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Serum Interleukin - 6 level among Sudanese Patients with Chronic kidney disease

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ABSTRACT

Background: High plasma interleukin-6 is common in chronic kidney disease patients due to chronic stress, prolonged inflammation, and fluid overload. However, conflicting opinions still exist. Moreover, the effects of age, sex, and ethnicity on interleukin-6 level in chronic kidney disease is not known. **Aim:** This study aimed to determine interleukin-6 level in chronic kidney disease patients in Khartoum, Sudan. **Methods:** This is a cross-sectional laboratory based study. A total of 88 participants consisting of 44 chronic kidney disease patients and 44 apparently healthy control. Of the 44 chronic kidney disease patients, 27 (61%) were male and 17 (39%) female. According to their age, 15 (34%) \leq 40 years and 29 (66%) $>$ 40 years old. Concerning the duration of disease, 31 (70%) were \leq 2 years and 13 (30%) were $>$ 2 years. Hemoglobin and interleukin-6 concentration were determined using enzyme linked immunosorbent assay. **Results:** Plasma interleukin -6 levels was significantly ($p= 0.011$) elevated in chronic kidney disease (Mean \pm SD = 51.72 \pm 9.63) compared to control group (Mean \pm SD = 24.77 \pm 3.27). When hemoglobin was considered, interleukin -6 correlates negatively with significant difference (Correlation coefficient = -0.0364, $p = 0.033$). However, there was no statistical significant difference among the sex, age, and duration of the disease. **Conclusion:** Interleukin -6 level was significantly elevated in chronic kidney disease. There was no significant difference in the interleukin -6 level among the sex, age, and duration of the disease. When hemoglobin was considered, there was a negative correlation with interleukin -6

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1. Introduction

Chronic Kidney Disease (CKD) is an irreversible loss of the kidney functions which is fatal in the absence of prescribed dialysis or kidney transplant (1,2). Nowadays, there are increasing evidences that associate CKD to the disruption in immune responses. CKD affects over 800 million individual worldwide and it is fast becoming a public health concern due to the high mortality and growing number of patients who required renal replacement therapy (3). Numerous systemic and local insults, including infections, hypoxemia, nephrotoxin, immune complexes dysregulation, advanced glycation end products are known to stimulate the kidney to produce systemic interleukin-6 (IL-6) (4,5). Some studies (6,7) have reported high plasma IL-6 level in CKD patients. Interleukin-6 accelerates the progression of CKD not only by aggravating kidney injury as described above but also by initiating its complications, especially the chronic vascular disease (CVD).

MATERIALS AND METHOD

Study design and Population

This was a cross-sectional laboratory-based study conducted in August- September 2020 consisting of a control group of forty-four apparently healthy participants, 27 (61.4%) were male, and a test group of forty-four CKD patients, 17 (38.64%) were female, proved by hemodialysis in Alrebat hospital Khartoum, Sudan.

The study participants were recruited from the Alrebat hospital Khartoum, Sudan. The apparently healthy volunteers for the control without CKD, diabetes mellitus, hypertension, viral infections (HIV, HBV, and HCV) or other known risk factors for CKD were included for the study. Personal data was obtained by standard questionnaire designed for dialysis patients.

Ethical clearance

The study received ethical clearance from both the ethical review committees at the Faculty of Medical Laboratory Science, Sudan International University and Alrebat hospital, Khartoum, Sudan. Inform consent was obtained from all the study participants.

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Sample Preparation and Procedure

On a 5 ml EDTA container, venous blood was collected by single non traumatic venipuncture. Haemoglobin was measured by automatic blood counter (Sysmex KX-21N) for both CKD patients and control group. The centrifuged plasma was harvested into a plain container for IL-6 estimation using enzyme linked immunosorbent assay (ELISA).

Principle of Enzyme Linked Immunosorbent Assay

This involves the reaction of an antibody with an antigen and a detection system to determine if a reaction has occurred which involve Binding of the test molecule or organism to a solid support e.g. micro titer plate.

Statistical analysis

The data obtained were categorized into different groups and analyzed by statistical using computer program statistical package for social science (SPSS), used F- test (ANOVA) and T- test. Analyzed data was represented in tables and figures.

RESULT

Our data (Table 1) showed that IL-6 was significantly (p value 0.011) increased in CKD group (Mean±SD =51.72±9.63) compared to control (Mean±SD=24.77±3.27). However, there was no statistical significant ($P > 0.05$) difference in IL-6 levels among the age groups, gender, and duration of the disease (Table 2).

The characteristics of the demographic data and mean hemoglobin (Hb) concentration in CKD are given in Table 3. Hb Mean ± SD = 10.5±1.29, age group Mean ± SD = 46.5±13.7, and Mean ± SD = 1.97±0.74.

