

Interrelated impacts of *Giardia lamblia*, Ghrelin,Cholecystokinin,and Interleukins 6,11,and 15 on the Digestive system in children

Zeyad Taha Hussein, College of Veterinary Medicine, University of Tikrit.Iraq .

zeyad81@tu.edu.iq

Abstract

Giardiasis is one of the main causes of diarrhea all over the world and among all age groups, as it infects approximately 285 million people annually. It affects it, including interleukins, including IL-6, IL-11, and IL-15. It is also affected by several hormones such as ghrelin and cholecystokinin. Therefore, the current study aimed to evaluate the concentration of some immunological indicators such as interleukin 6, interleukin 11, and interleukin 15, and to evaluate the concentration of some hormones in children. patients with giardiasis, and an attempt to shed light on the age factor and the region of residence in the change of these indicators when comparing the patient groups and the control group. (300) stool samples were collected from children with diarrhea cases whose age did not exceed ten years from the patients of Samarra General Hospital and some private laboratories from Rural and city population, and the research continued from 1/12/2022 to 1/6/2023. The study included examining samples for male and female children from the countryside and the city. The study included calculating the percentage of people infected with the parasite and the difference between males and females and between rural and city children. The concentration of interleukins (6,11,15) and the hormones ghrelin and cholecysteine were measured. The results showed a higher infection in male children compared to female children, and the infection in village children was high. Compared to the incidence of city children, the results of the statistical analysis showed a significant level ($P \leq 0.05$), and the results of the statistical analysis showed a significant increase at the level of significance ($P \leq 0.05$) in the concentration of interleukin-6 in patient samples compared to healthy subjects, and a significant difference occurred between patients and control In the concentration of interleukin 11, while interleukin 15 did not differ significantly from the control group, while there was a significant difference in the concentration of the hormones ghrelin and cholecystokinin between patients and control

Keywords: *Giardia lamblia* , Ghrelin,Cholecystokinin, Interleukins, Digestive system

Intrudaction

Giardia lamblia is a living anaerobic intestinal parasite that infects people of all ages. It enters the gastrointestinal tract through the mouth with water or food contaminated with parasite cysts to cause severe greasy diarrhea called Giardiasis. The parasite is a flagellated and eukaryotic microorganism. It was first described. Once by the Dutch scientist Antonie Van Leeuwenhoek in 1681 when he examined his feces under a microscope (1,2)

Giardiasis is one of the main causes of diarrhea worldwide and among all age groups, as it affects approximately 285 million people annually. *Giardia lamblia* parasite, which can be called *Giardia duodenalis* or *Giardia intestinalis*, is the pathogen causing this disease (3,4). Giardiasis is a disease that affects humans and animals alike. Therefore, it is considered a common disease (Zoonosis) between humans and animals. The site of infection with this parasite is the small intestine, which negatively affects the ability to absorb food, especially in the jejunum and ileum. After eating, the infectious bags of the parasite and the influence of digestive juices burst. The cyst is an active feeding parasite that has the ability to cause significant damage to the lining of the intestine due to its ability to adhere to the bilobed sucking discs (5,6) The parasite affects the human body and people who suffer from diseases or weakened immunity are more vulnerable to harm, and in some cases the infection is without symptoms. In other cases, clear clinical symptoms appear, represented by severe fatty diarrhea with a foul odor, with flatulence and intestinal colic. In some cases, the parasite may cause irritable bowel syndrome, malabsorption, significant weight loss, especially in children, and thus delay in growth and maturation. (7), and there is a defect in some of the chemical and immunological parameters of the body, as the body's immunity is affected by diseases that affect it, including interleukins, including IL-6, IL-11 and IL-15 (8) and several hormones such as ghrelin and cholecystokinin, which is secreted It is one of the enteroendocrine glands located in the small intestine and is an indicator indicating the presence of fat in the intestine and stimulates the secretion of bile to aid in the digestion and absorption of fat (9), so the current study aimed to assess the concentration of some immunological indicators such as interleukin 6, interleukin 11

and interleukin 15, and to evaluate the concentration of some Hormones in children with giardiasis, and an attempt to shed light on the age factor and the region of residence in the change of these indicators when comparing between patient groups and control groups.

