Journal of Applied Health Sciences and Medicine, 6(6):29–34, 2026. DOI: 10.58614/jahsm666

Journal of Applied Health Sciences and Medicine

ISSN (Online) : 2583-1887

Journal homepage: https://jpub.org/journal-details.php?journal-id=39

Research Article

A Comparative Study of Immune Correlation Among IL-2, IL-17, CD4 and CD8 in Patients Infected with Varicella-Zoster Virus

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Article Info

Keywords: *Varicella Zoster, IL-2, IL17, CD4, CD8.*

Received: *05.05.2026;*
Accepted: *17.06.2026;*
Published: *24.06.2026*

Abstract

Sixty blood samples from varicella zoster (VZV) patients and 29 samples from healthy controls were collected during the period from November 2022 to July, 2023. ELISA technique has been used to measure four immunes: IL-2, IL17, CD4 and CD8. The results proved that a positive correlation was observed between IL-17 and IL-2 levels with a correlation coefficient (R) of (0.768) and a significant P value ≤ 0.05. A negative correlation was found between IL-2 and CD4 with a correlation coefficient (R) of (-0.510). A positive correlation was detected between IL-2 and CD8 levels with a correlation coefficient (R) of (0.487) and a significant P value ≤ 0.05. A negative correlation was identified between IL17 and CD4 with a correlation coefficient (R) of (-0.496). A positive correlation was noted between IL-17 and CD8 levels with a correlation coefficient (R) of (0.447) and a significant P value ≤ 0.05. Additionally, a negative correlation was uncovered between CD4 and CD8 with a correlation coefficient (R) of (-0.577).

1. Introduction

Herpes zoster, commonly referred to as shingles, is caused by the varicella-zoster virus (VZV), which is the same virus responsible for chickenpox. This condition occurs when the dormant virus in the dorsal ganglia or sensory ganglia of the cranial nerve from a previous varicella infection becomes active again [1].

The varicella-zoster virus (VZV), a human herpesvirus, has evolved alongside its host, showcasing impressive pathogenic prowess. To combat both initial and reactivated infections, a combination of innate and adaptive immune reactions is crucial. However, VZV has developed defensive tactics against immune components, bolstering its pathogenic capabilities and ensuring its survival [2].

Chickenpox is a viral infection of the same virus that appears as an itchy rash with blisters and typically, the rash begins on the chest, back, and face before spreading to other areas. Symptoms of chickenpox may include fever, fatigue, sore throat, and headache [3]. These symptoms usually last for five to seven days and in some cases, complications such as pneumonia, encephalitis (encephalitis), and bacterial skin infections can occur and it is important to note that these complications are often more serious in adults than in children [4].

The reactivated infection causes excruciating pain when it appears as unilateral, localized lesions along nerve pathways [5]. The reactivation of a latent varicella infection (shingles), a condition that typically impacts a specific area along a sensory nerve, is triggered by the reawakening of a dormant varicella infection in the dorsal root ganglia and this ailment is more prevalent among older individuals or those with weakened immune systems [6].

Reactivation of the virus leading to shingles remains a mystery, occurring suddenly in individuals of any age group and however, individuals over the age of 60, those who had chickenpox before their first birthday, and individuals with weakened immune systems due to

How To Cite: D.N. Hamzah and M.N. Mezher. A comparative study of Immune Correlation Among IL-2, IL-17, CD4 and CD8 in Patients Infected with Varicella-Zoster Virus. *Journal of Applied Health Sciences and Medicine*, 6(6):29–34, 2026. https://doi.org/10.58614/jahsm666

illnesses or medication are at a higher risk of developing shingles [7]. Furthermore, individuals who have not been vaccinated against the virus or never had chickenpox as children may contract chickenpox through direct contact with the shingles rash [8].

Direct contact with vesicular fluid from active herpes zoster lesions can spread the virus and it is important to cover the lesions and avoid contact with sensitive individuals at home and work until the lesions have crusted over and dried up [9]. In Iraq, insufficient studies have focused on the immune response in patients infected with the varicella-zoster virus. Therefore, this study aims to investigate the correlation four biomarkers IL-2, IL17, CD4 and CD8 to understand the relationship between humoral and systemic immune response in patients infected with varicella zoster.

2. Methods

Patients and control

Sixty blood samples from varicella zoster (VZV) patients and 60 blood samples from healthy controls were collected during the period from November 2022 to July, 2023 at Al-Sadar Medical City in AL-Najaf City, Iraq. All patients have been diagnosed according to physician.

