Original Article

The spread of the parasite Giardia lamblia in the city of Samarra and its effect on some biochemical variables

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DOI: 10.47750/pnr.2022.13.S06.278

Abstract

The current study was conducted on patients infected with Giardia lamblia, who were admitted to Samarra General Hospital and some private laboratories in the city of Samarra / belonging to Salah al-Din Governorate, the age groups ranged from (1-40) years, the work was completed during the period from 10/2/2021 to 1/5/2022. The cases of parasite infestation were diagnosed by examining faeces samples by direct swab method using light microscope to detect the trophic and cystic phases. The current study examined 585 stool samples, the number of infections was 76, and the study includes several criteria (sex, age of residence), lipid profile and blood sugar. The results of the study recorded a significant difference in infection rate at the sex level, and the percentage of males (56.58%) was higher than females (43.42%). While the highest percentage of infection was recorded in the age groups aged (1-10) years in both males and females (38.16%)) and a lower percentage in the age groups ≥40 years (11.84%). The results of the study showed that there was a difference in the rate of infection in the months of the year, if the highest infection rate was in October, November and April, 30.29%, 17.12%, and 25.49%, respectively, and the lowest infection rate was in January, if the infection rate was 5.26%. The study showed that the highest percentage of parasite infection was among the people living in rural areas, and the percentage was 61.71% out of a total of 76, while the percentage of infection among city patients was 38.92%. The results indicated that there was a significant decrease in the level of cholesterol concentrations 162.7 ± 23.1, triglycerides 111.9 ± 26.5 and high-density lipids in the group infected with the parasite compared with the control group. .1 ± 18.8 but a significant increase.

Keywords: Giardia lamblia, giardiasis.

INTRODUCTION

Diarrhea is one of the top ten causes of death in all age groups, and therefore it is an important threat to global health. Since it is the second leading cause of death related to infectious diseases, it is important to control the pathogens that lead to diarrhea, including giardiasis, to reduce the possibility of an increase in diarrhea-related deaths. (Roshidi et al., 2021). Giardiasis is a major cause of diarrhea worldwide, affecting 280 million people annually, and is most prevalent in areas with poverty and lack of sanitation, as in many low-income countries as well, in high-income countries and industrialized regions. (Meningher et al., 2019). The parasite is known as Giardia duodenalis, and it is the causative agent of Giardiasis. It is the most common parasitic diarrheal disease that affects humans and more than 40 species of other mammals.

The World Health Organization has classified Giardia as the eleventh most important parasite in the world. Giardiasis is more common in children younger than 5 years old. Also, adults aged 30-40 years are most at risk (Lalle M., and Hanevik, 2018). It is one of the eukaryote Flagellate parasites (Adam, 2001), and it causes Giardiasis disease (Kumar and Singh, 2016, so it is a common disease between humans and animals, Zoonosis. (Thompson et al., 2009) the parasite affects the small intestine) jejunum and ileum) for humans, parasite infection occurs. After eating the bags, the infection can cause great damage to the lining of the intestine as a result of the parasite's attachment with the help of its bilobed sucking discs to the lining of the intestine (Faubert, 2000). The people most affected by giardiasis are those who suffer from immunodeficiency, as well as travelers to areas with high rates of infection with this parasite (Ahmad et al., 2020).

The infection may occur without symptoms or clinical symptoms usually appear in the form of foul-smelling diarrhea, abdominal pain and bloating, and infection may lead to long-term problems such as irritable bowel syndrome (IBS), chronic fatigue, and infection occurs by swallowing gastric cysts through the mouth. that are infested with water and food (Ferguson et al., 2020). The intestinal parasite Giardia lamblia is one of the common causes of diarrhea and malabsorption in humans, as it

causes many problems in them such as malabsorption, weight loss and delayed growth and development(David et al., 2011). The disease is associated with malnutrition and a deficiency in some elements and vitamins important to humans (El-Sayad et al., 2011). Aims of the study is to study the effect of age, gender and months on the epidemiology of the parasite G. lamblia in Samarra city and its suburbs. As well as the effect of parasite infection on some biochemical variables, namely cholesterol, triglycerides, High Density Lipoprotein (HDL) and sugar.

