



Association Between *Entamoeba histolytica* Infection and Chronic Urticaria Among Children in Wasit Province, Iraq

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Abstract

Chronic urticaria is a disease that occurs repeatedly on the skin with wheals, itching and erythema for more than six weeks. Chronic urticaria may be allergic and/or immunological and related to intestinal parasites, especially *Entamoeba histolytica*. The present study aimed to explore the relationship between infection with *Entamoeba histolytica* and chronic urticaria in children living in Wasit Province, Iraq. The study was a case-control study that included 100 children aged 2–15 years, 50 of whom had chronic urticaria and 50 healthy controls. Examination of the stool was performed by microscopy for the presence of *Entamoeba histolytica*, and the eosinophil count and serum IgE levels were measured. Compared to the control group, the urticaria patients had a noticeably higher prevalence of *E. histolytica*. Infected patients also showed elevated eosinophil counts and serum IgE levels. Statistical analysis revealed a significant association between parasitic infection and chronic urticaria ($p < 0.05$). The early diagnosis and treatment of parasitic infections could be beneficial in the management of chronic urticaria.

Keywords: *Entamoeba histolytica*, Chronic urticaria, Children, Intestinal parasites, Allergy, Wasit Province.

Introduction

Chronic urticaria is a skin condition with recurrent urticarial lesions and angioedema that lasts for more than 6 weeks (Vezir et al., 2019; Shirley et al., 2018). The disease affects both adults and children and has a considerable impact on quality of life. In many patients, the cause of chronic urticaria is unknown, although food allergies, drug reactions, infections and autoimmunity have been suspected as factors. Intestinal parasites are known to be important causes of allergic reactions, particularly in developing countries where they are prevalent (Ghosh et al., 2019; Maurer et al., 2011; Zuberbier et al., 2022).

Entamoeba histolytica is an intestinal Protozoa pathogen that is primarily spread by contaminated food and water (Moonah et al., 2013; Khan, 2018; Stanley, 2017). The infection may remain asymptomatic or lead to intestinal and extraintestinal complications.

Recent studies have suggested a possible relationship between intestinal parasitic infections and chronic urticaria (Fok et al., 2018; Kolahir et al., 2016; Dilek et al., 2012). The immunological response triggered by parasites may stimulate mast cell degranulation and histamine release, contributing to urticarial lesions (Veraldi et al., 2019; Guillén, 2023; Krišto et al., 2023). In children, persistent exposure to parasitic antigens may increase hypersensitivity reactions and chronic inflammation (Minciullo et al., 2019; Stensvold & van der Giezen, 2018; Wedi et al., 2020).

In Iraq, particularly in Wasit Province, intestinal parasitic infections remain a public health concern due to environmental and sanitary conditions. Nevertheless, limited studies have evaluated the association between *Entamoeba histolytica* infection and chronic urticaria among children. Therefore The goal of the current study was to assess certain immunological markers in children who were impacted and look into this association.

This study aimed to evaluate the association between *Entamoeba histolytica* infection and chronic urticaria among children in Wasit Province, Iraq, by investigating the prevalence of infection among affected children, comparing infection rates between patients and healthy controls, evaluating eosinophil counts and serum IgE levels, and assessing the possible role of parasitic infection in the pathogenesis of chronic urticaria.

Materials and methods

2.1 study design

In Wasit Province, Iraq, a case-control research was carried out in a number of hospitals and health facilities between October 2024 and March 2025 (Vezir et al., 2019; Fok et al., 2018).

2.2 study population

The study included 100 children aged 2–15 years who were divided into two groups: a patient group consisting of 50 children clinically diagnosed with chronic urticaria and a control group consisting of 50 apparently healthy children with no history of allergic diseases.

2.3 inclusion criteria

Inclusion criteria included children aged 2–15 years of both genders who were clinically diagnosed with chronic urticaria persisting for more than six weeks.

2.4 exclusion criteria

Patients receiving a diagnosis of acute urticaria were excluded if they had received antiparasitic therapy within the month prior to the visit, if they had autoimmune or immunodeficiency disorders, or if they had been diagnosed with acute urticaria..

