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ORIGINAL ARTICLE

The Spread of Parasitic Infections (some Protozoa and Helminths) in Al-Najaf al-Ashraf Governorate/Iraq

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ABSTRACT

Background: *The information infections with protozoa and helminths in both genders and across all age groups, ranging from one year to forty-five years. Objectives: This study aimed to determine the prevalence of parasite infection in Al-Najaf al-Ashraf Governorate, Iraq.* ***Methodology:*** *The study was conducted from January to June of 2024. A total of 498 stool, urine, and blood samples obtained from cases, ranging in age from one year to over 45 years and were scored among patients visiting the German Hospital's Parasitology and Helminthology Unit's laboratories.* ***Results:*** *of the samples 398 (80%) were positive and 100 samples (20%) were negative. According to our study, the prevalence of infection with harmful parasites (Amoebiasis, Giardiasis, Trichomoniasis, Toxoplasmosis, Schistosomiasis, and Hymenolepiasis) was 242 (60.8%), 84 (21.1%), 46 (11.6%), 14 (3.5%), 6 (1.5%), and 6 (1.5%), in accordingly. Infection rates for males and females were 38.2% and 61.8%, respectively, with a larger percentage of infections in the female gender. Of the people in the (1–14 year) age range, 94 (23.6%) had amoebiasis which was the highest infection rate. In all cases, there were considerable disparities between the reported single infection and doubled infections. The biggest ratio of infection was 390 (78.3%) in cases with Amoebiasis & Trichomoniasis and 2 (0.4%) in cases with Giardiasis and Hymenolepiasis.* ***Conclusion:*** *Infections with parasites can affect people of any gender, however females seem to be more vulnerable than men. Children between the ages of 1 and 14 were shown to be more susceptible to E. histolytica infection.*

INTRODUCTION

Globally dispersed parasitic illnesses, such as helminths or protozoa, significantly affect under developed countries. Certain parasites can harm both people and animals, which put both species at serious risk[1]. The spread of these illnesses is facilitated by several factors, including poor personal hygiene, inadequate environmental sanitation, and different socioeconomically associated behaviors. Particularly in areas with lax food hygiene regulations, food handlers' health and hygiene habits are crucial in evaluating whether or not food and drinks are contaminated. Food handlers may function as carriers and disseminators of diseases, contaminating food and potentially endangering the health of consumers[2]. As well as providing dangerous drinking water sources, poor medical treatment, farming practices, and animal breeding [3]. Humans of all ages can get pathogenic intestinal parasites; however certain age groups and surroundings are more vulnerable than others. Worldwide studies conducted in various regions have indicated that the prevalence of IPIs is influenced by individual circumstances, with children being particularly vulnerable. Researcher undertaken globally and in different areas have demonstrated that the incidence of IPIs is contingent upon personal circumstances, with children being at a heightened risk.[4]

Intestinal protozoan infections are caused by intestinal parasites, specifically Giardia lamblia and Entamoeba histolytica. Giardiasis and amoebiasis are the names of the parasites that cause diarrhea, respectively. Amoebic dysentery is a deadly illness that claims 100,000 lives per year. In the globe, it ranks third in terms of parasite-related deaths, after schistosomiasis and malaria. It can cause severe diarrhea, abscesses in the colon, liver, lung, and other organs. Malabsorption syndrome and weight loss are symptoms of the illness giardiasis, which can afflict both adults and children. Fecal-oral contact, tainted food, tainted drinking water, and E. histolytica and G. lamblia can all spread from person to person. With a frequency greater than the combined cases of Chlamydia trachomatis and Neisseria gonorrhoeae, trichomoniasis is most likely the most prevalent non-viral STI. An estimated 3.7 million Americans and 276.4 million individuals globally are affected by this genital tract illness, which is brought on by the flagellated protozoan parasite Trichomonas vaginalis[5]. Transmission typically happens through sexual intercourse, with very few exceptions [6].

