

Original Article

Association of Gender, Age, Physiological, and Biochemical Parameters among Chronic Renal Failure Patients at Zawia Kidney Hospital

Najat Mansour¹, Mabroukah Khalleefah^{1*}, Namat Soliman¹, Subhia Shaglabow¹, Sana Abdulgadir², Assia Ramdan¹

¹Faculty of Dentistry, University of Zawia, Zawia City, Libya.

²Faculty of Education, University of Zawia, Zawia City, Libya.

Corresponding Email. m.khalleefah@zu.edu.ly

ABSTRACT

Background and objectives. Chronic renal failure is a major problem and one of the main causes of morbidity and mortality in the world. Kidneys maintain internal balance of water, salts and minerals by eliminating waste products from the body. This study conducted to evaluate the association of physiological and biochemical changes among patients with renal failure who undergo dialysis compared to healthy people. Also, to identify the incidence of CKD in males and females. **Methods.** This study was conducted from January 2020 to December 2020 at Zawia Kidney Hospital. It was including 114 patients with chronic renal failure and 75 healthy people. The biochemical variables which were examined in the blood serum include glucose, triglycerides and cholesterol, urea, creatinine, and electrolytes in patients with renal failure as well as the healthy people. **Results.** This study showed that patients aged over 31 year had higher frequency of kidney failure. There was a statistically significant difference in the glucose levels between the patient's group and the control group ($p < 0.001$) with patients having higher average glucose levels compared to the control group. There were no statistically significant differences between the two groups in cholesterol levels ($p < 0.904$). However, there was a statistically significant difference in triglyceride levels between patients and controls (p -value = 0.021) as patients having higher levels compared to the control group. Statistically significant differences observed in urea, creatinine, calcium, sodium, potassium and phosphate values among renal failure and control groups as ($p < 0.001$ for each). In the relationship between blood type patients and kidney disease, the results showed a significant association between blood type and kidney failure ($p < 0.001$). Also, our study revealed that there is a significant correlation between gender and chronic renal failure ($p < 0.001$). In addition, an odds ratio of 11.7 indicates that the odds of men developing kidney failure are 11.7 times higher than that of women. **Conclusion.** Older ages, male, and O blood group are risk factors for chronic renal failure. Clear difference in the level of biochemical parameters in chronic renal failure compared to healthy people.

Keywords: Chronic Renal Failure, Glucose, Creatinine, Phosphate, Urea Physiological Changes.

Citation: Mansour N, Khalleefah M, Soliman N, Shaglabow S, Abdulgadir S, Ramdan A. Association of Gender, Age, Physiological, and Biochemical Parameters among Chronic Renal Failure Patients at Zawia Kidney Hospital. Khalij-Libya J Dent Med Res. 2023;7(2):171–177. <https://doi.org/10.47705/kjdmr.237215>

Received: 28/11/23; **accepted:** 23/12/23; **published:** 27/12/23

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INTRODUCTION

Chronic kidney disease (CKD) is a condition in which the kidneys become damaged and cannot

filter the blood well as they should. This damage causes waste product to build up in the body. This leads to many health problems, including cardiovascular diseases, Anemia, and bone diseases [1]. Kidney failure can be divided into two categories: acute and chronic [2]. Kidney failure affects 1.1 million people worldwide, this number is increasing at an approximate rate of 7% per year [2]. In the USA, incidence rate of kidney failure has increased from 44% to 85% during the years from 2000 to 2015 respectively [3]. In many cases, rates of kidney disease are determined by socioeconomic factors which leads to large disparities in the number of kidney failure patients [4]. Chronic renal failure (CRF) leads to high morbidity as well as high mortality, which needs special care in developing countries [5]. In fact, renal failure with its increasing prevalence, high costs for the treatment, and poor outcomes has become a global health problem [5]. There is a significant increase of early-stage chronic kidney disease (CKD) cases where the kidney function is lost, that leads to cardiovascular disease (CVD), and consequently causing premature death from failure [6]. Between 2007 and 2009, the number of patients on dialysis in Libya increased from 2116 to 2417, and it is expected the number will rise from 2417 in 2009 to 7667 in 2024. The percentage of the renal failure cases rate is expected to increase from 1.2% in 2014 to 16% in 2024. [7,8]. Kidney failure in Libya is often associated with uncontrolled diabetes, high blood pressure, smoking, hematological problems, atherosclerosis, malnutrition, and problems with bone and mineral metabolism. [7]. The aim of this study was to evaluate the association of physiological and biochemical changes among patients with renal failure who undergo dialysis compared to healthy people. Also, Due to the large increase in the number of patients with kidney failure in Libya, and

therefore the seriousness of this disease on the other hand, as well as the lack of studies and the changes accompanying it in recent years, therefore this study was conducted at the Kidney Hospital in the city of Zawiya, Libya.

