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Epidemiology of Some Parasitic Helminthes in Iraq from 2011 until 2015

Entsar J. Saheb*[1], Sinan Ghazi Mahdi[2], Israa S. Mosa[1], Muthana Ibrahim Abdul-Karim[2]and Adnan Nawar Khistawi[2]

[1]Department of Biology, College of Science, University of Baghdad, Baghdad, Iraq.
[2]Communicable Diseases Control Center, Parasitology and Helmanthology Units in Baghdad, Iraq

Abstract

Helminthes are among transmitting pathogens including Ancylostomiasis, Ascariasis, Enterobiasis, Hymenolepiasis, Strongyloidiasis, Taeniasis, Trichuriasis, Schistosomiasis, Echinococcosis. These helminthes have high effect on public health in human population around the world. Iraq is one of the most important endemic areas in the Middle East.The objective of this study is to determine the prevalence of some parasitic helminthes in Iraq from 2011 until 2015. This study was carried out in all Iraqi governorates from 2011until June, 2015.In 2015, the results showed that 6 patients were infected with Ancylostomiasis, 89 patients were infected with Ascariasis, 56206 patients were infected with Enterobiasis, 173patients were infected with Hymenolepiasis, non-patient infected with Strongyloidiasis. 25patients were infected with Taeniasis, 9 cases were infected with Trichuriasis. During the last five years, Iraq was absent of schistosomiasis. Conceding Echinococcosis infection, there were a total of 4769 patients. In 2011, 2012 and 2013 Najaf showed the highest incidence rates of infections 302 patients,277 patients and 215 patients respectively, while Babel, Salaheldin, Wasit, Anbar and Baghdad kerkh governorates had the lowest rate of Echinococcosis infection. In 2014, Thiqar showed the highest incidence rates of Echinococcosis infections (168 patients).In 2015, 81 patients were found in Najaf which reveling the highest incidence rate. Baghdad kerkhdid not record any infections. In conclusion during the time of this study, Iraq successfully eliminate Strongyloidiasis and schistosomiasis, on the other hand Enterobiasis and Echinococcosis represents a health problem in Iraq.

Keywords: Prevalence, Schistosomiasis, Echinococcosis.

وبائية بعض الديدان الطفيلية في العراق من عام 2011 حتى عام 2015

انتصار جبار صاحب*[1]، سنان غازي مهدي[2]، اسراء سالم موسى[1]، مثنى ابراهيم عبد الكريم[2]، عدنان نوار خستاوي[2]

[1]جامعة بغداد، كلية العلوم، قسم علوم الحياة، بغداد، العراق.
[2]مركز الامراض المتوطنة في العراق، قسم الطفيليات، العراق.

الخلاصة

الديدان الطفيلية من بين اهم مسببات الأمراض بما في ذلك الأنكلستومات، داء الصفر، داء السرميات، داء الديدان الدبوسية، الأسطوانيات، الشريطيات، داء المسلكات، البلهارزيا، مرض الأكياس المائية. هذه الديدان لها تأثير كبير على الصحة العامة في جميع أنحاء العالم. العراق هي واحدة من المناطق الموبوءة الأكثر أهمية في الشرق الأوسط. الهدف من هذه الدراسة هو تحديد وبائية بعض الديدان الطفيلية في العراق

