

Serum concentrations of CD4+ and CD8+ in patients infected with scabies caused by *Sarcoptes scabiei*

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ABSTRACT

Background: Scabies is one of the most important epidemic diseases in developing countries infecting males and females especially in rural areas. Therefore, this study aimed to evaluate the cellular immune response in patients infected with scabies caused by *Sarcoptes scabiei* depended on the measurement serum concentration of T-helper cell (CD4+) and T-cytotoxic cell (CD8+). **Materials and Methods:** Sixty patients (30 male and 30 female) infected with chronic scabies were included in this study and 30 healthy individuals were considered as control group. CD4+ and CD8+ levels in serum of patients and healthy individuals were measurement by using ELISA device. **Results:** The results proved that there was a significant increase ($P < 0.05$) in serum concentrations of CD4+ and CD8+ as compared with control group. On the other hand, the results demonstrated that there was a positive correlation between CD4+ and CD8+ ($R_2 = 0.0301$). Serum concentration of CD8+ was higher than CD4+ with significant increase ($P \text{ value} = 0.0001$). **Conclusion:** Human infected with *S. scabiei* lead to induce higher amounts of Th and Tc cells due to the high levels production of CD8+ and CD4+ in serum of patients.

Keywords: Scabies, *Sarcoptes scabiei*, T-helper, T-cytotoxic, CD4+, CD8+.

Introduction

Sarcoptes scabiei is one of the most important causative agents of scabies in worldwide. Scabies is a one of the most prevalent infection in all countries especially in developing countries [1, 2]. Patients infected with chronic scabies suffering from very strong itching due to allergic and inflammatory reactions mounted by the host against the parasite and its product such as eggs [3]. The clinical features in patients infected with scabies were characterized between mild to severe destructive [4]. The immune and inflammatory response features in patients are remaining not fully understood [5]. T-lymphocyte (T-cell) CD4+ T-helper (Th) and CD8+ T-cytotoxic (Tc) have an important role in immune response in scabies due to cytokines secreted such as interferon- γ (INF- γ), tumor necrotic factor- α (TNF- α) and interleukine-2 (IL-2) [6, 7]. T-helper cell secrete IL-13, IL-5

and IL-4 and mediated humoral immunity by inducing antibody production to fight extracellular parasite [8]. T-helper 2 cells are also dominant effector cells in the pathogenesis of IgE-mediated hypersensitivity in scabies and other allergic inflammatory infections [9]. Peripheral blood mononuclear cells isolated from patients infected with scabies secreted increased levels of Th2 cytokines include IL-13, IL-5 and IL-4 but decreased secretion of the Th1 cytokines INF- γ [10]. Cellular immune response in patients infected with scabies is still unclear. In Iraq, there are no studies focusing on the rule of T-cells (Th and Tc) in patients infected with scabies. Therefore, in this study we aimed to evaluate the cellular immune response in patient infected with scabies caused by *S. scabiei* due to the measurement serum concentration of CD4+ and CD8+ in these patients.

Materials and Methods

Patients: Sixty patients (30 male and 30 Female, ages range 18 to 40 years old) infected with chronic scabies cause by *Sarcoptes scabiei* (duration of infection 6 weeks) were included in this study, admitted to Al-Najaf general hospital in Al-Najaf City, Iraq, during the period from March to December 2017. Thirty healthy persons (15 Males and 15 females, ages range 18 to 40 years old), included in the current study were considered as the control group.

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Detection of patients infected with chronic scabies cause by *Sarcoptes scabiei*:

Sarcoptes scabiei was diagnosed in patients according to physical exam and inspecting the affected area of skin or removing a *S. scabiei* from the skin with a needle, taking a scrape off a small section of skin to obtain a tissue sample and examining this sample under a microscope to confirm the presence of scabies mites or their eggs [11].

Serum collection: Two ml of serum were collected from patients and healthy individuals as follow: 5 ml of blood were collected from two groups and centrifugation (Memmert Company, Germany) was done at 3000rpm for 5min. Serum was collected in sterile tube and stored at -15C until use [2].

