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Epidemiological Profile of End-Stage Renal Diseases in Riyadh, Saudi Arabia

A. A. Alkhlaif[1], A. K. Alsuraimi[2] and A. A. Bawazir[3*]

[1]King Abdullah's Dialysis Care Project, Riyadh, Saudi Arabia.
[2]College of Medicine, Al-Faisal University, Riyadh, Saudi Arabia.
[3]Department of Community and Environmental, College of Public Health and Health Informatics, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

Authors' contributions

This work was carried out in collaboration between all authors. Authors AAA and AAB designed the study, performed the statistical analysis, wrote the protocol, managed the analyses of the study and wrote the first draft of the manuscript. Author AKA managed the literature searches and editing. All authors read and approved the final manuscript.

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ABSTRACT

Background/Aims: The Saudi Center for Organ Transplantation (SCOT) reported (2015) a total of 15,782 dialysis patients in Saudi Arabia. Out of these patients, 14,366 were treated via haemodialysis, whereas the remaining 1,416 underwent peritoneal dialysis.
Aims: This study aimed to assess common factors that led to ESRD among dialysis patients at King Abdullah's Dialysis Care Project in Riyadh, Saudi Arabia.
Settings and Design: Cross-sectional hospital-based study was conducted in the period May-September 2017, in King Abdullah's Dialysis Care Project in Riyadh, Saudi Arabia.
Methods and Materials: This was a retrospective registry-based study using secondary data from the registry at King Abdullah's Dialysis Care Project in Riyadh, Saudi Arabia (South Center). Registered male and female adult dialysis patients at this centre were included in this study. Patient medical records including disease state, laboratory profiles, and medical complications were analyzed.

**Corresponding author: E-mail: bawazir56@gmail.com;*

Statistical Analysis Used: Statistical Packages for Social Science (SPSS version 22) was used to analyse the data obtained. Various statistical analyses were conducted including means, frequencies, and regression analysis (odds ratio).A P-value of less than 0.05 was considered as significant in the study.
Results: A total of 300 patients (55% males and 45% females) were included in this study. The mean age of the sample was 53 years (±SD 16). The prevalence of overweight and obese ESRD patients were 26% and 30%, respectively. The high frequent co-morbidities among ESRD patients were hypertension (82%) followed by diabetes mellitus (57%). The results showed that out of 90% of dialysis complications, 10% were cases of infection.
Conclusions: ESRD is an important public health problem in Saudi Arabia with alarming in its annual rates. For a better understanding of the aetiology and specific risk factors provoking ESRD in Saudi Arabia, further studies need to be conducted.

Keywords: ESRD; Riyadh; Saudi Arabia; risk factors; dialysis.

1. INTRODUCTION

Chronic kidney disease (CKD) has become a serious public health issue with over 1.4 million patients receiving renal replacement therapy worldwide with more than 1 million people die annually from End Stage Renal Disease (ESRD) [1]. Recently, the trend of ESRD was found associated with a several-fold increase in mortality and morbidity, especially the risk of cardiovascular diseases. Today, ESRD is regarded as a public health issue, where it imposes human suffering and causes catastrophic economic burden mainly in poor countries, where less than 2% of the ESRD patients have access to renal replacement therapy. Thus , this leads to premature death particularly among those diagnosed with ESRD at age of less than 20 [2]. However, the future predicts an increases in the ESRD rates, where it will be more prominent in low income countries, especially those with a growing population of diabetes and hypertension [3].

Early interventions have shown to reduce the economic burden of chronic kidney disease. In order to achieve this, we should identify individuals with an increased risk of renal disease as early as possible [4]. There are genetic and phenotypic make-up puts individuals at risk for developing kidney disease. The Factors such as race, gender, age, and family history are highly important [5,6]. Among the major contributing factors to ESRD were smoking, obesity, hypertension, and diabetes mellitus. In addition, exposure to heavy metals, excessive alcohol consumption, smoking, and the use of analgesic medications can contribute to kidney disease [6,7]. Comorbid state such as the occurrence of acute kidney injury, a history of cardiovascular disease, hyperlipidaemia, metabolic syndrome, hepatitis C virus, HIV infection, and malignancy are further risk factors to ESRD [8,9].

