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### Detection of parasitic contamination in Hilla city drinking water / Babylon province/ Iraq

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#### ABSTRACT

The aim of present study is to investigate the parasitic contamination in drinking water. Water samples (104) were collected from four regions (Al- Thawraa, Nader, Al-Bakerly and Al- Jazaer) of Hilla city, Babylon province, Iraq during January to June 2014. All samples were examined by filtration through cellulose nitrate filter paper of 0.45 micrometer pore size with pump. The total percentage of parasitic contamination in Hilla drinking water is 22.1% (23/ 104). These water samples were contaminated with 10 parasites phases (cyst and egg). They are: *Isospora belli* (1.9%), *Cyclospora cayetanensis* (1.9%), *Entamoeba histolytica* ( 14.4% ), *E. coli* (1.9%), *Giardia lamblia* (1.9%), *Hymenolepis diminuta* (0.96%), *Taenia* sp. (0.9%), *Ascaris lumbricoides* (1.9%), *Enterobius vermicularis* (0.96%) and Hook worms ( 4.8% ). The higher percentage of drinking water contamination with parasites is found in March (73%) but the lower percentage is found in January (5%). Hilla city regions are different in percentage of drinking water contamination with parasites (8.6%, 5.7%, 3.8%, and 3.8% in Al- Thawraa, Al- Jazaer, Al- Bakerly and Nader, respectively). The drinking water contamination with one species of parasites showed high percentage (16.3%), while the lowest percentage of contamination with two species or three species and more (2.8% and 2.8%, respectively). The present study had a considerable healthy importance because it is first study of drinking water contamination with parasites in Hilla city and it is explained the poor water supply in this town and the possibility mixed sewage water with drinking water especially in drain season.

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### INTRODUCTION

Water is essential element for life. It is used in many purposes such as drinking, bathing, showering, agriculture, and industrial activities....ect. Water has been considered as environment for many pathogenic organisms (bacteria, virus, and parasites) to grow and develop. Drinking water is defined as water intended primary for human consumption but which has other domestic uses, it should be clear, colorless, and well aerated, with no unpalatable taste or odor, and it should contain no suspended matter, harmful *lamblia* chemical substances or pathogenic micro- organisms (National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand, 1996).

Water borne diseases (involved parasites diseases) are founded in both developed and undeveloped countries and it is caused by pathogens transmitted by the fecal–oral route and by drinking water and or transmitted by other roads such as fecal droplet inhalation and exposure through contact (Cotruvo *et al.*, 2004). Drinking water (treated or untreated) is contaminated with parasites by sewage discharges and by wild or domestic animals (Dubey, 2005).

In many countries such as USA and other developing countries, the most dangerous parasites are *E. histolytica*, *G. lamblia* and *C. parvum* because they cause diarrhea in children and adults and the outbreak of these parasites occurred when the sewage water contaminated the drinking water (Barwick *et al.*, 2000; Thompson & Nonis, 2004; Schuster & Visvesvara, 2004; WHO, 2006; Caccio *et al.*, 2005).

There are few researches about drinking water contamination with parasites in World specially in Iraq country such as Soussan *et al.*, 1999 in Damascus, Syria; Al-Fahdawi (2002) in Ramadi city, Al- Anbar province, Iraq; Bakir *et al.* (2003) in Ankara, Turkey; Hadi and Faraj (2008) in Baghdad, Iraq; Yousefi *et al.* (2009) in Mazandaran province, north Iran; Ayaz *et al.* (2011 ) and Alam *et al* ( 2014 ) in Khyber Pakhtunkhwa province, Pakistan and Jarallah (Unpubl.) in Basrah marshes, Iraq.

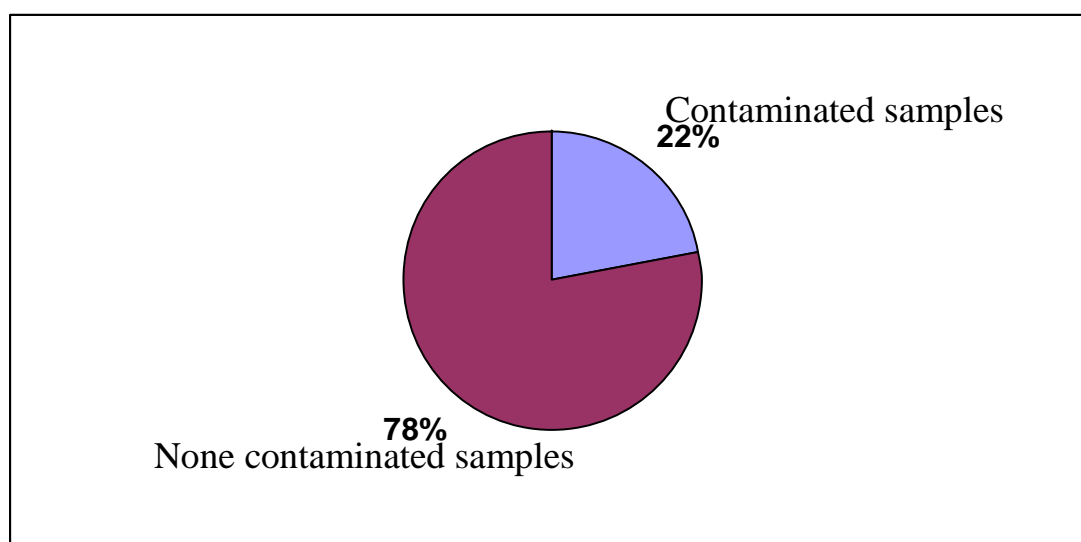
In fact, the sewage system of Hilla city is not typical and the toilet discharge under human houses in addition to the drinking water system in this city suffered from different problems such as oldness and broken, therefore the drinking water and sewage water are mixed in sum times specially in drain season, the present study aimed to investigation the parasitic contamination in Hilla drinking water.

