

Contamination of Different Drinking Water Sources with Parasites in Basrah Marshes Villages, Iraq

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Abstract

Human and animal are the main sources of water and environmental contamination. This study aims to discover and determine the prevalence of drinking water contamination with parasites. A total of 425 water samples were collected from Basrah marshes villages south of Iraq, during the period of November 2012 to May 2013. Water samples were examined by direct method and by sedimentation and floatation methods. From 425 water samples 155(36.4%) were parasitic and 270 (63.5%) were no contaminated. *Entamoeba histolytica* is the most common parasites that was detected in 34(8%) water samples followed by *Giardia lamblia* 31(7.2%) and then other types of parasites but in lower rates. The examinations included study some of the effective factors on the growth of these parasites such as temperature and pH. Statistically, there are significant differences ($p < 0.01$) among the contamination rates of water samples for all villages of Basrah marshes. Parasites are found in various water sources especially that found in rural villages of marshes land showed a higher prevalence of contamination can be explained by poor sanitation and personal hygiene, also Style life and environmental of marshes land, contamination water supply, lack of filtration and rottenness of water distributing pipes and warm climate in Basrah province.

Key words: Contamination, Drinking water, Parasites, Basrah marshes, Iraq

الخلاصة

يعتبر الإنسان والحيوان المصدران الرئيسيان لتلوث البيئة والماء . تهدف هذه الدراسة الى تحديد واكتشاف النسبة المئوية لتلوث مياه الشرب بالطفيليات. تم جمع 425 عينة ماء من قرى احوار البصرة جنوب العراق ، خلال الفترة من تشرين الثاني 2012 الى ايار 2013 . تم فحص عينات الماء بواسطة الطريقة المباشرة وبواسطة طرق التطويق والترسيب . من مجموع 425 عينة ماء (36.4%) كانت تحتوي على الطفيليات و(63.5%) 270 كانت غير ملوثة. اميبا النسيج *Entamoeba histolytica* هي اكثر الطفيليات عموماً التي تم تحديدها في (8%) 34 عينة ماء متنوعة بـ الجيارديا لامبليا *Giardia lamblia* (7.2%) 31 وتم الانواع الاخرى للطفيليات لكن في نسب اقل . تضمنت الفحوصات دراسة بعض العوامل المؤثرة على نمو هذه الطفيليات مثل درجة الحرارة والاس الهيدروجيني . احصائياً ، يوجد هناك فرق معنوي ($p < 0.01$) بين نسب التلوث لعينات الماء لكل قرى احوار البصرة. الطفيليات توجد في مصادر المياه المتنوعة خصوصاً التي توجد في القرى الريفية للاحوار التي تظهر نسب اعلى للتلوث والتي توضح رداثة الصرف الصحي والصحة الشخصية ، كذلك طريقة الحياة وبيئة الاحوار ، تجهيز الماء الملوث ، فقدان الترشيح وتعفن انابيب توزيع المياه وحرارة المناخ في محافظة البصرة.

الكلمات المفتاحية: التلوث، مياه الشرب، الطفيليات، احوار البصرة، العراق

Introduction

Contamination from sewage discharges and wild or domestic animals is important source for untreated water (Dubey *et al.*, 2005). Waterborne diseases occur world wide and outbreaks caused by the contamination of community water systems have the potential to cause disease in large number of consumers (Barwick *et al.*, 2000). At least 325 water associated outbreaks of parasitic protozoan diseases have been reported world wide (Kramer *et al.*, 2001).

Possible sources of water contamination including both human and animals sources are known to be important in the introduction of protozoa to a water system (WHO, 2004). Some contaminants result in acute effects. There is a direct relation between the prevalence of some parasitic diseases and the prevalence of that etologic agent in water (Yousefi. *et al.*, 2009).

