CARDIOVASCULAR RISK ASSESSMENT IN PATIENTS ON HEMODIALYSIS IN SULAIMANI CITY

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ABSTRACT

Background

Cardiovascular disease is the major cause of morbidity and mortality in patients with end-stage renal disease on hemodialysis. Cardiovascular disease is a group of disorders of the heart and the blood vessels. The end-stage renal disease required dialysis. Currently, Sulaimani city, has approximately 400 patients on hemodialysis.

Objectives

To determine the level of cardiovascular disease risk factors according to the World Health Organization / International Society of hypertension risk prediction charts to assess cardiovascular disease risk factors among patients with end-stage renal disease on hemodialysis.

Patients and Methods

This study is quantitative design (descriptive, cross-sectional) study, which was performed in two dialysis centers in Sulaimani City; those are the dialysis department-Shar teaching hospital and the dialysis center in Qrga. From September 2018 to March 2019, one hundred end-stages renal disease patients on hemodialysis were recruited. The socio-demographic, history and risks of cardiovascular disease, vital signs, anthropometric measurements, and laboratory investigations, were analyzed. Statistical Package for Social Sciences version (24) (SPSS) was used, the data analyzed was performed through; Descriptive statistics (frequency, percentage, mean, standard deviation, minimum, maximum and range). Inferential statistics (correlation test, chi-square, p-value, Fisher Exact Test).

Results

The mean age of the participants was 55.6 ±14.4 years. (53%) female (47%) male. Total cardiovascular disease risk levels were; (75%) low risk, (10%) moderate risk, (6%) high risk (9%) very high risk. Risk factors of cardiovascular disease were; hypertension (89%), diabetes mellitus (38%), smoker (27%), alcoholic (8%). Laboratory parameters; cholesterol of (8%) was more than 200mg/dl, Triglyceride of (14%) was more than 150 mg/dl. There was significant association between different CVD risk levels and some variables; age (p=0.016), SBP (p=<0.001) and respiratory rate (p=0.039) with CVD risk levels.

Conclusion

Most of the participants were married, female, illiterate, urban residence, and were on hemodialysis less than 1-year duration**.** A significant association between cardiovascular disease risks and each of Age, occupation, diabetes mellitus, history of ischemic heart disease, Systolic blood pressure, Diastolic blood pressure, pulse rate, respiratory rate, and 2 hr. postprandial blood glucose.

Keywords: *Cardiovascular disease risk factors; End-stage renal disease; Hemodialysis; Sulaimani city.*

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INTRODUCTION

Cardiovascular diseases (CVDs) are a group of disorders that include the heart or blood vessels or both. They contain coronary heart disease (CHD), cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis and pulmonary embolism [1]. Chronic kidney disease (CKD) is defined as kidney impairment or glomerular filtration rate (GFR) <60 mL/min/1.73 m^2 for 3 months or more, with adverse consequences of kidney failure, cardiovascular disease (CVD), and early death[2]. CKD severity is categorized into five stages according to the level of GFR. The last stage is termed end-stage renal disease (ESRD) and requires dialysis or renal transplantation [3] cardiovascular disease (CVD) is the main cause of morbidity and mortality in patients with ESRD on hemodialysis (HD). Subsequently, ESRD frequently results from hypertension and diabetes mellitus, the increased CVD risk in these patients has been expected to be the result of these diseases. However, it has been clarified how ESRD characterizes a CVD risk factor independently by both hypertension and diabetes mellitus. [4]

