Epidemiological and Clinical Features of Hydatid Cyst Disease in Babylon Province, During the years 2010-2015

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Abstract

Background:-Hydatid disease is a chronic parasitic disease highly endemic in Iraq, it has serious health and economic consequences.

Objectives:-To identify epidemiologic features in (person, place, and time) module of hydatid cyst disease and describing its clinical features among patients admitted to public hospitals for surgery.

Methodology:-This cross sectional study was conducted by reviewing the clinical records of 208 hydatid cyst patients who were admitted to eight public hospitals in Babylon province during 6 years period (2010-2015), the records of all patients of hydatid disease were studied single handy by the researcher, incomplete, duplicated records and non surgically operated patients were excluded from this study. The period of the study extended from February 2016 through June 2016, the following independent variables were studied; such as socio-demographic data, clinical presentation of the disease and the organs involved and other characteristics of cyst.

Results:-This study revealed that the average and the standard deviation of patients age were (34.13±16.17), females were significantly more infected than males ($p<0.05$), liver was the most infected organ (82.2%),more than two thirds of cases(70.2%) had a single cyst. The disease was predominantly present among rural dwellers(55.8%).About 15% of cases had cysts more than (10cm) in diameter. The predominant presentation of the disease was abdominal pain(52.4%) followed by abdominal mass.

This study revealed that this disease was predominated in people with low socioeconomic status.

Conclusion:-Hydatid cyst disease is an endemic disease in Babylon province, it was more common in females, low socioeconomic status groups, rural dwellers; liver is the most commonly infected organ. A strategic plan should be put to eliminate this disease in our society.

Keywords: Hydatid cyst, Epidemiologic features, Clinical presentation, Iraq, Babylon Province.

الخلاصة

خلفية البحث: داء الأكياس العداريه هو من الأمراض الطفيلية المزمنة المستوطنة لحد الآن في العراق,له عواقب صحية واقتصادية خطيرة.

الأهداف: للتعرف على السمات الوبائية لمرض الأكياس العداريه في النمط الوبائي (الشخص، المكان، والزمان) ووصف معالمه السريرية بين المرضى الذين يتم إدخالهم إلى المستشفيات العامة لإجراء العمليات الجراحية لغرض رفع الكيس.

طريقة البحث: أجريت هذه الدراسة المقطعية من خلال مراجعة السجلات السريرية ل(208) مريض بداء الأكياس العداريه الداخلين في ثمان مستشفيات عامه في محافظة بابل خلال فترة 6 سنوات (2010–2015)، وتمت دراسة سجلات جميع مرضى الأكياس العداريه بشكل مفرد بأيدي الباحث, وقد استبعدت السجلات الناقصة والمكررة والمرضى الذين لم يتم علاجهم جراحيا من الدراسة، هذا وقد امتدت فترة الدراسة من شباط 2016 حتى نهاية حزيران 2016, هذا وتمت دراسة المتغيرات المستقلة التالية: مثل البيانات الاجتماعية الديموغرافية والأعراض السريرية للمرض والعضو المصاب وغيرها من خصائص ومميزات الكيس.

النتائج: كشفت هذه الدراسة أن متوسط العمر و الانحراف المعياري للمرضى كان سن (34.13 ± 16.17)، وقد كانت إصابة الإناث أكثر من الذكور بفارق معنوي و إحصائي ملحوظ ($p<0.05$)، وكان الكبد العضو الأكثر إصابة بنسبة (82.2٪)، وقد كان أكثر من ثلثي الحالات (70.2٪) لديهم كيس منفرد. كما كان هذا المرض منتشراً في الغالب بين سكان الريف بنسبة (55.8٪) مقارنة بسكان المدينة. وكان حوالي(15٪) من الحالات لديهم أكياس قطرها يزيد عن(10سم). وكان العارض السريري السائد للمرض هو ألم البطن بنسبة (52.4٪) ويليه ورم البطن.

كشفت هذه الدراسة أن هذا المرض هو مرض منتشر بشكل كبير بين الناس ذوي الوضع الاجتماعي والاقتصادي المنخفض.

