RISK FACTORS OF CHRONIC KIDNEY INJURY AMONG DIABETIC AND NON-DIABETIC HEMODIALYSIS PATIENTS IN DUHOK GOVERNORATE, KURDISTAN REGION OF IRAQ

FARSAT SAEED SAADI[*]
BLAND BAYAR KHALEEL[**]
ZANA SIDIQ MOHAMMED[***]
NAJIM A. YASSIN[****]

Submitted 29 Dec. 2023; accepted 09April 2024

ABSTRACT

Background: The number of patients with chronic kidney disease and those requiring dialysis is increasing markedly and can be considered as a major public health challenges. The current study aims to report on the risk factors of chronic kidney injury among diabetic and non-diabetic hemodialysis patients in Duhok Governorate, Kurdistan Region of Iraq.

Methods: This is a cross-sectional study conducted in facilities that provide dialysis treatment in Duhok province, Kurdistan Region of Iraq. A total of 171 registered cases who diagnosed as a chronic renal failure requiring maintenance hemodialysis treatment were included.

Results: The most common age group having chronic kidney injury was 55-69 years old. The results showed that most common factors were DM and hypertension. High creatinine level group were those aged 40-69 years and patients without DM show higher frequency of high S. Creatinine level. S. Creatinine was higher among non-controlled diabetic patients.

Conclusions: Proper evaluation and screening of risk factors, and appropriate intervention and treatment of underlying causes, and regular follow up is needed to reduce the overall cost and economic burden and to minimize the consequences and improve the prognosis of patients with chronic kidney injury especially those with diabetes mellitus and hypertension.

Duhok Med J 2024; 18 (2): 76-84.

Keywords: Chronic kidney injury, risk factors, diabetes mellitus, hypertension, hemodialysis

The number of patients with chronic kidney disease and those on dialysis treatment is increasing markedly in Kurdistan Region. The cost of treatment of End Stage Renal Disease
(ESRD) is placing a huge burden on health systems[1]. ESRD is defined as a glomerular filtration rate < 15 mL/minute/1.73 m2.
The worldwide incidence of ESRD has increased[2]. Diabetic nephropathy is considered the most common cause of ESRD followed by hypertension, glomerulonephritis, polycystic kidney disease, recurrent infection, renal obstruction, etc.[3]. There are more than 500 million people diagnosed with DM in the world in 2021, majority are in low-medium income countries and 95% are having type 2 diabetes mellitus (T2DM). Around 1.4 million of Iraqis have diabetes mellitus (DM). The prevalence of T2DM in Iraq reported as a range from 8.5% (International Diabetes Federation-age-adjusted) to 13.9%[4]. According to a study conducted in Iraq in 2017, 34 % of patients with chronic kidney disease had diabetes, and 70 % of those patients had been receiving dialysis for more than a

https://doi.org/10.31386/dmj.2024.18.2.8

** Internal Medicine Specialist, Azadi Teaching Hospital, Duhok Governorate*
*** Diabetologist, Azadi Teaching Hospital, Duhok Governorate.*
**** Professor and Nephrologist, College of Medicine, Duhok University.*
***** Assistant Professor, Department of Medical Microbiology, College of Medicine, Duhok University.*
Corresponding author: Farsat Saeed Saadi. farsat.saadi@duhokhealth.org. Mobile: +964(0)7504757740.

year5. It is expected that the registered number of patients with DM will exceed 1.7 million by 20256. This posed a serious challenge to the country's already overburdened healthcare systems. There are around 100,000 cases of DM registered in Kurdistan Region, more than 95% are T2DM. T2DM is considered a major cause of premature illness and death[7]. In Duhok Governorate, there are 26,000 DM cases, 25,000 are T2DM. No studies involving T2DM and hemodialysis cases has been conducted in Duhok Governorate.

The current study aims to report on the risk factors of chronic kidney injury among diabetic and non-diabetic hemodialysis patients.

