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RESEARCH ARTICLE

Evaluation of some Immunological Parameters in Patients with Renal Failure

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ABSTRACT

End-stage renal failure is characterized by chronic inflammation, which is strongly associated with a higher likelihood of mortality and morbidity in those undergoing dialysis. In the next study, IL-6 and IL-10 will be evaluated in patients who are having hemodialysis as well as individuals who are not undergoing hemodialysis. There were forty-five people diagnosed with chronic renal failure who participated in the study. The ages of these individuals ranged from twenty to twenty-five years old. Our results in this study showed that there is no significant difference between the analyzed groups and the age parameter. This was stated in the context of the age parameter. Comparing the patients who were suffering from renal failure to the control group, it was revealed that the concentrations of serum IL-6 were significantly greater ($p = 0.005$) in the patients who were also suffering from renal failure. In individuals who were diagnosed with renal failure, Levels of cytokines such as IL-6 and IL-10 have been known to be pro-inflammatory and anti-inflammatory, both exhibited higher levels. Comparing the patients with renal failure who were exposed to compression to the control group, it was discovered that the concentration of IL-10 was considerably greater (p-value = 0.001) in the patients who were subjected to compression.

INTRODUCTION

Kidney failure ensues when either one or both of your kidneys cease to function adequately. Possible etiologies include diabetes, hypertension, and acute renal damage. Symptoms such as fatigue, nausea, vomiting, edema, and changes in bathroom frequency, **(Ikeda. *et al*.,2017).** Chronic kidney disease (CKD) is caused by a number of illnesses, the most common of which are diabetes and hypertension. **(Winocour. 2018). Kidney failure**: End-stage renal disease is a pathological state characterized by a significant decline in kidney function, resulting in an inability to effectively remove waste substances from the bloodstream, functioning at less than 15% of the normal capacity (Webster **et al.,2017). There** are a wide variety of medical illnesses that are now being encountered by people. Some of these conditions include diabetes, hypertension, nephritic syndrome, and polycystic kidney disease. **(**Dang et al.,2021**).** Infections can also impact the kidneys by activating the immune system in response to microbial antigens. This immune response can result in the formation of immune complexes in the bloodstream or within the kidneys themselves, as seen in viral glomerulonephritis (GN). On the other hand, infection-associated glomerulonephritis may occur because the infection has the potential to interfere with the proper functioning of both innate and cellular immunity. **(**Sharma and Kinsey 2018**).** There is a possibility that organ damage will occur as a result of sepsis-induced multi-organ failure. This type of failure includes systemic inflammatory response syndrome (SIRS), which is characterized by increased

cytokine production, and alterations in blood flow control. There are specific viral infections that are more common and have the ability to induce kidney damage through a variety of different pathways. Although every acute viral infection has the potential to produce immune-complex proliferative GN, there are particularly frequent viral infections Glomerulopathy can be caused by a range of viruses, such as hepatitis B virus, hepatitis C virus hepatitis E virus human immunodeficiency virus dengue virus, and hantavirus. Other diseases that can cause glomerulopathy include the Hantavirus and the dengue virus **(Divers *,etal*.,2019)**. Cytokine is the secretion of a minute protein by cells, on the connections between cells, or on the mechanisms by which cells communicate with one another at a particular level Examples of cytokines are interleukins, lymphokines, cell signalling molecules such as tumour necrosis factor, interferon, **(**Oktapodas et al 2022**)**. There are three different ways in which cytokines might exert their effects: on the cells that produce them (autocrine action), on cells that are geographically close to them (paracrine action), and in certain cases, on cells that are located a vast distance away (endocrine action) (Sid-Otmane et al., 2020). Several distinct types of cells are accountable for the creation of cytokines, with macrophages and helper T cells (Th) being the primary sources of cytokine synthesis due to their ability to produce cytokines. In peripheral nerve tissue, macrophages, mast cells, endothelial cells, and Schwann cells are capable of releasing cytokines during both normal and aberrant activities. (Xie et al., 2019). Types of Cytokine there exist cytokines that promote inflammation (pro-inflammatory cytokines) and cytokines that reduce inflammation (anti-inflammatory cytokines). (Conti et al., 2020).

MATERIAL AND METHOD

Population study

This study is conducted to determine the comparison in the system of cytokines such as IL-6 as pro-inflammatory and IL-10 as anti-inflammatory. Cytokine in people with renal failure in different age groups and compare it with recovering people of the same age groups.

A total of 90 samples were gathered, with 45 samples obtained from individuals diagnosed with renal failure as **table1** and the remaining 45 samples obtained from individuals without any health conditions (control group).