الاستنتاج: داء الأكياس العداريه هو مرض متوطن في محافظة بابل، أكثر شيوعا في الإناث، و بين مجاميع الناس ذوي الأحوال الاقتصادية والاجتماعية المنخفضة، وأكثر انتشاراً بين سكان الريف مقارنة بسكان المدينة، وان الكبد عادة هو العضو الأكثر عرضة للإصابة. يجب وضع خطه استراتيجيه للقضاء على هذا المرض في مجتمعنا.

كلمات البحث: الكيس العداري، السمات الوبائية، الأعراض السريرية، العراق، محافظة بابل.

Introduction

Hydatid cyst disease is one of the most important zoonotic diseases in the world and considered as a global public health problem (Benyan, *et al.* 2013). Also, it is one of the major socioeconomic problems in the world (Faheem, *et al.* 2013), caused by the larval stage of different species of the genus Echinococcus (Al-Naimi, *et al.* 2012).

It is endemic in Mediterranean area with other zoonotic diseases (Grosso, *et al.* 2012), and its endemicity is clear in Iraq (Benyan, *et al.* 2013). It is mostly a disease of Iraqi farmers, butchers, and rural dwellers. The prevalence of this disease in Iraq is not clearly identified.

This disease can occur in many forms, but the most important one is cystic echinococcosis which is also called unilocular echinococcosis, this form is caused by the larvae of Echinococcus granulosus and the second form is alveolar echinococcosis, caused by Echinococcus multilocularis (Liu, *et al.* 2015).

The larval stage and the adult form of Echinococcus granulosus located inside the small intestine of canines and dogs which act as a definitive host (Mor, *et al.* 2015) therefore, hydatid cyst disease occurs in sheep raising areas (Stoot, *et al*. 2010; Tappe, *et al.* 2011; Vejdani, *et al.* 2013).

Hydatid cyst disease in human affects mainly the liver, but also can affect lungs, and other sites of the body such as brain, musculature, heart, kidneys, orbit and bone marrow…etc (Grosso, *et al.* 2012; Sadjjadi, 2006).

This disease mostly diagnosed late because of its silent growth and its symptoms can occur after years from the infection when the internal organs compressed by the cyst (Cappello, *et al.* 2013).

Diagnosis of this disease depends on its clinical features which confirmed by using immunological assays and imaging techniques like ultrasonography ,magnetic resonance imaging and computed tomography scan (Elshikh, *et al.* 2015).

The main life threatening complications of this disease are anaphylactic shock, rupture of the cyst, new cyst formation, and bacterial infections (Cappello, *et al.* 2013).

The best treatment of human hydatid cyst is surgical resection which is the gold standard for diagnosis of this disease. Medical treatment can be used for patients with small asymptomatic cyst or those who does not fit for surgery by using albendazole as initial choice of treatment (Bernard, 2010; Matar and Hadbool, 2013).

The domestic animals such as dogs play a major role in the spread of Echinococcus granulosus infection in countries of the Middle East including Iraq through environmental contamination (Arbabi and Hooshyar, 2006).

This disease occurs in places in which cattle, goats, and sheep traditionally slaughtered and the infected organs can be eaten by dogs and wild animals (Arbabi and Hooshyar, 2006).

In Iraq hydatid cyst disease is one of the most serious health problem, where sheep, dairy cattle and goats are still butchered traditionally with absence of global or local programs for control (Al-Saeed and Al-Mufty, 2016).

In our country this health problem has economic, social, and health impacts, few studies were carried out in Iraq to describe the epidemiology of hydatid cyst disease .

To our best knowledge, this is the first study regarding epidemiological aspects of hydatid cyst disease in Babylon province.

This study was conducted to identify the epidemiological features (person, place, and time) of hydatid cyst disease in Babylon province and to describe its clinical features and other associated factors.

Materials and Methods:

This study is a descriptive cross-sectional epidemiological study done in Babylon province, in eight public hospitals namely Al-Hilla teaching hospital, Al-Eskandaria hospital, Al-Musaib hospital, Al-Mahawil hospital, Al-Hashimia hospital, Al-Qasim hospital, Al-Shomalli hospital and Al-Kifil hospital during the period from February 2016 through June 2016 .