METHODS

Study design and setting

This cross-sectional study was conducted at Zawia kidney hospital in Zawia city. A total of 114 patients suffering from renal failure and 75 healthy subjects as control were included in this study during the period from January 2022 to June 2022. The age of each study group was ranging between 11 and 80 years. A 5ml of Venus blood samples were withdrawn from all study participants and placed in sterile tube, then serum is obtained to examine glucose levels, cholesterol, triglyceride, urea, creatinine, calcium, and electrolytes for study population. Meanwhile, questionnaire interview was conducted to collect patient's demographic features, such as gender, age, marital status, residence, and diseases associated with kidney failure.

Statistical analysis

The obtained data were analyzed using the SPSS statistical program version 21, where the arithmetic mean, standard deviation, and Pearson's correlation coefficient were used for the variables included in the study. The T-test was used to compare the averages of the two study populations by testing the statistical hypotheses at the level of significance $\alpha = 5\%$ (P -value < 0.05).

RESULTS

In present study, out of 114 patients of CRF, 102 patients (89.5%) were male and 12 patients (10.5%) were female. The mean age of patients was calculated to be 50.34 years, with a standard deviation of 14.05. The distribution of cases by sex and ages into six age groups was revealed in table 1.

The maximum number of patients were 29 in age group of 41-50 years (25.4%), out of which 28 were

male and 1 were female, followed by 27 patients in 51-60 years' age group include 26 males and 1 female. In the same context, the t-test p-value is reported as 0.082, suggesting that the difference in ages between females and males is not statistically significant.

Table 1. Distribution of Cases by Age and Sex

Age (Yrs.)	Male		Female		P value
	N	%	N	%	
11-20	1	1.0	1	8.3	0.082
21-30	6	5.9	2	16.7	
31-40	18	17.6	4	33.3	
41-50	28	27.5	1	8.3	
51-60	26	25.5	1	8.3	
>60	23	22.5	3	25.0	
Total	102	100.0	12	100.0	

Table 2 presents a comparison between biochemical parameters among renal failure group and control group. The mean value of blood glucose for renal failure group and control group was 144.85±81.393 and 104.77±10.410 respectively.

Along the same line, there was a statistically significant difference in blood glucose levels between the two groups ($p < 0.001$). This suggests that patients have higher glucose levels compared to the control group. There were no statistically significant differences between the two groups in cholesterol levels ($p < 0.904$), as the mean value and standard deviation of cholesterol for patients and healthy subjects were 155.91±41.947 and 156.52±27.525, respectively. The mean value of Triglyceride for patients and healthy people in the current study was 133.04±87.002 and 111.48±37.411, respectively. There was a statistically significant difference in triglyceride levels between patients and controls (p -value = 0.021) as patients having higher levels compared to the control group.

Table 2. Biochemical variables

Variable	Patients (N=114)	Control(N=75)	P-value
	Mean±SD	Mean±SD	

Glucose	144.85±81.393	104.77±10.410	< 0.001
CHOL	155.91±41.947	156.52±27.525	0.904
TG	133.04±87.002	111.48±37.411	0.021

The results presented in table 3 shows the changes in kidney function parameters associated in study population of both groups. There were significant differences in urea and creatinine values in renal failure and control groups as ($p < 0.001$, $p < 0.001$) respectively) as the mean value of urea and creatinine for patient's group and healthy group were 64.60±16.902, 27.60±6.560, and 10.76±2.913, 0.72±0.192 respectively.

In the same context, there were significant differences in calcium, sodium, potassium, and phosphate values in patients and healthy studied population, ($p < 0.001$, $p < 0.001$, $p < 0.001$) respectively as the mean values were (8.56±1.157 and 9.58±0.632), (135.93±16.580 and 141.68±1.883), (4.88±0.907 and 4.18±0.298), and (5.97 ± 4.605 and 2.73±0.439), respectively. This outcome reveals that the values of calcium and sodium levels were lower in renal failure group than in healthy group, while the potassium and phosphate levels were higher in renal failure group compared to healthy group.

Table 3. Changes in kidney function associated with renal failure

Variable	Patients (N=114)	Control(N=75)	P-value
	Mean±SD	Mean±SD	
Urea	64.60±16.902	27.60±6.560	< 0.001
Creatinine	10.76±2.913	0.72±0.192	< 0.001
Calcium	8.56±1.157	9.58±0.632	< 0.001
NA	135.93±16.580	141.68±1.883	< 0.001
K	4.88±0.907	4.18±0.298	< 0.001
Phosphate	5.97±4.605	2.73±0.439	< 0.001

Table 4 shows Pearson correlation between creatinine and diabetes. It is obvious that Pearson correlation - 0.009 and ($P = 0.923$) indicating that there is no significant correlation between creatinine levels and glucose values in patients in this study.

Table 4. The relationship between creatinine and diabetes for patients

Variable	Correlation	Creatinine
Glucose	Pearson correlation	-0.009
	P-value	0.923

The distribution of A, B, O, and AB blood groups among patients was 20.2%, 14.0%, 62.3%, and 3.5% respectively, meanwhile chi square test for testing the equal frequency between patients in terms of blood type equal 90.982 and ($p < 0.001$) which indicate the distribution of patients is not equal in terms of blood type as demonstrated in table 5.