The infection with the obligatory intracellular protozoan parasite Toxoplasma gondii is the cause of toxoplasmosis. One-third of all people on the planet are afflicted with this chronic sickness [7]. Consuming raw meat that has tissue cysts can infect humans. If not, the illness develops via close contact with cats or from consuming food or water tainted by oocysts released by sick cats' feces. Research on the prevalence of T. gondii infection in expectant mothers worldwide has revealed notable differences throughout nations, ranging from 9% to 67% in European nations to 92.5% in Ghana. Moreover, T. gondii infection has also been shown to be quite prevalent in a few American nations while being uncommon in East Asian nations, including Korea and Japan [8]. Worldwide, infections with T. gondii have been found in approximately 6 billion people. IgG antibodies are used to assess the titer-prevalence of T. gondii. In the United States, one million new cases of toxoplasmosis are recorded annually, and 14% of individuals are seropositive by the time they are 40 years old. With 20,000 cases and 750 fatalities, retinal infection is therefore the second most common cause of food-borne illness-related mortality. There have been reports of somewhat high toxoplasmosis infection rates (40- 45%) in several Iraqi area[8].

The blood flukes of trematode schistosomes cause schistosomiasis (Bilharziasis). Schistosoma, haematobium, S. mansoni, and S. japonicum are the three species that threaten human health[9].

Schistosomes, a kind of trematode blood fluke, are the cause of bilharziasis, which is sometimes referred to as schistosomiasis. Three species are responsible for significant illnesses in humans: Schistosoma, haematobium, S. mansoni, and S. japonicum [9]. The primary cause of illness and death worldwide is parasitic illnesses, which mostly impact individuals in the world's worst regions [10].

Hymenolepis nana is a worldwide infection that affects millions of people. Infection symptoms include nausea, vomiting, itching around the anus, upset stomach, and diarrhea. Hymenolepis nana is the only human tapeworm in which the use of an intermediary host is voluntary. Intestinal Cestoda helminths are the source of the parasitic disease hymenolepiasis. It is common in warm, temperate climates and is still a problem for public health, especially for children living in rural regions [11]. The two main factors that determine how damaging the parasites are are their kind and infection density. Hand cleaning is recommended after using a water cycle since intestinal parasites are quite complex, especially in youngsters. Diseases caused by parasites can spread spontaneously between people or via tool sharing. In order to keep parasitic infections at bay, it is important to provide clean drinking water, teach students about personal hygiene, encourage early childhood education in the home and at school, and improve environmental cleanliness by encouraging children to wash their hands [12].

This research aims to determine the parasite prevalence in patients in the Governorate of Najaf, as well as their kind, age, and sex, to stop the spread of parasitic illness in this region.

METHODOLOGY

Data collection

The data for the current study were collected from the Parasitology and Helminthology Unit of the laboratories of the German Hospital in Al-Najaf Al-Ashraf from January until June for the year 2024.

The information was organized based on infections with protozoa and helminths in both genders and across all age groups, ranging from one year to forty-five years. During the course of the trial, 498 patients in total were seen. In order to characterize parasite infection, the data was sorted into two categories: single infections and double infections, with Positive 398 and Negative 100 representing the examined parasite infections.

Statistical analysis

Analyzed Data with the use of Chi-X^2 with P value ≤0.0001 to explain differences in statistical significance for parasitic infections according to age groups and sexes (male and female) and Chi-X^2 P value >0.05 to explain differences in statistical significance samples positive and negative, also for infections single and double.

RESULTS

The present study reported four protozoan infections and two helminthics in Al-Najaf Al-Ashraf provinces /Iraq. Table (1) shows the overall number of patients examined during the period of study was 498 patients, with 398 positives samples at a rate of 80%, whereas negative samples were 100 at a rate of 20% (Figure 1)

Table 1: The number ofpositive and negative samples

Samples	No.	percentages %
Positive of parasite	398	80%
Negative of parasites	100	20%
Total	498	100%

Table (2) showed that the high parasitic infection distribution was amoebiasis it was a total of 242(60.8%) infections, followed by giardiasis 84(21.1%), then Trichomoniasis 46(11.6%). Whereas the infections by toxoplasma was 14(3.5%) while infection with helminths was 6(1.5%) for Schistosomiasis and 6(1.5%) Hymenolepiasis.The relationship between parasites infections and the age groups it showed the high was infection age at the15-44 year 161(40.5%) infections followed by 1-14 year 128(32.2%) infections and the

