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# Effect study level of Interlukin (4, 8, 10) and Heamatological parameter in children infected with Enterobius vermicularis infection

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**Abstract**
**Background:** Enterobius vermicularis, a human-pathogenic intestinal parasite that is a member of the nematode family and causes enterobiasis, is most commonly found in children.
**Objectives:** The aim is to assess the magnitudes of interleukin (IL-4, IL-8, and IL-10) in children afflicted with pinworm.
**Supplies and Procedures:** This research had 65 youngsters in all, 20 of whom were control individuals. Between the ages of one and fifteen, there were forty-nine girls and twenty-six men. The levels of IL-4, IL-8, and IL-10 were assessed by the use of an enzyme-linked immunosorbent assay.
**Results:** demonstrate that the infection rate is greater in females than in men, with the infection percentage in females reaching 60% and the infection percentage in males reaching 40%., However, a recent study revealed that those between the ages of 6 and 10 have the highest rate of pinworm parasite infection. Additionally to demonstrating a rise in (IL-8) concentration levels relative to the control group, the current investigation demonstrated a distinct decline in the majority of blood parameters in individuals with Enterobius vermicularis infection. In contrast to the group that was healthy However, a rise in eosinophilic blood cells was indicated by the data.
**Conclusion:** IL-4, IL-8, and IL-10 levels in the serum were rising in enterobiasis patients.

**Keywords:** Enterobius, vermicularis, IL-4, IL-8, IL-10, heamatological parameter, immunological study, children

## 1. Introduction

The immune system is depending on an assembly of small soluble protein molecules that control many strong immune effector pathways. These mediators, also known as cytokines, are released by many cell subsets and affect the immune system in diverse ways [1]. Type 2 cytokines include interleukin-4 (IL-4), IL-5, IL-6, IL-10, and IL-13; type 1 cytokines that cause widespread inflammation include interferon-γ (IFN-γ) and tumor necrosis factor-β (TNF-β). T cells are the source of these two categories of cytokines. Th1 cells release TNF-β and IFN-γ, while Th2 cells release type 2 cytokines, which are similar to the common helper T-cell subsets from which these cytokines are formed. Th1 and Th2 cells generate different cytokines. Th1 cells create IFN-γ, which directly downregulates Th2 cells, whereas Th2 cells produce IL-4, which indirectly limits Th1 cell proliferation. Thus, it is possible to artificially encourage a Th1 response by using exogenous IFN-γ or anti-IL-4 neutralizing antibodies [2].

The nematode parasite Enterobius vermicularis, sometimes known as pinworm, is the cause of human enterobiasis, or pinworm illness. Over 1 billion individuals are thought to be afflicted with enterobiasis, which is a common disease that occurs in both temperate and tropical parts of the world. [1, 2]. Infection is frequent in families or groups and has a high prevalence in young children, especially in congested living situations with inadequate personal hygiene. According to a recent survey done throughout the island of Sri Lanka, 22% of kids in Grades 1–23 had enterobiasis [3]. People with the infection may show no symptoms at all or develop perianal pruritus (and/or vulvovaginitis in females), which can cause enuresis, sleeplessness, restlessness, and irritability as well as secondary skin infections from scratching [2, 4-6].

Additionally, it can occasionally result in appendicitis, vomiting, and stomach pain [7]. Enterobiasis is difficult to manage despite the availability of effective drugs because to autoinfection, reinfection, partial recovery of affected individuals, and high transmissibility [4].

Life cycle of Enterobius vermicularis is simple4. Gravid female worms go to the perianal area at night in order to deposit their eggs on the perianal skin. Infected individuals' proximal colons are home to adult worms. Extensive pruritus will be triggered by the worms' migration-related local irritation and their sticky eggs. Eggs can be transferred to fingers and dispersed into the surrounding environment more easily if the perianal area is scratched. After oviposition, these eggs become infectious within six hours. They can be spread by eating (or inhaling airborne eggs that are then consumed), either straight from contaminated hands or via objects that have been in contact with an infected individual, such as beds and cutlery [5, 28]. The unique eggs of E. vermicularis found in sticky perianal swabs are examined under a microscope to identify enterobiasis. Perianal swabs must be taken in the morning before the perianal area is cleaned, as egg deposition occurs at night. Furthermore, egg deposition differs, thus before ruling out infection, a sample must be taken on subsequent days [6]. In addition, Microscopical analysis is a time-consuming and specialized process for identifying eggs. As a result, conducting demographic surveys or screening big populations may be laborious and needs much planning. Therefore, the most helpful diagnostic technique for pinworm infection control would be one that is simple to use and that is just as sensitive and specific as microscopy for the detection of enterobiasis. In order to discover the antigens of E. vermicularis eggs that might be helpful as diagnostic targets for detection in infected persons, this study set out to describe the antigens of these eggs. [7, 29].