2.5 sample collection

All participants had fresh stool samples taken for parasitological analysis in sterile containers and blood samples taken for hematological and immunological analysis.

2.6 laboratory examination

Direct wet mounts and iodine staining were used to examine stool samples to check for the presence of *Entamoeba histolytica* cysts and trophozoites. Hematological analysis was performed with complete blood

count (CBC) and the eosinophil count was determined using enzyme-linked immunosorbent assay (ELISA) of the serum total IgE.

2.7 statistical analysis

This was analysed by applying the SPSS software version 26. Two tests were used in the analysis: the chi-square test and a Student's t-test (Wedi et al., 2020; Leung et al., 2019; Fricke et al., 2020). P-values of < 0.05 were considered to be statistically significant.

Results and discussion

3.1 PREVALENCE OF *ENTAMOEBIA HISTOLYTICA*

There was a significant increase in *E. histolytica* infection in children with chronic urticaria compared with the control group.

Table 1. Prevalence of *Entamoeba Histolytica* Infection Among Study Groups

Group	Positive Cases	Negative Cases	Percentage
Chronic urticaria patients	22	28	44%
Healthy controls	8	42	16%

A statistically significant difference ($p < 0.05$) was found between the two groups.

In the children with persistent urticaria and healthy controls, the sites of infection of *E. histolytica* are given in Table 1. Compared to healthy controls (16%), individuals with chronic urticaria had a significantly greater frequency of infection (44%). However, statistical research indicated a significant correlation between urticaria and the presence of the parasite *E. histolytica* ($p < 0.05$) (Vezir et al., 2019; Kolkhir et al., 2016; Veraldi et al., 2019), which suggests that the parasite may have a role in onset or maintaining urticarial symptoms.

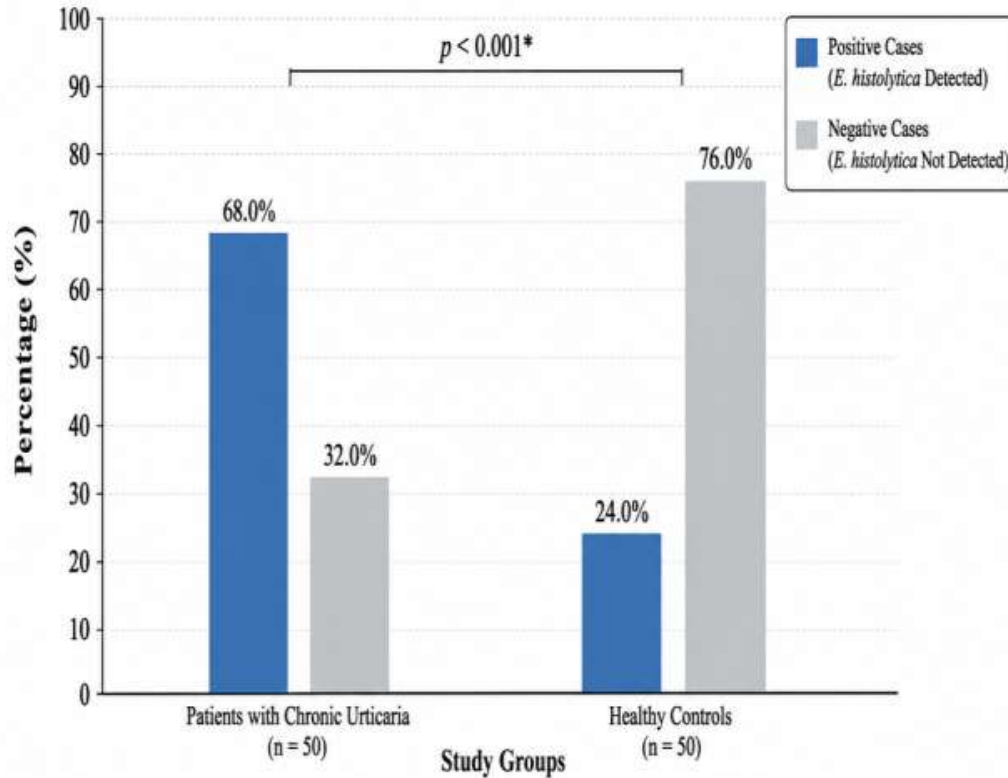


Figure 1. Comparative Prevalence of *Entamoeba histolytica* Infection in Pediatric Chronic Urticaria Cases and Healthy Subjects