Parasitic diseases are quite common in third world countries. In Iraq, the parasitic infection is widely prevalent with variable distribution in different areas. Helminth

and Protozoa parasites are found in various water sources especially in the water of rural villages of marsh land showed a higher prevalence of contamination, this higher prevalence of water source contamination can be explained by poor sanitation and hygiene, low socio-economic status and in appropriate health and nutritional education, contamination of water with animal and human sewage (Jarallah, 2009). The aim of this study is to monitor and determine the prevalence of water contamination with parasites.

Materials and methods

The study was carried on water samples from Basrah marshes villages. A total of 425 water samples collected from different sources in five villages belong to Basrah Province marshes south Iraq from November 2012 to May 2013. The pH and temperature were examined by using the pH meter and thermometer. The water samples collected in clean and sterilized disposable plastic bottles, the samples were labeled with date of collection and site of collection and transported to the laboratory of Marine Science Center in Basrah University for examination. The water samples were examined by direct method and by sedimentation and floatation methods (Alhadithy & Hubish, 1986) slides were prepared and examined under compound microscope, the prevalence of parasites in water samples was determined. The chi-square (χ^2) test was used as a test of significance. Data were analyzed using SPSS. (Spss, 1999).

Results

From 425 water samples only 155(36.4%) were contaminated with parasitic stages and 270(63.5%) were no contaminated. The means of Temperature and pH of water samples were illustrated in (Table 1 and Figure 1).

Table (1) Total prevalence of parasitic contamination of drinking water in all Basrah marsh villages

Villages	No. ExamS amp	No.+ve Samp	% contamination	Tm. Mean	pH mean
5	425	155	36.4	23	7.5

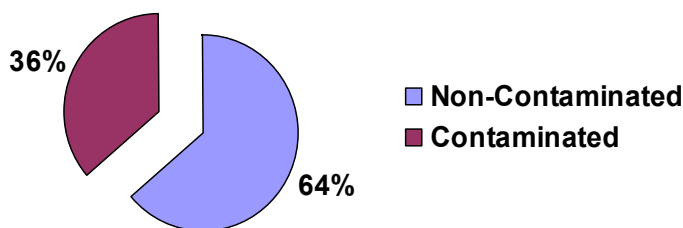


Figure (1): Frequency of water protozoa and helminth parasites in Basrah marsh villages in Iraq

The prevalence of contamination related with the increased water temperature. Significant statistical differences ($p < 0.01$) were observed among the contamination rates of water samples for all villages of Basrah marshes (Table 2 and Figure 2).

Table (2): Prevalence of parasitic contamination with Temperature and pH mean of drinking water in marsh villages of Basrah province

Villages	No of Exam Samp	No. +ve Samp	% contamination	Tm. Mean	pH mean
Abu-Milih	110	51	46.2	27	7.1
Al-Mishab	89	34	38.2	23	7.5
Hareer	56	9	16	19	7.7
Al-Dwoh	95	41	43.1	25	7.3
Al-Khet	75	20	26.6	21	7.9

$\chi^2= 18.46$ $df= 4$ $p<0.01$

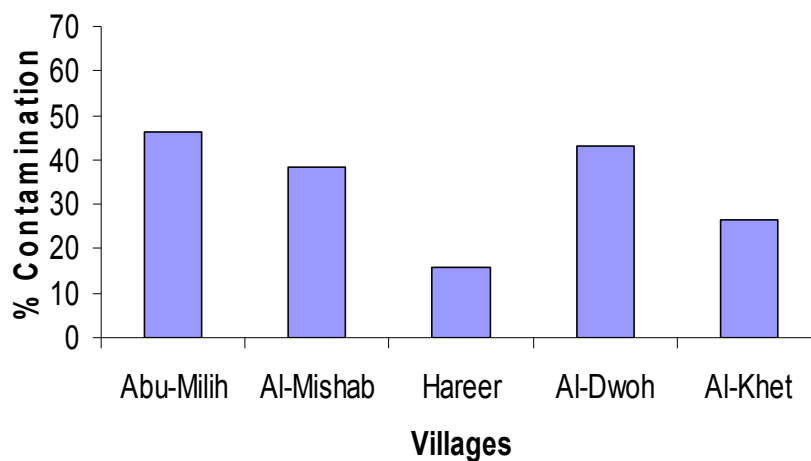


Figure (2): Contamination rate by parasites in drinking water of Basrah marsh villages in Iraq