last at the age 45≥ 109(27.3%) infections (Figure 2). This is an indicator of statistically significant differences using chi-square, P value ≤0.0001. Also, Amoebisis has the highest distribution according to age groups. It was reported in 94cases (23.6%) in ages 1-14 years, followed by the age 15-44 years 81cases (20.4%) and lowest in ages 45≥, 67(16.8%) infection. In giardiasis there was no difference between age groups 1-14 and 15- 44 where infections were 30 cases (7.5%) and 34 cases (8.5%) respectively and low in age 45≥ where reached 20(5.0%). Trichomoniasis was high in ages 15-44 and 45≥ years reaching 28(7%) and 16(4%) respectively, and low in ages 1-14 reached 2(0.5%), toxoplasmosis and not found in age groups 1-14 and 45≥, while shown in the age group 15-44 years 14(3.5%). In Schistosomiasis the infection was 4(1%) in age 45≥ and 2(0.5%) in age 14-44, Hymenolepiasis infections were equal in all age groups 2(0.5%).

Table 2: Distribution of parasitic infection according to age groups

Parasite infections	Amoebiasis	Giardiasis	Trichomoniasis	Toxoplasmosis	Schistosomiasis	Hymenolepiasis	Total
1 – 14	94(23.6%)	30(7.5%)	2(0.5%)	0(0%)	0(0%)	2(0.5%)	128(32.2%)
15-44	81(20.4%)	34(8.5%)	28(7%)	14(3.5%)	2(0.5%)	2(0.5%)	161(40.5%)
45 ≥	67(16.8%)	20(5.0%)	16(4%)	0(0%)	4(1%)	2(0.5%)	109(27.3%)
Total	242(60.8%)	84(21.1%)	46(11.6%)	14(3.5%)	6(1.5%)	6(1.5%)	398(100%)

X^2= 49.88, Df = 10, P value ≤.0001

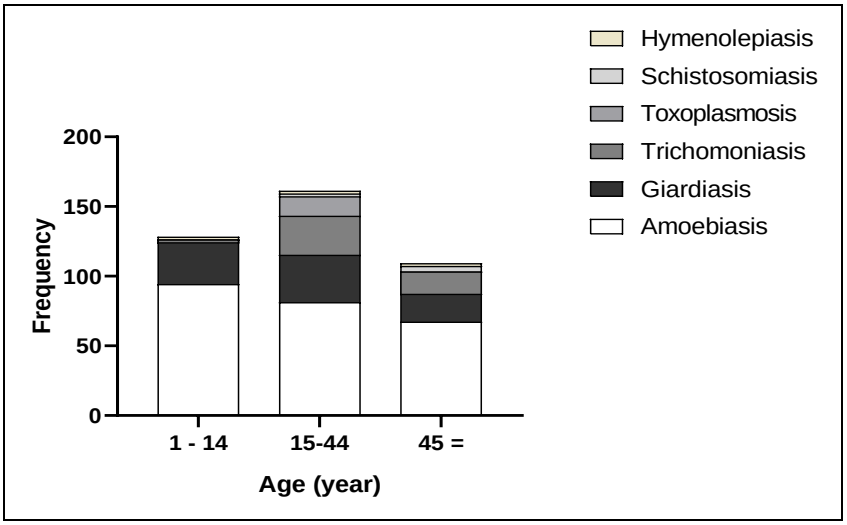

Fig. 2: Distribution of parasitic infection according to age groups

Table (3) showed the relationships between genders and parasitic infections in 398 positive samples, where infection in females 246(61.8%) are higher than the males 152(38.2%), This is a statistically significant difference using chi-square, P-value ≤0.0001. Also there was a high parasitic infection with Amoebiasis reaching 141cases(35.4%) in females while was low in males reaching 101(25.8%), followed by Giardiasis in females reaching 48cases(12.1%) and males reaching 36(9%) then Trichomoniasis in females reaching 39cases(9.8%) and male 7cases(1.8%) then toxoplasmosis in females reaching 14(3.5%) and was not found in males reaching 0(0%), Schistosomiasis in females were 4cases(1%) and males 2cases(0.5%), whereas the results were different in Hymenolepiasis which showed no infections in females while in males reached 6(1.5%) Figure (3).