Materials and methods

Examination of blood samples

5 ml of blood was drawn from the patients who tested positive for Giardia lamblia, in addition to the non-infected persons in the control groups.

The blood was separated and serum was isolated from it to perform some biochemical and hormonal tests:

The remaining part of the blood (8 ml) was placed in a sterile 10 ml Plain tube that does not contain an anticoagulant. It was left at laboratory temperature for 30 minutes, it was placed in a centrifuge at 2500 rpm for 10 minutes to obtain the blood serum, which was drawn by an automatic micro pipet, and distributed in (5) Eppendorf tubes to perform some tests:

1- Biochemical tests represented in the form of lipid profile and blood sugar. The tubes containing the serum were tightly closed and kept at a temperature of -20° C until used in conducting the tests.

Collection of samples

The study included the examination of 585 stool samples from patients in Samarra General Hospital and some private laboratories in the city of Samarra and its suburbs in Salah al-Din Governorate. The collection period lasted from 2/10/2021 to 1/5/ 2022. The study included examining samples in both males and females of different ages. The collected faecal samples were kept in sterile, dry plastic bottles with a tight seal prepared for this purpose. A paper sticker was placed on one of its sides to record (patient's name, sample number, gender, age, presence of diarrhea, symptoms, date of collection of the sample, and an infection with the parasite Giardia lamblia).

Biochemical tests

- Cholesterol test

A ready-made test kit from the Spanish company of origin was used, which is an enzymatic method that depends on the conversion of cholesterol esters into quinnoneimine dye.

- Triglyceride test

A ready-made test kit from the Spanish company was used, which is an enzymatic method that depends mainly on converting triglycerides into quinnoneimine dye.

- High-density lipoprotein test kit

A test kit produced by the Spanish company was used, and the method for measuring HDL-Cholesterol is the same as cholesterol measurement except that 25 microliters are added from the sample.

- Glucose kit

It is a ready-made analysis kit manufactured by the British company, which measures the concentration of blood sugar. The ready-made analysis kit consists of three packages containing the first of the regulator solution, the second on the enzymes, and the third on the standard solution.

Results and Discussion:

The results of the study showed that the rate of infection with G. lamblia parasite was 12.99% of the total of 509 samples, and the samples that gave a negative result for the presence of the parasite were 87.01% .

The results of the current study showed that the highest percentage of infection was in males, reaching 56.58% of the total of 273 samples, while the percentage in females was 43.42% out of the total of 312 samples. The statistical analysis using the X^2 test showed that there is a significant difference between the rates of infection in males and females in The current study is at the level of probability (P<0.05) as shown in Table (1).

Table (1): The number of samples examined and cases of infected males and females.

Groups	Male No. (%)	Female No. (%)	Total No. (%)
Positive	**43 (56.58)**	**33 (43.42)**	**76 (12.99)**
Negative	**230 (45.19)**	**279 (54.81)**	**509 (87.01)**
Total	**273 (46.67)**	**312 (53.33)**	**585 (100)**

The present results showed that the infection rate of Giardia parasite was the highest in the age group of (10-1) years in both males and females, and the lowest at the age of 40 years, Table (2). months).

Table (2): The number of samples examined and cases of the injured by age groups

Age groups	Male No. (%)	Female No. (%)	Total No. (%)
1-10 (years)	**18 (62.07)**	**11 (37.93)**	**29 (38.16)**
11-20	**11 (61.11)**	**7 (38.88)**	**18 (23.68)**
21-30	**2 (25)**	**6 (75)**	**8 (10.53)**
31-40	**7 (58.33)**	**5 (41.66)**	**12 (15.79)**
40 >	**5 (55.56)**	**4 (44.44)**	**9 (11.84)**
Total	**43 (56.58)**	**33 (43.42)**	**76 (12.99)**

The effect of infection with G. lamblia parasite on the concentrations of triglycerides, cholesterol and high-density lipoprotein HDL: The results revealed in Table (3) and appendices, that the average concentrations of cholesterol, triglycerides and HDL in the blood were lower in infected G. lamblia patients compared to the control group.