The ELISA. Technology is used to determine the ratio of IL-6 to IL-10 in the blood serum of anti-inflammatory activity. The use of statistical analysis allowed for an assessment of the data between the control group and the renal failure group.

A total of around ninety individuals participated in this study. Samples were obtained, with forty-five samples coming from individuals who were suffering from renal failure and forty-five samples coming from individuals who were in good condition as the control group.

All of the patients who were attending private clinics for urology and nephrology and who exhibited signs of renal failure and were planning to undergo restorative therapy were included in the study. Each individual who took part in the study provided their written informed permission and completed a written questionnaire that included both demographic and clinical information. Patients, both male and female, who had a clinical history of renal failure after long-term therapy were compared with 45 healthy participants who were matched with the case group in terms of age and gender.

Throughout the entirety of the patients that were included, we gathered information on the complete history of symptoms associated with renal failure. It was decided to separate the patients into three distinct groups. The table: In table 1, A total of fifteen patients were involved in the first group, with twelve male patients and three female individuals. During the research, which lasted from September 2023 to January 2024, there were three groups of patients: The second group consisted of twelve males and three females, and the third group consisted of fifteen patients, with six males and nine females represented in each group.

Table 1: Clinical data is grouped by patients

Number of patients	Age	Sex	
		Male	female
	under 20 years	12	3

	20-25 years	12	3
	over 25 years	6	9
Total No.: 45		30	15

Table 2 : Clinical data from the control group

Number of Control	Age	Sex	
		Male	female
	under 20 years	12	3
	20-25 years	12	3
	over 25 years	6	9
Total No.: 45		30	15

The control group contained of 45 healthy individuals who were identical to the case group in terms of physical characteristics such as age, gender, height, and weight. Patient protocol: -

The experimental design, which may be visualized in Figure 2, is contingent upon the monitoring of certain alterations that take place in renal failure. Patients connected with the system of cytokines, including IL-6, which is a pro-inflammatory cytokine, and IL-10, which is an anti-inflammatory cytokine, are included in the following categories of patients who have renal failure:

Examination of blood samples and cytokines parameters

Inflammatory cytokines in the blood are tested for analysis. In heparin-coated microtubules, collected blood specimens were taken from the veins of both the control group and the renal failure patients. We used a sample centrifuge at 5000 rpm for twenty minutes at four degrees Celsius. We used a conventional ELISA kit designed for human use to determine whether or not the cytokine (IL-6, which is anti-inflammatory, and IL-10, which is also anti-inflammatory) was present in the supernatants of the cells. The amount of complex cytokine antibodies that were taken up by the body was used to determine the findings, and the units of cytokine were expressed as pg/ml.

Evaluation of serum IL-6 and IL-10 by ELISA

The assessment of human IL-6 and IL-10 concentrations in the blood serum was achieved using the ELISA technique according to the instructions of the company (Elabscience-china).

Analysis of statistical

Descriptive statistics: Among them are the following: (1) statistical tables; (2) the arithmetic mean (M); (3) the standard error of the mean (SEM); (3) the standard deviation (SD); (5) and graphical representations in the form of bar charts.

Inferential statistics: To determine whether or not there are significant variations between spontaneous and induced cycles about all of the characteristics of blood samples, a paired t-test was utilized. Demonstrated that IL-6 and IL-10 the significance level was set at 0.05, and the confidence interval was set at 95%. It has been, possesses anti-inflammatory capabilities. This is about all of the criteria of inflammatory cytokines. A technique known as (ELISA) is utilized to ascertain the levels of IL-6 and IL-10 that are present in the blood serum and are identified as being anti-inflammatory.

RESULTS AND DISCUSSION

Comparison between renal failure and control

Table 3 contains the observational data, both the demographic and clinical characteristics of the patients who were diagnosed with renal failure and the control groups are included in this study. In terms of age values and demographic profile, the patients who were diagnosed with renal failure and the control group were almost equal.