Figure 1 showed the percentages of the age groups, gender, and duration of disease.

In figure 2, hemoglobin correlates negatively with IL-6 level (correlation coefficient = - 0.0364, P value 0.033).

Table 1: Study Interleukin-6 level

Parameters	Group	Number	Mean ± SD	P-value
IL-6 levels	CKD case	44	51.72±9.63	0.011
	Control	44	24.77±3.27	

Table 2: Characteristics of CKD patients

Variables	Gender	Number	Mean ± SD	P-value
Gender	Male	27	50.58±12.74	0.883
	Female	17	53.53±15.03	
Age	≤40 Years	15	56.24±21.30	0.772
	>40 Years	29	49.39±9.91	
Duration	≤2 Years	31	55.65±12.81	0.742
	>2 Years	13	42.35±11.62	

Table 3: Mean Hb and Demographic data

Variables	Minimum	Maximum	Mean ± SD
Age group	22.0	72.0	46.5±13.7
Duration	1.00	3.00	1.97±0.74
Hb	7.30	13.6	10.5±1.29

Figure 1: Percentages of the age groups, gender, and duration of the disease

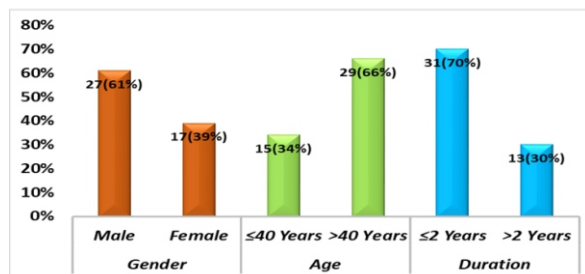
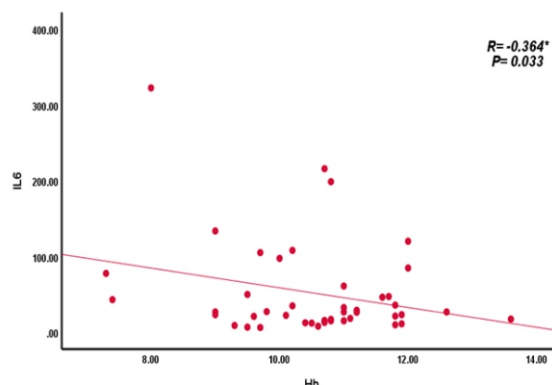


Figure 2: Correlation of IL-6 and Hb levels in CKD



DISCUSSION

Mortality due to CKD is a global problem due to high prevalence of CKD risk factors. The present study investigated the possible effect of Interleukin (IL)-6 in CKD patients on hemodialysis. Our result showed that the plasma IL-6 was significantly ($P = 0.011$) elevated in CKD patients (Mean±SD=51.72±9.63) compared to control (Mean±SD=24.77±3.27). Our finding is in tandem with previous study that documented interleukin-6 as a proinflammatory and anti-inflammatory cytokines which is elevated in chronic kidney disease (10). Similarly, some clinical and experimental studies have reported that IL-6 enhanced the progression of CKD and its related complications (10). Raised IL-6 expression in the urine of patients with mesangial proliferative glomerulonephritis is often associated with poor outcome (16). Moreover, high plasma IL-6 level is commonly observed in CKD patients (6). It is evident from the previous reports that IL-6 level is significantly higher in CKD patients compared with the apparently healthy group.

Furthermore, Interleukin-6 enhances the progression of CKD not only by inciting kidney damage as described above but also by instigating its complications, particularly the chronic vascular disease (CVD). Increasing evidences abound that IL-6 initiates endothelial injury essentially by reducing endothelial nitric oxide synthase and an anti-atherogenic adipocyte expression, and the inoculation of recombinant IL-6 exacerbates atherosclerosis. These mechanisms also suggests that IL-6 contributes to the increased incidence of CVD in CKD patients. Nonetheless, the elevated plasma IL-6 is not only a consequence of CKD, it also acts as a stimulant for the progression of CKD and its related complications (17). However, the present study is the first that demonstrated there was no significant association in IL-6 among the age groups, gender, and duration of the disease.

CONCLUSION

Based on these finding, interleukin-6 level was significantly raised in Chronic Kidney Disease. there was no significant association in IL-6 among the age groups, gender, and duration of the disease. Our data also showed a negatively significant association between Hb and interleukin -6 level in the study population.

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Conflict of interest: None declared.

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Authors' Contribution: All authors were equally involved in data collection, analysis, manuscript preparation, revision and finalization.

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