Table 3: Distribution of parasitic infection according to sexes

Parasite infections	Amoebiasis	Giardiasis	Trichomoniasis	Toxoplasmosis	Schistosomiasis	Hymenolepiasis	Total
Male	101(25.8%)	36(9%)	7(1.8%)	0(0%)	2(0.5%)	6(1.5%)	152(38.2%)
Female	141(35.4%)	48(12.1%)	39(9.8%)	14(3.5%)	4(1%)	0(0%)	246(61.8%)
Total	242(60%)	84(21.1%)	46(11.6%)	14(3.5%)	6(1.5%)	6(1.55)	398(100%)

X^2= 30.77, Df = 5, P value ≤0.0001

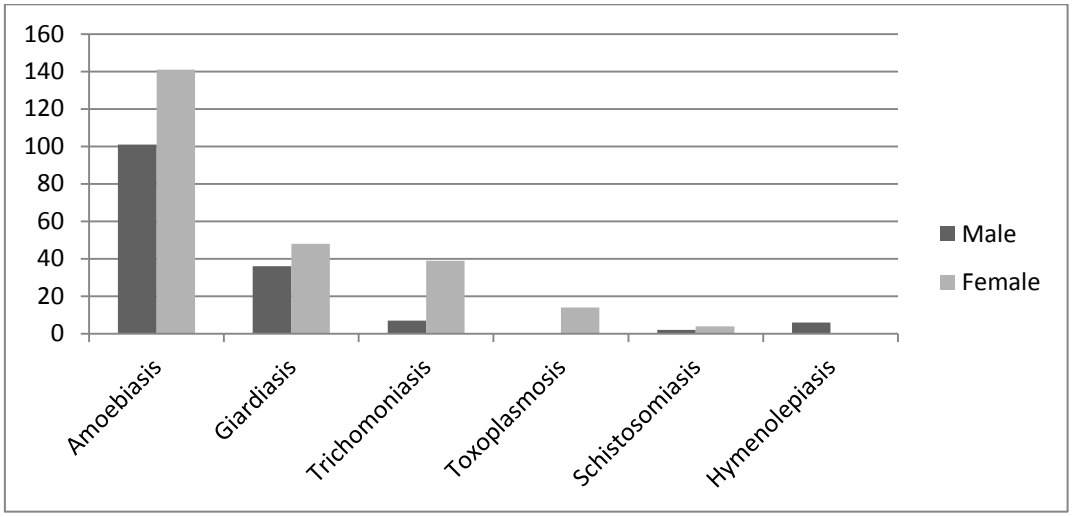

Fig. 3: Distribution of parasitic infection according to sexes

Table (4) explains the Types of parasitic infections; single and double. Out of 389 positive samples, a single infection was reported in 390(78.3%), while a double infection was found in 8 cases (1.6%) (Figure 4). There is a statistically significant differences P value >0.05.

Table 4: Type of parasitic infections in the examined samples

Type of parasitic infection	Positive	Negative	Total
Single	390(78.3%)	100(20%)	490(98.4%)
Double	8(1.6%)	0(0%)	8(1.6%)
Total	398(80%)	100 (20%)	498(100%)