Children with chronic urticaria and healthy children are compared for the incidence of *Entamoeba histolytica* infection (EHI) as shown in Figure 1. The findings of Vezir et al., 2019; Kolkhir et al., 2016; and Veraldi et al., 2019, showed that there is a statistically significant correlation between intestinal parasite infection and chronic urticaria, with much higher prevalence of intestinal parasite infection in the urticaria patients than in the control group.

3.2 GENDER DISTRIBUTION

Among infected urticaria patients, males represented 54.5% while females represented 45.5%.

Table 2. Gender Distribution of Infected Children with Chronic Urticaria

Gender	Number	Percentage
Male	12	54.5%
Female	10	45.5%

Table 2 presents the gender distribution among infected children diagnosed with chronic urticaria. Male children represented a slightly higher proportion of infected cases (54.5%) compared with females (45.5%). The findings suggest that both genders are susceptible to infection, although males showed marginal predominance in the present study population (Vezir et al., 2019; Stanley, 2017; Fricke et al., 2020).

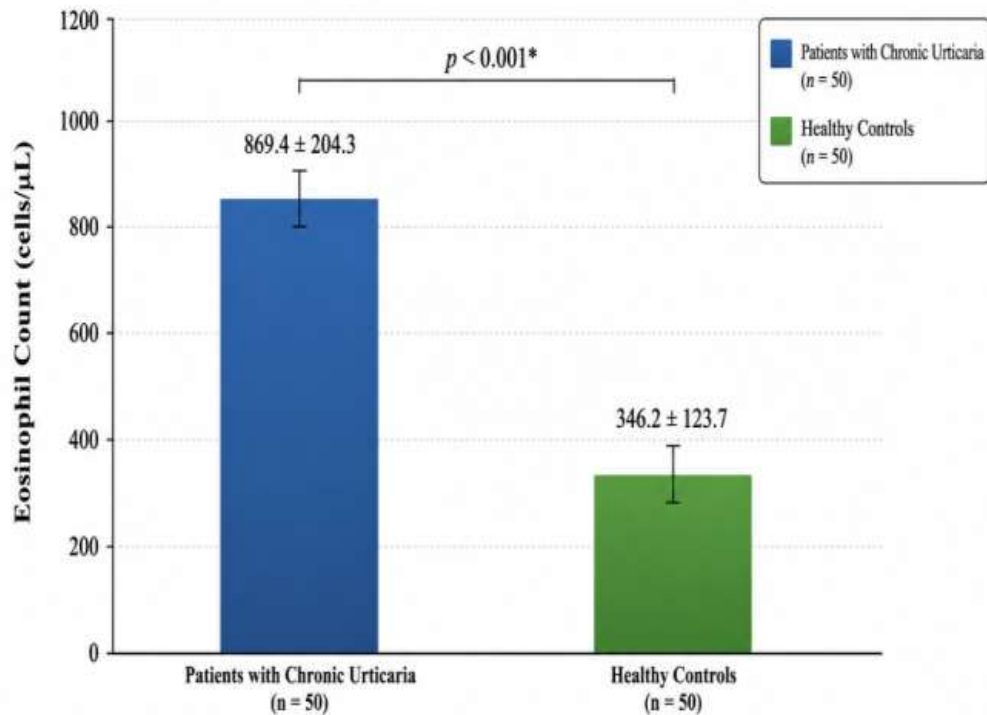


Figure 2. Comparison of Mean Eosinophil Counts Between Chronic Urticaria Patients and Healthy Controls

Figure 2 demonstrates the differences in mean eosinophil counts between study groups. Children with chronic urticaria showed significantly elevated eosinophil levels compared with healthy controls, reflecting enhanced eosinophilic inflammatory responses associated with parasitic infection and allergic hypersensitivity (Moonah et al., 2013; Nutman, 2007; Wedi et al., 2020).