*Email: ejsaheb@ualr.edu

من عام 2011 حتى عام 2015. قد أجريت هذه الدراسة في جميع المحافظات العراقية من عام 2011 حتى عام 2015. في عام 2015، أظهرت النتائج أن 6 أفراد كانوا مصابين بداء الأنكلستومات ، 89 شخص مصاب بداء الصفر، 56206 مصاب بداء السرميات، 173 شخص بداء المحرشفات، 25 شخصا بداء الشريطيات، 9 شخصا بداء المسلكات. خلال الفترة من 2011 الى 2015 كان العراق خاليا من اصابات البلهارزيا في حين سجلت ما مجموعه 4769 حالة مرضية بالأكياس المائية في عام 2011. بينما خلال الاعوام 2012 و 2013 , 2014 سجلت النجف أعلى معدلات الإصابة 302 مريضا و 277 مريضا و 215 مريضا على التوالي، في حين سجلت بابل، صلاح الدين، واسط، الأنبار وبغداد الكرخ أدنى معدل اصابة بمرض الأكياس المائية. في العام 2014 سجلت محافظة ذي قار اعلى معدلات اصابة (168) بمرض الأكياس المائية.في عام 2015، تم العثور على 81 مريضا في النجف التي سجلت أعلى معدل للاصابة بينما بغداد الكرخ لم تسجل أي إصابات. خلال فترة هذه الدراسة يمكن الاستنتاج ان العراق نجح بالقضاء على داء الأسطوانيات والبلهارزيا من ناحية أخرى لازال داء الدبوسياتوداء الأكياس المائية يمثل مشكلة صحية في العراق.

Introduction

Helminthes infections are a major public health problem [1]. Four species of nematodes are referred to as soil-transmitted helminthes (STHs): *Ascaris lumbricoides*; *Trichuristrichiura*; *Necator americanus*and *Ancylostoma duodenale*. The nematode *Strongyloides stercoralis* can also be considered a soil- transmitted helminthes [2]. *Ascaris lumbricoides* is the world's most common helminth infection that generally affects children [3].*Trichuris trichiura*is a soil-transmitted helminth which is prevalent in tropical and subtropical regions of the world with poor sanitation [4].*Ancylostoma duodenale*is one of the most prevalent worms [5]. *Strongyloides stercoralis* is an intestinal parasite. It has been estimated that 30-100 million people are infected around the world by this helminth, especially in tropical and subtropical regions[6]. *Hymenolepis nana* is the most prevalent parasite tapeworms. It is endemic in Asia, Africa, Eastern and Southern Europe and Brazil. Majority of the infections by *H. nana* is by self-infection through contaminated food or water with the eggs contained in faeces [7]. *Teaniasolium* is a zoonotic cestode. Humans are the only definitive hosts [8]. *Enterobius vermicularis* (pinworm) is the causative agent of enterobiasis, it is more common in children worldwide, particularly in the temperate and tropical regions. It is estimated that 200 million people are infected annually. This worm is commonly found in crowded institutions such as daycare centers, schools, hospitals and orphanages [9].

Schistosomiasis is the second most prevalent tropical disease after malaria infection.Schistosomiasis represents one of the main diseases of public health in the eastern Mediterranean region (EMR) [10]. Schistosomiasisis affecting 78 countries and territories in Africa, Asia, South America and the Middle East.Three species are caused dangerous diseases tohuman namely *Schistosoma, haematobium, S. mansoni* and. *S. japonicum.* Urogenitalschistosomiasis is caused by *S. haematobium.* The symptoms include hematuria, dysuria, bladder wall pathology, hydronephrosis, and it can also lead to squamous cell carcinoma. In adults, the infection can cause genital ulcers and other lesions resulting in poor reproductive health, with sexual dysfunction and infertility. On the other hand, intestinal schistosomiasis, caused by *S. mansoni*, presents with bloody diarrhea, chronic infections developing liver fibrosis, portal hypertension, and hematemesis [11]. *S.haematobium* is endemic in Africa and the Middle East, while *S. mansoni* is endemic in Africa, Middle East, the Caribbean, Brazil, Venezuela and Suriname. *S. japonicum* is found in China, Indonesia and the Philippines [12]. *Schistosomia*sis remains an important public health [13].

Echinococcosis is a zoonotic infection caused by *Echinococcus granulosus*, its definitive host are dog and other canids, and domestic animals for example sheep, goats, horses, camels, cattle, pigsasand human beings are intermediate hosts[14].The intermediate host ingests eggs *E. granulosus*, the egg then pass in the faeces of the final host and are immediately infective. Following ingestion by an intermediate host, they hatch in the small intestine and invade the blood vessels of the wall. Within twelve hours after ingestion, it arrives at the liver, where if not destroyed by phagocytic cells, it develops into a hydatid cyst [15].