X^2= 2.04, Df = 1, P value >0.05

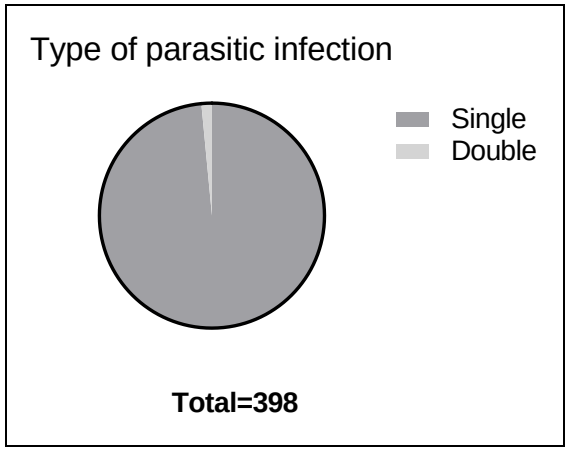

Fig. 4: Type of parasitic infections in the examined samples

DISCUSSION

The high prevalence rate of parasites in Najaf that has been reported in our work is in line with the results of earlier researchs. For example, a survey by Hussein *et al* [13] reported the prevalence rate in Duhok was 65.90%. Other studies carried out in Iraq and other nations have also shown comparable tendencies. For example, Ahmed *et al* [14] reported high rates of 63.8% in the Iraqi province of Mosul, while Jaffar *et al* [15] observed increased rates (66.4%) among rural inhabitants in Wassit. One of the main health issues, especially in underdeveloped nations. Our work shows the common occurrence of parasite infection in the people of Najaf. In all, 489 male and female samples were taken between January and June of 2024; 398 (80%) of the samples tested were positive. The infection rate in the 1-14 age group was 128 (32.2%) in our investigation. While the overall infection rate among young age in Diyala City was reported by Mahdi *et al* [16] to be 37.5%. another erport conducted in Baghdad City it was (24.39%) by Al-Taie[17]. The cause of this difference is the absence of adequate hygiene in children in this age range, which increases the likelihood of diarrhea. Additionally, children's immune systems are not fully developed, and parental disinterest in encouraging their independence males and females in various age groups were all living in the same disease-brone settings, which increased their risk of infection [18]. However, since male bodies are more tolerant than female bodies, variable percentages of infection may be related to differences in endocrine activity, as well as physiological, behavioral, and immunological

differences between the sexes. Our investigation revealed a connection between the patient's gender and parasite illness, which was consistent with results from additional Iraqi research [19].

The primary causes of the high incidence of intestinal parasites (Entamoeba and Giardia) in countries are the climate, inadequate sanitation, and contaminated drinking water. Additionally, cultural community knowledge influences and may aid in the management of all parasitic disorders, including the prevention of intestinal parasite dissemination. Poor sanitary conditions brought on by sewage and plumbing system degradation aid in the spread of parasite infections of the digestive tract. Iraq's main supply of drinking water is contaminated by the daily dumping of 0.5 million tonnes of sewage into its rivers. Diseases like amoebiasis and giardiasis develop out as a result of this condition [20]. The prevalence of amoebiasis and giardiasis varies throughout governorates within a single nation. The variations most likely reflect variations in each governorate's local environmental elements, crowded living arrangements, unsanitary conditions, and population density [21].

Infections by sexual agents are still common in Iraq. Iraq had a 9% infection rate with trichomoniasis in 2000. Following that, it sharply rose, reaching 51.1% and 35% in 2019 and 2020, respectively. Additionally, our investigation from today revealed 46 cases of trichomoniasis infection (11.6%), which is consistent with several other studies. Since trichomoniasis causes lower abdomen discomfort, preterm labours, and abortions, it is regarded as a public health hazard to expectant mothers and their unborn children, which explains the higher percentage of significant concerns [22]. Women are the gender most impacted since men do not exhibit any signs of the illness, but women may experience itching and irregular vaginal discharge [23]. Since most people sexually engage in this age range, it is seen that the 15–44 age group was the most affected. The prevalence and incidence of the four most frequent treatable sexually transmitted infections (STIs) in men and women between the ages of 15 and 49, including trichomoniasis, are consistent with the 2016 estimates released by the WHO in 2019 [24].

There are several reasons that toxoplasmosis is common throughout the nation, including the disparities in climate and cultural customs among Iraq's various areas .That 30 percent of people on the planet are infected with Toxoplasma[25]. Human toxoplasmosis seroprevalence can be influenced by a number of variables, including weather conditions that impact oocyst survival in the environment and, consequently, have a significant impact on infection rates. Naturally, tropical nations with warm, humid climates show higher incidence. Other influences include the type of meat or vegetable ingested, how it is cooked, how it is cleaned, and so on Diaz-Suárez and Estevez [26]. In contrast to Saja and Khalaf [27], who discovered that the main infection happens in the early stages of childhood (4-7 years old), our results in the toxoplasmosis age group did not coincide with their findings. People's prolonged close contact with the oocysts is most likely caused by the large cat population polluting the soils both inside and outside of homes[27]. Consistent with our findings, research indicated that throughout the reproductive years (15-44), 85% of American women are vulnerable to acute Toxoplasma infection [28].