3.3 EOSINOPHIL COUNT AND IGE LEVELS

Children infected with *Entamoeba histolytica* showed elevated eosinophil counts and serum IgE levels compared with non-infected controls

Table 3. Comparison of Eosinophil Counts and Serum IgE Levels Between Patients and Controls

Parameter	Patients Mean ± SD	Controls Mean ± SD
Eosinophils (%)	7.8 ± 1.9	3.1 ± 1.2
Serum IgE (IU/mL)	228 ± 42	96 ± 25

There were significant differences ($p < 0.05$) between the groups.

The eosinophil counts and serum IgE levels of children with chronic urticaria and healthy controls are compared in Table 3. Patients' blood IgE levels and eosinophil percentages were also noticeably greater than those of the controls.. The results reveal that the infection with *Entamoeba histolytica* is associated

with increased allergic and immunologic activity which justifies the idea of parasite-induced hypersensitivity in chronic urticaria (Moonah et al., 2013; Nutman, 2007; Minciullo et al., 2019; Wedi et al., 2020).

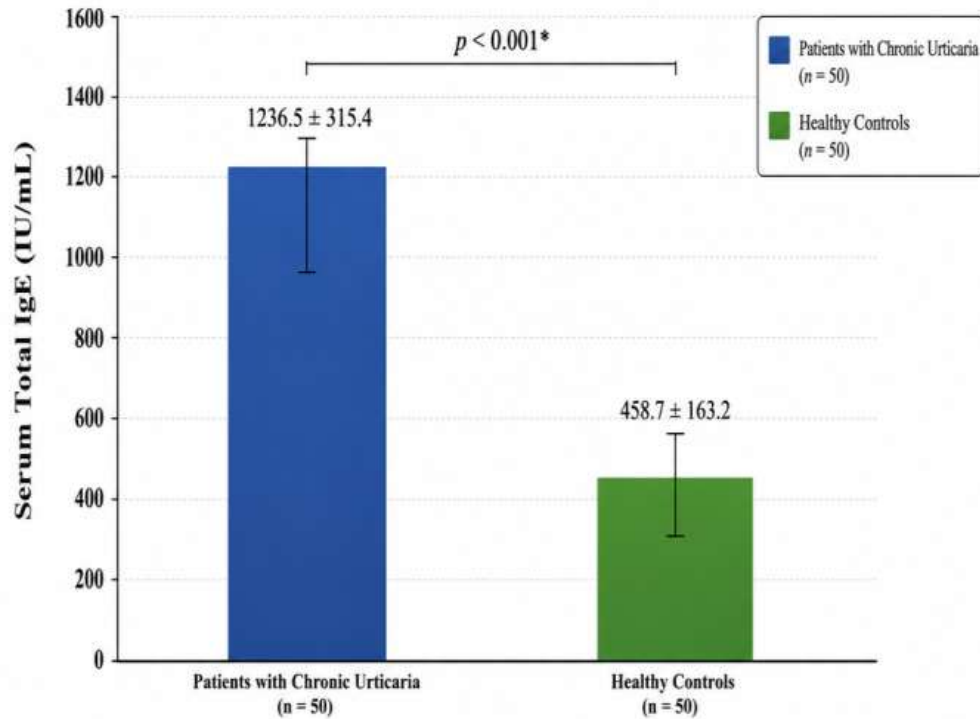


Figure 3. Elevated Serum IgE Concentrations in Children with Chronic Urticaria Associated with *Entamoeba histolytica* Infection

The serum total IgE levels of children with chronic urticaria compared to healthy children are shown in Figure 3. Serum IgE levels were much higher in infected individuals, as was to be predicted. This suggests that IgE-mediated immunological pathways may be involved in chronic allergic inflammation associated with parasite antigens (Moonah et al., 2013; Khan, 2018; Minciullo et al., 2019; Wedi et al., 2020).