Table (3): The effect of infection with G. lamblia parasite on the concentrations of triglycerides, cholesterol and high-density lipoprotein.

Groups	HDL	Cholesterol	Triglycerides
	M±S.D		
Infected	36.72 ± 3.48	162.7 ±23.1	111.9 ± 26.5
Control	37.04 ± 4.11	240.3± 17.5	166.3 ± 46.6
Calculated t value= 0.26 n.s Tabular t value=1.691		Calculated t value= 17.91* Tabular t value=1660	Calculated t value=6.09* Tabular t value=1.682

(*) indicates that there are significant differences at the level of 0.05

(n.s) indicates that there are no significant differences at the level of 0.05<p

The result, in Table (4), showed a rise, but not significant, in the level of sugar in the blood of those infected with the parasite compared with the control group.

Table (4): Effect of G. lamblia parasite infection on blood sugar

Groups	GLU
	M±S.D
Infected	116.1 ± 18.8
Control	110.6± 14.1
Calculated t value= 1.03 n.s Tabular t value=1.689	

Discussion:

The results ot the current study with regard to the gender factor agreed with the studies of some researchers in this regard. Al-Dulaimi (2004) recorded the highest infection rate in males, reaching 32.7% compared to females, which amounted to 25.2% Al-Dulaimi (2004), and Younas et al., (2006) recorded the highest infection rate in males, reaching 63.5%, while in females it was It recorded an infection rate of 36.5%, which is in agreement with that of AL-Saeed and Issa (2006) who recorded the highest infection rate in males 41.6% compared to 35.6% in females. Also, the infection rate in males was 52% higher than in females 48% Al-Jubouri (2008). Al-Kubaisi (2007), Al-Jubouri (2009) and Salman (2012) confirmed in the city of Tikrit, and Hussein et al., (2012) in Sudan confirmed that it agrees with Al-Safo (2012) and Ihsan and Harith et al., (2017) also emphasized that The rate of infection in males is higher than in females, and the reason for the fact that the rate of infection in males is higher than females is that males are more mobile, active and more susceptible to infection due to their presence in public places, and their frequent contact outside and exposure to pollution more than females, and that the movement of females and their games are more restricted than males And they spend most of the time indoors. The results of the current study differed with regard to the sex factor and the percentage of parasite infection with the findings of a number of studies, as it recorded a higher percentage in females, which amounted to 6.68%, and in males, 5.74% (Mohsin (2009), and a higher rate of infection in females was 57.3%, while it was In males, 22.6% Shakkooury and Wandy (2005) in Jordan. The reason for the variation in the infection rate between the sexes may be due to environmental factors and differences in the physical conditions of each sex. The reason may also be due to the fact that the number of people examined in males is higher than females, as well as some social habits of attention to males more than females (Al-Douri, (2017), and AL-Al_Mekhlafi et al., (2013) concluded that the gender factor is related to its effect On the incidence of Giardia lamblia with other factors such as the nature of nutrition and livelihood.

The study agreed with Hussein (2012) in Dhi Qar, the highest infection rate was recorded at 33.3% in the age group (48-24). They agreed with what was stated by Younas et al., (2006) that the highest rate of infection was in the pre-school age by 35% than the primary school age, which was 30.29%, as well as with Al-Asadi, (2007) and it was also recorded by 58% in the age groups (9-0) years, in Colombia Alfonso et al., (2016). And with Naz et al., (2018) in Pakistan, the rate of 11.11%, while the results of this study differed with what was found by Fattohi et al. (2008), where the highest infection rate was recorded at the age of (2-1) years. It also showed that the highest infection rate was in The age group (10-6) years, and the lowest percentage was in the age group (12-11). In Iran, the highest rate of infection was recorded in the age group (14-2) years, Sayyri et al (2005). Celiksoz et al (2005) in Turkey showed that the highest rate of infection was in the age group (7-5 years). The reason for the high rates of infection with this parasite in age groups is due to the ignorance of this group and their lack of knowledge of general hygiene rules and the fact that children at this age are more mobile and active, as well as children's habits of playing in contaminated soil in pools or sewers with stagnant water contaminated as well as eating food and ice cream From the street vendors Mohsen (2009), or the cause is due to acquired immunodeficiency among these children (Anim - Baidool et al., 2016),