METHODS

This is a cross-sectional study conducted in facilities that provide dialysis treatment in Duhok Governorate which include Renal Dialysis and Lithotripsy Center in Duhok City, Zakho Dialysis Unit, Akre Dialysis Unit and Amedy Dialysis Unit. The study conducted from February 15th to May 15th, 2023. Blood sample taken from enrolled registered patients. From 235 cases, 171 were the study sample according to the inclusion criteria which are: male and female with T2DM, age above 25 years, diagnosed as a chronic renal failure requiring maintenance hemodialysis treatment.

Patients aged less than 25 years old, having renal failure for less than 6 months, those who decline to answer the questionnaire, those who will voluntarily withdraw from dialysis, those with severe mental health disorders, pregnant and lactating women were excluded.

Ethical Approval to conduct this study research protocol was approved by the Ethical Committee from the concerned health sectors in Duhok city, namely, the General Directorate of Health and College of Medicine in Duhok University. Before patients' interview each patient informed about the aim of the study and the confidentiality of their data were ensured by the researcher also their rights to refuse or participate in the present study confirmed and then oral informed consent obtained for interview.

Each patient subjected to personal interview using a structured questionnaire prepared by the researchers according to the study's aim and collected comprehensive data on a wide range of issues related to risk factors of chronic kidney injury, diabetes and non-diabetes status and hemodialysis.

Relevant data for the present study included sociodemographic variables such as: age and gender, family history of DM and renal transplantation, chronic renal failure, date of starting hemodialysis, duration of hemodialysis and history of hospital admission and blood sugar records (4 continuous daily readings in home and hospital).

The objectives of the study and questionnaire have been fully explained to the hemodialysis personnel who were responsible for data collection and background information about the study and its objectives provided to all patients. The final cause of chronic renal injury was confirmed and provided to the data collection staff by the attending physician. The analysis of data carried out by using the Statistical Package for Social Sciences (SPSS) version 27.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

The origin of the most of the participants ranged were from Duhok (60%), age group 55-69 years old was the most common with almost equal gender distribution (Table: 01). The mean BMI of 25.4 (SD=5.2), mean duration of hemodialysis of 2.7 years (SD=3) and mean S. Creatinine of 7.3 mg/dl (SD=2.7) (Table: 02).

Table 01: Distribution of the hemodialysis patients according to city, age and gender

Characteristic		No.	%
City	Duhok	102	59.6
	Zakho	42	24.6
	Akre	22	12.9
	Amedy	5	2.9
Age (years)	25 - 39	32	18.8
	40 - 54	34	19.9
	55 - 69	65	38.0
	70 - 85	40	23.4
Gender	Male	85	49.7
	Female	86	50.3
Total		**171**	**100.0**

Table 02: Descriptive statistics of age, BMI, duration of hemodialysis and S. Creatinine

Characteristic	Minimum	Maximum	Mean	Standard Deviation
Age (years)	25	85	55	30
BMI (kg/m^2)	11.7	51.3	25.4	5.2
Duration of Hemodialysis (years)	0.50	15.00	2.65	2.95
S. Creatinine (mg/dL)	2.20	20.00	7.34	2.70

The frequency of different risk factors in hemodialysis patients showed that most common factors were DM and hypertension (Table: 03).

Table 03: Distribution of the patients on hemodialysis, according to possible risk factors and S. Creatinine level under characteristics of study population

Characteristic		No.	%
DM	Yes	125	73.1
	No	46	26.9
HT	Yes	71	41.5
	No	100	58.5
Smoking	Yes	52	30.4
	No	119	69.6
Alcoholism	Yes	2	1.2
	No	169	98.8
BMI (kg/m^2)	< 18.5	14	8.2
	18.5 - 24.9	64	37.4
	25 - 29.9	60	35.1
	≥ 30	33	19.3
Family history of DM	Type 1 DM	0	0.0
	Type 2 DM	75	43.9
	None	96	56.1
Family history of kidney transplantation	Yes	10	5.8
	No	161	94.2
Family history of chronic renal failure	Yes	32	18.7
	No	139	81.3
Blood sugar control	Diabetic-Controlled	30	17.5
	Diabetic-Uncontrolled	41	24.0
	Not Diabetic	100	58.5
S. Creatinine (mg/dL)	< 5	27	15.8
	≥ 5	144	84.2
Total		**171**	**100.0**

The most frequent high creatinine level group was those age 40-69 years (p = 0.04), patients without DM show higher frequency of high S. Creatinine level (p=0.042), the other risk factors showed no significant relationship with S. Creatinine level (Table: 04).