### MATERIALS AND METHODS

Water samples (104) were collected from four regions in Hilla city (Al- Thawraa, Nader, Al- Bakerly and Al- Jazaer) during January to June 2014 by used sterilized containers. One liter from each samples were filtrated through cellulose nitrate filter paper (Sartorius stedima, Germany) has 0.45 micrometer pore size with pump in advance zoology laboratory in department of Biology, collage of Sciences, university of Babylon. Suspended Matter in filter papers was examined microscopically by Olympus compound microscope after dissolved in a 0.9% sterilized normal saline. Fresh preparations were examined visually at magnifications of 100X and 400X over approximately 100 fields for parasite cysts, trophozoites and helminthes eggs. A portion of each sample was stained with Lugol iodine on a separate slide. And then cold acid-fast staining technique was used too for the identification of *I. belli* and *C. cayetanensis* (Bakir *et al.*, 2003).

### Results:

The total percentage of Hilla drinking water contamination with parasites is 22.1% (Figure 1 & Table 1).



**Fig. 1:** Total percentage of drinking water contaminated with parasites in Hilla city.

**Table 1:** Total percentage of drinking water contaminated with parasites in Hilla city.

Percentage ( % )	No. of contaminated samples	Total sample
22.1%	23	104

In the present study, the drinking water of Hilla city is contaminated with ten parasites: five types of protozoa and same types of helminthes (Table 2). The *E. histolytica* was highest percentage (14.4%) but the Hook worms ware 4.8%. The percentage of drinking water contamination with *I. belli*, *C. cayetanensis*, *E. coli*, *G. lamblia* and *A. lumbricoides* was 1.9% while the percentage of drinking water contamination with *H. diminuta* and *E. vermicularis* was 0.96%.

**Table 2:** Types of parasites which contaminated of drinking water in Hilla city.

Percentage ( % )	No. of contaminated samples	Types of parasites	
1.9%	2	<i>I. belli</i>	1
1.9%	2	<i>C. cayetanensis</i>	2
14.4%	15	<i>E. histolytica</i>	3
1.9%	2	<i>E. coli</i>	4
1.9%	2	<i>G. lamblia</i>	5
0.96%	1	<i>H. diminuta</i>	6
0.96%	1	<i>Taenia sp.</i>	7
1.9%	2	<i>A. lumbricoides</i>	8
0.96%	1	<i>E. vermicularis</i>	9

4.8%	5	Hook worms	10
2201%	23	Total	

The monthly differences in percentages of drinking water contaminated with parasites explained in (Table 3), the highest percentage found in March (73%) and lowest percentage was found in January (5%).

**Table 3:** monthly distribution of parasitic contamination in drinking water of Hilla city.

Percentage ( % )	No. of contaminated samples	No. of examined samples	Months ( 2014 )	
5%	1	20	January	1
25%	4	16	February	2
73.8%	7	16	March	3
15%	3	20	April	4
37.5%	6	16	May	5
12.5%	2	16	June	6
22.1%	23	104	Total	7

The percentages of drinking water contaminations with parasites were different according to the region of Hilla city (Table 4). The lower percentage is found in Nader and Al- Bakerly (3.8%) but in Al- Jazaer is equal to 5.7%. The higher percentage is found in Al- Thawraa (8.6%).

**Table 4:** Distribution of drinking water parasites in Hilla city regions.

Percentage ( % )	Positive No.	Regions	
8.6%	9	Al- Thawraa	1
3.8%	4	Nader	2
3.8%	4	Al- Bakerly	3
5.7%	6	Al- Jazaer	4
22.1%	23	Total	5

The results of current study are showed the mixed contamination with parasites in drinking water of Hilla city. The contaminated with one type of parasite had higher percentage but drinking water contaminated with two types of parasites or more hand lower (Table 5).