Data were collected by reviewing the records of 208 hydatid cyst disease patients out of 289 records which labeled as hydatid cyst disease cases, the selection of 208 records depends on the criteria of being complete, non duplicated, and surgically operated for removal of hydatid cysts, those patients were admitted to eight public hospitals in Babylon province during 6 years period (2010-2015). The data collection consider different independent variables such as age, sex, place of residence, level of education, occupation, family monthly income, presence of domestic animals, personal hygiene, any family history of hydatid cyst disease, organ of involvement, symptoms, number of cysts, the size of the cyst and whether primary or secondary occurrence of the disease in addition to the duration of hospitalization. Incomplete and duplicated records were excluded from the study. Data analysis were done by using SPSS version 20, Pearson's chi-square test (χ^2) test and t-student test were used to determine the associations between different variables. A p-value of $\leq$ 0.05 was considered as statistically significant.

Results

Our study showed that the overall mean age of the patients of hydatid cyst disease was (34.13±16.17) years. Figure 4.1 shows that about (36.5%) of patients were at age 40 years or more and only (4.80%) of them were under the age of 10 years.

Table 4.1 shows the proportions of hydatid cyst disease patients admitted to four public hospitals in relation to total admission to surgical wards (cause specific rate) in each hospital of Babylon province during 2015, the highest number and proportion of hydatid cyst disease patients was (285/100000) admitted to Al-Hilla teaching hospital followed by Al-Musaib hospital (113/100000).

Table 4.2 shows the relationship between the means of days of hospitalization and the age of patients of hydatid cyst disease with gender. The mean of days of staying in hospital for each hydatid cyst patient is about (4days).

Table 4.3 shows the distribution of patients with hydatid cysts by socio-demographic characteristics. About(65.4%) of patients were females and the female to male ratio was (1.88:1). Regarding the place of patients residence, more than half of the study group(55.8%) were lived in rural areas, and (54.3%) of them have primary school level of education and about two thirds (69.7%) of patients were unemployed. Considering the family income (43.8%) of the study group were belonged to low income and another (43.8%) were belonged to the middle or just enough income.

Table 4.4 shows the relationship between patients gender and areas of residency. Females lived in rural areas were significantly infected in high rate with hydatid cyst disease (61%) $p < 0.05$.

Table 4.5 explains the distribution of patients with hydatid cysts according to environmental and behavioral factors. About one third (31.2%) of the patients have domestic animals. And about half of them live in areas in which animals traditionally slaughtered (outside the slaughtered houses), one third (28.7%) of hydatid cyst patients mentioned that they frequently do not wash vegetables before eating.

Figure 4.2 shows the distribution of hydatid cysts by the size of the cyst in cm, about two thirds (58.7%) of patients had hydatid cysts with 6-10 cm, while (15.30%) of the study group had cysts more than 10 cm in size.

Figure 4.3 shows the distribution of hydatid cysts by number of cyst. About (29.80%) of patients had more than one cysts (multiple cysts).

Table 4.6 shows the distribution of patients with hydatid cysts by the organ affected, family history, and clinical manifestations. About (82.2%) of patients had liver hydatid cysts, and (92.3%) of patients had hydatid cysts for the first time(primary hydatid cyst). About half (52.4%) of them mentioned that suffering from abdominal pain was the leading clinical manifestation.

Table 4.7 shows the association of hydatid cysts number in the organs' affected. There was a significant association between hydatid cysts number with organs affected (the liver shows highest significant proportion of multiple cysts (72.6%) followed by the kidneys (8.1%) $p<0.05$.

Table 4.8 shows the association of hydatid cysts size with organs' affected. There was a significant association between hydatid cysts size and organs affected

(the liver shows the highest significant proportion (100%) for having hydatid cyst more than (10cm) $p<0.05$).

