

A comparative study between some physiological parameters for diabetic and non-diabetic renal failure patients in Al-Zawiya Center for the treatment of kidney diseases

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المستخلص:

الخلفية والهدف: مرض الكلى المزمن (CKD) هو تحول أو تلف تدريجي ولا رجعة فيه يؤدي إلى الفشل الكلوي، وفي الغالب يكون كنتيجة لمضاعفات داء السكري. والجدير بالذكر أن معدل انتشار مرض الكلى المزمن في ليبيا ما يزال غير معروف. لذلك هدفت هذه الدراسة إلى مقارنة نتائج بعض المتغيرات الفسيولوجية عند مرضى الفشل الكلوي المصابين بداء السكري وغير المصابين بداء السكري والذين يجرون جلسات غسيل الكلى في مركز الزاوية لعلاج أمراض الكلى. طريقة البحث: تمت مراجعة نتائج التحاليل الطبية لـ 120 مريضاً (70 ذكر و 50 أنثى) من سجلات المركز. حيث أخذ متوسط نتائج التحاليل لكل مريض بشكل منفصل للمتغيرات التالية: الهيموجلوبية (Hgb)، الصوديوم (Na)، البوتاسيوم (K) والكلوريد (Cl). النتائج: وقد أظهرت النتائج أن 98.33% من الحالات كان معدل الهيموجلوبين لديها منخفضاً. وقد وجد أن 33.33% من الحالات لديها مستويات منخفضة من الصوديوم. بالإضافة إلى تسجيل مستويات عالية من البوتاسيوم عند 16.66% من الحالات المصابة بالفشل الكلوي المصاحب بمرض السكري وعند 28.33% من غير المصابين بالسكري. وأخيراً، فإن 38.34% من الحالات المصابة بداء السكري و 20.00% من غير المصابين بالسكري لديهم قيم منخفضة الكلوريد. الاستنتاجات: أظهرت نتائج هذه الدراسة وجود اختلافات في العديد من المتغيرات الفسيولوجية لدى مرضى الفشل الكلوي، وقد كانت التغيرات أكثر وضوحاً لدى مرضى السكر المصاحب بالفشل الكلوي.

Abstract:

Background and objective: Chronic Kidney Disease (CKD) is a progressive and irreversible illness resulting in renal failure that mostly caused by diabetes mellitus complications. It is worth mentioning that

prevalence of CKD in Libya is still unknown. Therefore this study aimed to compare the results of some physiological variables cohort of diabetic and non-diabetic renal failure patients, who are receiving dialysis sessions at Al-Zawia Center for the treatment of kidney diseases. **Methods:** The medical analyses results for 120 patients (70 males & 50 females) were reviewed from the Center records. The average results for each patient were taken separately for the following parameters: (Hbg), (Na), (K) and (Cl). **Results:** The results showed that 98.33% of cases had a low Hbg rate. Also 33.33% of studied cases had low Na levels. High level of K at 16.66% of diabetic cases and in 28.33% of non-diabetics. Finally, 38.34% of diabetics and 20.00% of non-diabetics had low Cl values. **Conclusions:** In this study, the results showed that there were differences in many physiological parameters in patients with renal failure, the changes was more pronounced in patients who are diabetics in combination with renal failure.

Keywords: *Chronic Kidney Disease, chronic Kidney or Renal failure, Diabetes mellitus, and Al-Zawia center for the treatment of renal diseases.*

Introduction:

Chronic Kidney Disease (CKD), also known as chronic Kidney or Renal failure, is a progressive and irreversible disease which is characterized by kidney damage and decreased in renal functions, it can be a temporary (often acute) or a chronic condition. CKD is considered as a serious health problem throughout the world, decreased renal function refers to abnormality of detoxification, often assessed as creatinine clearance or glomerular filtration rate (Levey *et al* 2007; Hsu and Chertow 2000).

The common risk factors for CKD in Arabian countries are hypertension, diabetes mellitus, and obesity (Farag *et al* 2012). Renal disease is a common finding in diabetics (Canadian Institute for Health Information 2011). Diabetes mellitus is a growing epidemic, and it is the most common cause of CKD as well as renal failure. In diabetics, the diabetic nephropathy affects approximately 20–40 % of cases, making it one of the most common complications related to diabetes (ADA 2015). The classic description of diabetic nephropathy is defined as a progressive increase in proteinuria in people with longstanding diabetes followed by declining in renal function that eventually can lead to end stage renal disease (ESRD) (Lemley *et al*

2000). Key risk factors for diabetic nephropathy include having diabetes for long time, poor glycemic control, hypertension, obesity and cigarette smoking (**Philip et al 2013**).