Table 04: Relation of S. Creatinine level in hemodialysis patients to their characteristics

Characteristic		S. Creatinine mg/dL				Total		*P*-value*
		< 5		≥ 5				
		No.	%	No.	%	No.	%	
Age (years)	25 - 39	8	25	24	75	32	100	**0.04**
	40 - 54	1	2.9	33	97.1	34	100	
	55 - 69	9	13.8	56	86.2	65	100	
	70 - 85	9	22.5	31	77.5	40	100	
Gender	Male	10	11.8	75	88.2	85	100	0.151
	Female	17	19.8	69	80.2	86	100	
DM	Yes	16	22.5	55	77.5	71	100	**0.042**
	No	11	11.0	89	89.0	100	100	
HT	Yes	19	15.2	106	84.8	125	100	0.727
	No	8	17.4	38	82.6	46	100	
Smoking	Yes	8	15.4	44	84.6	52	100	0.924
	No	19	16.0	100	84.0	119	100	
Alcoholism	Yes	0	0.0	2	100.0	2	100	1.000
	No	27	16.0	142	84.0	169	100	
Total		**27**	**15.8**	**144**	**84.2**	**171**	**100**	

A statistically significant longer duration of dialysis in females than to investigate the relation between S. Creatinine and other characteristics of the patients on hemodialysis in males (P < 0.001) has been found (Table: 05).

Table 05: Relation of duration of hemodialysis patients to gender

Duration	Gender	No.	Mean	Std. Deviation	Std. Error Mean
Duration of hemodialysis (years)	Male	76	1.96	2.35	0.27
	Female	76	3.64	3.45	0.40

treatment, the results showed that S. Creatinine is higher among non-controlled diabetic patients (p=0.042) (Table: 06).

Table 06: Relation of S. Creatinine in hemodialysis patients to their characteristics

Characteristic		S. creatinine mg/dL				Total		*P*-value*
		< 5		≥ 5				
		No.	%	No.	%	No.	%	
BMI (kg/m^2)	< 18.5	2	14.3	12	85.7	14	100.0	0.729
	18.5 - 24.9	9	14.1	55	85.9	64	100.0	
	25 - 29.9	12	20.0	48	80.0	60	100.0	
	≥ 30	4	12.1	29	87.9	33	100.0	
Family history of DM	Type 2 DM	15	20.0	60	80.0	75	100.0	0.182
	None	12	12.5	84	87.5	96	100.0	
Family history of kidney transplantation	Yes	2	20.0	8	80.0	10	100.0	0.659
	No	25	15.5	136	84.5	161	100.0	
Family history of chronic renal failure	Yes	6	18.8	26	81.3	32	100.0	0.619
	No	21	15.1	118	84.9	139	100.0	
Blood Sugar Control	Controlled	9	30.0	21	70.0	30	100.0	**0.042**
	Not controlled	7	17.1	34	82.9	41	100.0	
	Not diabetic	11	11.0	89	89.0	100	100.0	
Total		**27**	**15.8**	**144**	**84.2**	**171**	**100.0**	

* Based on Chi square test or Fisher's exact test.

Results showed that the first risk factors is diabetes mellitus among diabetics patients and hypertension among non-diabetic patients (Table: 07).

Table 07: First and second risk factors for hemodialysis among DM and non-DM patients

Risk Factor		DM			
		Yes		No	
		No.	%	No.	%
1st risk factor	DM	68	95.8	1	1.0
	HT	2	2.8	57	57.6
	Cardiovascular diseases	0	0.0	7	7.1
	Family history	0	0.0	1	1.0
	Inherited CKD	1	1.4	16	16.2
	Recurrent renal stone	0	0.0	4	4.0
	Socio-economic	0	0.0	4	4.0
	Medications	0	0.0	6	6.1
	Unknown reasons	0	0.0	3	3.0
Total		**71**	**100.0**	**100**	**100**
2nd risk factor	HT	48	90.6	2	4.0
	Cardiovascular diseases	3	5.7	6	12.0
	Family history	0	0.0	4	8.0
	Inherited CKD	1	1.9	9	18.0
	Recurrent renal stone	0	0.0	4	8.0
	Medications	1	1.9	2	4.0
	Old age	0	0.0	1	2.0
	Unknown reasons	0	0.0	22	44.0
Total		**53**	**100.0**	**50**	**100.0**