Table 3: Demographic and clinical characteristics of patients and controls

Parameter	***Patients***	***Control***
Gender:* male *(female)	23(17)	19(23)
Age, year	<20- >25	75-90
Treatment : treated or not –treated	40	(41)

Table 4: Clinical documents is grouped by patients

Number of patients	***Age***	***Sex***	
		Male	***female***
	Under 20	6	4
	20-25	5	8
	over 25	12	5
Total No.: 45		23	17

Table 5: Clinical data from the control group

Number of Control	***Age***	***Sex***	
		Male	***female***
	Under 20	4	5
	20-25	6	8
	Over 25	9	10
Total No.: 45		19	23

Table 6: Patient age and control group

Parameter	**Patient (n=40) (Mean ±SD)**	**Control (n=41) (Mean ±SD)**	**p-value**
Age	86.72(5.03)	81.27(2.48)	$p < 0.01$

A determination was made, based on the data, that all of the patients were freshly diagnosed cases (before treatment). This was done to lessen the impact that the medications had on the parameter values that were observed. The findings of our investigation indicate that there was not a statistically significant difference in the age parameter between the groups that participated in the study. This was reported by the findings of our inquiry. The results presented in Table 4-5 revealed a result that does not agree with the research that says that there is a relationship between age, gender and the

incidence and severity of renal failure patients in many studies (Ramsey et al., 2017; Bulloch et al., 2017). Our result agreed a with previous Iraqi study that Saied: "Also, no effect of age was found on all measured variables" (Al-Fayyada & Al-Lehebe,2021).

There was a total of 90 plasma samples included in the sample, with 45 patients with renal failure disease and 45 controls included. As for the individuals who participated in the study, table 1 shows their demographic information. There were no differences in gender between the two groups, as indicated by the statistical analysis ($\chi 2 = 1.233$, $p = 0.267$). Patients who were suffering from renal failure had considerably worse cognitive scores on the Mini-Mental State Examination (MMSE), as was to be predicted. It was shown that there were no significant changes in the prevalence of vascular risk factors, such as hypertension, diabetes, and current smoking status, between the group that had renal failure and the group that served as the control.

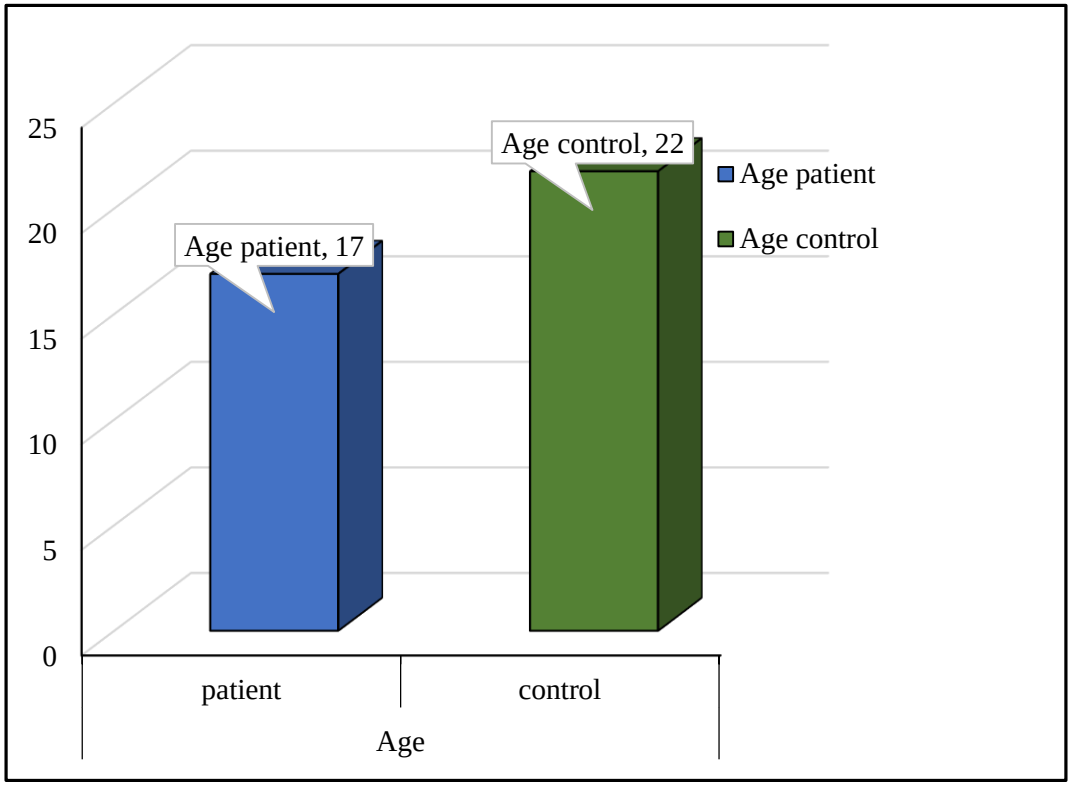

Figure 1: Demographic and clinical characteristics of patients and controls.

Comparison of interleukins between renal failure patients and control groups

The level of serum IL-6 in renal failure patients and control groups is expressed in Figure 1 and table 7. Concentrations of serum IL-6 significantly increased (p= 0.005)in the renal failure patients (0.66± 0.43)ng/mL in comparison with the control group (4.15±9.58) ng/mL.