Renal diseases can be a particularly life devastating complications, as it is associated with significant reductions in both length and quality of life (**Bell et al 2001**). A variety of kidney diseases can be seen in people with diabetes, including diabetic nephropathy, ischemic damage associated with vascular disease and high blood pressure. (**Mazzucco et al 2002**). The total number of patients suffering from chronic renal failure in the Middle East is about 100000, with a prevalence rate of 430 patients per million population (**Najafi 2009**). The overall prevalence of diabetes in 200 Egyptians with chronic kidney disease was 69% (**Alghaythi et al 2018**).

DM can lead to a myriad of long-term health complications such as coronary heart disease, renal failure and stroke (**Health Promotion Board, Singapore 2011**). DM is estimated by the World Health Organization (WHO) that 3% of the world's population (194 million) have diabetes and the prevalence is expected to double by the year 2025 to 6.3% (**Wild et al 2004**). In Libya, according to the World Health Organization (WHO), it is estimated that there were 88,000 diabetics in 2000, and this ratio is expected to reach 245,000 by 2030, and according to local epidemiological studies, the prevalence of known diabetes patients over the age of 20 years is 3.8%. (**Kadiki et al 1999**). As of 50% of type 2 diabetic patients were unaware of their diabetes “undiagnosed”, the actual prevalence is probably higher, for instance, in the town of Tajoura, the west part of Libya; 7.9% of all adult members of 1094 randomly selected families (2996 persons aged between 20 and 75 years) had diabetes (**The National Board for Scientific Re-search 2001**). In Benghazi, in the eastern part of Libya, screening of randomly selected group of 868 subjects revealed that about 23% above the age of 20 years were glucose intolerant, two-thirds had diabetes and the rest had impaired glucose tolerance **Kadiki et al 2001**).

There is a rising trend of ESRD due to DM. The proportion of diabetics among new ESRD patients increased from 48.2% in 1999 to 63.5% in 2011 (**Health Promotion Board, Singapore 2013**).

In Surman and Subrata, the results of biochemical tests showed a significant increase in the levels of triglycerides, cholesterol, urea, creatinine, potassium and sodium ions, while the rise in the blood uric acid level was mild (**Sukinah and Asma 2019**).

The exact prevalence of CKD in Libya is unknown, the ESRD in Libya is a major health problem where the incidence rate is one of the highest in the world, the total adult cases was reached 2417 in 2016, where 624/million of population undergoing dialysis as a result of ESRD, and it is expected that the number of dialysis patients will increase to 7667 in 2024 (**Alashek 2016**).

Aim of the study:

The present study aimed to compare the results of some physiological variables (parameters) among a sample of diabetic and non-diabetic renal failure patients, who are having dialysis sessions at Al-Zawia Center for the treatment of kidney diseases.

Subject and methods:

Study population: The study was conducted on 120 patients with renal failure who are receiving dialysis sessions at Al-Zawia center for the treatment of renal diseases. The number of male cases in this study was 70 patients (35 suffering from renal failure with diabetes mellitus; and 35 suffering from renal failure alone). While the number of female cases was 50 (25 of them suffering from renal failure with diabetes; 25 suffering from renal failure only). So equally 60 cases for those suffering from renal failure and diabetes, and who are suffering from renal failure without diabetes.

The cases were divided into two age groups: the first group included the patients who are aged of 40 years or older, which represent 81 cases (56 males and 25 females), while the second group included patients who are less than 40 years, that represent 39 cases (14 male and 25 female) as shown in table 1.

A comparative study between some physiological paramete.....(177 -188)

Table 1- Distribution of patients suffering from renal failure accompanied with diabetes mellitus and patients suffering from renal failure with no diabetes mellitus according to age groups and gender.

Sex	Diabetics			Non-diabetics		
	≥ 40	< 40	Total	≥ 40	< 40	Total
Male	33 (55.00%)	02 (03.33%)	35 (58.33%)	23 (38.33%)	12 (20.00%)	35 (58.33%)
Female	23 (38.33%)	02 (03.33%)	25 (41.66%)	02 (03.33%)	23 (38.33%)	25 (41.66%)
Total	56 (93.33%)	04 (06.66%)	60 (100%)	25 (41.66%)	35 (58.33%)	60 (100%)

Data collection: The results of the medical analyses for patients were collected from the records of Al-Zawia Center for the treatment of renal diseases during the period from 01/07/2017 to 31/12/2017. The average results for each patient were taken separately for the following parameters: hemoglobin (Hbg), Urea, creatinine, sodium (Na), Potassium (K) and chloride (Cl).