Measurement of biomarkers

ELISA technique has been used to measure four immunes: IL-2, IL17, CD4 and CD8 in patients' blood and healthy individuals.

Statistical analysis

It was performed using (graph-pad-prism), and a mean value and standard error (SE) were calculated for each value. The statistical analysis took into account statistically-significant P values of less than 0.05.

3. Results and Discussion

3.1. Correlation between IL2 and IL17

A statistically significant positive correlation between IL-17 and IL-2 levels (p-value ≤ 0.05) Figure 1. The correlation coefficient (R) is 0.768, indicating a positive association. This means that as the concentration of IL-17 increases, the concentration of IL-2 tends to increase as well, and vice versa.

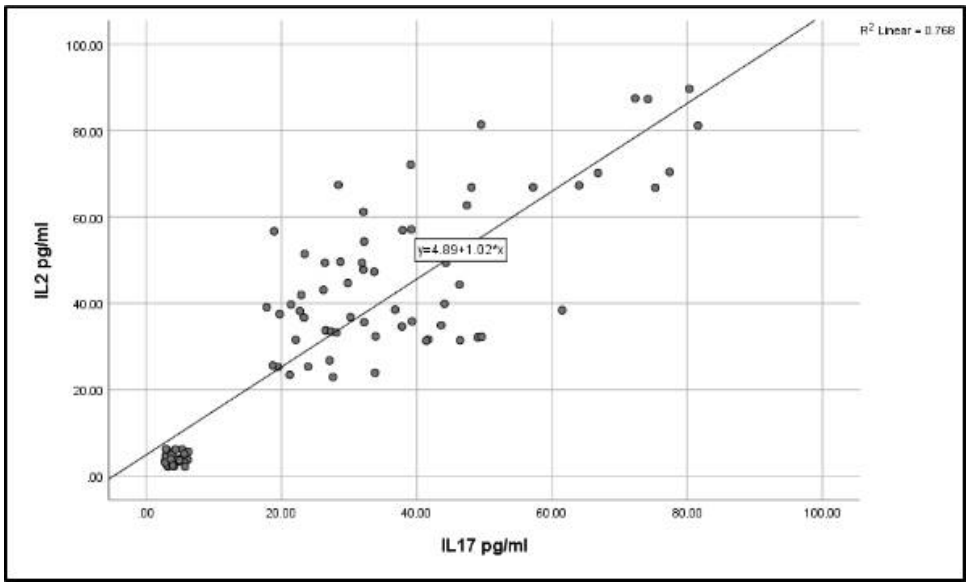

Figure 1: Correlation between IL-17 and IL-2 in VZV patients

Figure 1 shown a scatter diagram between serum concentrations of IL-17 and IL-2 in VZV patients would visually depict the correlation observed in the figure. This would be helpful to see the spread of data points and confirm the presence of a positive association (r = 0.768, P-value <0.05).

The data presented shows a significant positive correlation between the levels of interleukin-17 (IL-17) and interleukin-2 (IL-2) in individuals with varicella-zoster virus (VZV) infection. With a correlation coefficient (R) of 0.768, there is positive association between these two cytokines. This implies that as IL-17 levels rise, IL-2 levels also tend to increase, and vice versa [10]. The correlation is visually depicted in Figure 1 through a scatter diagram illustrating the serum concentrations of IL-17 and IL-2 for each patient. The distribution of data points on the diagram confirms the positive relationship between IL-17 and IL-2 levels, providing further support for the correlation analysis. This correlation is significant as it indicates a potential interaction between these cytokines in the body's immune response to VZV infection [11].

3.2. Correlation between IL2 and CD4

A statistically significant negative correlation between IL2 and CD4. The correlation coefficient (R) is (-0.510), indicating a negative association Figure 2.