DISCUSSION

Chronic kidney injury can be considered as a major public health challenges. Proper evaluation and screening of modifiable risk factors, and appropriate intervention and treatment of underlying causes, and regular follow up will minimize the consequences and improve the prognosis. In addition, the overall cost and economic burden of renal replacement therapy especially hemodialysis might be reduced by the aforementioned practices. DM causing significant morbidly and mortality via causing progressive micro and macro vascular complications8, similar impacts are applied to hypertension9. Some other non-modifiable risk factors for chronic kidney injury are race, gender, age, and family history[10]. In this study, the most common possible risk factor of patients with chronic kidney injury in patients who were on ongoing hemodialysis in our study was DM (73.1%) and hypertension (41.5%). This is conclusive with Kohagura (2023) findings that impact of hypertension and diabetes mellitus are major risk factors for developing chronic kidney injury[11]. Additionally, hypertension and diabetes exert further synergistic influence on the risk of renal failure[12]. In a community-based population study for 10 year follow up, the prevalence of newly developed chronic kidney injury over 10 years was 19.2% and determined that not only hypertension and DM but also several metabolic abnormalities were independent risk factors for renal injury[13]. One of the important findings was relation of chronic kidney injury to the age. High creatinine level group were found among patients aged 40-69 years including those without DM. This is comparable with the theory that state that after the age of 40, renal filtration threshold falls by 1% per year and the glomeruli will be more susceptible to damage by high blood sugar and blood

pressure[14]. Mallappallil et al. (2014) refers to the fact that the prevalence of chronic kidney injury in US adult population was 39.4% in persons aged over 60 years old compared to 12.6% in persons aged 40-59 years old and 8.5% in persons aged 20-39 years old[15]. Higher S. Creatinine level was reported among uncontrolled diabetic patients. Here, the rapid decline in renal function is considered a major challenge in patients with poor glycemic control[16].

Moreover, a statistically significant finding has been found in relation to the duration of dialysis and the longer duration of dialysis have been reported in females than in males. In reference to other risk factors, the study concluded that cardiovascular diseases, family history, and recurrent renal stones are also risk factors for developing chronic kidney injury in diabetic and non-diabetic patients on hemodialysis. This has been referred to in a study conducted by Ferraro et al. (2013) that found relation of further risk factors to chronic kidney injury[17]. In conclusion, the most common age group was 55-69 years old having chronic kidney injury and the most common factors were DM and hypertension. High creatinine level group were those age 40-69 years and patients without DM show higher frequency of high S. Creatinine level. S. Creatinine was higher among non-controlled diabetic patients. Proper evaluation and screening of risk factors, and appropriate intervention and treatment of underlying causes, and regular follow up is needed.

CONFLICT OF INTEREST

The authors declared that they have no conflict of interest.

REFERENCES

1. Stengel B, Billon S, Van Dijk PC, Jager KJ, Dekker FW, Simpson K, et al. Trends in the incidence of renal replacement therapy for end-stage renal disease in Europe, 1990-1999. Nephrol Dial Transplant. 2003; 18(9): 1824-33.
2. Usami T, Sato R, Yoshida A, Kimura G. Regional variation in end-stage renal disease. Curr Opin Nephrol Hypertens. 2002; 11(3):343-6.
3. Hashmi MF, Benjamin O, Lappin SL End-Stage Renal Disease. [Updated 2023 Feb 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan. Available from: https://www.ncbi.nlm.nih.gov/books/NBK499861/.
4. Abusaib M, Ahmed M, Nwayyir HA, Alidrisi HA, Al-Abbood M, Al-Bayati A, et al. Iraqi Experts Consensus on the Management of Type 2 Diabetes/Prediabetes in Adults. Clin Med Insights Endocrinol Diabetes. 2020; 19:13:1179551420942232.
5. Alhajim SA. Assessment of the quality of life in patients on haemodialysis in Iraq. East Mediterr Health J. 2018; 5:23(12):815-820.
6. Abdulah DM, Hassan AB, Saadi FS, Mohammed AH. Impacts of self-management education on glycaemic control in patients with type 2 diabetes mellitus. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2018;12:969-975.
7. Hassan AB, Salih SF, Hassan II, Saadi FS, Abdulah, DM, Ahmed IH, et al. Circulating betatrophin in relation to metabolic, inflammatory parameters, and oxidative stress in patients with type 2 diabetes mellitus, Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019;13:458-463.
8. Rajab HA, Hassan AB, Hassan II, Abdulah DM, Saadi FS. Circulating