In hemodialysis patients, atherosclerotic cardiovascular disease (ASCVD) accounts for about half of deaths in ESRD and contributes to the extremely high total annual mortality of 23% in such patients [5]. Ischemic heart disease (IHD); (angina, myocardial infarction, and sudden cardiac death), cerebrovascular disease, peripheral vascular disease (PVD), cardiomyopathy and congestive heart failure are the spectrum of CVD in CKD [6]. The increased of CVD in dialysis patients is only partially clarified by an augmented prevalence of traditional risk factors, such as hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and physical inactivity [7]. The extra risk may be conferred by nontraditional factors that are often observed in progressive CKD, such as hyper homocysteinemia, anemia, abnormal calcium/phosphate metabolism, inflammation, malnutrition, oxidative stress, and elevated lipoprotein(s) [7]. Many factors raise the risk of cardiovascular disease in dialysis patients. Modifiable factors such as anemia, uncontrolled arterial blood pressure, hyperinsulinemia, dyslipidemia, mineral metabolism disorders, oxidative stress, and inflammation contribute to the improvement of cardiovascular disease beyond non-modifiable factors such as age, sex, and genetics [7]. Lifestyle modifications play a significant role in primary and secondary prevention from cardiovascular diseases. Having a balanced bodyweight, smoking cessation, systematic physical activity, and a regular diet are the main goals in defense from cardiovascular diseases [8].

Aims of the study

To determine the risk factors of cardiovascular disease in patients with end stage renal disease on hemodialysis in Sulaimani city and its relation with Sociodemographic status

PATIENTS AND METHODS

Study design

A quantitative design (descriptive, cross-sectional) study, was conducted to assess the risk factors of CVD among patients on hemodialysis who aged 20 years and more in Sulaimani city by using the WHO/ ISH risk prediction charts, The data were collected prospectively from 1st September 2018 to 1st March 2019 from 2 dialysis centers in Sulaimani City which are the dialysis department-Shar teaching hospital and the Qrga dialysis center.

Ethical consideration

Scientific agreement from University of Sulaimani/ college of nursing, the ethical agreement of college of medicine and official agreement of the directory of the health of Sulaimani to carry out the study was obtained. Conducted in line with the Helsinki Declaration which ensures confidentiality, anonymity, and voluntarily [9]. Besides, verbal consent was obtained from each participant.

Sampling

A convenient sample of (100) patients with ESRD on hemodialysis were included.

Inclusion criteria

Patients with ESRD on hemodialysis, age more than 20 years old, patient's consent.

Exclusion criteria

Pregnant, renal transplanted patient, peritoneal dialysis, acute renal failure.

Tools of Data Collection

Close-ended questions used to measure the variables

were three-parts structured questionnaires; the first part consists of socio-demographic data, second part consist of (patient's history and CVD risk factors), and the third part consists of (vital signs, and anthropometric measurements, and investigations).

Rating Scales and Score

Using the World Health Organization / International Society of hypertension risk prediction charts (WHO / ISH) 10-year combined myocardial infarction and stroke risk (fatal and non-fatal) [10].

- Green <10% Low risk
- Yellow 10% to <20% Moderate risk
- Orange 20% to <30% High risk
- Red 30% to <40% Very high risk
- Deep Red > 40% Very high risk

These charts indicate 10-year risk of a fatal or non-fatal major cardiovascular events (myocardial infarction or stroke), according to age, sex, blood pressure, smoking status, total blood cholesterol, and the presence or absence of diabetes mellitus for 14 WHO epidemiological sub-regions [10].

Statistical analysis

Statistical Package Social Sciences version (24) (SPSS) was used, the data analyzed was performed through; Descriptive statistics (frequency, percentage, mean, standard deviation, minimum, maximum and range). Inferential statistics (correlation test, chi-square, p-value, Fisher Exact Test).

RESULTS

Table.1 shows Sociodemographic characteristics. The mean age of the participants was 55.6 (±14.4) years. The majorities (43%) of participants were from the age group 41-60 years, nearly half of the participants were illiterate, housewives (45%), and married (82%).

Table.2 shows the sum of CVD risk factors and patient comorbidities. (89%) of the participants had established hypertension, (37%) had DM, (27%) were smokers, and (8%) were alcoholic.

Table.3 represents CVD risk levels among the participants; (75%) had a low risk and (25%) had a (moderate, high, very high) risk for cardiovascular disease. Calculated by WHO/ISH risk prediction charts.