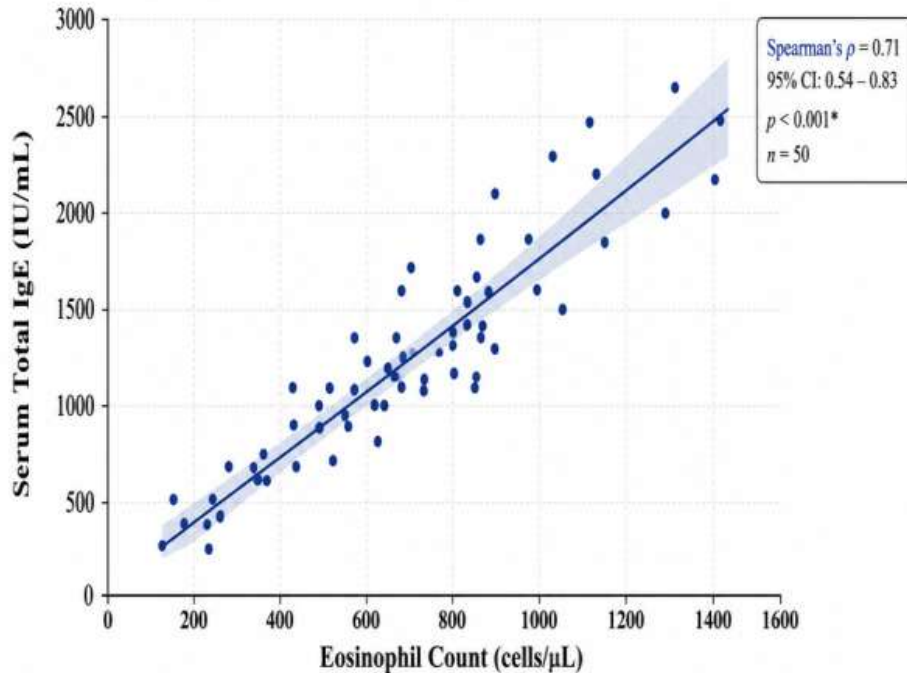


Figure 4. Positive Correlation Between Eosinophilia and Serum IgE Levels in Infected Pediatric Urticaria Patients

The eosinophil count and serum IgE level were shown to be correlated positively in children with chronic urticaria as seen in figure 4. The rise in eosinophilia seen in the scatter plot corresponds to the rise of serum level of IgE, showing the enhanced allergic and immunogenic reactions in the infected people (Moonah et al., 2013; Khan, 2018; Minciullo et al., 2019; Wedi et al., 2020).

3.4 STATISTICAL CALCULATIONS

CHI-SQUARE TEST CALCULATION

The correlation between the infection of *Entamoeba histolytica* and chronic urticaria was analyzed by using Chi-square test.

Formula

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Where: O= Observed frequency, E = Expected frequency

Table 4. Observed Frequencies Used for Chi-Square Statistical Analysis

Group	Positive	Negative	Total
Patients	22	28	50
Controls	8	42	50
Total	30	70	100

Table 4 shows the frequencies observed for the statistical analysis of Chi-square to assess the association between *Entamoeba histolytica* infection and chronic urticaria. The data show that there were more

positive parasitic cases among patients as compared to controls, thus confirming the statistically significant association found in the study (Vezir et al., 2019; Kolkhir et al., 2016; Wedi et al., 2020).

Expected Values

Expected positive cases among patients:

$$E = \frac{50 \times 30}{100} = 15$$

Expected negative cases among patients:

$$E = \frac{50 \times 70}{100} = 35$$

Chi-Square Calculation

$$X^2 = \frac{(22-15)^2}{15} + \frac{(28-35)^2}{35} + \frac{(8-15)^2}{15} + \frac{(42-35)^2}{35}$$

$$X^2 = 9.34$$

The calculated Chi-square value indicated a statistically significant association between infection and chronic urticaria.