and Julio et al., (2012) pointed to the disparity in the role of age as risk factors for infection with Giardia lamblia. And he mentioned that the possibility of age affecting infection may be linked with acquired immunity, and thus infection is slightly higher in age groups less than 5 years old.

Results are in agreement with those in similar studies (Devendra et al., 2005; Das et al. al., 2002; Ma'ani and Jabir, 2013; El-tayeb et al.m 2014). The Giardia parasite affects the lipid receptors, which leads to poor absorption of substances, especially fats, and thus leads to the formation of fatty stools. Our findings do not agree with several studies (Devendra et al., 2005; Ahmet et al., 2010), which reported higher serum cholesterol concentrations in patients with parasitic diseases as compared to the control group. Cholesterol is a major component of eukaryotic membranes and has an important role in membrane synthesis and function. The membrane biosynthesis in Giardia needs cholesterol; Since Giardia is unable to make and produce cholesterol, it acquires cholesterol from the upper small intestine. (Das et al., 2002) These processes increase the supply of fatty acids in the liver, which stimulates a rise in triglyceride synthesis in the liver. (Ma'ani and Jabir, 2013; Khovidhunkit et al., 2004) that with respect to intracellular parasites, these parasites acquire host cholesterol that is eliminated by the LDL pathway; In infected cells, this pathway is specifically elevated (Coppens et al., 2000). The results of this study revealed a significant decrease in serum HDL in patients infected with G. lamblia compared to the control group. The decrease may be due to a defect in the bile gland due to blockage of the bile ducts by the parasite G. lamblia and thus leads to fat loss, which is a complication of Giardia infection, which leads to foul-smelling stools accompanied by undigested fats (Ma'ani and Jabir, 2013). This study is inconsistent with the finding of Ma'ani et al., (2013) in Iraq which reported a normal value of HDL in patients with Giardia, while it is in agreement with various studies that found higher concentrations of HDL in serum. in patients infected with the parasite compared to the healthy group (Feingold and Grundeld, 2022; Al-Hadraawy et al., 2016; Pirillo et al., 2015; Shao and Heineken, 2009).

Symptoms that result from infection with the parasite Giardia lamblia infect the duodenum and small intestine, and prevents the absorption of nutrients. If this infection is not treated, symptoms may last for six weeks or longer. Then to the infection in which there are no symptoms. Although symptoms may cause reduced absorption of carbohydrates in patients without symptoms, these tests are not considered diagnostic. Some studies have also shown that Giardia may be a cause of vitamin B12 deficiency anemia as a result of other problems caused by the intestinal absorption system. (Heyworth, 2016). The amount of sugar consumption also correlates with the severity of the disease, as poorly absorbed carbohydrates are often associated with diarrhea. The monosaccharides are absorbed by facilitated diffusion with a limited capacity; When the amount ingested exceeds capacity, malabsorption and diarrhea occur. The disaccharides must be broken down by polysaccharides, such as sucrose or lactose, which may be insufficient due to mucosal disease or genetic regulation. Unabsorbed carbohydrates lead to osmotic retention of fluid in the intestinal bacterial fermentation resulting in gas. Which indicates malabsorption of carbohydrates. Lactose is a common cause of diet-induced diarrhea (Hammer and Hammer et al., 2012; Mattar et al., 2012; Jones et al., 2011).

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