MATERIALS AND METHODS

-Collection of Stool samples

(300)stool samples were collected for children with diarrhea cases whose ages do not exceed ten years from the patients of the Samarra General Hospital and some private laboratories from the rural and city residents. The research continued from 1/12/2022 until 1/6/2023. The study included examining samples for male and female children from the countryside and the city. Faecal samples were collected in clean containers, taking into account that they are not mixed with urine or soapy water, and then examined under a microscope to ensure the presence of the parasite, whether in its active or cystic phase.

-Collection of Blood samples

(5ml)was drawn from the blood of patients who had confirmed the presence of the Giardia lamblia parasite in their samples, and the groups consisted of 60 children aged 5years distributed into three groups, namely (20) infected children from the countryside and (20) infected children from the city, and (20) blood samples were taken from healthy children And the same age for comparison with them as a control group.The blood was placed in tubes of (5 ml) sterile capacity for 30 minutes at laboratory temperature, then it was placed in a centrifuge to separate the serum as it was placed at a speed of 2500 revolutions / min for 15 minutes, after which the serum was distributed on 5 Eppendorf tubes and frozen at a temperature of Temperature -20 until the target tests are conducted.

-Immunological and biochemical examinations

1-Interleukin-6: This assay was based on the Direct Sandwich principle to estimate the level of Human Interleukin IL-6 in blood serum by using ELISA and according to the instructions of the work kit numbered SL1001Hu and prepared by SUNLONG company.

2-Interleukin-11: This test was based on the Direct Sandwich principle to estimate the level of Human Interleukin IL-11 in blood serum by using the ELISA and according to the instructions of the work kit numbered SL0969Hu and equipped by SUNLONG company.

3-Interleukin-15: This test was based on the Direct Sandwich principle to estimate the level of Human Interleukin IL-15 in blood serum by using ELISA and according to the instructions of the working kit numbered SL3478Hu and equipped by SUNLONG company.

4-Ghrelin hormone: This test was based on the Direct Sandwich principle to estimate the level of Human Ghrelin in the blood serum by using ELISA and according to the instructions of the work kit numbered SL1947Hu, which was prepared by SUNLONG Company.

5- Cholecystokinin: This test was based on the Direct Sandwich principle to estimate the level of Human cholecystokinin in the blood serum by using ELISA and according to the instructions of the working kit numbered SL2102Hu, which was prepared by SUNLONG Company.

-statistical analysis

The results were statistically analyzed using Dunkin's multiple range test to compare between control and patients infected with Giardia parasite, and the level of significance was calculated when performing the statistical analysis of all data at the probability level ($P \leq 0.05$).

Results and Discussion

Table 1: Number of cases and percentages of infection with Giardia lamblia.

Groups	Number	Percentage
Giardia +	40	13.3 %
Giardia -	260	86.6%
Total	300	100%

Table 2: Percentage of G. lamblia infection by sex.

Groups	Number	Percentage
Male	24	60%
Female	16	40%
Total	40	100%

The results of the study showed that the highest infection rate was in males, as it reached 60% of the total samples, while the percentage in females reached 40% of the total samples, as shown in Table (2). Perhaps the infection rate in males is higher than females because male children are more mobile Playful and exposed to pollutants from public places compared to females, and this result is consistent with what is recommended (10).

Table 3: Examined samples and cases of infection with the Giardia lamblia parasite, according to the location of the patients' residence.

Groups	Number	Percentage
City	14	35%
Village	26	65%
Total	40	100%

While the results of the current study showed that the highest rate of parasite infection was in the rural areas, amounting to 65%, compared to the city population, in which the infection rate reached 35% of the total samples studied, as shown in Table (3). Perhaps this is due to the low economic and social level for the rural population compared to the city population, as well as the pollution of water and food and the collection of sewage water in the form of watercourses inside the villages, and this is consistent with the study (11), and the nature of life in the villages depends heavily on animal husbandry, which helps On the multiplication of insects and their transfer of parasite bags to food, as well as the difficulty of obtaining clean water for drinking,

which leads to their dependence on river water, as well as the use of animal waste as organic fertilizer and lack of awareness of personal hygiene and thus the ease and speed of transmission of some diseases between individuals and this is consistent with what the study concluded. (12).