There was significant association between different CVD risk levels and some variables; age (p=0.016). History of IHD (p=0.051), pulse rate (p=0.05), SBP (p=<0.001) and respiratory rate (p=0.039) with CVD risk levels, Table 4.

Regarding biochemical parameters was represented. A significant correlation was found between 2 hr. postprandial blood glucose (p=0.052) with CVD risks, Table5.

Table 1. Socio-demographic characteristic of the study sample.

Socio-demographic characteristic		Frequency	%
Age (year)	20-40	16	16.0
	41-60	43	43.0
	61-80	41	41.0
	Total	100	100
Gender	Female	53	53.0
	Male	47	47.0
	Total	100	100
Levels of education	Illiterate	41	41
	Able to read and write	14	14
	Primary school	19	19
	Secondary school	20	20
	Institution or university	6	6
	Total	100	100
Occupation	Employed Governmental	5	5
	Self Employed	2	2
	Student	2	2
	Housewife	45	45
	Unemployed	32	32
	Retired	14	14
	Total	100	100
Marital status	Single	10	10
	Married	82	82
	widowed	2	2
	Total	100	100
Residency	Urban	76	76
	Suburban	24	24
	Rural	0	0
	Total	100	100

Table 2. Cardiovascular risk factors of the study sample

Variables	Frequency	%
Hypertension		
Yes	89	89.0
No	11	11.0
Diabetes mellitus		
Yes	38	38.0
No	62	62.0
Smoker		
Yes	27	27.0
No	73	73.0
Alcohol		
Yes	8	8.0
No	92	92.0

Table 3. Distribution of the sample according to total CVD Risk levels

Total CVD Risks	No.100	
	Frequency	%
<10% Low risk	75	75.0
10% -<20% Moderate risk	10	10.0
20%-<30% High risk	6	6.0
≥30% Very high risk	9	9.0
Total	100	100

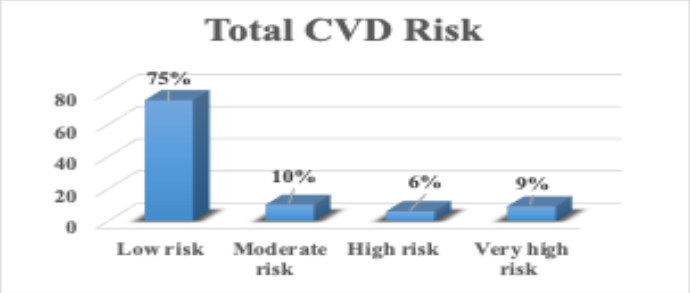

Figure 1. Distribution of the participants by total CVD Risk levels.

Table 4. The compared mean of some variables between different CVD risk levels.

Variables	Total Cardiovascular risk N=100					P. Value
	Low M(SD)	Moderate M(SD)	High M(SD)	Very high M(SD)	Total M(SD)	
Age	53.20(14.59)	60.8(13.78)	60.17(11.23)	67.56(8.03)	55.67(14.47)	0.016
Duration of HD	1.61(0.67)	1.60(1.07)	1.33(0.51)	1.56(726)	1.59(0.71)	0.834
Date of dx. of CRF	2.36(1.22)	2.10(1.19)	2.17(1.47)	2.11(0.92)	2.30(1.20)	0.564
History of IHD	0.71(1.54)	1.90(2.47)	2.17(2.04)	0.67(1.65)	0.91(1.73)	0.05
Family hx. of CVD	0.19(0.39)	0.20(0.42)	0.33(0.51)	0.11(0.33)	0.19(0.39)	0.767
Pulse rate	86.25(12.53)	81.30(12.05)	77.67(12.84)	76.11(12.66)	84.33(12.82)	0.05
SBP	134.4(16.68)	157.50(16.20)	168.17(11.32)	189(19.31)	143.72(23.97)	<0.001
DBP	81.07(13.67)	77.50(13.17)	90.67(5.95)	83.56(12.19)	81.51(13.29)	0.258
Respiratory rate	17.33(2.16)	15.80(1.75)	15.67(1.50)	16.44(1.33)	17.00(2.09)	0.039
SPO2	1.01(0.11)	1.10(0.31)	1.00(0.001)	1.00(0.001)	1.02(0.14)	0.298
Temperature	37.22(0.50)	37.13(0.43)	37.08(0.38)	37.27(0.57)	37.21(0.49)	0.849
BMI	24.79(5.33)	23.97(3.34)	27.27(9.50)	23.18(9.14)	24.71(5.85)	0.592
Waist circumference	67.43(24.46)	55.70(19.14)	77.17(29.43)	74.56(30.91)	67.48(25.01)	0.282
Leg edema	0.56(0.88)	0.50(0.85)	1.00(1.09)	0.89(1.26)	0.61(0.93)	0.535