## 2.2 Materials and Methods

### 2.2.1 Research period and sample

The study was conducted from April 2022 to March 2023. Twenty controls, consisting of 26 boys and 39 girls, ages ranging from 1 to 15 years, made up the total of 65 children. For kids that come to the Al-Zahraa Hospital in the Governorate of Najaf When the mothers of the study's participating children were interviewed, they each filled out a special questionnaire form.

### 2.2.2 Cellophane tape sample collection and examination

The specimens were obtained by repeatedly applying the tape's adhesive side to the children's perianal and anal regions. Next, the tape was put on the glass slide with the label, put into a clean, sterile nylon envelope, and sealed tightly. This practice was employed at night or early in the morning, with the help of the children's mothers, before peeing, bathing, or defecating [8]. This procedure was carried out with the mothers of the children before they had a bath, went to the bathroom, or defecated in the early hours of the morning. A light microscope was used to analyze the collected materials.

### 2.2.3 Blood sample collection and examination

Three venous blood samples were taken from 65 children: 20 were in the healthy group (not infected) and 65 were infected (group with enterobiasis). Samples were collected at the Al-Zahra Teaching Hospital in the Governorate of Najaf. After allowing the blood sample to clot for 15 to 20 minutes at room temperature, the serum was extracted by centrifuging it for 10 minutes at 3000 rpm in a gel tube. To avoid freezing and thawing the samples too frequently, which might compromise the quality of the data, the acquired serum was divided into many portions for various studies and placed in 200 l Eppendorf tubes. All sera were kept at 200 °C until the immunological testing was finished.

### 2.2.4 Analysis of Immunological Parameters

Using ELISA, peripheral blood samples from 20 healthy volunteers and the patients were examined for IL-4, IL-8, and IL-10. ELISA kits for humans were utilized to measure the concentrations of IL-4, IL-8, and IL-10 in serum. Analysis was done on the correlation between the cytokine concentration and the parasite species or clinical symptoms. [9, 11].

### 2.2.5 Data entry and statistical analysis

Using the Statistical Program for Social Sciences (SPSS) version 22.0, a newly devised coding approach was used to code the acquired data. The chi-square test was employed to investigate and assess the relationship in between the two elements in this investigation. To describe the counting of numbers and percentages of various variables, frequency analysis was employed. The t-test was used to compare the variations in serum parameters between the two groups. In statistical analysis, $p<0.05$ served as the threshold for significance [9].

## 3 Results

### 3.1 Distribution Patients Infected according to gender

The results of the current study, Table (1) illustrates that the infection rate is greater in females than in males, with females having an infection percentage of 60% and men having an infection percentage of 40%.

**Table 1:** Distribution Patients Infected with Enterobius vermicularis according to gender

| Gender | No. of positive sample | Percentage% | No. of Healthy control |
|---|---|---|---|
| Male | 26 | 40% | 10 |
| Female | 39 | 60% | 10 |
| Total | 65 | 100% | 20 |

### 3.2 Distribution Patients Infected according to age bracket

The results of the current study shown that the age range from 6 to 10 is the one most affected by the pinworm parasite, whilst the age range from 11 to 15 has the lowest prevalence of infection, as shown in Table (2).

**Table 2:** Distribution of Enterobius vermicularis according to age group

| Age group | No. of positive sample | No. of Healthy control |
|---|---|---|
| 1-5 | 22 | **7** |
| 6-10 | 31 | **7** |
| 11-15 | 12 | 6 |
| Total | 65 | 20 |

### 3.3 Effect the *Enterobius* vermicularis infection on interleukins (IL-10, IL-8, and IL-4)

The current study's findings demonstrated an increase in interleukin (IL-4, IL-10) and (IL-8) concentration levels as compared to the control group. where the level of (IL-8) reached (27.80±1.62), where the concentration level reached

(IL-8) 11.31±1.15 (in the control group, while the lowest concentration level was for (IL-10, whose concentration level was (13.81)±3.16) as displayed in table 3.

