediately was taken to the laboratory of parasitology Kalar hospital. The purpose of the fecal flotation solution is to 'float' the parasite eggs by using (Zinc Sulfate) (14, 15)*;* (Dryden *et al*. 2005; Blagburn *et al*. 1996).

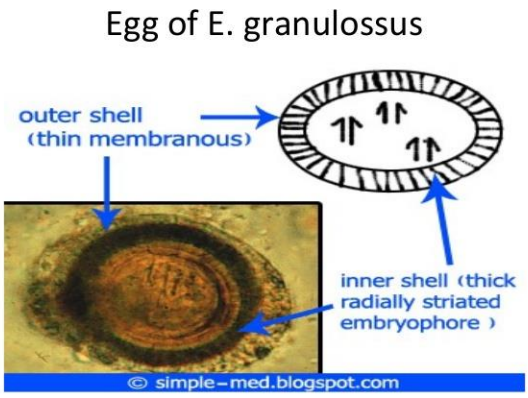

Figure: 2 Egg of *Echinococcus granulosus*

Results and Discussion

The present study was conducted to know the prevalence of cystic echinococcosis \ hydatidosis in patients admitted to the surgical departments of all private and governorate hospitals during five years period from (2013 to 2017). Cystic hydatid disease is still a significant public health and economic problem among Iraqi countries. Previously many report in Iraq have been recorded variable indices of human morbidity due to the hydatid disease with the surgical case rate ranging between 1 and 20 patients per 100,000 inhabitants nationwide (16,17,18,19 , 20 , 7). The results of the current study indicated that out of total (3330) patients admitted to the surgery department of many hospitals, 56 of which (1,68%) were found to be infected with hydatid cystic

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disease at approximately 5.6/100,000 persons and at average 11.2 cases per a year (among Kalar City population 200,000 person). This result was higher than that recorded by (8), in a year 2000, they found the prevalence with human occurrence was estimated to be 2/100,000 inhabitant's city population (2milion person). While our results was approximately agreed to that recorded by (21), in the same city in 2011, they found among total of 17598 patients admitted to the Erbil surgical departments, 0.85 % of which were found to be infected with cystic echinococcosis, and about 6.3 /100,000 persons among Erbil population. According to the resent study the incidence of this disease is very high beside on the few of kalar city population (200,000persons).

The previous studies in Iraq have been recorded variable indices in human's morbidity, all these cysts was belonging to the one species (*E.granulosus*) the type that is still prevalence and endemic in Iraq). The incidence was varying between (1-20) patients per 100,000 person (7,20,8,16,17,18,19). Comparing the results of our study with the others was don previously, we found our results is higher than that reported in Kuwait 3.6/100000; (17), in Libya 4.2/100,000 (18), in west bank of Palestine 3.1/100,000 (19), and in Basra city 3.2/100000 (22). While the incidence of the current study is lower than that recorded from Tunisia 15/100,000 (23); in Morocco 3.6-15.8/100,000 (24), and in Spain 19/100,000 (25). Recently Huseen and Al-quraishi (2015) recorded 24 cases of cystic hydatidosis in Babylon city with percentage 12.5%, among 192 patients admitted to surgical department in Babylon hospitals (26).

Table (1) is showing the percentage of infection in males and females of 56 patients according to their age groups. It was found that the age group (41-50) years were 13 (23.21%) being the highest rate compared to other age groups, indicating that the peak age of incidence lay in the third decade (16,07%) and fifth decade (14,28%) of patients. The finding of this study is agreement with many previous studies (22, 16, 27, 28, 21, and 29). They found that the maximum prevalence of hydatidosis in human occurs among patients in the fourth decade of age. While some other researchers have found high incidence in 3rd. decade and younger patients (37, 20, 18 and 35). 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. The significantly higher prevalence of hydatidosis found among female patients in this study 30 (53.57%) may be due to epidemiological factors related to cultural and occupational risk, hence the higher rate of infection observed among housewives may have closely contact with infection sources, such as soil or vegetables contaminated with eggs of *E. granulosus* from dog feces. Consequently, education efforts to prevent transmission should be directed at this group. Wilson *[32,* explained that the high incidence of hydatidosis among Arab women is due to their domesticity, resulting in greater risk of infection.

As shows in (Table 2) the percentage of infection according to their occupations was being higher in the housewives 22 (39.28%). The finding of our study is supported by several previous studies, (20, 8); in *Iraq;* and (33, 28, and 31) in Iran and (37) in India,

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hence they found that the housewives were more infected with cystic hydatidosis among other occupations.

Table (3) shows the percentage of cystic hydatidosis among 56 patients according to organs involvement. Among total of patients infected and treated surgically, liver had the highest rate of infection, 31(55.35%) followed by 9(16.07%) in lungs and the rate of infection in females 30(53.57%) was more than males 26(46.42%). This result was agreement with other previous researches (8, 34 and 37).

In this study the determining of economic losses due to cystic human hydatidosis was calculated at the first time in Kalar city. We found that the treatment of 56 patients admitted to the private and governorate hospitals coasted approximately 112,000$ (USA$), and at about 22,400USD$ per a year. In our study the economic losses was calculated (priced) by measuring the mean price of each operation of cystic hydatidosis in man (2000 USA$). The economic losses depend upon the incidence of human CE cases per 100,000 and also to the cost of treatment per capita. In the present study the cost of treatment per capita were 2000 US$. For example the economic effects of one such disease, CE have been explored in Uruguay (38), and Wales (39), 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. whereas Wales, as part of the United Kingdom, is a wealthy, industrialized nation, with an estimated annual (GDP) of 18,130 US$ per capita.

