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OCCURRENCE OF PROTOZOAL PARASITES IN *RATTUS RATTUS* RODENT IN BAGHDAD AND OUTSKIRTS, IRAQ

Hanan Jawad Nayyef
Trop. Biol. Res. Unit, College of Science, University of Baghdad, Iraq
*Corresponding author email: hanan_j_n@yahoo.com

ABSTRACT
The aim of present work is estimating common parasitic infections in Rodents distributed in Baghdad and outskirts. Protozoan parasites prevalence in the rat (*Rattus rattus)* may consider as a health problem. Eighty five rats were trapped and screened for protozoan parasites. Direct smear method and different parameters were used in this work. Results showed that all trapped rats were infected with parasite in a different percentage with combination among parasites types. Percent of male infected rats with parasites were (27.06%) more than female (23.53%). Fourkinds of protozoa were discovered in this work includes *Cryptosporidium parvum* (79.06%), *Entaomeba histolytica* (7.69%), *Isospora* (31.25%) *and Hymenolepis nana* (23.07). Multiple parasitic infection noticed per host and high prevalence in the male rats.

KEYWORDS: Rodents, parasites, Iraq.

INTRODUCTION

Protozoan parasites are representing a common health problem in the world (Andrews *et al*., 2014). Rats are the most important mammals on the world; they adapted to different habitats and challenge the environmental changes. In addition, they are considering as reservoirs of different zoonotic diseases including toxoplasmosis, babesiosis, and leishmaniasis (Harkness *et al*., 2013). In addition, transmission of zoonosis diseases to humans can event by contact with rodent's feces, urine, saliva, and hair (Singleton, Grant *et al*., 2015). Changing of rodents' ecosystem by human may be one of many causes to zoonotic diseases epidemic (Terraube Julien *et al*., 2015). *R. rattus* is a nocturnal species preferring dry habitats, live in sandy or hamada deserts and absent from mountains and rocky microhabitats. It inhabits burrows, and can be gregarious or solitary. *R. rattus* feeds on plants of various species and dung from camels and donkeys. Season of breeding of the rat occurs from November to June, gestation lasts more than 31 days, and 1-5 individuals are born (Harper, Grant A., et al 2015). *Hymenolepis nana* is one of famous parasites. It is a dwarf tapeworm and most common human infection. There are about 50 to 75 million people's carrier of disease worldwide. It is endemic from Asia to Africa to and Europe. Parasite life cycle include two types of host.The intermediate host of parasite includes arthropods and the definitive host includes humans or rodents (Cabada *et al*., 2016). Life cycle with *H. nana* is beginning when humans and rodents infected with cysticercoid arthropods or embryonated eggs from contaminated water, food or hands. After the ingestion eggs hatched releasing a six-hooked larva called oncosphere (hexacanth). Hexacanth can penetrate the villi then develops into a cysticercoid larva (Thompson, RC Andrew, 2015). *H. nana* infection is most often asymptomatic; however, symptoms can attend heavy worm burden (Kim Bong *et al*., 2014). Helminthes and protozoan are considering the most infections in the world too. Rrats' protozoan infections are high in some of developing countries (Barda, Beatrice *et al*., 2014). World Health Organization reports refer to present about 450 million individuals infected with intestinal parasites. According to the WHO Foodborne disease burden Epidemiology Reference Group (FERG) in the year 2015, there are identification of a new 4 species of food borne trematodes as important causes of annual total of 200 000 illnesses and more than 7 000 deaths (Torgerson *et al*., 2014). These infections may cause different diseases as anemia, malnutrition, and mental impairments (Getahun, Zewditu *et al*., 2017). The studies deal with epidemiology of rodents and their parasitological importance in Baghdad are little. The aimed of recent work is to evaluate the parasitic protozoan infections of the rat *R. rattus* in Baghdad, Iraq.

METHOD &MATERIALS

Sample collection

This study was carried out in 2016 (June to December), in Baghdad province and outskirts (rural areas) in Iraq. A total of 85 rodents were collected by using Sherman Live Trap-Nights (7.5 x 9 x 22 cm). The trapped rodents brought to Tropical -Biological –Research- Unit -laboratories. For each rodent, the data of location, body length, weight, and sex were recorded. The screening of parasites was used the standard parasitological procedure according to *Kataranovski et al.* (2008). The identification of helminths was depended on the Key for Helminths of Rodents (Gassó, Diana *et al*., 2014), and taxonomic keys to cestode and

nematode parasites in (Paul *et al*., 2015). Different parameters including, mean intensity of infection, index of infection, mean abundance of infection, and prevalence were calculated according to Kisielewska, 1970)

$$\%P = (total\ of\ positive \times 100) \div total\ of\ rats$$
$$MI = total\ of\ parasite \div total\ of\ positive$$
$$MA = total\ of\ parsites \div total\ of\ rats$$
$$I = (total\ of\ positive + prevalence) \div total\ of\ rats$$

The Statistical Analysis

Statistical Analysis was done by using the statistical software package SPSS v.23 (SPSS Inc. Chicago. LL, USA). Relationships between variables were examined by chi-square test; risk factor for protozoan infection in the subjects was determined by using logistic regression analysis. Significance level was set at 5%.

RESULTS

Total trapped rats in this work were 85 rats. Male trapped rodents were 45 rats with percent 52.94 while female trapped rats were 40 rats with percent 47.06. Infected rodents with parasites were 43 rats with percent 50.59 while non-infected rodents were 42 rates with percent 49.41. The results of study showed no significantly differences between female and male trapped rats and significantly difference between infected and infected rats (Table1). Results of current study showed that the parasite *C. varpum* is the highest prevalence in rats under test; C. *varpum* parasite prevalence was 79.06 %. The *parasite E. histolytica* was the lowest prevalence in rats in this work. *E. histolytica* prevalence in rats was 7.69% (Table 2).