human anti nucleolus antibody (ANCAb) and biochemical parameters in type 2 diabetic patients with and without complications. PLoS ONE. 2020;17:15(8):e0237109.

9. Whelton PK, Klag MJ. Hypertension as a risk factor for renal disease. Review of clinical & epidemiological evidence. Hypertension. 1989; 13:I1-97.
10. Kazancioğlu R. Risk factors for chronic kidney disease: an update. Kidney Int Suppl (2011). 2013; 3(4): 368-371.
11. Kohagura K. The public health impact of hypertension and diabetes: a powerful tag team for the development of chronic kidney disease. Hypertens Res. 2023; 46: 339–340.
12. Wang M, Li J, Li Y, Yao S, Zhao M, Wang C, et al. The effects of hypertension and diabetes on new-onset chronic kidney disease: A prospective cohort study. J Clin Hypertens. 2020; 22(1): 39-46.
13. Yamagata K, Ishida K, Sairenchi T, Takahashi H, Ohba S, Shiigai T, et al. Risk factors for chronic kidney disease in a community-based population: a 10-year follow-up study, Kidney International. 2007; 71:159-166.
14. CDC. Chronic Kidney Disease Surveillance System-United States. Atlanta-Georgia. Centers for Disease Control and Prevention. [Cited November 21st, 2023] Available from http://www.cdc.gov/ckd.
15. Mallappallil M, Friedman EA, Delano BG, McFarlane SI, Salifu MO. Chronic kidney disease in the elderly: evaluation and management. Clin Pract (Lond). 2014;11(5):525-535.
16. Fujii M, Ohno Y, Ikeda A, Godal K, Li Y, Nakamura Y, et al. Current status of the rapid decline in renal function due to diabetes mellitus and its associated factors: analysis using the National Database of Health Checkups in Japan. Hypertens Res.2023;46:1075–1089.
17. Ferraro PM, Taylor EN, Eisner BH, Gambaro G, Rimm EB, Mukamal KJ, et al. History of kidney stones and the risk of coronary heart disease. JAMA. 2013; 24;310(4): 408-15.

پوختە

هوکارێن مەترسی یێن نەخوشیێن گولچیسکا یێن دومدرێژ دناڤ نەخوشێن گولچیسکێن وان دهێنە شیشتن یێن نەخوشیا شەکرێ هەی و یێن نەخوشیا شەکرێ نەبیت ل پارێزگەها دهوک/هەرێما کوردستانێ – عیراق

پێشەکی و ئارمانج: ژمارا ئەو نەخوشێن نەخوشیێن دومدرێژ یێن گولچیسکان هەین و پیدڤی ب شویشتنا گولچیسکان دبن ب شێوەکێ بەرچاڤ دزیدەبوونێ دایە و دێتە هژمارکرن وەك ئاستەنگەکا سەرەکی یا ساخلەمیێ. ئارمانجا ڤێ ڤەکولینێ راپورتکرنا هوکارێن مەترسی یێن نەخوشێن گولچیسکان یێن دومدرێژ دناڤ نەخوشیێن شەکر هەی و یێن نەخوشیا شەکرێ نەبیت کو پیدڤی ب شیشتنا گولچیسکان هەنە ل پاریزگەها دهوکێ/ هەرێما کوردستان – عیراق.