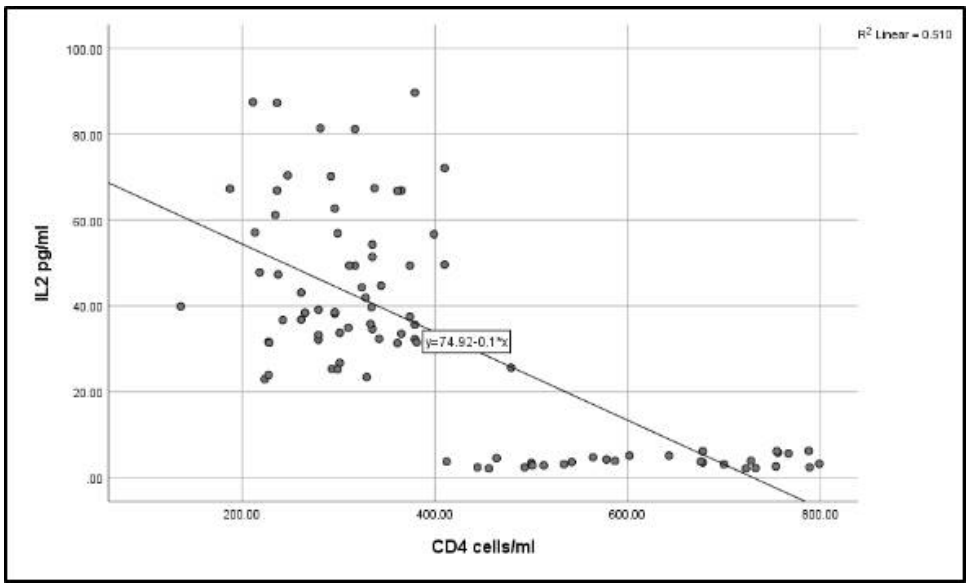

Figure 2: Correlation between IL2 and CD4 in VZV patients

Results reveal a significant negative correlation between IL2 and CD4 levels among patients with varicella zoster virus (VZV) infection. A correlation coefficient (R) of (-0.510) indicates a negative correlation, indicating that as the concentration of IL2 rises, the CD4 count tends to decrease, and vice versa. Figure 2 represents this negative correlation visually through a scatter plot that depicts the relationship between the concentration Serum IL2 and CD4 cell counts in VZV patients [12]. The scatter plot shows a downward trend, indicating that higher IL2 levels are generally associated with lower CD4 counts, and vice versa and this negative association confirms the complex interplay between IL2 and CD4 in the immune response to VZV infection [13].

3.3. Correlation between IL2 and CD8

The results demonstrated that a statistically significant positive correlation between IL-2 and CD8 levels (p-value ≤ 0.05). The correlation coefficient (R) is (0.487), indicating a positive association Figure 3.

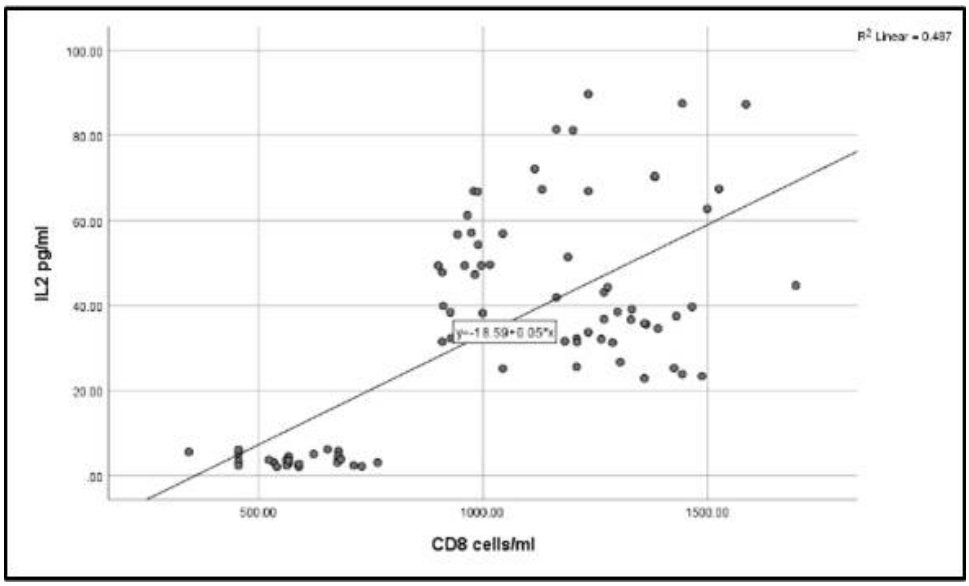

Figure 3: Correlation between IL2 and CD8 in VZV patients

The findings reveal a statistically significant positive correlation between IL-2 and CD8 levels among patients with Varicella-Zoster Virus (VZV) infection. The correlation coefficient (R) of (0.487) indicates a positive association, suggesting that as IL-2 concentration increases, CD8 count tends to increase as well, and vice versa [14]. This positive correlation underscores the role of IL-2 in regulating the immune response to VZV infection, particularly in activating and proliferating CD8-positive T cells and CD8-positive T cells play a crucial role in

the immune defense against viral infections by directly targeting and eliminating virus-infected cells [15]. The scatter diagram presented in Figure 3 visually depicts this positive correlation, with data points showing an upward trend and this graphical representation reinforces the statistical findings and provides a clear visualization of the relationship between IL-2 and CD8 levels in VZV-infected patients.