**Table 3:** In contrast between infected patients with Enterobius vermicularis and healthy control interleukins (IL-4, IL-8 and IL-10) concentration

| Mean ± standard error | | | | |
|---|---|---|---|---|
| Group | NO. | IL-4 (Pg/ml) | IL-8 (Pg/ml) | IL-10 (Pg/ml) |
| Infected patients | 65 | 18.33±2.15 | 27.80±1.62 | 13.81±3.16 |
| Healthy control | 20 | 9.25±1.2 | 11.31±1.15 | 10.53±2.1 |
| LSD | | 2.7 | 5.1 | 1.4 |

### 3.4 Effect the *Enterobius* vermicularis infection on blood parameters

The present study's findings demonstrated a discernible decline in the majority of blood parameters in individuals harboring Enterobius vermicularis infection. In contrast to the group that was healthy The findings, however, revealed that individuals with Enterobius vermicularis infection had more eosinophilic blood cells than the control group. Table (4):

**Table 4:** Comparative between hematological parameters in infected and Non – infected children with *Enterobius vermicularis.*

| Hematological parameters | Infected children M±SD | Non-infected children M±SD |
|---|---|---|
| RBCs (X106/mm$^3$) | 3.39±0.38* | 5.61±0.44* |
| Hb (g/dl) | 9.98±1.9* | 14.02±0.77* |
| PCV (%) | 40.02±2.89* | 39.69±2.38* |
| PLT (X10 $^3$/mm$^3$) | 395.33±140.29* | 229.88±64.13* |
| MCV (FL) | 73.59±7.97 | 86.02±4.07 |
| MCH (pg.) | 23.14±2.78 | 29.82±1.5 |
| MCHC (g/dl) | 39.18±2.27 | 31.84±1.47 |
| WBCs (cells/mm$^2$) | 13.11±5.05* | 7.35±1.69* |
| Neutrophils (%) | 63.71±19.13* | 44.08±9.22* |
| Basophils (%) | 1±0.24* | 0.59±0.36* |
| Eosinophils (%) | 5.01±3.33* | 2.21±1.48* |
| Lymphocytes (%) | 36.57±12.29 | 32.32±4.62 |
| Monocytes (%) | 5.13±3.77 | 5.31±1.08 |

## 4 Discussion

The most significant intestine harmful parasite, particularly in children, is still this nematode. This pinworm is spread by eating infected eggs that are directly transferred from mouth to mouth by fingers [10, 12]. The perianal itch (pruritis ani), which is usually caused by nail biting, poor hygiene, or insufficient hand washing, makes this simpler. The presence of pinworm eggs in the perianal folds causes it. [13-14]. The latest study's findings indicate that women are more likely than males to become infected, with women having a 60% infection rate compared to 40% for men. Although this difference was not statistically significant, the prevalence of E. vermicularis and sex in the current study indicated that female children were more likely to contract the infection. These figures corroborate the findings of additional research carried out in Mosul City and the Baghdad district of Al-Mahmoudyia, which indicated that helminth infections were more common in female children [15, 25]. As observed in Basrah and Egypt, other research found that the helminth was more common in male youngsters as opposed to the current study [26, 27].

According to the current study's findings, the age range of 6 to 10 is the most affected by the pinworm parasite. We evaluated the incidence of pinworm infection in students from the first to the fifteenth grades. Consistent with other research findings, the present study's analysis showed that children over five had a significantly higher likelihood of having pinworm infection than younger children under five [15, 19, 17]. This could be explained by the fact that play activity programs designed for children over five differ slightly from those designed for children under five, with the former emphasizing outside play instead of sleep. As such, they are more likely to play in the dirt and have more regular physical contact with their friends than younger children, which raises the possibility that they will become ill with pinworm disease. These differences in prevalence may be caused by the fact that young children bite their fingers with teeth, share beds, and put their fingers in their mouths (1, 15, 16), all of which raise the possibility of infection by direct contact.

The current study's results, which demonstrated an increase in IL-8 concentration level relative to the control group and interleukin (IL-4, IL-10), corroborate the notion that children infected with intestinal helminth infections had higher levels of IL-8 than children without intestinal helminth infections. Myeloid and lymphoid cells of various types release the anti-inflammatory cytokine IL-8, which controls the inflammatory process. A number of IL-8-producing cell types become active during infection, which inhibits the function of Th1 cells, natural killer cells, and macrophages. The down-modulatory factor IL-8 induces a modified Th2-cell phenotype in allergy-related disorders. The higher IL-8 levels in preschoolers and students are consistent with with research conducted by Sanchez *et al.* [18, 20, 23].

The present study's findings demonstrated a discernible decline in the majority of blood parameters in individuals harboring Enterobius vermicularis infection. In contrast to the group that was healthy The present study discovered a connection between enterobiasis and anemia. Most children get anemia as a result of this parasite. Hemoglobin concentration was significantly decreased in children with enterobiasis. The parasitism effect is most likely the cause of the innate connection between E. Coli infection and anemia. It is anticipated that intestinal parasites will reduce food intake and absorption in addition to causing persistent diarrhea and enteropathy [26, 21, 22]. This discovery corroborates the findings of research conducted by Dohan and Al-Ward [30, 31] and Qadir and Aziz [27].

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