**Table 5:** Mixed parasite contamination of drinking water in Hilla city.

Total	Contaminated with three type of parasites or more	Contaminated with two type of parasites	Contaminated with one type of parasite	
23	3	3	17	Positive samples
22.1%	2.8%	2.8%	16.3%	Percentage ( % )

### Discussion:

The drinking water supply systems are usually correlated with economic status in any country. In Iraq, this system was suffered from different problems since the 1980 because of gulf wars, embargo and the instability after 2003. In addition, the sewage system is not available in most of the Iraqi towns. However, the present sewage systems in most cities are not efficient or satisfice with the international requirements. These problems are leaded to the contamination of drinking water by different pathogenic agents such as parasites due to the mixing of sewage water with drinking water.

The figure (1) and table (1) showed the total percentage of parasitic contamination in Hilla drinking water (22.1%). This percentage referred to the contamination of drinking water in Hilla city by different groups of parasites (protozoa and helminthes) as indication of hygiene problems in water supply system (Hadi & Faraj 2008). This percentage is higher than that found in other researches such as Bakir *et al.* (2003) in Ankara, Turkey (5.8%) Hadi & Faraj (2008) in Baghdad in Iraq (17.2%) Yosefi *et al.* (2009) in Mazandaran province, north Iran (19%); Ayaz *et al.* (2011) in Pakhtunkhwa province in Pakistan (3.5%) and Alam *et al.* ( 2014 ) in Khyber Pakhtunkhwa province, Pakistan (17.64%) while this percentage is lower than from other research such as Jarallah (Unpubl.) in Basrah marshes, Iraq (36.4%). This differences refer to economic status (Theresa, 2000; Al- Fahdawi, 2002; Yosefi *et al.*, 2009) or refer to sum researchers were sued other type of water in addition to drinking water (Ayaz *et al.*, 2011 in Pakhtunkhwa province in Pakistan ).

In current study, the drinking water of Hilla city was contaminated with ten different types of parasites in different percentages (Table 2). *E. histolytica* has higher percentage (14.4%) followed by hook worms (4.8%) and other parasites have lower percentage. All parasites in this study are favorites and distributed in worm climate (Bogitsh *et al.*, 2013). Some parasites cause diarrhea and are consider very important health problem in different area in world such as *E. histolytica*, *G. lamblia* and *C. parvum* (Barwick *et al.*, 2000; Thompson & Nonis, 2004; Schuster & Visvesvara, 2004; WHO, 2006; Caccio *et al.*, 2005). Researches in Iraq and other country recorded many parasites occurred in present study in different percentage (Al-Fahdawi, 2002; Bakir *et al.* (2003); Hadi & Faraj, 2008; Yosefi *et al.*, 2009; Ayaz *et al.*, 2011; Jarallah, Unpubl). These differences in

percentages are depends on socio-economic status, community hygiene status and the case of drinking water system and sewage system; in further to that current study had been recorded parasites species more than previous studies.

Many parasites prefer worm climates to complete their life cycle but the cold conditions reduce prevalence of this parasites in addition, some conditions facilitated the boosting of parasites prevalence such as rain season when the sewage water mixed with the drinking water ( Griffiths, 1998). Table (3) showed the higher percentage occurred in May (73.8%). In this month precipitation create amount of rain in Iraq in 2014 and the temperature in this month is appropriate to growth and distribution of parasites on the contrary thereof, in the cold conditions (in January, the percentage of water contamination is lower, 5%) the incidence of many parasites reduced. This result is compliant with result of other research (Hadi & Faraj, 2008).

Many residential quarters in Hilla city have not sewage system and human toilet discharge under your houses in addition to these residential quarters are differed in socio-economic status. Al- Thawraa is public region and is very crowded and the understructure of this region is very neglected and destructive specially the sewage system and drinking water supply system. In table (4) showed Al- Thawraa has higher percentage of drinking water contamination (8.6%) followed by Al-Jazaer (5.7%) finally Al-Bakerly and Nader have (3.8%). The differs between percentage of water contamination with parasites and regions are depends on socio-economic status of the society, in addition to various other factors such as environmental, geographical distribution, hygienic conditions, less awareness and also less education of the people in that area (Hadi & Faraj, 2008; Alam *et al.*, 2014).

The current study showed the contamination of drinking water with single species parasites has higher percentage (16.3%) but contamination with two types or more has lower percentage (2.8%). These results are compliant with other results (Bakir *et al.*, 2003; Yousefi *et al.*, 2009; Jarallah, Unpubl.).

We concluded from present study that the drinking water supply system in Hilla city languish from different problems, these problems lead to contamination of drinking water with parasites.

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