Entamoeba histolytica is the most common parasites that was detected in 34(8%) water samples followed by *Giardia lamblia* 31 (7.2%) and then other types of pathogenic parasites but in lower rates. Statistically, there are significant differences ($p<0.01$) among the rates of three contamination types (Table 3).

Table (3): Prevalence of contamination in drinking water according to type of parasites in Basrah marsh villages

Parasites	Contamination 1 type n= 425		Contamination 2 type n= 155		Contamination 3 type n= 155	
	No.	%	No.	%	No.	%
Non infected	270	63.5	-	-	-	-
<i>E. histolytica</i>	34	8	3	1.9	-	-
<i>E. coli</i>	26	16.7	5	3.2	3	1.9
<i>G. lamblia</i>	31	7.2	6	3.8	2	1.2
<i>B. coli</i>	3	0.7	-	-	-	-
<i>C. parvum</i>	19	4.4	3	1.9	1	0.6
<i>E.vermicularis</i>	21	4.9	2	1.2	-	-
<i>A. lumbricodes</i>	9	2.1	-	-	1	0.6
<i>H. nana</i>	7	1.6	1	0.6	-	-
<i>E. granulosus</i>	5	1.1	3	1.9	1	0.6

$\chi^2= 136.17$ $df= 2$ $p<0.01$

Discussion

Water supply systems in Iraq sustained major damage brought about by wars, economic sanctions, looting of equipment and failure to carry out regular maintenance and quality control testing and monitoring. Iraq has two major natural water sources, namely the Tigris and Euphrates rivers; Iraqi southern marshes which form a triangle region bound by three major southern cities, Thi-Qar to the west, Maysan to the northeast and Basrah to the south. The three major marshes: Al-Hammar, The Central marshes and Al-Huwaiza marshes form the core of the marshlands of southern Iraq (Bedair *et al.*, 2005).

Out of 425 water samples, 155 were contaminated with different type of parasites. From 155 contaminated samples, 26(16.7%) were contaminated with non pathogenic protozoa parasites and others were 129(83.2%) were contaminated with infective stages of protozoa and helminth of pathogenic parasites. The high rate of water contamination observed in Abu-Milih village 46.2% followed by Al-Dwoh 43.1%, Al-Mashab 38.2%, Al-Khet 26.6% and Hareer 16% villages. This is due to lake of healthy drinking water, low socio-economic status and contamination water supply (Theresa, 2000; Al-Fahdawi, 2002; Yousefi, *et al* 2009). Also, the people of marshes famous with breeding domestic animals such as buffalo, cows, sheep and goats and chicken in or near their houses that increase the chance of contact between drinking water and animal feces (Jarallah, 2009; WHO, 2008). In the present study, nine different types of parasitic were determined from the water samples. *Entamoeba histolytica* is the most common parasites that was detected in water samples 34(8%), followed by *Giardia lamblia* 31(7.2%) and then other types of pathogenic parasites but in lower rates. *E. histolytica* and *G. lamblia* were common among parasitic protozoa; same results were indicated by Al-Fahdawi (2002) and Shaikh *et al.* (2009). Considering the warm climate in this areas cause correlation with both water temperature and increasing activity of parasites. Many studies demonstrated that water is a major source of ambiasis and giardiasis (Theresa, 2000; Al-Fahdawi, 2002;

Shaikh, 2009; Yousefi, *et al* 2009). The important factor in this study is the temperature; the temperature degree of water for all villages was not equal but nearly. In the present study the mean pH was 7.5, similar results pH = 7.5 were reported from Ramady province in Iraq (Al-Fahdawi, 2002). The active of parasites was increased with increased of water temperature; it was found there is increasing with *E. histolytica* and *G. lamblia* when increasing of temperature and decreased of their activation in cold months (Al-Fahdawi, 2002). In Iraq, many studies have provided more information about parasitic infection in different part of the country (Mahdi & Jassim, 1987; Al-Abiady& Al-Dabbayh, 1993; Mahmud, 1994; Al-Dulaim, 1996; Awad& Al-Azizz, 2005 ; Hadi & Faraj, 2008 ; Jarallah, 2012).