Many countries have eliminated schistosomiasis, such as Iran, Oman, Lebanon, and Tunisia; furthermore, it is no longer as common in Egypt, Saudi Arabia, Morocco, Syria, Jordan, and Iraq. In Yemen, people still consider it to be a major health concern. According to a survey conducted throughout all of Iraq's governorates, there were no reports of schistosomiasis infections between 2011 and 2015 [29]. Due to the intentional removal of damp soil, which killed the Bulinus truncatus snail—the intermediate host for S. haematobium—in both of the country's rivers, Iraq has been free of schistosomiasis for the last few years [30]. By 2020, all governorates in Iraq were guaranteed to be free of schistosomiasis thanks to the national control initiatives. Nonetheless, our research indicates only 6 (1.5%) of the 592 individuals studied in 2024 had schistosomiasis. This finding is consistent with a study conducted in the province of Babylon between 2016 and 2017, which indicated that only 2 (0.4%) of the patients had the disease [31]. Significant variations in sample size are probably the cause of the discrepancy in findings across these investigations.

The most common tapeworm found in people worldwide is Hymenolepis nana. Children in tropical and subtropical locations are prone to it, particularly in places with inadequate or nonexistent sanitation [32]. Since asymptomatic people are the primary source of infection by consistently excreting eggs in their faeces, they can also have an impact on the prevalence of H. nana in the population. Research indicates that rats that live close to people and have access to food and shelter have the potential to spread a wide range of illnesses. This study's results are consistent with previous studies that reported a low human infection rate of H. nana, with a 3.0% infection rate reported in Abha, South Western Saudi Arabia. Moreover, they used 634 stool samples from Baghdad Al-Rasafa to report a 1.8% infection rate of H. nana in children.According to the study, each age group had 2(0.5%) and 6(1.5%) infection rates. Moreover, the results of this investigation were in opposition to those of Shahnazi *et al* [33], who discovered that those under 30 had the highest infection rate. As a result of two major risk factors—not washing veggies before eating or washing hands after using the restroom—the present study discovered that H. nana infection is common in people of all ages. The

main reasons for this are both the economic situation and the absence of parental awareness[33].

The findings of our investigation suggested the presence of two distinct forms of parasite infections: single (390 cases, or 78.3%) and double (8 cases, or 1.6%), respectively. These findings align with the findings of Hussein *et al*[34], which indicated an increase in single infections (66.7%), a decline in double infections (32.7%), and an additional decline of 0.6% for tripled infections. Additionally, these results are compatible with Hussein *et al* [34], which found the highest infection rate of 92.4%) and a decline into 7.6% for single and double infections, respectively, Another report Zangana *et al* [35], which found 63% for single infections and 36% for mixed infections in Erbil City. Finally, Al-Hassany, Najim Abd-Alwahid [36]also aligned with these findings, scoring 76.2%), (19.3%), and (4.5%) for single, double, and tripled infections, respectively. The reason for the highest frequency of single infections rate in this study might be because a particular parasite was more common than other parasites, which led to a large number of patients having the same parasite. Furthermore, connected to harmful behaviours are environmental factors that facilitate the spread of certain parasites. As well as global epidemiological distributions of parasites that are present in populations in both rural and urban areas [37].

Regarding the disparities in parasite infections between studies, they can be attributed to variations in the research area's climate, patient ages, diet, immunity, and health practices, among other factors. These variables contribute to variations in parasite infection rates among studies, in addition to the study's of various seasons.

CONCLUSION

The low socioeconomic position of certain families may be the cause of the high occurrence of certain parasite illnesses. Currently, the Al-Najaf Al-Ashraf Governorate in Iraq has to make efforts to manage these parasite illnesses. Infections with parasites can affect people of any gender, however females seem to be more vulnerable than men. Children between the ages of 1 and 14 were shown to be more susceptible to *E. histolytica* infection than children in other age groups. *E. histolytica* was the most often found intestinal parasite.

RECOMMENDATIONS

Guidelines Health awareness and education initiatives are to be launched everywhere in light of the study's conclusions. Encouraging good hand hygiene, promoting safe and clean drinking water sources, discouraging the eating of raw or unwashed fruits and vegetables, and improving living circumstances should be the main objectives of these efforts. The control and prevention of parasite infection spreads largely depends on early detection and efficient therapeutic management.

Declarations:

Consent for publication: Not applicable

Availability of data and material: Data are available upon request.

