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Evaluation of Serum Immunoglobulins IgM, IgG, Interleukins IL-33 and IL-37 in Women Infected with *Trichomonas Vaginalis*

Noor Ghassan Kazem Jaber Al-Dulaimi*, Maha Falih Nazzal and Ibtisam Badday Hassan
College of education for pure sciences, Department of biology, University of Diyala, Baqubah, Iraq

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ABSTRACT

During infection with *Trichomonas vaginalis*, immune cells, antimicrobial peptides, cytokines, chemokines, and adaptive immunity evolve in the reproductive tract, and a pro-inflammatory response is generated to eliminate this invading extracellular pathogen.

This case-control study aimed to evaluate some immunologic parameters (IgM, IgG,Il-33, IL-37) in women infected with *Trichomonas vaginalis* parasite.

The current study was conducted on (45) women with Trichomoniasis who visited Al-Batoul Teaching Hospital and private gynecology clinics in Baqubah, Diyala Governorate, during the period from November 2023 to July 2024. The study also included (45) healthy uninfected women as a control group. Estimation the levels of immunoglobulins IgM, IgG and interleukins IL-33, IL-37 were carried out using the Enzyme linked immuno sorbent assay technique (ELISA).

There was a highly significant increase in the (mean±SD) of IgM and IgG in women with Trichomoniasis (2.09±0.77) and (14.32±6.67) respectively compared to the mean ±SD of these antibodies in healthy women (0.07±0.12) and (0.23±0.13) respectively (p=0.00). The results showed that there was a highly significant increase in the mean ±SD of IL-33 and IL-37 in women with trichomoniasis (13.85±2.41) and (14.29±1.85) respectively compared to the mean±SD of these interleukins in healthy women (0.56±0.73) and (7.35±1.19) respectively (p=0.00).

It can be concluded from the current study that there was a highly significant increase in the levels of IgM, IgG, IL-33 and IL-37 in women infected with trichomoniasis.

Corresponding Author:

* Noor Ghassan Kazem Jaber Al-Dulaimi
University of Diyala -College of education for pure sciences-Department of biology
Diyala / Baqubah
Email: xyz_author@gmail.com

1- INTRODUCTION

Trichomonas vaginalis is the causative agent of trichomoniasis, a common human urogenital infection. It is the most common, treatable, non-viral sexually transmitted disease (STI) worldwide, with an estimated 156 million cases among men and women aged 15–49 [1].

Trichomonas vaginalis is endemic in Iraq, where several epidemiological studies over the past decade in several Iraqi cities, such as Baghdad, Kufa, Najaf, and Mosul, have confirmed positive diagnosis of infection among women attending government hospitals [2,3]. Although infection rates are almost identical in men and women, prevalence and symptoms are significantly higher in women (99 million cases in women compared to 11.5 million cases in men) [1].

The most commonly used diagnostic methods include microscopic examination of vaginal wet swabs, which is inexpensive but insensitive. Experienced technicians can easily diagnose only 48–68% of samples taken from symptomatic women. Cultures of vaginal swabs on culture media increase the accuracy of diagnosis but take 3–5 days[4]. Various techniques have been used to identify and detect *Trichomonas vaginalis*, including monoclonal antibody binding antigenic profiling and real-time polymerase chain reaction (RT-PCR) [5].

The host-parasite interaction in trichomoniasis is complex. It depends on the host immune response to the trichomoniasis and the virulence factors of the parasite. This leads to pathological consequences through the escape of the parasite from the permanent physical barrier of the female reproductive tract after effective cell adhesion of the parasite to epithelial cells and successful destruction and phagocytosis of target cells, resulting in chronic infection. The active or passive immune response of T cells of the infected host plays a vital role in controlling or exacerbating trichomoniasis [6].

Cytokines, including interleukins, are a large group of proteins, including peptides and glycoproteins, secreted by specific cells in the immune system. They are produced throughout the body by various immune cells. The high levels of leukocyte chemoattractant protein (LCP) in symptomatic individuals with *Trichomonas vaginalis* are due to the host response to parasite antigens and the activation of LCP-producing cells, namely mast cells. Mast cells are known to rapidly secrete potent inflammatory mediators, such as chemokines and histamines, in response to *Trichomonas vaginalis* infection [7].

1. Materials and methods

The current study was conducted on women with Trichomoniasis after confirming their diagnosis by examining their vaginal swabs. The infected women visited Al-Batoul Teaching Hospital and private gynecology clinics in Baqubah, Diyala Governorate, during the period from November 2023 to July 2024. Pregnant women were excluded from this study.

In this study, 5 ml venous blood was taken and put in gel-containing tubes and left at room temperature (20-25°C) for 10 to 15 minutes to allow the blood to clot, then centrifuged for 15 minutes at 3,000 rpm to obtain serum, which was placed in Eppendorf tubes and stored at -20°C until later serum IgM , IgG, IL-33 interleukin IL-37 were measured using ELISA.

2.1 Statistical analysis

In this study, the Statistical Package for Social Sciences (SPSS-25) was used for statistical analysis. The data were normally distributed and expressed as (mean ± SD). An independent sample t-test and one-way analysis of variance (ANOVA) were used to compare between groups.

2. RESULTS

The current study included (90) women divided into two groups, the first group included (45) patients infected with *Trichomonas vaginalis*, their ages ranged between (19-43) years with an average of (32) years. The second group included the control group or uninfected women (healthy) with (45) women whose ages ranged between (34-43) years with average of (34) years. The results showed that the highest percentage of Trichomonas vaginalis infections (14%) occurred among women in the age group (≤25) years and the lowest percentage of infections (7%) occurred among women in the age group (26-30) years, as shown in table (1).