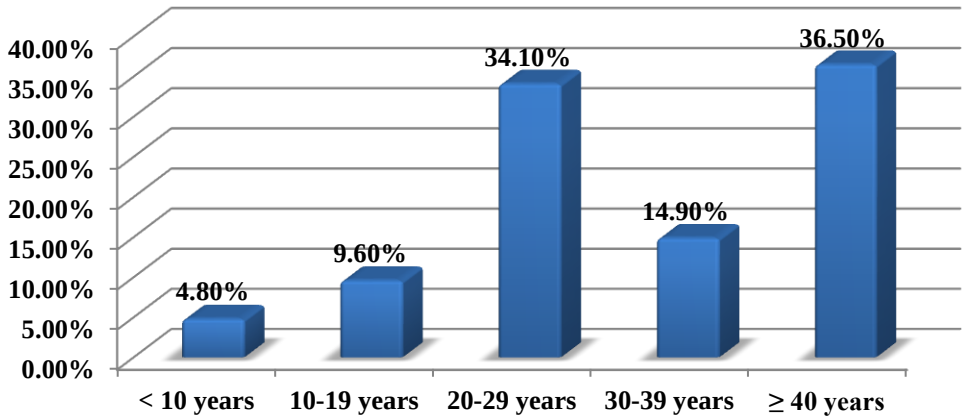

Figure 4.1: Distribution of Patients with Hydatid Cysts by Age Group

Table 4.1: Proportions of Hydatid Cyst Disease Patients Admitted to Four Public Hospitals in Relation to Total Admission to Surgical Wards in Each Hospital of Babylon Province During 2015.

Hospital	No. of patients of hydatid cyst disease	No. of patients admitted to surgical wards	Annual No. of hydatid cyst per 100000
Al-HillaTeachingHospital	28	9804	285
Al-Qasim Hospital	0	888	0
Al-Musaib Hospital	4	3524	113
Al-Eskandaria Hospital	4	3814	104
Total	36	18030	199

Table 4.2: Relationship Between The Means of Days of Hospitalization and The Age of Patients of Hydatid Cyst Disease With Gender.

Variable	Sex	Mean	S.D (±)	t-test	P value*
Days of hospitalization	female	3.78	0.81	1.444	0.150
	male	3.62	0.68		
Total		**3.70**	**0.74**		
Age (years)	female	35.16	16.34	1.261	0.209
	Male	32.19	15.75		
Total		**33.67**	**16.04**		

*p value ≤ 0.05 is significant

Table 4.3: Distribution of Patients with Hydatid Cysts by Socio-demographic Characteristics.

Variable	Frequency (%)
***Sex**	
Male	72 (34.6%)
Female	136 (65.4%)
Total	208 (100.0%)
Residence	
Urban area	92 (44.2%)
Rural area	116 (55.8%)
Total	208 (100.0%)
Educational levels	
Illiterate	33 (15.9%)
Primary school	113 (54.3%)
Secondary school	51 (24.5%)
University/diploma	11 (5.3%)
Total	208 (100.0%)
Occupational status	
Governmental employee	22 (10.6%)
Self-Employed	41 (19.7%)
Non-Employed	145 (69.7%)
Total	208 (100.0%)
Family income	
Low	91 (43.8%)
Enough	91 (43.8%)
High	26 (12.4%)
Total	208 (100.0%)

***Female : Male ratio (1.88:1)**

`Table 4.4: Relationship Between Patients Gender and Areas of Residency.

Variable	Sex		Total	χ^2	*P* values
	Male (%)	Female (%)			
Residence					
Urban Area	39 (54.2)	53 (39.0)	92 (44.2)	**4.407[a]**	**0.036***
Rural Area	33 (45.8)	83 (61.0)	116 (55.8)		
Total	72 (34.6)	136 (65.4)	208(100.0)		

*p value ≤ 0.05 is significant

[a:] Fischer Exact test

Table 4.5: Distribution of Patients with Hydatid Cysts According to Environmental and Behavioral Factors.

Variable	Frequency (%)
Presence of domestic animals	
No	143 (68.8%)
Yes have:	
sheep	25 (12.0%)
dogs	24 (11.5%)
cows	16 (7.7%)
Total	208 (100.0%)
Live in area of traditional slaughtering of animals	
Yes	101 (48.6%)
No	107 (51.4%)
Total	208 (100.0%)
Washing of vegetables	
Yes	148 (71.2%)
No	60 (28.7%)
Total	208 (100.0%)

Table 4.6: Distribution of Patients with Hydatid Cysts by The Organ Affected, Family History, and Clinical Manifestations.