Measurement of human CD4+ and CD8+: Human CD4 and CD8 kits were provided from Elabscience Company, Bulgaria. CD4+ and CD8+ levels in serum of patients and healthy individuals were measurement by using ELISA device (Human Reader Company, Germany) according to instructions of the manufacturer.

Statistical Analysis: T-test was used in the current study for comparison between the samples by using SPSS V.10 computer software. P value less than 0.05 was considered statistically significant [12, 13].

Results

The results of the current study proved that there was a significant increase (P value= 0.0018) in serum concentration of CD4 in total patients infected with chronic scabies (1744.3 ± 199.13 pg/ml) as compared with control (841.80 ± 47.452 pg/ml) (Figure 1). Also, the results demonstrated that there was a significant increase in serum concentration of CD4 in male (1926.8 ± 328.99 pg/ml) and female (1561.9 ± 225.45 pg/ml) infected with chronic scabies as compared with control with P value; 0.0308 and 0.0197, respectively (Figure 2). Serum concentration of CD8 in total patients infected with chronic scabies (4046.2 ± 97.963 pg/ml) was higher than in total control (3464.9 ± 131.25 pg/ml) with high significant increase (P=0.0007) (Figure 3). On the other hand, serum concentration of CD8 in male patients was in high level (4082.6 ± 135.34 pg/ml) as compared with male control (3483.8 ± 191.21 pg/ml) with significant increase (P value= 0.0138). The same serum concentration of CD8 was increased in female patients (4009.7 ± 143.74 pg/ml) as compared with female control (3446.1 ± 186.43 pg/ml) with significant increase (P value= 0.0241) (Figure 4). On the other hand, there was a highly significant increase in serum concentration of CD8+ (4078.7 ± 97.399 pg/ml) in total patients (P value=< 0.0001) as compared with serum concentration of CD4+ (1734.6 ± 192.65 pg/ml) (Figure 5). But there was a positive correlation between CD4+ and CD8+ ($R^2=0.0301$) (Figure 6).

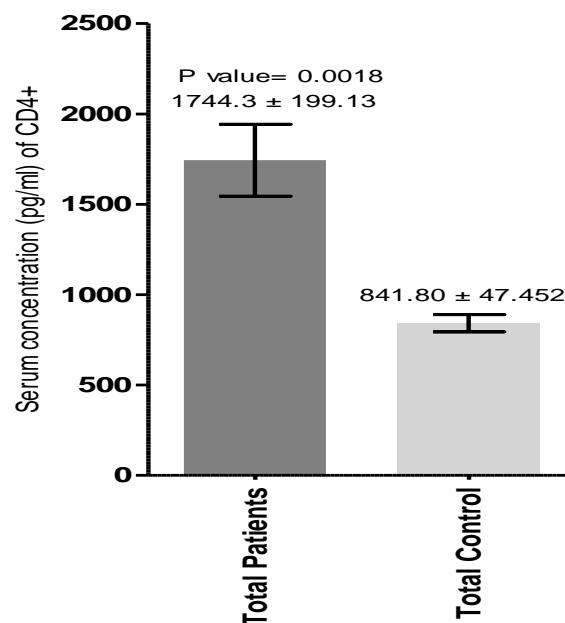


Figure 1: Serum concentration (pg/ml) of CD4+ in total patients infected with scabies

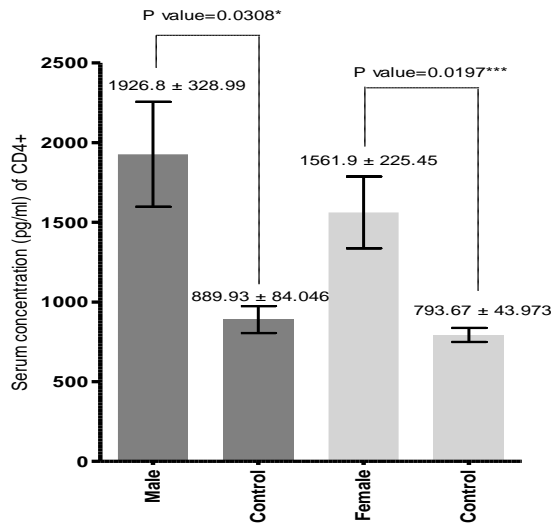


Figure 2: Serum concentration (pg/ml) of CD4+ in male and female infected with scabies