TABLE 1: Number and percent of sex and parasite infection trapped rodent *R. rattus*.

Parameters	Male (%)	Female (%)	Total (%)
No. of Rodents	45 (52.94)	40 (47.06)	85 (100)
Infected	23 (27.06) *	20 (23.53) *	43 (50.59)
Non-infected	22 (25.88)	20 (23.53)	42 (49.41)

* Significantly differences at p<0.01

TABLE 2: Quantitative indices of parasites species infection of the *R. rattus* rodent

Parasite species	Parasite Type	N (No. of infected rodent)	T (No. of total rodent)	% P (prevalence)
C. varpum	Protozoa	34	43	79.06*
H. nana	Helminthes	3	13	23.07
E. histolytica	Protozoa	1	13	7.69
Isospora	Protozoa	5	16	31.25

*p<0.01

Results data of Rats infected number, parasites number, prevalence, infection index, mean infection intensity and mean abundance of parasites in *R. rattus* are tabulated in Table 3. The most prevalent parasites were *C. varpum* (40%), *Isospora* (5.88%), *H. nana* (3.52%) and *E. histolytica* (1.17%). There were no significant differences in the prevalence for individual protozoan species. The results of this study showed multiple infections with four parasitic infection species per each male rat host and female. Parasitism including one species was found in 52.17% of the male infected rats and 50% of the infected female rate. Multiple infections involving two species of parasites were found in 26.08% of the male infected rat and 40% of the female infected rats. Parasitic infection with three species was found in 13.05% of the male infected rats and 10% of the female infected rats. Four species parasitic infection were found in 8% of the male infected rats and not found in female rats (Table 4).

TABLE 3. Quantitative indices of parasites infection of *R. rattus*

Parasite species	N1 Rats infected number	N2 Parasites number	%p prevalence	I infection index	MI mean intensity	MA mean abundance
C. varpum	34	60	40	0.87	1.76	0.70
H. nana	3	4	3.52	0.07	1.33	0.04
E. histolytica	1	2	1.17	0.02	2	0.02
Isospora	5	7	5.88	0.12	1.4	0.08
Total	43	73	50.58	1.10	1.62	0.85

Significantly different at * p<0.01

TABLE 4: Intestinal helminthes infection prevalence in rats of different sex

No. of Rats	Infected (%)	Non-infected (%)	No. of parasite species/ host			
			1	**2**	**3**	**4**

Total No.	43	42	22	14	5	2
(%)	(50.59)	(49.41)	(51.16)	(32.56)	(11.62)	(4.66)
Male No.	23	22	12	6	3	2
(%)	(27.06)	(25.89)	(52.17)	(26.08)	(13.05)	(8.69)
Female No.	20	20	10	8	2	0
(%)	(23.53)	(23.533)	(50)	(40)	(10)	(0)

*Significantly different at $p<0.01$

DISCUSSION

This study showed that *R. rattus* from this area is host to four protozoan parasitic species. The moderate H. *nana* prevalence is in accordance with results of Stojčević *et al*. (2004) in Croatia. High in prevalence of *H. nana* in the rat was recorded in Argentina and Buenos Aires (Gomez Villafañe *et al*., 2008). A moderate to the high prevalence of *H. nana* is in accordance with result obtained in different areaof the world; in Qatar (Abu-Madi *et al*., 2001, 2005), Argentina (Gomez Villafañe *et al*., 2008) and Southeastern Asia- Kuala Lumpur, Malesia (Paramasvaran *et al*., 2009).

Most of parasite species showed a higher prevalence in the male rats than in females. This result was agreed with another study which explained that according to territories in infected males and to the home range of males tends to overlap which could increase their exposure to infection while reproductive females appear a stronger site-specific organization (Calhoun, 1962). In addition, the testosterone male hormone has a negative influence on function of immunity (Folstad *et al*., 1992). Another opinion considers the larger bodies of males are easier targeted by parasites (Arneberg, 2002). This study documented the high prevalence rate of protozoan infection in rats. Findings of the study appeared that more than 30% of the inhabitants of rural places of Baghdad, Iraq are infected with at least one of intestinal parasites, although some of them were non-pathogenic. This finding is consistent with other studies performed in different geographical areas of Iraq (Rassam *et al*., 1979). In Iraq, results of previous studies indicated that Giardia and Blastocystis are the most known intestinal protozoan parasite among population (Al Saeed, A. T., and S. H. Issa, 2006).

Results of the recent study indicate that intestinal parasitic infections are still a significant problem public health in Iraq, same as other developing countries. In a study in Saudi Arabia (Riyadh), the prevalence rate of intestinal parasitic infection was 32.2% in all of population and 34.4% among children under 12 years old (Bashir, Mubarak Ahmed Abouzeid, 2015). The prevalence rates of parasitic diseases in some of other developing countries were higher than reported in the current study (Beard *et al*., 2003). Contaminated water supply, vegetables and soil, might be the most important sources of infection for the villagers. In Nepal as well as Yaman, the hand washing practice had a strong association with the prevalence of protozoan parasites (Sarkari Bahador *et al*., 2016). In addition, another study

was documented the high prevalence rate of intestinal parasites in inhabitants of rural region in southwestern Iran (Arani, Abolfath Shojaei *et al*., 2008).

Higher rate of pathogenic protozoan in remote area is related to health facilities and sanitary conditions that are usually low.

CONCLUSION

Findings of the recent work showed high prevalence of parasitic infection in rats distributed in Baghdad and outskirts.

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