Competing interests: The author(s) declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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REFERENCES

1. Kandeel M, Akhtar T, Zaheer T, *et al*. Anti-parasitic Applications of Nanoparticles: A Review. Pakistan Veterinary Journal, 2022, 42.2.
2. Derrick J, Hollinghurst P, O'Brien S, *et al*. Measuring transfer of human norovirus during sandwich production: simulating the role of food, food handlers and the environment. International journal of food microbiology, 2021, 348: 109151.
3. Mahdi, N. K. Prevalence of intestinal parasitic infections in Iraq during a period from 2000-2022. J Infect Dis Epidemiol, 2022, 8: 268.
4. Clarke, Naomi E, Ng-Nguyen D, *et al*. A cluster-randomised controlled trial comparing school and community-based deworming for soil transmitted helminth control in school-age children: the CoDe-STH trial protocol. BMC infectious diseases, 2019, 19: 1-10.
5. Centers for Disease Control and Prevention, "Trichomoniasis," USA, 2017. Available: www.cdc.gov/std/trichomonas
6. Edwards T, Burke P, Smalley H, *et al*. Trichomonas vaginalis: Clinical relevance, pathogenicity and diagnosis. Critical reviews in microbiology, 2016, 42.3: 406-417.
7. Naji M M, Al-Hadraawy S K, AL-Dujaili A H. Study Role of Some Neurotransmitters in Schizophrenia and Toxoplasmosis Patients. J Surv Fish Sci. 2023;10(3S):772–83.
8. Cong W, Dong X Y, Meng Q F, *et al*. Toxoplasma gondii Infection in Pregnant Women: A Seroprevalence and Case Control Study in Eastern China. BioMed research international, 2015, 2015.1: 170278.