Materials and Methods

The data presented in this paper was gathered from the Communicable Diseases Control Center, Parasitology and Helmanthology Units in Baghdad for the period from 2011 to June 2015. The data analysis was based on results of transmitted helminthes tests that were done by the laboratory system service. These data were exported from most Iraqi governorates to the Communicable Diseases Control Center. The dataset was rigorously tested.

Statistical Analysis

The Statistical Analysis System- SAS (2012) program was used to study the effect of difference factors in study parameters. Chi-square test was used to compare between percentages in this study.

Results and Discussion

In 2015, a total of 56419 patients: 6 patients were infected with Ancylostomiasis, 84 patients were infected with Ascariasis, 56206patients were infected with Enterobiasis, 173patients were infected with Hymenolepiasis, 25 patients were infected with Taeniasis, 9 patientswere infected with Trichuriasiswere reviewed in this paper as shown in Table-1. The highest incidence rate of Ancylostomiasiswas in Anbargovernorate which was 6patients, while the other entire governorates were nil of this disease. Najafgovernorate showed the highest incidence rate of Ascariasis (78 patients) while Muthanagovernorate showed the lower incidence (1 patient) only. This study also revealed that Thiqargovernorate showed the highest incidence rate of Enterobiasis (30504 patients), while the lowest incidence rate was in Sulaymaniyah (12 patients only). Hymenolepiasis highest incidence rate was in Najaf governorate (41 patients), Kirkuk, Diyala and Missan showed incidence rate (2 patients). The entire governorates were nil of Strongyloidiasis. The highest incidence rate of Taeniasiswas in Diala. Trichuriasishighest incidence rate was in Muthana governorate (9 patients) Table-1.

The present data demonstrate that female participants have higher prevalence of Ancylostomiasis and Enterobiasis infection (4 and 28831) than males (2 and 27375) respectively. On the other hand, the males have higher prevalence of Hymenolepiasis, Taeniasis and Trichuriasis infection (114, 17, 5) and (59, 8, 4) females respectively Table -2.

Table1-The prevalence of Ancylostomiasis (An), Ascariasis (As), Enterobiasis (En), Hymenolepiasis (Hy), Strongyloidiasis (St), Taeniasis (Ta) and Trichuriasis (Tr) in 2015.

Governorate	An	As	En	Hy	St	Ta	Tr	P-value
Dahok	0	0	856	0	0	0	0	0.001 **
Erbil	0	0	71	0	0	1	0	0.0034 **
Sulimaniyah	0	0	12	0	0	6	0	0.081 NS
Ninewah	0	0	596	0	0	0	0	0.001 **
Kirkuk	0	3	460	2	0	0	0	0.001 **
Salaheldin	0	0	0	0	0	0	0	1.00 NS
Diala	0	0	606	2	0	13	0	0.001 **
Baghdad rasafa	0	0	2148	9	0	0	0	0.001 **
Baghdad kerkh	0	0	7037	3	0	0	0	0.001 **
Anbar	6	0	900	0	0	0	0	0.001 **
Wasit	0	0	510	7	0	0	0	0.001 **
Babil	0	0	1119	4	0	0	0	0.001 **
Karbala	0	0	415	0	0	0	0	0.001 **
Najaf	0	78	1230	41	0	5	0	0.001 **
Qadisyah	0	2	764	5	0	0	0	0.001 **
Muthana	0	1	960	11	0	0	9	0.001 **
Thiqar	0	0	30504	15	0	0	0	0.001 **
Missan	0	0	40	2	0	0	0	0.001 **
Basrah	0	0	7978	37	0	0	0	0.001 **
Grand total	6	84	56206	173	0	25	9	0.001 **

** (P<0.01), ** (P<0.01), NS: Non-significant.

Table 2- Relationship between genders and the infection with Ancylostomiasis, Enterobiasis, Hymenolepiasis, Strongyloidiasis, Taeniasis and Trichuriasisin 2015.