Table 7: Concentration of serum Il-6 in renal failure patients and control groups.

Parameter	Patient (n=44) (Mean ±SD)	Control (n=45) (Mean ±SD)	p-value
IL6	0.66± 0.43	4.15±9.58	0.005

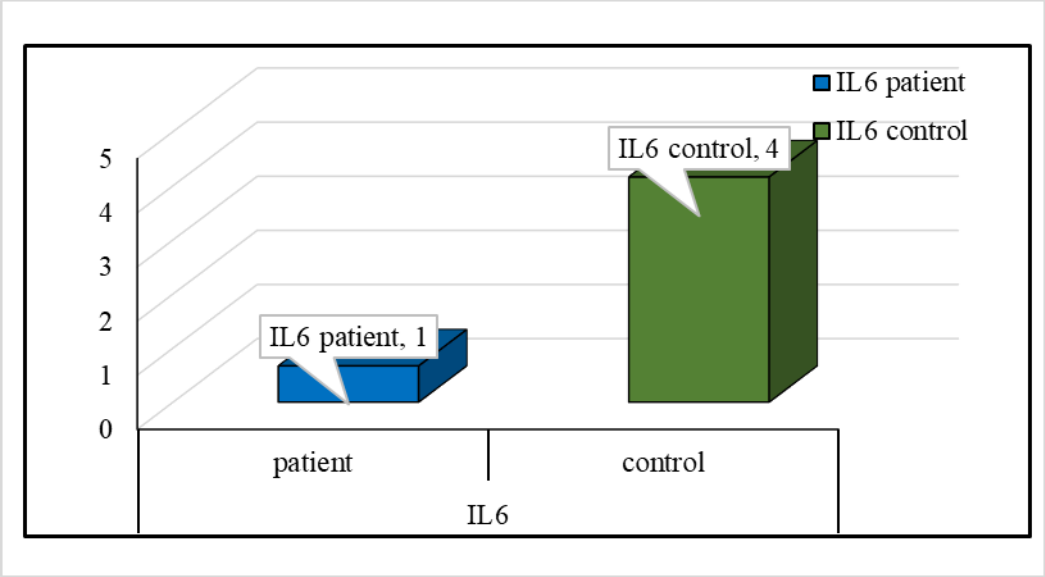

Figure 2: Concentration of serum Il-6 in renal failure patients and control groups.

The obtained results are in agreement with several studies that have noticed an increase in inflammation levels in depressed individuals in comparison with healthy controls. These results indicate that renal failure patients exhibited immunological responses to inflammation **(**Syed-Ahmed & Narayanan 2019**).** The rise in interleukins, such as IL-6, implies that the immune system abnormality, which is either genetic or acquired in depression, is the cause of the elevated levels of pro-inflammatory cytokines **(**Sahib Shukur & Al-Ramahy 2019)

Innate immune cells, counting mast cells, dendritic cells, and macrophages, as well as other immune cells, are the ones responsible for the generation of IL-6. Band T lymphocytes are also responsible for this **(Choy & Rose-John 2017).** Furthermore, the release of interleukin-6 (IL-6) is a function of a group of cells that are not leukocytes. These cells include endothelial cells, fibroblasts, astrocytes, epithelial cells, and a few malignant cells **(**Arnold ***et al.,*** **2017).** There is a correlation between elevated levels of IL-6 and several pathological conditions that cause inflammation as well as cancer. That this is a result of inflammatory reactions and that it acts as a marker of inflammation is something that is recognized. **(**Brenner ***et al.,*** **2017)**

It has been proved without a reasonable doubt that inflammatory cytokines disrupt the equilibrium of trace elements, as evidenced by numerous investigations conducted on animals and clinical trials including adult patients **(**Weyh ***et al.,*** **2022).**

IL-6 is a cytokine that important in cell communication and has been linked to several disorders, such as inflammatory, neurological, vascular, and neoplastic conditions **(**Jones & Jenkins 2018**).** The regulation of IL-6 levels in the body is mostly controlled by gene expression, as IL-6 is quickly removed from the bloodstream and has a very short half-life of 20-60 minutes **(**Reinhardt et al **2019).**

Figure 3 and Table 8 explain the level of serum IL-10 in the renal failure patients and control groups. There was a significant increase in IL-10 concentration (p-value 0.001) for renal failure patients (266.93±154.73)pg/mL in compression with the control group (463.13±514.80)pg/mL.

