Determination of Demographic Liver Health with Giardia lambila Infection Analysis in Diyala

Noora Dhyaaldain Abed [1*], Shahad Abdul Jabbar Mohammed [2]

Abstract

Background: Giardia lamblia infection is known to affect liver function indicators, yet its correlation with demographic factors remains unclear. This study aimed to investigate this relationship, focusing on sex, age, and residence, to better understand the impact of the parasite on liver health. Objective: The objective was to assess the effect of Giardia lamblia infection on liver function indicators and its association with demographic variables such as sex, age, and residence. Method: Blood samples were collected from 48 Giardia-infected patients at Al-Batool Teaching Hospital and Shahraban General Hospital, with 20 healthy individuals serving as controls. Samples were obtained between February and May 2020. The age range of participants spanned from under two years to 12 years. The Giesse diagnostic kit from Italy was employed to measure liver function indicators. A colorimetric method was used to estimate the activity of aminotransferase enzymes (GOT and GPT) and phosphatase enzyme levels. Results: The study found the highest infection rate among 2-4-year-olds, with males exhibiting a higher infection rate compared to females (54.16% vs. 45.839%). Rural areas showed a higher infection rate (56.25%) compared to urban areas (43.75%). Infected children displayed increased levels of aminotransferase enzymes (GOT, GPT, and ALP) compared to the control group. Conclusion: Giardia lamblia infection correlates with elevated liver function indicators, particularly among children aged 2-4 years and males. Additionally, residence in rural areas appears to be a risk factor for higher infection rates. These findings underscore the importance of early detection and intervention strategies to mitigate the impact of Giardia lamblia on liver health, especially in vulnerable populations.

Keywords: Giardia lamblia, Liver function indicators, Aminotransferase enzymes (GOT and GPT), Phosphatase enzyme, Demographic factors

Significance | This study analyzed the Giardia infection as early detection for liver health intervention.

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Introduction

The *Giardia* is one of the most widespread genera of intestinal parasites that cause diarrhea globally (Abu-Aljadael et al., 2013). It is a common cause of diarrhea in both children and adults and is transmitted orally and faecally through direct or indirect ingestion of feces (Hooshyar et al., 2019). The life cycle of *G.lamblia* consists of two stages: Trophozoite and Cyst. The trophozoite is the pathogenic stage and Cyst is the infectious stage, both of which are present in the fecal matter of a patient infected with Giardia. Trophozoite pathogenesis occurs due to direct damage to the lining of the intestine or mechanical obstruction of the intestinal villi and absorption (AL-Kahfaji and Zainab 2019). Studies have shown a close relationship between intestinal parasitic infection *Giardia* in particular and malnutrition in children, especially at school age, which has a direct impact on their growth and educational outcomes. Social and economic conditions, poor sanitation, and

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housing play an important role in the spread of this parasite (Botero-Garcés et al., 2009). As Giardiasis infection can impede the growth of the child even when it is asymptomatic, and the infection leads to malabsorption as it prevents the absorption of many biochemical elements essential for the growth of the child. They are under 5 years old (Magged, 2019). Previous experimental studies indicated that parasitic infections are likely to affect and alter transaminase levels. The reason for the change in the level of these enzymes is the result of the severe effects of parasitic pathogens on liver functions because some pathogenic parasites choose the liver as a permanent or temporary site of infection and reproduction (Pohl et al., 2001; Onyesom and Onyemakonor, 2011). Liver function can also be altered due to modulation and effect of supplements and chemicals (Walid et al. 2024, Iman et al. 2024). Because of the increased prevalence of giardia infection among children in Iraq in general and in Diyala Governorate in particular and its effect on children, which facilitates their infection with other diseases that accompany parasitic infection, the current study aimed to study the effect of giardia infection on indicators of liver function infected with the giardia in Diyala Governorate, Iraq as well as a study aspect associated with parasite infection such as (sex, age, housing).

Material and Methods

Study groups

The current study included 68 people divided into two groups, the first group included 48 patients infected with the intestinal parasite *Giardia lamblia* from the patients attending Al-Batool Teaching Hospital and Shahraban General Hospital who was diagnosed with the parasite, and the second group included 20 healthy people (they were asked about the absence of chronic diseases or any other disease and of both sexes). The ages of the study groups ranged from less than two years to 12 years, and some information about the patient (age, gender, and residence) was taken.

Blood sample collection

Five milliliters of venous blood were taken from the study participants, using medical syringes, and placed in a plastic tube that does not contain (EDTA) to conduct biochemical tests.

Biochemical tests

Five milliliters were placed in a plastic tube to conduct the biochemical tests. The diagnostic kit (Giesse / Italy) was used, and the colorimetric method was used to estimate the activity of GOT and GPT aminotransferase enzymes using the diagnostic kit (Biomerieux / French).

Statistical analysis

The statistical program SPSS was used to find (the arithmetic mean, standard deviation, and T. test for two independent groups).

Results

Demographic factors affecting infection with the intestinal parasite Giardia.

The current results showed that the highest rate of infection with *Giardia* intestinal parasite was in the age group (2-4) years compared with other age groups and it was 21 (43.75%), while the infection rate was in the age group (10-12) years 2 (4.16%). The percentage of intestinal *Giardia* infection among males was higher than that recorded in females (54.16% and 45.83%, respectively). The lowest rate was in the city (43.75%), as shown in **Table 1**.

Levels of liver enzymes in people with and without giardiasis.