Helminthes	Male	Female	P-value
Ancylostomiasis	2	4	0.075 NS
Enterobiasis	27375	28831	0.051 *
Hymenolepiasis	114	59	0.0446 *
Strongyloidiasis	0	0	1.00 NS
Taeniasis	17	8	0.0419 *
Trichuriasis	5	4	0.263 NS
Grand Total	27513	28906	0.0372 *
LSD	317.22 **	382.617 **	---

** (P<0.01), ** (P<0.01), NS: Non-significant.

In this study, during the period 2011 until 2015, there were no infections with schistosomiasis in Iraq. On the other hand a total of 4769 patients infected with echinococusis in the same period in all Iraqi provinces Table-3. In 2011, 2012 and 2013, Najaf showed the highest incidence rates of infections 302 patients, 277 patients and 215 patients respectively, while Babel and Salaheldin, Wasit, Anbar and Baghdad kerkh were had recorded the lowest rate of infection during the same years. In 2014, Diqar showed the highest incidence rate of infections (168 patients) while Anbar showed the lowest rate of infection (0 patents). In 2015, (81 patients) was found in Najaf reveling the highest incidence rate. Baghdad kerkh did not record any infections.

Table 3-Relationship between governorate and year with Echinococosis infection.

Governorate	2011	2012	2013	2014	2015	P-value
Dahok	42	76	9	34	32	0.001 **
Erbil	25	27	8	6	8	0.026 *
Sulimaniyah	27	13	11	1	3	0.031 *
Ninewah	271	195	185	80	43	0.001 **
Kirkuk	16	12	22	7	12	0.036 *
Salaheldin	0	0	0	2	5	0.44 NS
Diala	32	34	26	21	32	0.039 *
Baghdad rasafa	57	41	26	20	16	0.001 **
Baghdad kerk	5	5	0	1	0	0.287 NS
Anbar	5	0	1	0	2	0.262 **
Wasit	18	0	5	4	4	0.001 **
Babil	0	13	12	14	23	0.001 **
Karbala	43	42	48	54	52	0.049 *
Najaf	302	277	215	139	81	0.001 **
Qadisyah	87	87	92	37	18	0.001 **
Muthana	213	179	41	49	65	0.001 **
Thiqar	130	108	135	168	84	0.001 **
Missan	12	6	6	4	7	0.072 NS
Basrah	166	125	39	34	35	0.001 **
Iraq	1451	1240	881	675	522	0.001 **
P-value	0.001 **	0.001 **	0.001 **	0.001 **	0.001 **	----

* (P<0.05), ** (P<0.01), NS: Non-significant.

The present data demonstrate that females' participants have significantly higher prevalence of Echinococosis infection than males Table- 4. During the period from 2012 to 2015, the main age

group of infection with Echinococosis was (5-45) with infection, while the lowest rate of infection was in the age group of less than one year Table- 5.

Table 4- Relationship between genders and the infection with Echinococosis

Year	Male	Female	P-value
2012	7	16	0.0416 *
2013	306	557	0.0291 *
2014	236	439	0.0083 **
2015	212	408	0.0061 **
Grand Total	276	1420	0.001 **
LSD	82.159 **	138.53 **	---

** (P<0.01), ** (P<0.01).

Table 5-Relationship between age and the infection with Echinococosis.

Year	less than 1	1 - 4	5 - 14	15 - 45	More than 45	P-value
2012	0	0	0	20	3	0.0256 *
2013	0	5	77	578	199	0.001 **
2014	1	12	101	421	141	0.001 **
2015	2	18	192	830	254	0.001 **
Grand Total	3	35	370	1849	597	0.001 **
LSD	2.00 NS	6.749 **	26.815 **	62.964 **	47.207 **	---

** (P<0.01), ** (P<0.01), NS: Non-significant.

The biggest problems facing the medical parasitology are the problem of controlling the spread of human worms. Approximately 150 worms can cause multiple diseases leading to the affection of the economy in many of the countries of the world [5]. The principle mode of transmission of worm is usually occurs via ingestion of infectious egg by anus to mouth transfer by finger. However the transfer can also occur by inhalation or aerosolized eggs from the surface as in case of pin worm infections which are spread among young children with the habits of nail biting or poor hygiene and infected children can easily spread the infection to other family members [16]. Intensity of infection is influenced by cultural and genetic factors, as well as hygiene, environmental and socioeconomic variables [17]. A large number of epidemiological studies carried out in different countries and in our country have shown that the prevalence and epidemiological features of intestinal parasites vary in different parts of the world, even in different regions of the same country [18]. These differences might be due to variation in both host-specific and environmental factors that may affect transmission of helminthes infections [19].