ڕێکێن ڤەکولینێ: ئەڤ ڤەکولینە ب دیزاینا کرووس-سێکشن هاتیەکرن ل هەمی سەنتەرێن چارەسەریا شویشتنا گولچیسکان پاریزگەها دهوکێ/ هەرێما کوردستان– عیراق. سەرجەم 171 حالەتێن هاتینە تومارکرن کو وەک ژ کارکەفتنا گولچیسکان یا دومدرێژ هاتینە دەستنیشانکرن و پیدڤی ب چارەسەریا شویشتنا گولچیسکان هاتینە بەشدار کرن.

ئەنجام: پترین کەسێن نەخوشیێن دومدرێژ یێن گولچیسکان هەی ژیێ وان دناڤبەرا 55-65ساڵ دا بو. ئەنجامان دیارکر کو پترین هوکار پیکهاتینە ژ نەخوشێن شەکرێ و فشارا بلند یا خوینێ. گروپێ ئاستێ کریاتینینی یێ بلند ژیێ وان دناڤبەرا 40-69ساڵان دا بووە. ونەخوشێن نەخوشیا شەکرێ نە فرینکوێنسی یا بلندتر نیشانددەت. ئاستێ کریاتینینی دناف نەخوشێن شەکرێ یێن نەهاتینە کونترولکرن زێدەتر بوو.

دەرئەنجام: هەلسەنگاندن و چاڤدێریکرنەکا دروست یا هوکارێن مەترسی هەی، و دەستێوەردانەکا گونجای و چارەسەریەکا گونجای بو هوکارێن هاتینە پێشکێشکرن و دیفچوونەکا بەردەوام زۆر یا پێویستە بۆ کێمکرنا بارگرانیا ئابووری و تێچوویێن گشتی و باشترکرنا رەوشا ساخلەمی لدەف نەخوشێن توشبووی ب نەخوشیێن دومدرێژ یێن گولچیسکانە ب تایبەت ئوێن نەخوشێن شەکرێ و بلندبوونا فشارا خوینێ هەی.

الخلاصة

عوامل خطورة الإصابة الكلوية المزمنة بين مرضى غسيل الكلى المصابين بمرض السكري وغير المصابين بمرض السكري في محافظة دهوك، إقليم كردستان – العراق

الخلفية والأهداف: يتزايد عدد المرضى الذين يعانون من أمراض الكلى المزمنة وأولئك الذين يحتاجون إلى غسيل الكلى بشكل ملحوظ ويمكن اعتباره تحديا رئيسيا للصحة العامة. تهدف الدراسة الحالية إلى الإبلاغ عن عوامل الخطر لإصابة الكلى المزمنة بين مرضى غسيل الكلى الذين يعانون من مرض السكري وغير المصابين بمرض السكري في مراكز غسل الكلى في محافظة دهوك، أقليم كردستان العراق.

طرق البحث: هذه دراسة مقطعية أجريت في المراكز التي تقدم علاج غسيل الكلى في محافظة دهوك، أقليم كردستان العراق. تم تضمين ما مجموعه 171 حالة مسجلة تم تشخيصها على أنها فشل كلوي مزمن تتطلب علاج غسيل الكلى.

النتائج: كانت الفئة العمرية الأكثر شيوعا هي 55-69 سنة التي تعاني من إصابة مزمنة في الكلى. أظهرت النتائج أن العوامل الأكثر شيوعا هي مرض السكرى وارتفاع ضغط الدم. كانت مجموعة مستوى الكرياتينين العالية هي أولئك الذين تتراوح أعمارهم بين 40-69 سنة والمرضى الذين لا يعانون من مرض السكرى يظهرون تواترا أعلى من ارتفاع مستوى الكرياتينين و كانت نسبة الكرياتينين أعلى بين مرضى السكري غير المنضبطين.

الاستنتاجات: هناك حاجة إلى التقييم والفحص المناسبين لعوامل الخطر والتدخل المناسب وعلاج الأسباب الكامنة، والمتابعة المنتظمة لتقليل التكلفة الإجمالية والعبء الاقتصادي وتقليل العواقب وتحسين التشخيص عند المرضى الذين يعانون من إصابات الكلى المزمنة وخاصة داء السكري وارتفاع ضغط الدم.