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The Role of Interleukin-17 in Heart and Vascular Diseases at Thi-Qar Governorate

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Abstract:

The objective of this study is to assess Interleukin-17 in cardiovascular patients. This study was conducted in the heart center in Thi-Qar Governorate, during the period between 1/12/2023 to 1/4/2024. The study was investigated to measure Interleukin-17 (IL-17) levels in the serum using Enzyme-Linked Immunosorbent Assay (ELISA). The study included 100 participants: 50 patients with heart and vascular diseases and 50 healthy subjects serving as controls. The statistical analysis showed a significant increase in serum the mean concentration of (IL-17) in patients (10.90 ± 4.28) pg/ml compared to the healthy control group (8.108 ± 3.72) pg/ml with a statistically significant difference ($P=0.001$). So, it is concluded that the high level of IL-17 in the serum has to do with cardiovascular diseases.

Keywords: Heart and Vascular diseases, IL-17, smoking.

Introduction:

Cardiovascular diseases (CVD) are a group of disorders and defects that affect the heart and blood vessels and include a large and wide range of diseases such as atherosclerosis, as well as coronary heart disease (CHD), which is a group of diseases caused by a defect or damage in the coronary arteries that supply the muscle the heart, causing narrowing or blockage of these arteries, which leads to serious complications on the heart muscle that may lead to death [1].

Interleukin-17 is a powerful stimulatory cytokine for inflammation that is mainly produced by activated T cells (CD4 + T) or what is known as Th17, but this does not mean that only this type of T cell produces IL-17; Also secreted by monocytes, a natural killer T (NKT) cells, dendritic cells (DCs), macrophages, and natural killer cells, in addition to other immune cells, IL-17 performs multiple immunological functions, regulating the immune response and working with other cytokines to trigger the required immune response [2].

The fact that IL-17 is an inflammatory cytokine involved in most of the innate and adaptive immune responses, and since most cardiovascular diseases are caused by inflammation or inflammation has an

important role in the course of disease development, most studies have shown that it has a decisive role in the emergence and development of diseases of the heart and blood vessels [3].

The participation of Interleukin-17 in the immune and inflammatory responses is distinguished by its being a regulator of inflammation, as its inflammatory effect is concentrated in its ability to stimulate the expression of mediators in various inflammations such as cytokines, chemokines, adhesion molecules, and growth factors, as well as synergy with other cytokines, so most studies of cardiovascular diseases show an increase in the concentration of IL-17 in the blood serum of cardiovascular patients [4].

Thus, the main aim of the present study was to evaluate interleukin-17 and its relationship with cardiovascular diseases.

Methods and Material:

Design of Study:

fifty samples were collected from patients attending the heart center in Thi-Qar Governorate who were hospitalized in the center's halls, as well as those who were hospitalized in the Coronary Care Unit (CCU) with cardiovascular diseases (CVD), and fifty samples from healthy people as a control group in Thi-Qar Governorate. From 1/12/2022 to 1/4/2023 for both sexes, a questionnaire was completed to collect information about patients and healthy people.

Collection of Blood Samples:

Two (ml) of venous blood were drawn from all participants using a disposable syringe, and were transferred into a gel tube, after that, to obtain blood serum, the blood samples were transferred to the centrifuge and run at 4000 r / min for 10 minutes to separate the blood serum from the rest of its components. Then the serum was transferred to Eppendorf tubes and stored at (-20 C) until it is used to estimate the interleukin-17 level.

Estimation of IL-17 level

Enzyme-Linked Immunosorbent Assay (ELISA):

The Enzyme-Linked Immunosorbent Assay (ELISA) technique was used to measure the levels of interleukin-17 in the serum of all samples. The ELISA kit is manufactured by (SunLong Biotech Co., LTD - SL0978Hu-China).

Statistical Analysis:

The data underwent statistical analysis using SPSS, version 23.0. Data are represented as the mean \pm standard deviation (SD). Comparison of a group of differences in numerical variables was estimated by t-test and data were analyzed using Chi-Square test. Where the level of significance was measured by the P value at a significant level (P.value \leq 0.05).

Results:

1-Interleukin-17 (IL-17):

The current study showed that the level of IL-17 in patients with cardiovascular diseases was (10.90 \pm 4.28 pg/ml) and was high compared to the control group, whose IL-17 level was (8.108 \pm 3.72 pg/ml) and with a significant difference. Statistical significance (P.value = 0.001).

As shown in Table (1).

Table (1): Comparison of the levels of IL-17 among two studied groups.