Table 1. Distribution of study groups according to age

Cases	≤25 years	26-30 years		31-35 years	36-40 years	≥41 years
Infected	14%	7%		10%	10%	9%
Control	10%	6%		8%	11%	15%
Total	24%	13%		18%	21%	24%

The results in table (2) showed that there was a highly significant increase in the mean and standard deviation of IgM antibody in women with Trichomoniasis (2.09±0.77) compared to the mean and standard deviation of this antibody in healthy women (0.07±0.12) (p=0.00). The results in table (2) also showed a highly significant increase in the mean and standard deviation of IgG antibody in women with Trichomoniasis (14.32±6.67) compared to the mean and standard deviation of this antibody in the control group (0.23±0.13) (p=0.00).

Table 2. Mean and SD of immunoglobulins (IgM and IgG) among the study groups

Antibody type	mean±SD Infected women	mean±SD Controls	P value
IgM	(2.09±0.77)	(0.07±0.12)	0.00**
IgG	(14.32±6.67)	(0.13±0.23)	0.00**
**There are significant differences at a significance level of 0.01			

Data in table (3) revealed that there was a highly significant increase in the mean±SD of interlukin-33 and interleukin-37 in women infected with trichomoniasis (13.85±2.41) and (14.29±1.85) respectively compared to the mean±SD of these interleukins in healthy controls (0.56±0.73) and (7.35±1.19) respectively (p=0.00).

Table 3. Mean and SD of interlukins (IL-33 and IL-37) among the study groups

Interleukin	mean±SD Infected women	mean±SD Controls	P value
IL-33	(13.85±2.41)	(0.56±0.73)	
IL-37	(14.29±1.85)	(7.35±1.19)	0.00**
**There are significant differences at a significance level of 0.01			

3. DISCUSSION

The current study was conducted on (45) women with Trichomoniasis and (45) healthy uninfected women as a control group. Our results showed that the higher infection rate occurred in the age group (≤25) years and the lowest percentage of infections occurred among women in the age group (26-30) years, and this result agreed with Sutton et al [8] who showed a higher rate of infection among young women with the age of (18–25) years and also agreed with Tine et al.'s study [9] who showed that women under 25 were the most affected. However, our results didn't agree with Younis and Elamami who observed that trichomoniasis was higher in the age group more than 40 years [10].

As for the emergence of high rates of infection in young women (≤25) years, it may be attributed to sexual activity and the high concentration of sex hormones, in addition to the increase in glycogen, which causes the pH to shift to

the base. Also, the high rates of infection in middle-aged women may have been due to previous infections that were cured and the antibodies to the parasite remained [11].

With regard to immunoglobulins (IgM and IgG), our results revealed a highly significant increase in their levels in women infected with *Trichomonas vaginalis*. These results were in agreement with the study of [11], who confirmed the increased levels of IgM and IgG in women infected with trichomniasis. Moreover, in the last 40 years the presence of anti-T. vaginalis antibodies (IgA, IgM, and IgG, and its subclasses) in serum and cervicovaginal secretions has been demonstrated by radioimmunoassay, ELISA, and immunofluorescence methods [12].

Immune variables play an important role in maintaining human health. Infection with some parasites and changes in these variables can lead to a variety of symptoms, leading to increased production of immune cells such as B and T lymphocytes. This also leads to increased levels of antibodies such as IgG and IgM [13].

The understanding of the mechanisms involved in the interaction between T. vaginalis and the host immune response may contribute to the development of new targets to fight the parasite [14].

IgM is the first type of antibody secreted during the primary immune response, and therefore its presence in plasma is considered a diagnostic method. It indicates the presence of a recent infection, and due to the multiple binding sites for antigens, it has a high ability to coagulate antigens [15].

IgG is the most abundant type of antibody in plasma, as it represents 80-70% of all antibodies. It is characterized by its ease and speed of movement in cells because it is smaller in size and more abundant. It protects various types of disease causes such as bacteria, viruses, fungi, and toxins [16].

IL-33 is a polymorphic cytokine of the IL-1 family that is gaining significant attention due to its important role in chronic inflammatory and autoimmune diseases. IL33 is also associated with injuries, trauma, autoimmune diseases, respiratory diseases, gastrointestinal diseases, central nervous system diseases, cardiovascular diseases, and other diseases. Therefore, understanding the key factors that influence IL-33 signaling and its potential role in immune and inflammatory diseases is crucial for scientific studies and clinical treatment [17].

Among the cytokines is IL-37 and its immunological role in viral, bacterial and fungal infections has received increasing attention [18].

Functionally, IL-37 is an anti-inflammatory cytokine that has inhibitory effects on inflammatory responses by affecting the production of pro-inflammatory cytokines [19]. Because of this immune function, IL-37 has been indicated to play a key role in the pathogenesis of a variety of inflammatory and autoimmune diseases, and in fact, dysregulated expression of IL-37 has been reported under these conditions. Besides, the anti-viral, anti-bacterial and anti-fungal properties of IL-37 have also been recognized [18].

4. CONCLUSION

It can be concluded from the current study the highest percentage of *Trichomonas vaginalis* infections occurred among women in the age group (≤25) years and the lowest percentage of infections occurred among women in the age group (26-30) years. There was a highly significant increase in the levels of IgM, IgG, IL-33 and IL-37 in women infected with trichomoniasis in comparison with the healthy uninfected women.

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