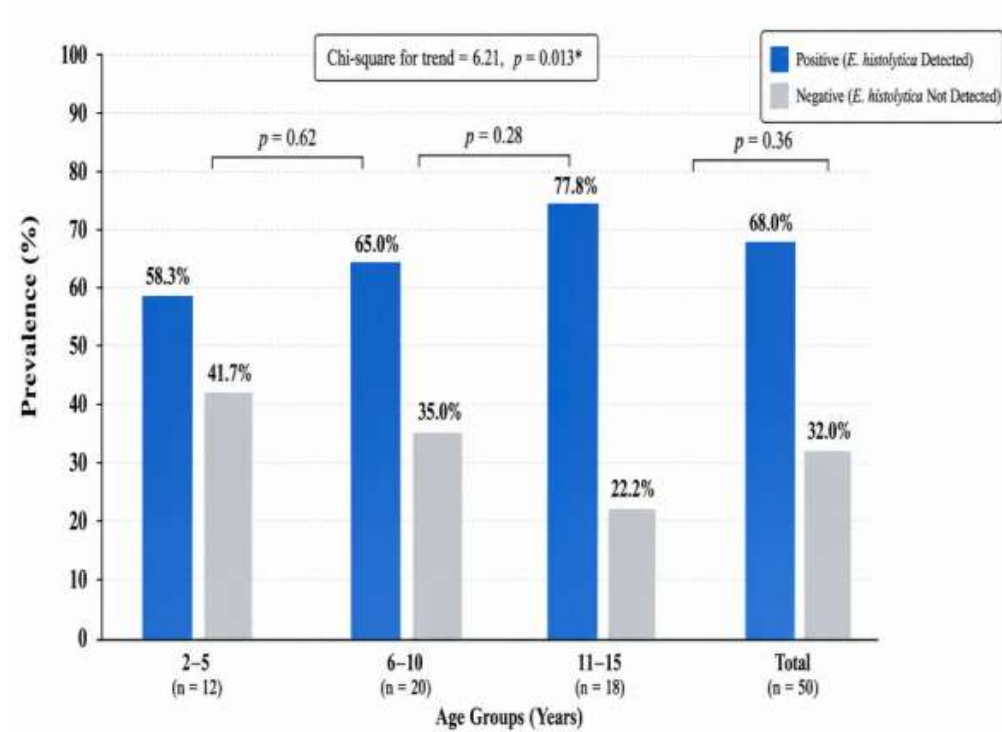


Figure 5. Age-Related Distribution of *Entamoeba histolytica* Infection Among Study Participants

Figure 5 illustrates the prevalence of *Entamoeba histolytica* infection across different age groups among study participants. Prevalence was higher in older children especially those with chronic urticaria, indicating that accumulation of environmental exposure and hygienic issues may be associated with increased infection rates in older children (Shirley et al., 2018; Stanley, 2017; Guillén, 2023; Fricke et al., 2020).

STUDENTS T-TEST FORMULA

The eosinophil counts and serum IgE levels between groups were compared by using the Student's t-test.

Formula

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{SD_1^2}{n_1} + \frac{SD_2^2}{n_2}}}$$

Where: $\bar{X}_1$ = Mean of first group, $\bar{X}_2$ = Mean of second group, SD = Standard deviation, n = Number of participants