Table 8: Serum IL-10 in renal failure patients and control groups

Parameter	Patient (n=44) (Mean ±SD)	Control (n=45) (Mean ±SD)	p-value
IL10	266.93±154.73	463.13±514.80	0.001

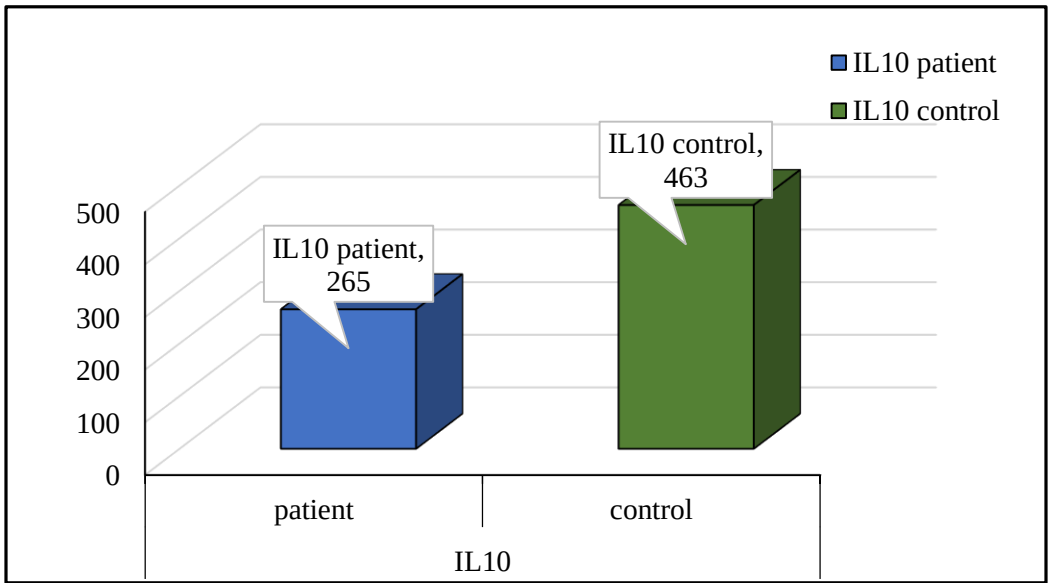

Figure 3: Serum IL-10 in renal failure patients and control groups.

One of the most significant cytokines that contributes to the reduction of inflammatory reactions is IL-10. It plays a function in the down-regulation of that response. Additionally, it has the ability to destroy the synthesis of cytokines that are pro-inflammatory and plays a vital role in the guideline of hyperactive responses, which would otherwise result in the development of auto-inflammatory diseases **(**van der **et al., 2020).**

The IL-10 cytokine plays a vital role in controlling immune activities by inducing broad inhibition of immunological responses. This is achieved by its pleiotropic effects, which involve the autocrine/paracrine properties of IL-10, including direct binding to leukocytes and its functional impact on these immune cells **(**Munshi **et al.,2019).**

Comparison of parameters in renal failure patients and controls depends on gender

According to the findings of the comparison of parameters between patients with renal failure and control groups based on gender, there was no significant difference between the groups that were studied for each of IL10 and IL6; however, there is a significant difference between the groups that were studied for each of IL6 and age groups as table 9-10.

Table 9: The parameters in renal failure patients and controls vary depending on gender.

Parameter	Male (n=60) (Mean ±SD)	Female (n=29) (Mean ±SD)	p-value
IL6	1.46± 1.46	4.44±11.98	0.001
IL10	387±454.4	322.96±213.74	0.176
Age	17.61±10.11	23.29±20.27	0.022

Also they found in Iraqi study :"Sex has no effect Except for lipoxygenase, uric acid, IL6, IL10,GSH, and albumin in females compared to males**"(Al-Fayyada & Al-Lehebe,2021).**

Table 10: Comparative analysis of parameters in patients with renal failure and control groups.

Parameter	Patient (n=44) (Mean ±SD)	Control (n=45) (Mean ±SD)	p-value
IL6	0.66± 0.43	4.15±9.58	0.005
IL10	266.93±154.73	463.13±514.80	0.001
Age	16.9±11.3	21.8±16.5	0.647

CONCLUSIONS

1-The results indicated that there was no statistically significant difference in the age parameter between the groups under study.

2- Concentrations of serum IL-6 significantly increased (p= 0.005) in the renal failure patients in comparison with the control group.

5- There was a significant increase in IL-10 concentration (p-value 0.001) for renal failure patients in compression with the control group.

6- The levels of cytokines that promote inflammation, such as IL-6, and those that discourage inflammation, such as IL-10, were shown to be higher in persons who were suffering from renal failure.

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