Table.5 The compared mean of some chemical parameters between different CVD risk levels:

Variables	Total Cardiovascular risk N=100					P. Value
	Low M(SD)	Moderate M(SD)	High M(SD)	Very high M(SD)	Total M(SD)	
Cholesterol	139.37(37.36)	143.90(39.58)	147.67(34.47)	177.56(99.73)	143.76(46.57)	0.141
Triglyceride	116.71(61.50)	101.14(38.86)	116(12.50)	102.60(76.61)	113.68(58.38)	0.895
2 hr. post prandial BS.	137.85(78.13)	174.40(75.86)	212.17(157.79)	203(138.85)	151.83(92.52)	0.05
Hb	9.12(1.55)	8.54(1.36)	10.23(2.08)	9.43(2.10)	9.16(1.63)	0.230
WBC	2.03(0.64)	2(0.81)	2(0.001)	2(0.70)	2.02(0.51)	0.997
Platelet	216.80(79.81)	225.80(105.39)	236.17(58.30)	208.56(67.01)	218.12(79.63)	0.910
Blood urea	135.44(55.23)	150.92(43.53)	159.35(43.41)	159.35(53.41)	150.12(65.05)	0.584
Creatinine	7.78(5.43)	7.38(4.30)	8.40(3.48)	8.40(3.48)	6.57(3.13)	0.893
Na	137.26(5.41)	137.58(4.65)	138(4.85)	138(4.85)	136.89(4.01)	0.979
K	7.08(8.96)	5.27(0.84)	4.52(0.71)	4.52(0.71)	5.56(1.32)	0.767
Cl	100.51(12.29)	104.36(4.15)	104.36(4.15)	104.43(5.48)	5.56(1.32)	0.440
Ca	7.95(1.60)	7.75(3.84)	7.75(3.48)	9.34(2.14)	105.22(4.46)	0.379
Ph	5.70(1.37)	5.98(1.07)	5.98(1.07)	5.80(0.43)	7.05(1.68)	0.352

DISCUSSION

In the current study, the calculated low risk (risk = <10%) by WHO/ISH risk prediction charts was (75%) as compared to the study which is done in Primary Health Care Settings in Sulaimani city among 500 participants aged 40-82 years, [11] was (72.7%). Moderate risk (risk =10% - <20%) in the current study was assessed to be (10%), in contrast to the study in Sulaimani [11], which was (4.9 %.). (15%) of the participants are at high-very high risk of a CVD event (≥20%) as compared to the study In Iraq,[18] in which about 20 % of the participants were at high-very high risk of a CVD event.

In the present study, most of the participants were female 53 (53%), as compared to another study from Cameroon [12] the majority of the study subjects were male 33 (75%). another study which was conducted at dialysis Clinic, in New England Medical Center; New Haven CAPD; and Johns Hopkins University.[13], showed that most of the samples were male (54%). The most common occupation was a housewife (45%), and most of the sample from urban areas (76%). The level of education of most of the study samples, were illiterate (41%), as compared to another study from Cameroon [12], which shows most of the patients' education were university/college (38.6%). A study in a rural population of South India,[14] more than half of cases were illiterate (60.5%). moreover the study in Iraq [15], 45.225% had a secondary school level of education. In the present study, we notice that most of the participants were married (82%) as compared to another study from Cameroon, [12], the majority of the study subjects were married (70.5%).