Variable	Frequency (%)
Organ affected	
Liver	171 (82.2%)
Spleen	10 (4.8%)
Kidney	10 (4.8%)
Leg	4 (1.9%)
Peritonium	4 (1.9%)
Liver and spleen	3 (1.4%)
Liver, peritoneum and large intestine	1 (0.5%)
Lung	3 (1.4%)
Liver and peritonium	2 (1.0%)
Total	208 (100.0%)
Family history of hydatid cysts	
1st time	192 (92.3%)
Recurrent infection (1st in liver)	14 (6.7%)
Recurrent infection (1st in spleen)	1 (0.5%)
Recurrent infection (1st in cutaneous tissues)	1 (0.5%)
Total	208 (100.0%)
Clinical manifestations	
Abdominal pain	109 (52.4%)
Abdominal mass	54 (26.0%)
Abdominal pain and mass	31 (14.9%)
SOB	3 (1.4%)
Leg pain	4 (1.9%)
Abdominal pain and dysuria	4 (1.9%)
Abdominal mass and dysuria	3 (1.4%)
Total	208 (100.0%)

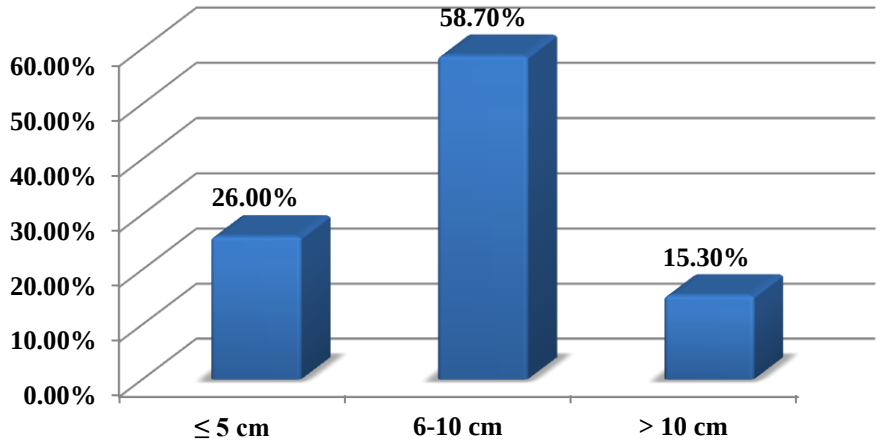

Figure 4.2: Distribution of Patients with hydatid cysts by size in (cm)

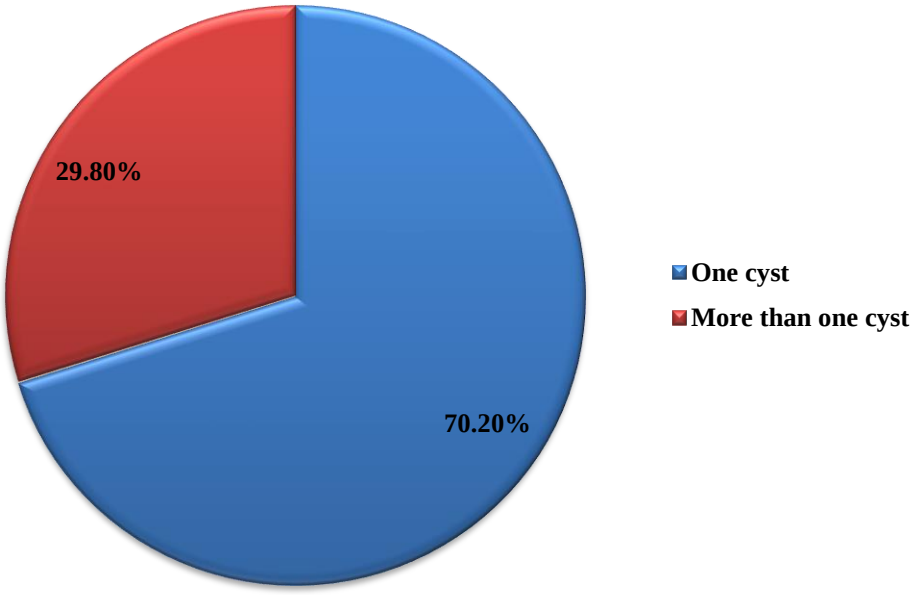

Figure 4.3: Distribution of Hydatid Cysts by Number of Cysts

Table 4.7: Association of Hydatid Cysts Number by Organs' Affected.