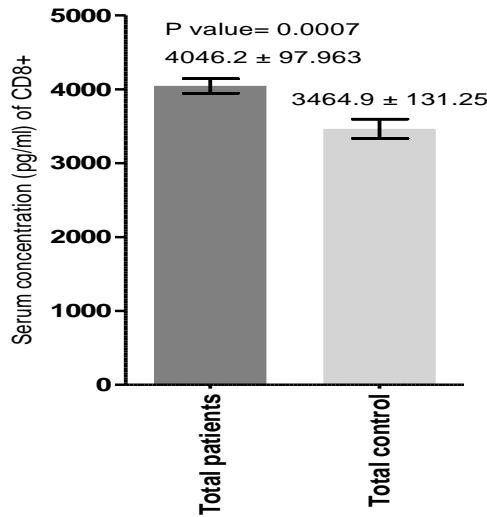


Figure 3: Serum concentration (pg/ml) of CD8+ in total patients infected with scabies

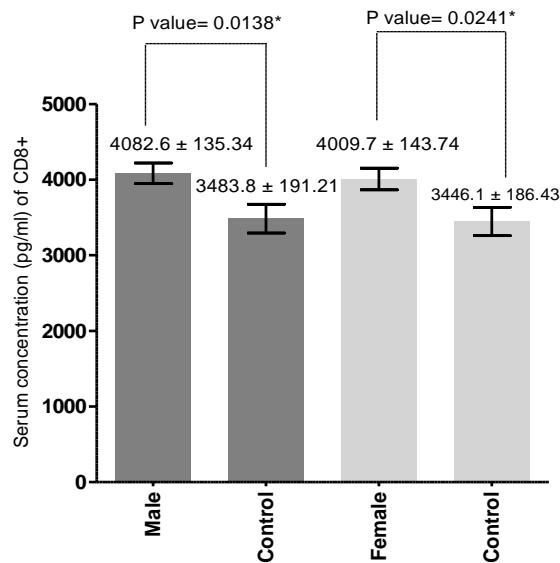


Figure 4: Serum concentration (pg/ml) of CD8+ in male and female infected with scabies

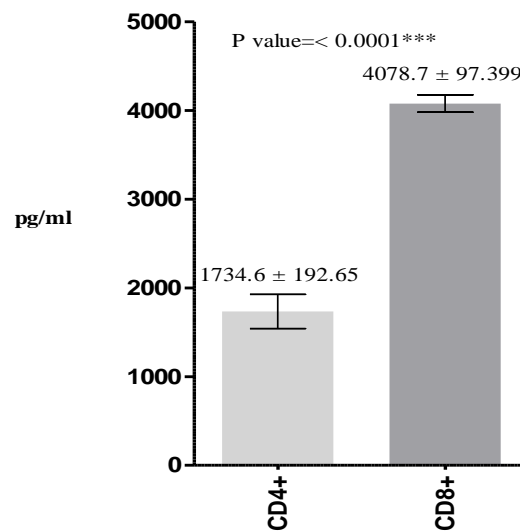


Figure 5: Serum concentration (pg/ml) of CD4+ and CD8+ in total patients infected with scabies