3.4. Correlation between IL17 and CD4

There is a statistically significant negative correlation between IL17 and CD4. The correlation coefficient (R) is (-0.496), indicating a negative association Figure 4.

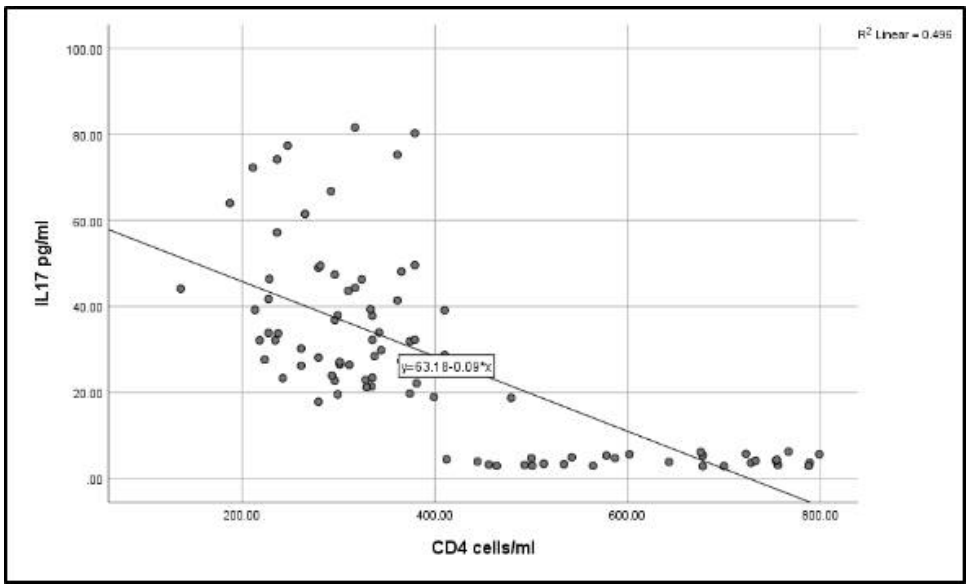

Figure 4: Correlation between IL17 and CD4 in VZV patients

The analysis reveals a statistically significant negative correlation between IL17 and CD4 levels among patients with Varicella-Zoster Virus (VZV) infection. The correlation coefficient (R) of (-0.496) indicates a negative association, suggesting that as IL17 concentration increases, CD4 count tends to decrease, and vice versa. This negative correlation underscores the potential role of IL17 in modulating CD4-positive T cell responses during VZV infection [16]. IL17, as a pro-inflammatory cytokine, has been implicated in various immune processes, including the promotion of inflammation and the recruitment of immune cells to sites of infection. The scatter diagram depicted in Figure 4 visually illustrates this negative correlation, with data points displaying a downward trend and this graphical representation reinforces the statistical findings and provides a clear visualization of the relationship between IL17 and CD4 levels in VZV-infected patients [17].

3.5. Correlation between IL17 and CD8

There is a statistically significant positive correlation between IL-17 and CD8 levels (P-value <0.05). The correlation coefficient (R) is (0.447) indicating a positive association show Figure 5.