Groups	Patients N=50	Healthy N=50	T. value	P.value
IL-17 level	10.90±4.28	8.108±3.72	3.47	0.001
df=48, p.value ≤ 0.05 It means that the difference is significant				

2- The effect of smoking on the L-17 level.

when the samples of the patients under study were distributed according to smoking status and IL-17 level, the findings of the study demonstrated that the IL-17 level was higher in smokers than in non-smokers, where the IL-17 level for smokers was 12.48 ± 3.65 , while it was $10.15 \pm$ for non-smoking with no statistically significant difference. and as shown in Table (2).

Table (2): Comparison of the effect of smoking on the L-17 level among two studied groups.

patients Group	Non-smoking patients N=30	Smoking patients N=20	T. value	P.value
IL-17-level	10.15±4.40	12.48±3.65	-1.83	0.073
df=48, p.value ≤ 0.05 It means that the difference is significant				

Discussion:

Some studies in Dhi Qar Governorate, such as (Attia & Salman, 2022), indicated an effective role for inflammation, immunity, and chemical compounds of the immune system, such as chemokines, in the emergence and development of cardiovascular diseases [5].

The results of the current study indicated that the level of interleukin 17 in the patient group (10.90 ± 4.28) was higher compared to the level of interleukin 17 in the healthy group (8.108 ± 3.72), which indicates the role of interleukin 17 in the emergence and development of cardiovascular diseases.

The current study agreed with (Csiszar and Ungvari; 2004) on the influence of the inflammatory role of IL-17 in stimulating the development of cardiovascular diseases. The study indicated that interleukin-17 stimulates cytokines, chemokines, and adhesion molecules in different types of cells, as well as its synergistic behavior with inflammatory cytokines such as necrosis factor (TNF), and its effects on cells, Vascular endothelium, and smooth muscle of blood vessels [6].

The current study also agrees with (Zhou et al; 2014), which indicated that the role of inflammatory IL-17 has an important role in ventricular remodeling after myocardial infarction, as ischemic heart disease following myocardial infarction is a major cause of heart failure [7].

A study (Mora-Ruiz et al., 2019) showed that the infarcted heart suffers from severe and sudden necrosis of cells that have been subjected to acute ischemia, as this leads to the release of their cellular contents and begins a severe inflammatory reaction or what is known as the inflammatory phase, in which the IL- 17 is responsible for a large part of it. It significantly stimulates apoptosis as well as free

radical release and stimulation of adhesion molecules such as intracellular adhesion molecule ICAM-1 and vascular cell adhesion molecule-1. VCAM, and platelet endothelial cell adhesion molecule PECAM-1, which contributes to the stimulation and accumulation of white blood cells in the inflammatory state, interleukin 17 stimulates reactive oxygen species by stimulating widespread cardiac neutrophil production, leading to tissue damage and exacerbation of the inflammatory response in the muscle of heart suffering from infarction [8].

This is consistent with the results of the current study, which indicate the harmful effect of interleukin 17 on the heart.

The results of the current study showed that the level of interleukin 17 in the group of patients who habitually smoke was (12.48±3.65), which was higher compared to the level of interleukin 17 in patients who did not habitually smoke, which was (10.15±4.40), which indicates that smoking increases the level of interleukin 17 in the group of patients who habitually smoke. Interleukin 17, thus increasing the level of inflammation, which has a negative role in cardiovascular diseases.

The current study agreed relatively with (Wada et al; 2021) in which laboratory animals (mice) were used, as the study showed that exposure to cigarette smoke for a relatively long period causes an inflammatory pathway and an increase in the level of IL-17 and an increase in the production of neutrophils. Inflammation and an increase in IL-17 levels lead to an exacerbation of the inflammatory process. Since most diseases of the heart and blood vessels have inflammation as a primary factor in their emergence and development, smoking and its association with an increase in IL-17 level and the activation of the inflammatory pathway can be considered a risk factor for cardiovascular disease [9].

The current study differed from (Simon et al; 2013), which links low levels of IL-17 in blood serum with an increased risk of developing major cardiovascular diseases in Caucasian patients with acute myocardial infarction (AMI), as the main finding of this study indicated that higher levels of IL-17 are associated with better outcomes in patients with acute myocardial infarction, which supports - according to the study - the protective regulatory role played by IL-17. The study also indicated that there is a higher risk of death and recurrence of MI in patients with low levels of IL-17 and high levels of the molecule. VCAM-1, suggesting an important modulatory role of IL-17 in vasculitis [10].

Conclusions:

The current study revealed that the high level of interleukin 17 concentration has a fundamental and influential role in the emergence and development of cardiovascular diseases.

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