9. Molehin A J, McManus D P, You H. Vaccines for human schistosomiasis: recent progress, new developments and future prospects. International Journal of Molecular Sciences, 2022, 23.4: 2255.
10. Dawaki S, Al-Mekhlafi H M, Ithoi I, *et al*. Prevalence and risk factors of schistosomiasis among Hausa communities in Kano State, Nigeria. Revista do Instituto de Medicina Tropical de São Paulo, 2016, 58: 54.
11. Cabada M M, Morales M L, Lopez M, *et al*. Hymenolepis nana impact among children in the highlands of Cusco, Peru: an emerging neglected parasite infection. The American journal of tropical medicine and hygiene, 2016, 95.5: 1031.
12. Gelaye B, Kumie A, Aboset N, *et al*. School-based intervention: evaluating the role of water, latrines and hygiene education on trachoma and intestinal parasitic infections in Ethiopia. Journal of water, sanitation and hygiene for development, 2014, 4.1: 120-130.
13. Hussein J N, Meerkhan A A. The incidence of intestinal parasites among children in Hivi pediatric hospital, Duhok, Iraq. Science Journal of University of Zakho, 2019, 7.1: 1-4.
14. Ahmed N M, Al-Niaeemi B H, Dawood M H. Epidemiological and clinical aspects about the endemic intestinal parasites in reviewers of Mosul General hospitals and healthcare centers/Nineveh governorate-Iraq. EurAsian Journal of BioSciences, 2020, 14.2.
15. Jaffar Z A, Merdaw M A Z. Incidence of intestinal parasitic infections among random samples at Al-Aziziyah hospital in Wasit province/Iraq. Baghdad Science Journal, 2021, 18.2: 0217-0217.
16. Mahdi A F, Hussein R A. Prevalence of intestinal parasitic infections among children in diyala province. Diyala Agricultural Sciences Journal, 2018, 10. special Issue: 373-384.
17. Al-Taie, L H. Prevalence of intestinal parasitic infection in Baghdad city. *Journal of the Faculty of Medicine Baghdad*, 2009. *51(2)*: p. 187-191.
18. Asires A, Wubie M, Reta A. Prevalence and Associated Factors of Intestinal Parasitic Infections among Food Handlers at Prison, East and West Gojjam, Ethiopia. Journal of advance in medicine.2019; 2101089.
19. Jaeffer, Harith Saeed. Prevalence of Giardia lamblia and Entamoeba histolytic/Entamoeba disparate infections among Children in AL-Shulaa and AL-khadi mya–Baghdad-Iraq. J Univ Anbar Pure Sci, 2011. 5: p. 6-10.
20. Ibrahim, Amjed Qays. Prevalence of Entamoeba histolytica and Giardia lamblia in Children in Kadhmiyah Hospital. The Iraqi Journal of Veterinary Medicine, 2012, 36.1: 32-36.
21. Al-Kahfaji, Maani Seher Abid. Prevalence of intestinal parasitic infection in children under five-year in Hilla, Babylon Province. Medical Journal of Babylon, 2014, 11.3: 744-748.
22. Bedair N H, Ali H Z. Comparison of trichomoniasis diagnosis by microscopic methods and indirect ELISA technique in a sample of Iraqi women. Iraqi Journal of Science, 2020, 742-748.
23. Oyeyemi O T, Fadipe O, Oyeyemi I T. Trichomonas vaginalis infection in Nigerian pregnant women and risk factors associated with sexually transmitted infections. International journal of STD & AIDS, 2016, 27.13: 1187-1193.
24. Klavs I, Milavec M, Berlot L, *et al*. Prevalence of sexually transmitted infections with Chlamydia trachomatis, Neisseria gonorrhoeae, Mycoplasma genitalium and Trichomonas vaginalis: findings from the National Survey of Sexual Lifestyles, Attitudes and Health, Slovenia, 2016 to 2017. Eurosurveillance, 2022, 27.14: 2100284.
25. Naji MM, Al-Tamimi TGY, AL-hadraawy SK, *et al*. Some Hematological Markers Alteration in Patients Infected with Toxoplasmosis and Schizophrenia. Lat Am J Pharm. 2024; vol. 43(4), p 1366-74.
26. Diaz-Suárez O, Estevez J. Seroepidemiology of toxoplasmosis in women of childbearing age from a marginal community of Maracaibo, Venezuela. Revista do Instituto de Medicina Tropical de São Paulo, 2009, 51: 13-17.
27. Saja Jabbar, Khalaf AL-Ghezy. Diagnostic study of Toxoplasma gondii and Cytomegalovirus in pregnant and aborted Women with some Epidemiological and Immunity parameter in Thi-Qar province-Iraq. College of Education for pure Science University of Thi-Qar for the degree of Master in Biology (parasitology), 2012, 3-4.
28. Jones J L, Kruszon-Moran D, Wilson M, *et al*. Toxoplasma gondii infection in the United States: seroprevalence and risk factors. American journal of epidemiology, 2001, 154.4: 357-365.
29. Mohammed, Mohammed Omer. The human seroprevalence of Echinococcus granulosus in Sulaimani Governorate. The Iraqi Postgraduate Medical J, 2013, 12.1: 45-50.
30. Yunusa E U, Awosan K J, Ibrahim M T O, *et al*. Prevalence, epidemiological characteristics and predictors of occurrence of urinary schistosomiasis among Almajiri school children in Sokoto, Nigeria. *International Journal of Medicine and Medical Sciences*, 2016, 8.3: 22-29.

31. Centers for Disease Control and Prevention, "Summary of Health Information for International Travel," USA, 2003. Available: http://www.cdc.gov/travel/blusheet.htm.
32. Al-Mekhlafi HM. The neglected cestode infection: Epidemiology of *Hymenolepis nana* infection among children in rural Yemen. Helminthologia.2020; 57(4):293-305.
33. Shahnazi M, Mehrizi M Z, Alizadeh S A, *et al*. Molecular characterization of Hymenolepis nana based on nuclear rDNA ITS2 gene marker. African Health Sciences, 2019, 19.1: 1346-1352.
34. Hussein R A, Shaker M J, Majeed H A. Prevalence of intestinal parasitic infections among children in Baghdad City. Journal of College of Basic Education, 2011, 71: 130-147.
35. Zangana I K, Qader N H, Aziz K J, *et al*. Prevalence of gastrointestinal parasites in horses in Erbil province. North Iraq. Al-Anbar Journal of Veterinary Sciences, 2013, 6.1.
36. Al-Bayati M H J, Al-Hassany N A A. Epidemiological and diagnostic study for some intestinal parasites that infect children in Diwaniya province. Al-Qadisiyah Journal of Pure Science, 2014, 19.1.
37. Daoud Y T, Dakhil K M, Al-Mozan H D K. Study the infection with intestinal parasites (Entamoeba histolytica) and its effect on the blood nature in children from Thi-Qar province. Al-Qadisiyah Medical Journal, 2014, 10.18: 152-158.