Table 4 is showing the prevalence and contamination of *E. granulosus* eggs, in feces of stray dogs, during the examination of 60 feces samples, among six different localities in Kalar city. The first study of incidence of hydatid disease in Iraq was done by Senekji and Beattie (40), they found 17.8% of Iraqi dogs were infected with parasite *E.granulosus*. The, data of our study revealed that out of total faecal samples examined, 22 of which were contaminated with eggs (36.6%) of the parasite. The overall infection rate of the present study was higher than that reported in Kirkuk province (20%) by molan and baban (41), in a year 1992 and recently by Hassan and Barazanji, 2018, (42), in the same area (6.49%); and in Basra province (14.7%) by (43), Maktoof and Abu Tabeekh(2015). While the result of our study was less than they recorded in Diala 38% and Theqar 56% provinces by*[41];* and also in Erbil city 79.1%, by (45, 8), and in Baghdad city, 44.6% by (44). These results considered to be a very high level of infection that requires cooperation between Iraqi Health Ministry and the World Health Organization (WHO) for establishing a radical effective anti-parasite control protocol. The finding of present study in humans indicated that the hydatidosis is still the big problem in kalar city north east of 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 Iraq.

Conclusions and Recommendations:

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The results of current study showed a high infection rate of hydatidosis in people of Kalar city at approximately 5.6 cases per 100,000 persons and at average 11.2 cases per one year. Among total patient's infected, house wives 39.28% were highly involvement and liver was highly infected 31(55.3%) among all organs of infected patients. The age group 41-50 years, was 13(23.21%) highly infected than others, and the females (53.57%) were high infected than males (46.4%). The study of economic loses among 56 cases treated surgically was approximately 112000$ USA$. The infestation rate of eggs of *E. granulosus* was highly found at the Slaughtered animal's area (60%), (south of city). According to the results of present study, we recommend some suggestions that may help people to reduce the infection of cystic hydatidosis in humans.

1- Cleaning vegetables and fruits very well with tape water at least three times for each sample.
2- Keep your hands clean before eating.
3- Keep the children away from dog's box.
4- Using burner in slaughtered animals to burn the infected organs of infected animals to avoid reaching the larval stage to the final hosts(dogs).

Acknowledgment

Finally we would like to thanks all managements of private and governorate hospitals in Kalar city, Kurdistan Iraq for their helpful and supporting our current work.

Table 1:-Prevalence of cystic echinococcosis in patients admitted to surgery department hospitals in Kalar city according to their age groups.

Age group	No. Of infection (%)		
	Male	Female	Both
≥10	1 (33.33)	2 (66.66)	3 (5.35)
11-20	3 (37.50)	5 (62.50)	8 (14.28)
21-30	3 (33.33)	6 (66.66)	9 (16.07)
31-40	5 (55.55)	4 (44.44)	9 (16.07)
41-50	4 (30. 76)	9 (69.23)	13 (23.21)
51-60	6 (75.00)	2 (25.00)	8 (14.28)
61-70	2 (33.33)	2 (66.66)	4 (3.57)
≥71	2 (100.00)	--	2(3.57)
Total	26 (46.42)	30 (53.57)	56 (100)

Table 2:- Prevalence of cystic echinococcosis in patients admitted to surgery department in hospitals in Kalar city accordings to their occupation.

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Type of occupation	No. of infection (%)
Doctor assist	1 (1.78)
Teacher	2 (3.57)
Employee	2 (3.57)
Children	3(5.35)
Retired	3 (5.35)
Student	11 (19.64)
Worker	12 (21.42)
Housewives	22 (39.28)
Total	56 (100)

Table 3:-Prevalence of cystic echinococcosis in organs of infected patients admitted to surgery departments in hospitals of Kalar city.

DOI: https://doi.org/10.26750/vol(6).no(1).paper8 http://journal.uor.*edu*.krd/index.php/JUR Vol. 6, No.1, June. 2019

Organs Involved	Females Infected (%)	Males Infected (%)	Total (%)
Liver	16	15	31 (55.35)
Lungs	5	4	9 (16.07)
Kidney	2	2	4 (7.14)
Bone	2	2	4 (7.14)
Eye	2	1	3 (5.35)
Ovary	2	0	2 (3.57)
Abdomen	1	1	2 (3.57)
Testes	0	1	1 (1.75)
Muscles	0	1	1 (1.75)
Total	30 (53.57)	26 (46.42)	56 (100.0)

Table 4: Show the Percentage of infection of 60 samples of dogs feces examined among different localities of Kalar city.

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Localit yof the study	Site among the city	No. of sample examined	No. of sample infected	Percentage of infection
Jutyaran, Sharawan & Awarakan	North	10	1	10%
Sirwan, Sarkawtn & Shairwana	South	10	4	40%
Sharawan 1	center	10	3	30%
Mamostayan & Azyaran	East	10	3	30%
Shorsh & Hamreen	West	10	5	50%
Slaughtered Animals	south	10	6	60%
Total	City sites	60	22	36.6%

DOI: https://doi.org/10.26750/vol(6).no(1).paper8 http://journal.uor.*edu*.krd/index.php/JUR Vol. 6, No.1, June. 2019

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DOI: https://doi.org/10.26750/vol(6).no(1).paper8 http://journal.uor.*edu*.krd/index.php/JUR **Vol. 6, No.1, June. 2019**