Statistical analysis: The Statistical Package for Social Science version 10 (SPSS) software for biostatic analysis was used to achieve valid and reliable results obtained in this study. Data were then presented in tables and figures. P value of less than 0.05 was considered significant.

Results:

The results of the current study showed that hemoglobin (Hbg) levels were low in all diabetics included in this study (males and females). While among non-diabetic patients, the results showed that all males and 23 (92.00%) females had a reduction in Hbg. Meanwhile, 2 females (less than 40 years) had a normal level of Hbg as described in table 2.

Table 2- describes the hemoglobin levels among non-diabetes according to age groups and gender.

		Age group				
		≥ 40		< 40		Total
		Normal	Low	Normal	Low	
Sex	Male	0 (0%)	23 (65.71 %)	0 (0%)	12 (34.29%)	35
	Female	0 (0%)	02 (08.00%)	02 (08.00%)	21 (84.00%)	25
	Total	0 (0%)	25 (41.67%)	02 (03.33%)	33 (55.00%)	60

As depicted in table 3, the results of sodium (Na) in diabetics were low in 11 (31.43%) out 35 males who belong to the first age group, but the number

A comparative study between some physiological paramete.....(177 -188)

of cases that had normal Na level were 24. In regard to females Na levels were low in 6 (24.00%) out of 25 cases, (4 in first age group and 2 in second age group), while the normal Na levels found in 19 cases.

Table 3- elucidate the distribution of sodium levels among diabetics according to age groups and gender.

		Age group				
		≥ 40		< 40		Total
		Normal	Low	Normal	Low	
Sex	Male	22 (62.86%)	11 (31.43%)	02 (05.71%)	00	35
	Female	19 (76.00%)	04 (16.00%)	0 (0%)	02 (08.00%)	25
	Total	41 (68.34%)	15 (25.00%)	02 (03.33%)	02 (03.33%)	60

As described in table 4, in non-diabetic males 10 (28.57%) out of 35 had low Na rates (6 cases in first age group and 4 in second age group), however 25 had normal Na levels. Conversely, 13 (52.00%) out of 25 females recorded low levels (2 cases in first age group and 11 in second age group), while 12 cases had normal Na levels.

Table 4- explains the distribution of sodium levels among non-diabetics according to age groups and gender.

		Age group				
		≥ 40		< 40		Total
		Normal	Low	Normal	Low	
Sex	Male	17 (48.57%)	06 (17.14%)	08 (22.86%)	04 (11.43%)	35
	Female	0 (0%)	02 (08.00%)	12 (48.00%)	11 (44.00%)	25
	Total	17 (28.33%)	08 (13.33%)	20 (33.34%)	15 (25.00%)	60

The results of Potassium (K) levels in diabetic patients were high in 4 (11.43%) out of 35 males, all of them belong to first age group, whereas 31 cases had normal K levels. In females, the K levels were high in 6 (24.00%) out of 25, (4 of whom belong to first age group and 2 to the second age group) and there were 19 cases had normal K levels. All of these results were shown in table 5.

Table 5- illustrates the results of potassium in diabetics according to patient's age groups and gender.

		Age group				
		≥ 40		< 40		Total
		Normal	High	Normal	High	
Sex	Male	29 (82.86%)	04 (11.43 %)	02 (05.71%)	0 (0 %)	35
	Female	19 (76.00%)	04 (16.00%)	0 (0%)	02 (08.00%)	25
	Total	48 (80.00%)	08 (13.34%)	02 (03.33%)	02 (03.33%)	60

A comparative study between some physiological paramete.....(177 -188)

Table 6 shows that the levels of K in non-diabetics were high in 8 (22.86%) out of 35 males (7 of them belongs to the first age group and 1 to the second age group) in compare to females, 9 (36.00%) out of 25 had high K levels (2 of whom belongs to first age group and 7 to the second age group).

Table 6- shows the distribution of potassium levels among non-diabetics according to age groups and gender.

		Age group				
		≥ 40		< 40		Total
		Normal	High	Normal	High	
Sex	Male	16 (45.71%)	07 (20.00%)	11 (31.43%)	01 (02.86%)	35
	Female	0 (0%)	02 (08.00%)	16 (64.00%)	07 (28.00%)	25
	Total	16 (26.67%)	09 (15.00%)	27 (45.00%)	08 (13.33%)	60

Table 7 shows the results of both diabetic males and females in relation to their CL levels. There were 14 (40.00%) out 35 males (13 of them belongs to first age group and 1 to second age group) with low levels, while there were 1 (02.86%) patient had high Cl level. According to the same table 9 (36.00%) out of 25 of females had low Cl levels (all of them belongs to first age group) while only 4 (16.00%) patients had high Cl levels (3 in first age group and 1 in second age group).