The results of the current study showed that the rate of GOT values was slightly higher among people infected with giardiasis (15.521%) compared to non-infected people (14.715%), while GPT showed a significant increase in people infected with the Giardia parasite (16.131%) compared to people The non-infected, which was (13.695%). The results showed an increase in ALP value in people infected with Giardia intestinal parasite (80.827%) compared to healthy people (76.840%), as shown in **Table 2**.

Discussion

Demographic factors and their relationship to infection with *Giardia* intestinal parasite

The results of the current study showed that the highest infection rate was in the age group (2-4) and this is consistent with what was recorded by (AL-Difaie, 2016), which showed the highest infection rate (40.7%) in the age group (2-4) years. It also agrees with the study that was conducted in Dhi Qar, as the highest infection rate was recorded in the age group (24-48) months, at (33.7%), while ALSaeed and Isaa, (2006) showed the highest infection rate among children in the age group (10-12) years at a rate of (81.2 %) and the lowest percentage in the age group (2-4) years. The high rates of infection in the age group (2-4) may be due to the lack of care for cleanliness and the children's play with materials thrown on the ground and contact with polluted materials, as the child is eager to taste anything.

The current study showed that the rate of males infected with giardiasis was higher (54.16%) compared to females (45.83%). The results of the current study agree with the findings of (ALSaeed and Isaa 2006; Hussein, 2010; Al-ibady, 2017; Ejiofor et al., 2011), while Firdu et al., (2014) showed that the infection was higher in females (29.27%) compared to males (8.11%). The reason for the higher incidence in males may be due to the multiplicity of actors and activities carried out by males compared to females, as males are the most mobile and contact group with external environmental factors during play and more in contact with peddlers. Regarding the residence, the highest rate of infection with giardiasis was among the population of rural areas compared to the urban population, and this study is consistent with the findings of Rayan et al., (2010), which indicated that the rate of infection in rural areas was higher

Table 1. Infection rate of *Giardia lamblia* with demographic factors.

Demographic factors	**Patients**		**Control**	
	No.	**%**	**No.**	**%**
Less than two years of age	9	18.75	3	15
4-2	21	43.75	5	25
4-6	3	6.25	5	25
6-8	9	18.75%	2	10%
8-10	4	8.33%	2	10%
10-12	2	4.16%	2	10%
Sex				
Male	26	54.16	8	40
Female	22	45.83	12	60
Residence				
Rural areas	27	56.25	11	55
Urban areas	21	43.75	9	45

Table 2. Levels of liver enzymes in people infected with the parasite and those not infected.

Serum (unit/liter)	**Type**	**Mean**	**Standard deviation**	**t. test**
GOT	Infected Uninfected	15.521 14.715	3.556 2.732	0.907
GPT	Infected Uninfected	16.131 13.695	4.379 3.139	2.254
ALP	Infected Uninfected	80.827 76.840	5.712 7.891	2.335

than in the urban (17.9%, 14% respectively), this may be attributed to several factors, including lack of sanitation services, lack of awareness and hygiene, direct contact with animals, lack of drinking water suitable for human consumption and other pollutants, as the development in the cultural and economic level of some rural areas is an important factor in reducing infection rates with this parasite.

Liver enzyme levels in subjects with or without intestinal giardiasis.

The current study showed an increase in the levels of liver enzymes in children infected with giardiasis compared to the results of the control group, as the values of GOT, GPT, and ALP increased among those infected with the parasite. The results of the current study are consistent with what was shown by (Rahimi et al., 2017; AL-Abodi, 2018).) who indicated that *Giardia lamblia* infection and its effect on some biochemical variables in the serum of infected patients before and after treatment showed an increase in the activity of liver enzymes GOT and GPT before treatment, in agreement with what was shown by (AL-Abodi, 2018) who found a decrease in the concentration of Liver enzymes GOT and GPT in patients compared to the control group. The increase in GOT or GPT could be caused by hepatitis, cirrhosis, or liver cancer, and the possible cause of this change in enzymes in people infected with *Giardia* may be due to the effect of the parasite. The release of enzymes into the bloodstream may occur after an infection or cell death, and it may In affected people, the energy stored in food is not utilized properly, and therefore the energy stored in the liver is resorted to, which causes an increase in GOT and GPT enzymes to compensate for it (Rahimi et al., 2017). The current study indicated an increase in the level of ALP in the serum of people infected with *Giardia* compared to non-infected people, and this is consistent with Al-Bayati, 2013), who indicated that the increase in ALP enzyme could be a result of diarrhea and malabsorption, which in turn leads to the loss of many minerals. And salts such as calcium and sodium, and because this enzyme has a role in transporting these minerals, its secretion increases to compensate for the deficiency in those minerals.

Conclusion

The current study concluded that young children are more susceptible to infection with the *Giardia* parasite, especially the age group under 5 years, and this is due to the way they play and their behavior in using their mouth by tasting everything that falls into their hands, in addition to the infection of males more than females, and this is due to their frequent contact with the environment outside during play, and that infection with giardiasis causes an increase in the levels of GOT, GPT, and ALP aminotransferases, Therefore, the energy contained in the food is not used properly, and therefore the energy stored in the liver is used, which causes an increase in the level of these enzymes to compensate for it.

Author contribution

N.D.A., S.A.J.M. designed the study, analysed data, conducted laboratory experiments, and wrote the manuscript.

Acknowledgment

None declared

Competing financial interests

The authors have no conflict of interest.

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