Variable	Hydatid cyst		Total	χ^2	*P* values
	one cyst (%)	> one cyst (%)			
Organ affected					
Liver	126 (86.3)	45 (72.6)	171 (82.2)		
Spleen	9 (6.2)	1 (1.6)	10 (4.8)		
Kidney	5 (3.4)	5 (8.1)	10 (4.8)		
Leg	4 (2.7)	0 (0.0)	4 (1.9)		
Peritonium	0 (0.0)	4 (6.5)	4 (1.9)	**25.939**	**<0.001*[a]**
Liver and spleen	0 (0.0)	3 (4.8)	3 (1.4)		
Liver, peritoneum and large intestine	0 (0.0)	1 (1.6)	1 (0.5)		
Lung	2 (1.4)	1 (1.6)	3 (1.4)		
Liver and peritoneum	0 (0.0)	2 (3.2)	2 (1.0)		
Total	146(100.0)	62(100.0)	208(100.0)		

*p value ≤ 0.05 is significant

[a:] Fischer Exact test

Table 4.8: Association of Hydatid Cysts Size with Organs' Affected.

Variable	Hydatid Cyst			Total	χ^2	*P* values
	≤ 5 cm (%)	6-10 cm (%)	> 10 cm (%)			
Organ affected						
Liver	38 (70.4)	101(82.8)	32(100.)	171 (82.2)		
Spleen	5 (9.3)	5 (4.1)	0 (0.0)	10 (4.8)		
Kidney	5 (9.3)	5 (4.1)	0 (0.0)	10 (4.8)		
Leg	4 (7.4)	0 (0.0)	0 (0.0)	4 (1.9)		
Peritonium	0 (0.0)	4 (3.3)	0 (0.0)	4 (1.9)	23.50[a]	<0.024*
Liver and spleen	0 (0.0)	3 (2.5)	0 (0.0)	3 (1.4)		
Liver, peritoneum and large intestine	0 (0.0)	1 (0.8)	0 (0.0)	1 (0.5)		
Lung	2 (3.7)	1 (0.8)	0 (0.0)	3 (1.4)		
Liver and peritonium	0 (0.0)	2 (1.6)	0 (0.0)	2 (1.0)		
Total	54 (26.0)	122 (58.7)	32 (15.3)	208(100.)		

*p value ≤ 0.05 is significant

[a:] Fischer Exact test

Discussion

In our study we found that the majority of patients were at age of 40 years or more, while the lowest percentage of them were at age below 10 years, this can be explained by the long period of time needed for the growth and development of the cyst therefore, because of this slow growth, the cyst rarely discovered in young children and adolescents except if the cyst affects the brain itself (Rokni, 2009). This result differs from many studies carried out in Iraq such as a study which was conducted in Kirkuk and Tikrit by Kadir MAA, *et al.* (Kadir, *et al.*, 2006) and another study which was carried out in Baghdad teaching hospital and in Al-Kut governorate by Al-Obaidi SM, *et al.* (Al-Obaidi, *et al.*, 2014), in both previous studies, the age of the majority of hydatid cyst patients were between(20-30) years, also our results differ from the results of other investigator outside Iraq such as Turkey and Iran in which the most affected age group was(16-30) and (31-40) years, respectively (Mor, *et al.* 2015; Vejdani, *et al.* 2013).

This difference may be due to the variations of the sample sizes of these studies or it may be related to the early diagnosis of this disease in these countries due to more utilization of updated diagnostic tools, well functioned health facilities and high level of awareness of public and health care providers about the epidemiological and clinical features of this health problem or due to the different inclusion criteria used for diagnosis.

This study showed that the annual disease specific rates of hydatid cyst patients who were admitted to four hospitals in Babylon province were (199 per 100000), the greatest number of them were admitted to Al-Hilla teaching hospital, this can be explained by the fact that it is the largest referral hospital at Al-Hilla city therefore, most cases of hydatid cyst disease were referred from other hospitals at periphery of Babylon province to this hospital in order to reach to proper treatment and care.

Our study showed that the mean days of hospitalization for patients with hydatid cyst disease was about four days, this reflects the cost and burden of this chronic disease on the national health system in Iraq. This finding disagrees with a study done by Mousavi SR, et al. in Iran in which the mean duration of hospitalization was more (Mousavi, *et al.*, 2012).