Table 5. The association between Blood type and ESRD patients

Blood type	Patients		Chi Square	P-value
	N	%		
A	23	20.2	90.982	< 0.001
B	16	14.0		
O	71	62.3		
AB	4	3.5		

The association between genders in studied groups were shown in table 6. The distribution of males and females among patients and healthy subjects were 102 (76.1%), 12 (21.8%), 32(23.9%), and 43(78.2%) respectively. The chi-square test was conducted, resulting in a chi-square value of 48.038 and ($p < 0.001$). This indicates a statistically significant association between gender and group. The odds ratio is also provided, with a value of 11.422, which suggests that males are 11.422 times more likely to be patients than females. Overall, the results indicate a significant association between gender and group, with a higher proportion of males being patients compared to females.

Table 6. The association between Gender and group

Gender	Patient	Healthy			
Male	102	32			
Female	12	43			

	N	%	N	%	Chi Square	P-value	Odds ratio
Male	102	76.1	32	23.9	48.038	< 0.001	11.422
Female	12	21.8	43	78.2			

DISCUSSION

A total number of 189 subjects whom of which 114 diagnosed with chronic renal failure and 75 healthy participants are participated in this study. The biochemical parameters were observed and analyzed statistically and compared to other previous studies.

Chronic renal failure patients have a substantial number of problems that affect people's health. The ages of the patients suffering from kidney failure in the current study were between 11 and 60 years. Renal failure age groups of 11-20 and 21-30 years had a lower incidence of kidney failure, while patients aged over 31 year had higher frequency of kidney failure. Our findings were in line with other studies [9-13].

The causes of chronic kidney failure in most Libyans are due to the spread of diabetes and high blood pressure, life style [14]. The results showed that there were statistically significant differences in glucose levels between the patient's group and the control group ($p < 0.001$), with higher average glucose levels in the patients compared to the control group. This is consistent with other studies [15-18].

Also, current study revealed that there is no significant difference in cholesterol levels in patient and control groups. On the other hand, triglyceride levels appear higher in patients compared to the control group, and this is consistent with the results indicating a significant increase in lipid levels among patients with chronic kidney failure due to lower levels of some enzymes and proteins [19].

Kidney failure passes through five stages, where during the first and second stages, patients do not show any symptoms, and the condition is often diagnosed through a routine examination of kidney. Therefore, creatinine and urea are considered among the most important routine examinations for patients with a family history of hereditary kidney diseases such as polycystic (disease kidney polycystic) [12].

This study showed that the levels of urea and creatinine increased significantly in patients with

renal failure compared to control. In accordance with our findings, alike findings found in previous work pointed out that the level of creatinine concentration in blood serum rises more than the normal rate suggesting a defect in kidney function [10]. Elevated serum urea and creatinine levels can be explained by the fact that decreased kidney function leads to reduced waste disposal, which leads to an increase in their concentration in Serum.

An observation in this study showed a clear significant increase in phosphate in the blood serum of patients with chronic renal failure compared to the healthy group, and these observations are in line with previous studies [20-23].

Also, the results in this study indicated that there were high levels of potassium ion concentration and lower concentrations of both sodium and calcium among patients with chronic renal failure compared to the healthy group. In the blood serum, the deficiency of sodium ions patients with chronic renal failure may be due to a deficiency of aldosterone hormone, which increases the loss of sodium ions in the urine [19,24]. On the other hand, our study does not correspond to a study that showed an increase in the level of potassium, sodium and calcium [25].

Although diabetes is one of most common causes of kidney failure according to the results of various studies [26,27], there was no relationship between creatinine and diabetes in patients with kidney failure according our observations, where the probability value ($p = 0.923$) is greater than the significance level. This study showed a clear indication that the blood type is an important factor in the development of renal failure. The most frequent blood group in patients with renal failure was blood type O by 62.3%, followed by blood group A by 20%, and the least frequent group in patients with renal failure was AB by 3.5%. This is Likewise, agrees with various studies [28-30] whose results confirmed that the most frequent species is the O blood group by 60%, and the least frequent species is the AB blood type by 4%.

The results of this study indicate that the incidence of kidney failure in men is 11.7 times higher than the

incidence of women, and this study is consistent with others [31-37]. There was a preponderance of cases in men, 68.2%, with a mean age of 69.44 ± 7.2 years. M. On the other hand, this study was not in line with another study which pointed out that the number of renal failure females is more than males [10].

CONCLUSION

Our study indicates that older ages, male, and O blood group are prone to chronic renal failure more than others. In the same context, blood type and biochemical parameters are key factor in the occurrence and the diagnosis of chronic renal failure. To estimate chronic renal failure conditions and treatment, prospective investigations with large sample size is needed

Acknowledgements

Special thanks to Dr. Abdalhalim Al-Suaiee on the statistical analysis.

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