Regarding the duration of CRF, most of them were between 1 to 5 years, 52% of them were on hemodialysis for less than 1 year, in contrast to the study in the southern metropolitan Brazilian city, [16] nearly all of them were on hemodialysis for about 3 years. In our study, most of the participants had hypertension (89%) comparable to the study from Port Harcourt, Rivers State Nigeria, [17]. 62.7% of the participants had hypertension. and the study,[18]. more than half 66.7% of the participants had hypertension, also the study in this southern metropolitan Brazilian city [16]. 87.5% of the participants had hypertension. Regarding diabetes mellitus, 38% of the participants had diabetes mellitus, in comparison to the study, [12]. only 11.4% had diabetes millets, moreover, the study in this southern metropolitan Brazilian city, [16], 35.8% of the participants had diabetes millets. Additionally, the study in the United States, [8], 23% had diabetes mellitus. Tobacco use is related to a markedly increased risk of heart disease in dialysis patients the

study in this southern metropolitan Brazilian city [16]. In our study, 27% of participants were smokers, as a contrast to a previous study from Cameroon [12], only 4.5% of them were smokers, another study in this southern metropolitan Brazilian city [16], 53.7% of the participants were a smoker. Besides, the study in the United States, [8]. 23% had diabetes mellitus. 8.5% were active smokers. In our study, only 8% of the participants were consuming alcohol, as compared to another study from Cameroon, [12] in which only 11.4% were consuming alcohol.

Mean and (±SD) of SBP of this study were 143.72±23.976, as comparable to another study from Port Harcourt, Rivers State Nigeria [17]., was 130.1±22.6, and the study [7]. Systolic blood pressure (mm/Hg) 111±13.72. Mean and (±SD) of DBP of this study were 81.51±13.293, as comparable to the study [7] +Diastolic blood pressure (mm/Hg) 73±13.02, and the study from Port Harcourt, Rivers State Nigeria, [17], was the same result as our study, DBP 81.2±15.4.Regarding essential laboratory parameters, 2 hours postprandial blood glucose in our study 151.83±92.520, as comparable to the study, [7] blood glucose (mg/dl) 108.00±48.00 and another study from Pakistan , [19]. Blood Glucose (mmol/L) 8.18 ± 5.50. Total cholesterol of the present study was 143.7±46.57, as compared to the study from Pakistan, [19] total cholesterol (mmol/L) 5.17 ± 1.70, furthermore the study, [7] total cholesterol (mg/dl) 91.00±22.30. On the other hand total cholesterol of the present study were >200 mg/dl only 8% in contrast to the study, [16], total cholesterol >200 mg/dL – 22.5%The mean triglyceride of our study 113.6 ± 58.38 mg/dL as compared to the study, [7] Triglyceride (mg/dl) 127.20±18.50. in our study mean and (±SD) of BMI were 24.71±5.855 as compared to the study from Port Harcourt, Rivers State Nigeria [17], mean of BMI of the sample was 24.2±4.8, and the study from Pakistan [19] Body mass index (kg/m2) 24.42±1.56, in addition, the study in this southern metropolitan Brazilian city [16]. BMI (kg/m2) – mean (SD) 24.7 (4.7). The mean of Waist circumference of our study was 67.48±25.16 as compared to the study by from Port Harcourt, Rivers State Nigeria [17], which was 88.7±12.5.

In conclusions, three-quarters of the participants had low risk (risk <10%) and one-quarter had moderate, high and very high risk (risk >10%) of fatal or non- fatal CVD events. Significant relationship with CVD risk found with the following: Age, occupation, diabetes mellitus, history of IHD, Systolic blood pressure, pulse rate, 2 hr. postprandial blood glucose. On the other hand, an insignificant association with CVD risk were residency, education, gender, marital status, smoking, alcohol, S. cholesterol, S. triglycerides, Hb, WBC, platelet, B. urea, BMI.

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