Table 4: Biochemical parameters studied in the research for the patients and the control.

<i>Parameters</i> \ <i>Groups</i>	Control	Children of City	Children of Village
IL-6	39.46 ± 1.59 B	43.26 ± 1.95 A	43.94 ± 2.85 A
IL-11	54.43 ± 7.34	60.49 ± 1.90	62.49 ± 1.92 B
IL-15	10.57 ± 2.67 A	9.27 ± 2.35 A	9.89 ± 2.50 A
Ghrelin	71.84 ± 14.10 B	85.34 ± 4.79 A	88.24 ± 6.49 A
Cholecystokinin	41.83 ± 7.28 A	29.87 ± 10.55 B	34.45 ± 12.78 A

*Different letters horizontally indicate the existence of significant differences

Interleukins are a group of cytokines that stimulate a series of reactions within white blood cells and make them able to resist disease and congestion, and there are several types of interleukins, including interleukin 6, which plays an important role in the response to inflammation and may be elevated in cases of chronic diseases (13). The parasitic infection may have contributed to strengthening dendritic cells that originate in the bone marrow and which are a source of IgA that is produced in the intestine in response to parasitic infection and thus increase the level of interleukin-6 (14), and the results of the statistical analysis showed a significant increase at the level of significance ($P \leq 0.05$) in the concentration of Interleukin-6 in patient samples from the countryside, which was (43.94 ± 2.85) and the city, which was (43.26 ± 1.95) compared to the control group, which was (39.46 ± 1.59), and this indicates the stimulation of the immune response in patients as a result of parasite infection compared to the control group, and this is consistent with Study (15), infection with a parasite stimulates the production of a large number of neutrophilic white blood cells, which in turn activate interleukin-6 to resist the parasite, while interleukin-11 is a cytokine that regulates the inflammatory and immune response, and is sometimes

used to stimulate the production of blood platelets (16). The results of the statistical analysis showed a significant increase at the level of significance ($P \leq 0.05$) in the concentration of interleukin 11 in the samples of patients of city children, which was (1.90 ± 60.49) , while there was no significant difference in rural children whose concentration of interleukin was (62.49 ± 1.92) from the control group. Which was (54.43 ± 7.34) , in some cases rural children may have the ability to resist diseases more than the ability of city children to do so, which may be due to the nature of their nutrition based on healthy vegetables, fresh dairy products and proteins, while interleukin increased significantly compared to control, which indicates the reaction This is consistent with study (17), while the concentration of interleukin-15 did not differ significantly between patients and control as shown in Table (4), and the results of the statistical analysis showed a significant increase at the level of significance ($0.05 \leq P$) in the concentration of the hormone ghrelin in samples Patients from the countryside, which was (88.24 ± 6.49) and the city, which was (85.34 ± 4.79) compared to the control group, which was (71.84 ± 14.10) , perhaps the increase in ghrelin is due to anorexia caused by parasite infection, which thus leads to increased production of some anti-inflammatory factors Such as the hormone ghrelin, and thus our study does not agree with the study (18), which showed a significant decrease in the concentration of ghrelin in patients with giardiasis compared to healthy subjects. The results of the statistical analysis showed a significant decrease at the level of significance ($P \leq 0.05$) in the concentration of the hormone cholecystinin in the samples of patients of city children, which was (29.87 ± 10.55) , while it did not differ significantly from the rural children whose concentration of the hormone was (34.45 ± 12.78) from the control group. Which was $(41.83 \pm 7.28 A)$, that the cholecystinin hormone is a peptide hormone responsible for activating and digesting fats and protein produced from the first part of the small intestine in response to the presence of partial digestion of food in the duodenum helps to contract the gallbladder and thus the secretion of bile into the intestine and causes the release of digestive enzymes suppresses the feeling Starvation occurs in its center in the brain, and it acts as a neurotransmitter. Its concentration may be low in patients, due to the occurrence of intestinal disorders and epithelial epithelial lining of the intestine. This is consistent with (20, 19).

conclusions

We conclude from the study that infection with intestinal parasites such as Giardia parasite has effects on the immune and inflammatory response and the activation of the role of intestinal hormones.

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