Regarding the sex distribution of cases in this study, females were obviously more infected with hydatid cyst disease than males. This difference in sex distribution varies according to socioeconomic, traditional, and cultural factors (Faheem, *et al.* 2013). In our study females in rural areas were significantly highly affected than males, this can be related to the occupational exposure of the housewives in these areas where females especially housewives are in close contact with contaminated raw vegetables, cleaning the houses which contain the feces of dogs or sweeping the yards in which the dust can be contaminated with the causative agents of hydatid cyst disease, (Arbabi and Hooshyar, 2006)while in urban areas the high rate of female infection may be due to eating contaminated uncooked vegetables (Lotfi, 2004). These results agree with many studies which were done in Iraq such as the study done by Al-aubaidi TE. on 90 patients with hydatid cyst disease who were treated surgically from 2006 to 2009 at Baghdad teaching hospital in which (61.3%)

of patients were females(Al-aubaidi, 2010)and similar to the findings of other investigators in other countries such as the survey of human hydatidosis which was done in Tehran, Iran from 2000 to 2010 which showed that (56%) of the study group were females (Mousavi, 2012) but disagree with other studies such as a study of cystic hydatidosis in Western Sicily, in which males to females ratio was 2:1 (Cappello, *et al*. 2013) and other study of hydatid cyst disease which was done at hospitals of epidemic zones of Andhra Pradesh, India in which males account about (72.03%) of the study group (Faheem, *et al.* 2013).Other researchers showed that testosterone may increase the chance of males mice to get infection more than females mice (Al-Kuraishi, 2009).

The present study showed that most of patients lived in rural areas. This mostly occurs due to the characteristics of transmission of the disease which affects dogs and other herbivores, and because of close contact of people in these areas with dogs which may eat the infected organs of the infected animals slaughtered in traditional way in these regions therefore, in these areas the primitive slaughtering of these infected animals will maintain the life cycle of echinococcus (Al-Saeed and Al-Mufty, 2016). This result goes with the findings of other studies in Iraq (Shehatha, *et al.*, 2009), and another study of hydatid disease which was conducted in Iran for the period from 1993 to 2002 by Darwish B, in which (81%) of the patients were from rural areas (Darwish, 2006), but this finding does not go with a study done in hospitals of Kermanshah, in Iran which showed that (57.7%) of the study group were lives in urban areas (Vejdani, *et al.* 2013).

Regarding socioeconomic status this study revealed that about two thirds of the patients were non-employed and about half of them had a primary school level of education, while about (43.8%) of them were with low income, these findings reflect the fact that hydatid cyst is a disease of low socioeconomic population and it is considered as one of the infectious disease of poverty, because poor socioeconomic status makes the conditions worse due to shortage of proper health services, and this will facilitate the spread of these infectious diseases and prevent people from obtaining the needed tools to avoid infection (Harris and Reza, 2012). These findings are similar to the findings of a study conducted in Al-Yemen in which the researcher found that the patients of hydatid cyst disease are attending public hospitals more than the private, and this reflects the fact that most of patients of hydatid disease are from low socioeconomic level (Alghoury, *et al.*,2010) and disagree with the findings of other study which was done in Iran by Lotfi, M. who reported that (68.3%) of the study group were having low educational level (illiterate) (Lotfi, 2004).

Regarding the environmental and behavioral factors, this research shows that about one third of the patients with hydatid cyst disease have domestic animals or dogs at their homes and sometimes they may eat dirty or contaminated vegetables without washing, and about half of the patients mentioned that the traditional slaughtering of animals was the usual method of slaughtering in their areas of living. All these environmental and behavioral factors play an important role in maintaining the life cycle of the causative agent. This finding agrees with the finding of other

researchers who found that about (43.7%) of the patient of hydatid cyst disease were exposed to environmental risk factors (Cappello, *et al.* 2013).

The most frequently affected organ in our study was the liver, this can occur because the liver acts as a first filter for the larval stage of echinococcus in human body (Faheem, *et al.* 2013). This result is similar to the findings of other researchers such as the study conducted in Palestine by Abu-Hasan N., et al. which showed that the liver was the most affected organ in (58.2%) of the study group (Abu-Hasan, et al., 2002) and disagrees with the findings of other study which was conducted by Mor N, et al. in Turkey, in which the lung was the most affected organ in (49.4%) (Mor, et al. 2015). This difference in infected organ in our patients and patients of other studies may be related to the sample size and the fact that lung hydatid cyst easily diagnosed in comparison with hepatic cyst because of the frequent chest x-ray which requested to each patient with respiratory symptoms in Iraq (Nourjah, *et al.*, 2004).