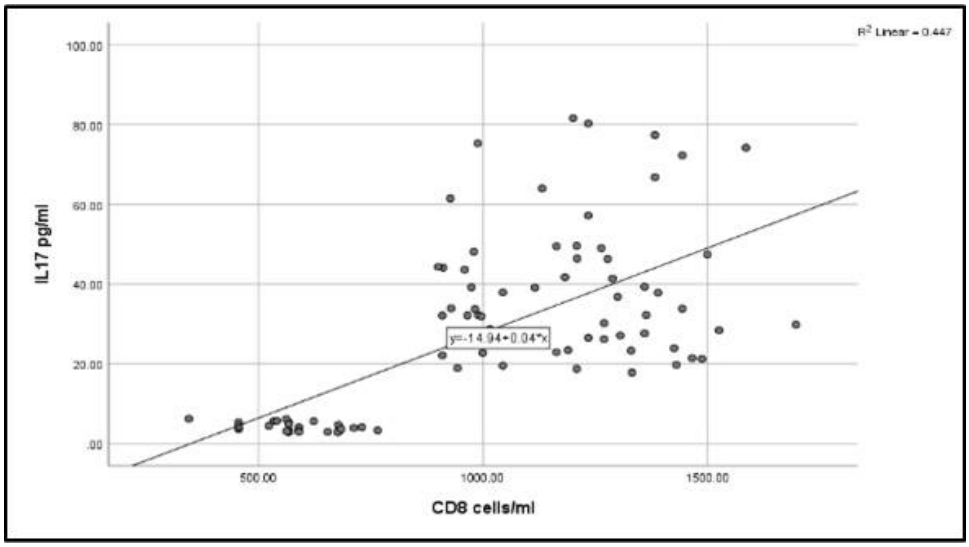

Figure 5: Correlation between IL17 and CD8 in VZV patients

The analysis reveals a statistically significant positive correlation between IL17 and CD8 levels among patients with Varicella-Zoster Virus (VZV) infection. The correlation coefficient (R) of (0.447) indicates a positive correlation, suggesting that as IL17 concentration increases, CD8 count tends to increase, and vice versa ('Immunity against Varicella Zoster virus in patients with systemic lupus erythematosus or rheumatoid arthritis', 2012). This positive correlation underscores the potential role of IL17 in modulating CD8-positive T cell responses during VZV infection. IL17, as a pro-inflammatory cytokine, is known to contribute to immune responses against pathogens, including viruses, by promoting inflammation and enhancing the recruitment and activation of immune cells, including CD8-positive T cells [18].

3.6. Correlation between CD4 and CD8

Figure 6 showed a statistically significant negative correlation between CD4 and CD8. The correlation coefficient (R) is (-0.577), indicating a negative association. The explanation for this result is the patients with Varicella-Zoster Virus (VZV), there is a significant negative correlation between CD4 and CD8 counts, indicating an inverse relationship between these two immune parameters [19]. The correlation coefficient (R) of (-0.577) suggests a strong negative association, meaning that as the CD8 count increases, the CD4 count tends to decrease, and vice versa [20]. A scatter diagram in Figure 6 visually represents this negative correlation. The diagram shows the relationship between the number of CD4 and CD8 cells in VZV patients.

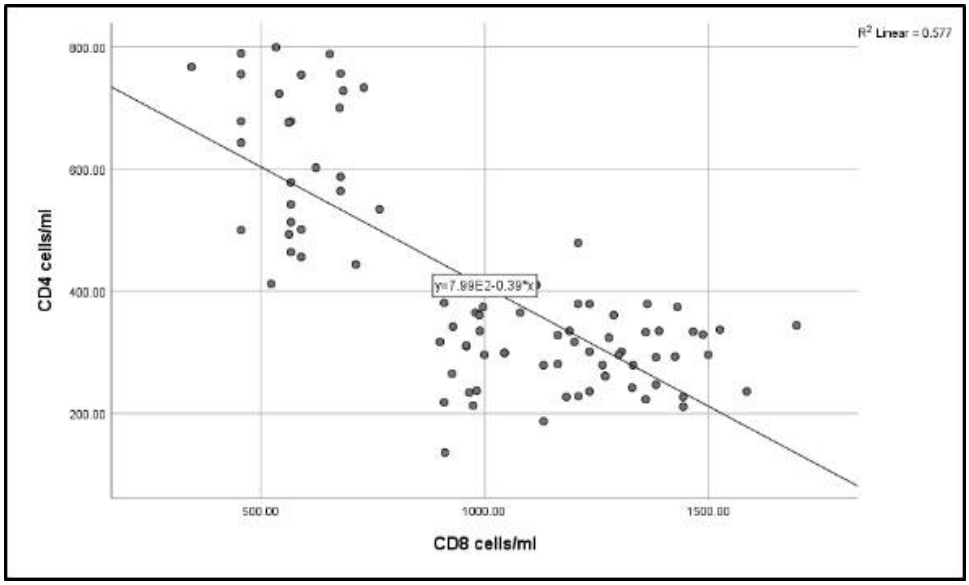

Figure 6: Correlation between CD4 and CD8 in VZV patients

4. Conclusion

Individuals infected with Varicella-Zoster Virus show increased CD8 counts and altered CD4/CD8 ratios, indicating strong cytotoxic T cell reactivity. The higher levels of IL-2 and IL-17 in VZV patients emphasize their possible involvement in fighting the virus.

Connections between IL-2, IL-17, and CD8 levels, along with inverse associations with CD4, highlight complex interactions in the response to VZV.

No significant differences in IL-2 and IL-17 levels were observed between males and females, suggesting comparable immune reactions between the sexes.

Article Information

Disclaimer (Artificial Intelligence): The author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.), and text-to-image generators have been used during writing or editing of manuscripts.

Competing Interests: Authors have declared that no competing interests exist.

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