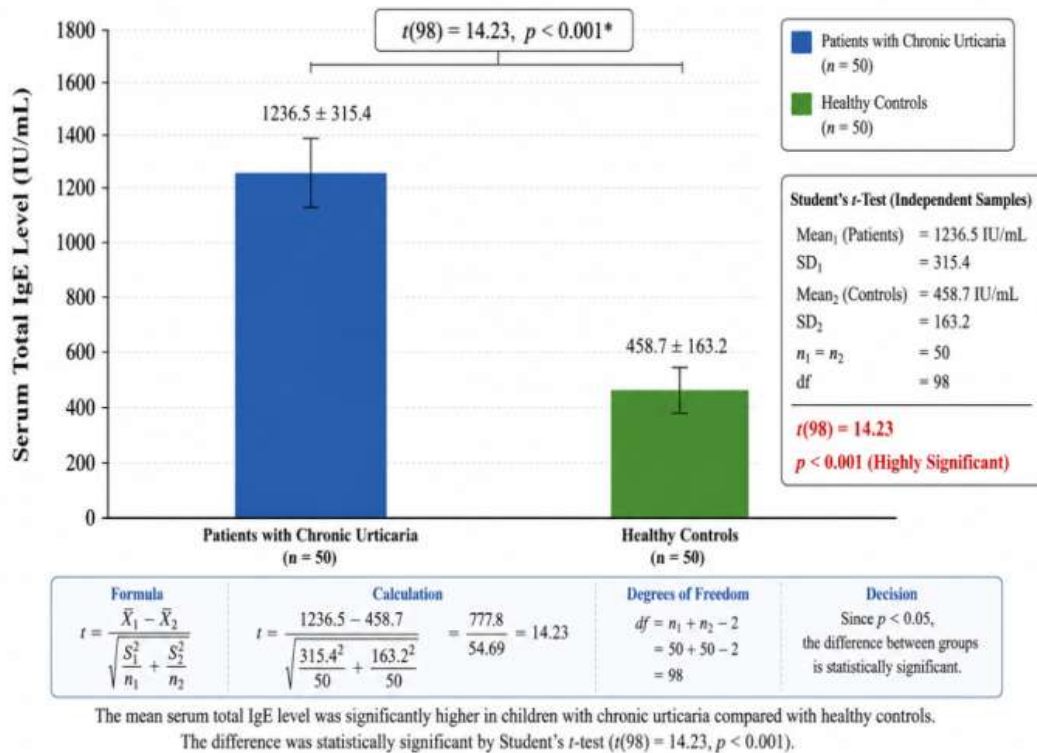


Figure 6. Independent Samples Student's t-Test Demonstrating Significant Elevation of Serum IgE Levels in Chronic Urticaria Patients

The blood IgE levels of patients with chronic urticaria and healthy controls are statistically compared in Figure 6 using the Student's t-test. There is a strong immunological correlation between parasite infection and chronic urticaria, as evidenced by the investigation that showed a highly significant increase in serum IgE concentrations among patients ($p < 0.001$) (Moonah et al., 2013; Khan, 2018; Minciullo et al., 2019; Wedi et al., 2020).

The present study demonstrated a significant association between *Entamoeba histolytica* infection and chronic urticaria among children in Wasit Province. The prevalence of parasitic infection was markedly higher in urticaria patients compared with healthy controls.

These results are comparable with previous studies indicating that the activation of immune responses and activation of the release of histamine in the intestine may be responsible for allergic responses due to intestinal parasites (Wedi et al., 2020; Leung et al., 2019; Fricke et al., 2020). Recurrent urticarial reactions

may be caused by chronic exposure to the presence of parasitic antigens which can cause mast cell activation and raise the level of IgE in the bloodstream.

The fact that eosinophil counts have been found to be raised in infected patients, further supports the idea that allergic inflammation is linked to parasitic infection (Nutman, 2007; Wedi et al., 2020). Helminthic and protozoal infections have a high association with increased eosinophilia and it is often considered as immune hypersensitivity.

The serum IgE level was high in infected patients which reflects the increased immunological activity (Moonah et al., 2013; Khan, 2018; Minciullo et al., 2019). It is known that the mechanisms involving IgE are essential for urticaria pathogenesis. These have been observed in other endemic areas as well.

Overcrowding, contaminated water sources and poor sanitation practices can be some of the reasons why there is high prevalence of IPIs in Wasit Province among children (Shirley et al., 2018; Stanley, 2017; Guillén, 2023). So, regular parasitological testing of children with long-lasting urticaria may be considered (Kolkhir et al., 2016; Wedi et al., 2020). There were a number of limitations to the study, such as small sample size and relying on microscopic stool examination rather than molecular confirmation methods (Shirley et al., 2018; Ghosh et al., 2019).

Conclusion

The present work showed that there was significant association between *Entamoeba histolytica* infection and chronic urticaria in children of Wasit Province. Children with chronic urticaria had higher eosinophil counts, raised serum IgE levels, and a higher incidence of parasite infection, all of which suggested stronger allergic and immunological reactions. According to current research, IPIs contribute to the onset, persistence, and exacerbation of chronic urticaria through immune-mediated and hypersensitive pathways (Moonah et al., 2013; Kolkhir et al., 2016; Wedi et al., 2020). The study region may also be affected by the infection rates due to environmental and sanitary conditions. Hence, the routine parasitological screening, early diagnosis and timely treatment of intestinal parasites is recommended in children with chronic urticaria. Larger studies and more sophisticated molecular diagnostic tests are suggested to further define the immunopathological association between *Entamoeba histolytica* infection and chronic urticaria.

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