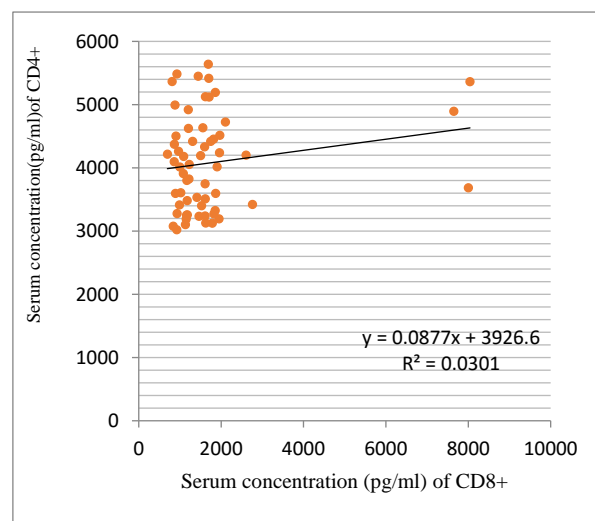


Figure 6: Correlation between serum concentration of CD4+ and CD8+ in patients infected with scabies

Discussion

Scabies is a one of the most important skin infections mainly caused by *Sarcoptes Scabiei*. There are over one hundred million infections all over the world [14]. Cellular immune response in human infected with chronic scabies is still not fully understood. In this study, we aimed to compare between serum concentration of CD4+ and CD8+ in patients infected with scabies caused by *S. Scabiei*. The results proved that there was a high significant increase in CD4+ and CD8+ as compared with control and there was a positive coloration between CD4+ and CD8+. On the other hand, serum concentration of CD8+ was higher than CD4+. T-cells play an important role in cell mediated immune response. CD4+ T-cell has been demonstrated as the most prevalent T-lymphocytes in skin lesions in human infected with scabies [15, 16]. These results are not in agreement with Akdis et al. (1999) [17] that they suggested that the corresponds to inflammatory cells in the skin lesions from patients with scabies have a significantly greater number of infiltrating CD4+ lymphocytes compared with CD8+. While

the results of the current study are in agreement with Walton et al. (2008) [18] and Liu et al. (2014) [19] when they demonstrated that there was an increased number of infiltrating CD8+ T-cell as compared with CD4+ cells according to immune-histology and flow cytometry study. Other studies by Roberts et al (2005) [20] and Walton et al (2008) [18] indicated that the number of T-cell and B-cell in the blood of patients infected with scabies have been within normal ranges. Bovenschen et al (2005) [21] and Walton et al (2010) [10] suggested that the greater number of CD8+ T-cell is due to a selective movement of CD8+ T-cell leading to epidermal hyper proliferation. Therefore, the cytotoxic T-cell is responsible for the imbalance of inflammatory response and may contribute to the failure of the skin immune system to induce an effective response resulting in uncontrolled growth of this mite [22, 23]. Patients infected with *Sarcoptes scabiei* hurt from powerful inflammatory reactions itching and mediated through allergic mounted by the host against the mite and its products, a comprehensive range of clinical symptoms

from acute destructive to minor occurs in scabies but despite the significant worldwide impact of the disease, the inflammatory and immune responses related with the diverse symptoms of this disease remain poorly understood [14]. This increase in serum concentration of CD4 and CD8 may be due to inflammation of skin and produce the gamma interferon (INF- γ) and interleukin-10 (IL-10) in the patients of scabies or may increase the eosinophil in skin of scabies' infection [24, 25]. In skin infection and inflammatory site high numbers of eosinophils are produced and for this reason, the concentration levels of IL-4 and IL-13 increased [26-28].

Conclusions and Future Recommendations

Infection by chronic scabies for 6 weeks caused by *Sarcoptes scabiei* in human leading to inducement of higher amounts of T-cytotoxic cell and T-helper cell due to the high levels production of CD8+ and CD4+ in serum of patients. It is recommended to evaluate other immune cells and other CD markers such as T-lymphocyte cell (CD3+), Granulocyte cell (CD15+) and Monocyte cell (CD14+) to provide complete and clear immune vision against *Sarcoptes scabiei*.

Significant Statements

This study discovered that T-cytotoxic and T-helper cells have an important role in immune response in patients infected with *Sarcoptes scabiei* which was not proved previously. This study will help researchers to discover more details about new mechanisms of immune response in individuals infected with scabies.

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