Soil-transmitted helminths infect over 1.45 billion people including 819 million patients infected with *Ascaris lumbricoides*, 465 million with *Trichuris trichiura* and 439 million with hookworm (*Necator americanus* and/or *Ancylostoma duodenale*) [20]. This study proved that there is an epidemic of enterobiasis, hymenolepiasis and ascariasis infections in Iraq. Good hygiene can help to prevent severe disease. Hands and raw foods must be washed before eating. Children should be taught not to eat soil, and to wash their hands after playing with pets or outdoor activities [21]. The present study confirmed that entrobiasis was the most prevalent helminthic infections in Iraq due to sanitation and personal hygiene practices, especially hand washing, are still poor among Iraqi people (especially children). Community participation in providing health education to people at home should be improved as well as the risk factors such as toilet facilities, hand washing facilities, water for domestic use to avoid and reduce the transmission of helminthes.

In 1986, prevalence of schistosomiasis had dropped to 0.46%. In 1995, the infected proportion additional declined to 0.12. In 2003 and 2010, prevalence was still estimated at 0.1%. The incidence of schistosomiasis in Iraq is decreased due to the national control program, with no cases reported since

2011 which indicates that the country is moving toward the disease elimination phase. In 2015, the country is in the elimination phase [22- 24]. Schistosomiasis was removed from the Islamic Republic of Iran, Oman, Lebanon, and Tunisia. Transmission has been greatly reduced in Egypt, Saudi Arabia, Iraq, Morocco, Syria, and Jordan, while in Yemen schistosomiasis is considered a major health problem[25].In areas endemic for the disease, it affects poor and rural communities without access to safe drinking water and suitable sanitation because people suffering from the disease contaminate water sources with their urine containing parasite eggs which hatch in water and then enter into freshwater snails to develop into infective larval form of the parasite. Poor hygiene and contact with infected water make children susceptible to the infection; and women doing domestic routines in infested water, such as washing clothes, are also at risk ble [26]. The basic means of preventing *Schistosoma* infection is avoiding contact with fresh water infested with *Schistosoma* parasites. Any aquatic activities in these bodies of water expose the skin to possible penetration by the cercaria [27]. The snail control has led to a decrease in the prevalence of infection.The provision of domestic water supplies was also suitable in disturbing transmission and inhibiting the breeding of snails in the large swamps and marshes where molluscicide alone was not effective [28].

Hydatidosis, of which 95% is cystic echinococcosis (CE), is widely spread in all Mediterranean basin countries with incidence determined in humans from 0.28 in France to 15 cases per 100,000 inhabitants in Tunisia. In highly endemic countries as in China, central Asia and South America prevalence reach to 50 per 100,000 persons with CE in slaughtered livestock ranging between 20 to 95% [29]. A study has proven that hydatidosis is prevalent in humans in Baghdad governorate and that the risk factors for its transmission exist [30]. In this study, the infection with Echinococcosis was significantly decreased. Age above 5 years revealed the highest rate of infection; this may explained by these age often go outside the house and attend playschool or school [31].The high risk of CE of adult human infection seems to be most important of acquiring CE infection by children in contact with infected dogs by playing or increasing movement on polluted environmental with eggs and other characterized unhygienic places[32].The highest prevalence rate of this parasite belongs to the different parts of the country especially in the provinces of Najaf, Ninewah and Muthana, Khurdestan which have a mild climate and more rainfall and humidity, this will cause increase the survival rate of the eggs and the transmission cycle of the parasite. Therefore, the different climate conditions of the country have an important role in the infection prevalence rate. It must be noted that the stray dogs which are infected with the parasite play an actual role [33]. Factors such as climate, soils, vegetation, systems of agriculture and animal farming influence both the host and the Echinococcus parasite in epidemiologically significant ways [34].

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