In this study, the main protozoa parasites are *Entamoeba histolytica*, *Entamoeba coli*, *Giardia lamblia*, *Cryptosporidium parvum* these protozoa parasites are regarded as water borne pathogenic in development countries (Athari, 1996 ; Yousefi, *et al*. 2009). In the current study, the drinking water contamination of *C. parvum* was 19(4.4%), in contrast with recent study in Pakistan *C. parvum* was 88(19.5%) in tap water, pond and drain water (Ayaz *et al*. 2011). There are many factors effect on parasitic infection, environmental of marshes, animal domestic wastewater, poor life, lake hygiene and water supplying play an important roles in increased the parasitic infection (Mahdi & Jassim, 1987 ; Jarallah, 2012). In the present study *Balantidium coli* is the less than other parasites which recorded, *B. coli* was diagnosed in 3 water samples (0.7%) , this findings is in agreement with study done in Ramady city in Iraq (Al-Fahdawi, 2002). While, recent study in Khyber Pakhtunkhwa province in Pakistan the contamination rate of *B. coli* in drinking water was (5.7%) (Ayaz *et al*. 2011).

The prevalence contamination of water samples was 155(36.4%). The present study demonstrated there were 113(72.9%) protozoa parasites and 42(27%) helminths among positive water samples. The prevalence of Enterobiasis and Ascariasis in this study was 4.9% and 2.1% respectively, these are within the range of prevalence rate for Enterobiasis 4% (Al-Fahdawi, 2002), while no contaminated with Ascariasis was reported (Al-Fahdawi, 2002). The present findings of *Hymenolepis nana* was similar to the finding of previous study reported by Al-Fahdawi (2002) & Jarallah(2012). The contaminated water samples with *Echinococcus granulosus* in this study was observed, but there are no contaminated rate were reported with this worm by Al-Fahdawi (2002). In this study the percentage of infection with of *Echinococcus granulosus* was 1.1% . That is may be due to the different regions of water samples collection between two studies. The water contamination with *E. granulosus may be* due to that the people in the rural villages especially in marshlands have dog in their houses, because they use the dogs as a guard for them, and the presence of dog is an important risk factor for the transmission of the hydatidosis (Robertd & Janovy, 1996). The water contamination is relating with the socioeconomic levels of the population, sanitation, personaland community hygiene, climatic factors (Barwick *et al*. 2000; WHO, 2004, Yousefi, *et al* 2009).

Individuals in rural areas who use surface water supplies have very few protections from contamination soils an become saturated and ground water may be in undated with on site sewage contamination and other sources of animal wastes may have contaminated water supplies.(WHO,1985). Water sources are generally polluted, biologically and chemically, due to lack of appropriate systems for safe disposal of sewage, wastewater, industrial, agricultural and medical waste and lack of control over high risk practices that contribute to environmental degradation and contamination of natural water resources. Baghdad and Anbar are the most affected areas for water supplies. In conclusion Parasites are found in various water sources

especially that found in rural villages of marshlands showed a higher contamination rate can be explained by poor sanitation and personal hygiene, also Style life and environmental of marshes land, contamination water supply, lack of filtration, rottenness of water distributing pipes and warm climate in Basrah province It is suggested that, control of water contamination required: reduce the infection in human, keeping the drinking water faraway of animals, destroyed the reproduction place of flies, insect vectors and reservoir hosts, healthy education and healthy water supplying.

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