Table 7- illustrates the chloride levels among diabetics according to patient's age groups and gender.

		Age group						
		≥ 40			< 40			Total
		Low	Normal	High	Low	Normal	High	
Sex	Male	13 (37.14%)	19 (54.28%)	01 (02.86%)	01 (02.86%)	01 (02.86%)	0 (0%)	35
	Female	09 (36.00%)	11 (44.00%)	03 (12.00%)	0 (0%)	01 (04.00%)	01 (04.00%)	25
	Total	22 (36.67%)	30 (50.00%)	04 (06.66%)	01 (01.67%)	02 (03.33%)	01 (01.67%)	60

Table 8 explains the results of Cl for patients who are suffering from renal failure only. In terms of males, the Cl levels were low in 10 (28.57%) out of 35 (6 cases in age group 1 and 4 in age group 2). In females, 11 (44.00%) out of 25, (2 cases in first age group, and 9 in second age group) had low Cl levels.

A comparative study between some physiological parame.....(177 -188)

Table 8- describes the chloride levels among non-diabetics according to patient's age groups and gender.

		Age group						
		≥ 40			< 40			Total
		Low	Normal	High	Low	Normal	High	
Sex	Male	06 (17.14%)	17 (48.57%)	0 (0%)	04 (11.43%)	08 (22.86%)	0 (0%)	35
	Female	02 (08.00%)	14 (56.00%)	0 (0%)	0 (0%)	09 (36.00%)	0 (0%)	25
	Total	08 (13.33%)	31 (51.68%)	0 (0%)	04 (06.66%)	17 (28.33%)	0 (0%)	60

Discussion:

Diabetes is the leading cause of kidney disease in Canada (**Canadian Institute for Health Information 2011**). The results of the Sukinah and Asma study in Surman and Subrata showed that there is a noticeable significant decrease in the level of hemoglobin in patients with chronic renal failure. The results of biochemical tests showed a significant increase in cholesterol, urea, creatinine, potassium and sodium ions (**Sukinah and Asma 2019**).

The study showed that 98.33% of cases had low Hbg rate (without significant differences in sex, age, or diabetic status) meanly due to the dialysis process. This is consistent with results of **Azab and Mohammed 2015** at Zahra Hospital for Kidney Diseases and Surgery. Anemia and low blood cell counts among patients with renal failure may be due to an insufficient production of the hormone erythropoietin by the kidneys, or as a result of both iron and folate deficiency, increased red blood cell breakdown, and accumulation of nitrogenous waste materials; all of these disturbances can lead to decrease RBCs production and shorten their live-span (**Suresh et al 2012; Al-Abachi et al 2012**).

The kidneys play a decisive role in regulating the levels of sodium and potassium ions, therefore, the disturbance of their levels in the blood are connected with renal functions. It is evident from the results of the current study that 33.33% of cases had low Na levels with no significant differences in regard to diabetes as well as to age and gender. The lack of sodium ions in the blood serum among patients with renal failure may be due to deficiency of the aldosterone hormone which increases the loss of

sodium ions in the urine. These results are similar to the results that were recorded among patients with chronic kidney failure in Iraq in 2012 (**Al-Abachi et al 2012**).

The results of this study also showed a high level of potassium in 16.66% of cases with CRF accompanied with diabetes as well as in 28.33% of CRF cases without diabetes, with significant differences (P value 0.04), the reason for this may be due to the dietary style variation between the two groups, it was also found that age had no effect on the levels of serum potassium, while the high levels were more among females than males without any significant differences. These findings appear to be in accordance with the results recorded in chronic renal failure patients in Iraq (**Al-Abachi et al 2012**).

With regard to the Cl values, the results indicated that there were none of non-diabetics had high Cl levels, while 08.33% of diabetic patients had a high level of Cl. On contrary, 38.34% of diabetics with CRF and 20.00% of non-diabetics with CRF had low Cl levels, (no significant differences were found with respect to gender or age).

Conclusion:

In the present study which was conducted on patients with renal failure who were receiving dialysis sessions at Al-Zawia Center for the treatment of kidney diseases showed that there were differences in the results of the analyzes for many physiological variables (parameters) in patients with renal failure. The changes was more pronounced in diabetic patients, and this requires special and increased periodic evaluation of changeable parameters in diabetic with renal failure.

Recommendations:

It is highly recommended to maintain physical fitness, exercise and maintain normal blood pressure and blood sugar by eating healthy diets. Furthermore, doing a periodic blood tests that can help to detect any kidney injuries at an early stages.

Eventually, further researches are advised regarding diabetes and its relationship to renal failure as well as the effects of diabetes on the kidneys.

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