Most of the patients in this study were infected for the first time (primary infection), this finding is similar to the findings of other studies such as a study carried out in Iran (Vejdani, *et al.* 2013) and a study conducted in Central Saudi Arabia (Fahim and Al Salamah, 2007).

Regarding symptomatology of hydatid cyst disease, this study reveals that about half of the patients were presented with abdominal pain and this finding goes with the results of other studies which were conducted in Baghdad teaching hospital and in Iran (Mousavi, 2012; Al-aubaidi, 2010), but this result does not agree with the findings of other researches who found that the majority of patients were asymptomatic at time of diagnosis (Al-Naimi, *et al.* 2012).

This study showed that about (58.7%) of the cysts measured about (6-10 cm) in diameter, this can occur mostly due to the long time between the entrance of the larva of echinococcus and the appearance of symptoms, and due to late diagnosis of the disease in our patients as a result of their low level of awareness and poor health services utilization and may be related to unawareness of junior Iraqi doctors and general practitioners to the endemic status of this disease and the lack of their awareness about the symptomatology of it (Cappello, *et al.* 2013). This result agrees with other studies conducted in Iraq and other countries such as Al-Yemen, in which (94%) of the hydatid cysts were (≥5) cm in largest diameter (Al-Naimi, *et al.* 2012; Alghoury, *et al.*,2010)and disagrees with another study conducted in India, in which most of the cysts (68.64%) were (<3) cm in diameter (Faheem, *et al.* 2013).

Regarding the number of cysts, this study showed that the majority of patients had single cyst and about one third of cases had more than one cyst(multiple cysts), the presence of more than one cyst may be due to re-exposure of the patient to the larva of the parasite or due to ingestion of large number of scolices at the same time (Al-Saeed and Al-Mufty, 2016). This result goes with a study carried out in Duhok-Kurdistan Region-North of Iraq, showed that (54.2%) of the study group were with single hydatid cyst (Al-Saeed and Al-Mufty, 2016),and disagrees with a study done by other researchers who reported that (60%) of their study group were with multiple cysts (Cappello, et al. 2013).

This study found that there was statistically association between the liver and high number of hydatid cysts inside the body of human, this means that the liver has a high susceptibility to have multiple cyst greater than other organs; on the other hand, the liver shows another significant association with the size of the cyst, this mean that it is more likely to have cyst with size more than (10) cm than other organs, this may be explained by the fact that the larval stage of echinococcus passes from the wall of intestine and through portal circulation to enter the liver as a first drainage organ therefore, the liver acts as a first trap of the parasite larva and it is for this reason more liable to have multiple and large cyst than the other organs. This finding is similar to the findings of other study done in Iraq (Al-Naimi, *et al.* 2012).

Conclusion

In conclusion, hydatid cyst disease is still a public health problem endemic in Babylon province. It affects mainly people with low socioeconomic status especially those who live in rural areas and mostly occurs in females. It affects almost all the body organs but the most affected organ is the liver. It can occur mostly as a single cyst usually measure from (6-10) cm in diameter. The main symptom of this disease is abdominal pain, while the main reported sign is abdominal mass.

Recommendations

1- Increase level of awareness of people about this serious parasitic disease which was highly endemic in our country by using different kinds of health education activities such as; health education lectures in primary health centers, media, religious leaders talks, and local NGOs.

2- Increase in quantity and quality of the slaughtering houses in Babylon province and encourage butchers to use these public supervised slaughter houses.

3- Improvement of health information system through restarting up to date electronic recording system at district hospital levels.

4- Refreshment training courses, seminars, scientific meetings and scientific conference should be held to raise the level of awareness of health care providers in collaboration with WHO office in Iraq and other International NGOs.

5- The curricula, medical and health teaching materials in Iraqi and health institutes should contain adequate and up to date scientific teaching materials that deal extensively with this high priority public health problem in Iraq.

6- Nation wide epidemiological surveys to identify the disease for both human and animals should be done in order to measure the extent of this highly endemic zoonotic disease and to put a strategic successful plan to reduce the prevalence of this disease.

7- Urgent well plan effective campaigns should be started in Babylon province to eliminate stray dogs, these campaigns are strongly requested to get rid of these dogs which play the major role in transmission of this disease to human. This can be done through intersect-oral collaboration activities between different departments such as veterinary department, public health department, college of

veterinary medicine in Al-Qassim Green University in Babylon province, local environmental NGOs and the local police departments.

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