The Kingdom of Saudi Arabia (KSA) is a country with marked rise in prevalence and incidence of ESRD; this rise exceeds those reported from many countries due to enormous and rapid changes in lifestyle, high population growth, fast increase in life expectancy and massive urbanization over the last three decades [4,10]. In the annual report of the Saudi Centre for Organ Transplantation [11], has shown a total of 15,782 dialysis patients, 14,366 of them are treated by haemodialysis and the remaining 1,416 by peritoneal dialysis [12]. The prevalence of end-stage renal failure treated by dialysis is estimated to be 513 cases/ per million population (pmp), while the incidence of treated ESRD is estimated at 136 cases/pmp [12]. This conditions almost raised a question on what are the most common factors attributed to ESRD among dialysis patients at King Abdullah's Dialysis Care Project in Riyadh. So the aim of this study is to quantify the number of common causes such as diabetes, hypertension, and glomerulonephritis among the dialysis patients and to determine the prevalence of common causes that lead to the development of end-stage renal disease in this centre. In addition, to find out the role of the main laboratory tests in correlation to the occurrence or as predictors of ESRD. Findings from any work in this field could help in better understanding of these factors lead to end stage renal disease.

2. SUBJECTS AND METHODS

2.1 Study Area/Setting and Design

This cross-sectional hospital-based study was conducted in the period May-September 2017, in King Abdullah's Dialysis Care Project in Riyadh,

Saudi Arabia. This project encompasses seven centres distributed in different regions of the Kingdom, in which this centre was included among the others with fully equipped dialysis centres and a capacity of 98 dialysis chair to serve people in southern part of Riyadh city. This centre receives both gender (male and female) and working two shifts per day with an average of 4320 dialysis settings per month.

2.2 Study Subjects

All clinical recorded male and female adult patients went under dialysis at King Abdullah's Dialysis Care Project (KADCP) were included in this study. However, the deceased and kidney transplant patients were excluded from the study.

2.3 Sample Size and Sampling Technique

The sample size was calculated according to characteristics of the health institution with a total of 700 patients. With the prevalence of common diseases such as diabetes mellitus (DM) being nearly 50% among haemodialysis patients, [13] a sample size of 244 was calculated using a 95% confidence interval, at an alpha level equal to 0.05, and 80% power. However, in order to increase statistical power, the sample size was increased to include 300 haemodialysis patients. According to the list of total 700 registered patients in the centre, systematic sampling selection was used with a random selection of the first case and then followed using a sampling interval of 2 subjects.

2.4 Data Collection Methods, Instruments Used, Measurements

This study uses a quantitative approach where secondary data was collected through medical records of dialysis patients at KADCP in Riyadh (south centre). Therefore, data related to the following domain such as DM, hypertension, obstructive uropathy and other factors were collected from the electronic records present in the centre.

The data collected were reported in an excel data sheet which consists of four parts. Part one included demographics characteristics of the patients i.e. age, gender, residency, weight, height and BMI score; part two, included patient past history; part three, was ESRD-related laboratory tests' results (phosphorus, calcium, Albumin, and parathyroid hormone); and part four included the present illnesses that co-exist with ESRD.

Missed data of any patient in the electronic system were searched from the original hard copy medical file. Some laboratory investigations were required as a supplementary to determine the patient's status. These ESRD-related laboratory investigations such as phosphorus, adjusted calcium, Albumin, and parathyroid hormone and others were periodically ordered from each patient in the centre to check if there are any triggering issues that might contribute to ESRD and its co-morbidities, which would reflect on dialysis patients' quality of life and expectancy. The laboratory findings were categorized into normal, low and high based on the international standard accordingly. Abnormal results of such lab tests will develop a clear understanding between the relations of these results and ESRD's co-morbidities.

2.5 Statistical Analysis

Collected data were checked for incompleteness or duplication and then entered into a computer program. Statistical Packages for Social Science (SPSS version 22) was used to analyse the data obtained. Various statistical analyses were conducted including means, frequencies, and regression analysis (odds ratio). A P-value of less than 0.05 was considered as significant in the study hypothesis.

2.6 Ethical Considerations

No direct contact with patients was required; however, privacy and confidentiality were completely protected. No identifiers or personal information was collected or stored including participant's name, IDs and others. This study was approved by the IRB of the King Abdulla International Medical Research Centre (SP17/098/R).

3. RESULTS

3.1 Characteristics of End-stage Renal Disease Patients in Saudi Arabia

The total number of patients included in this study was 300, 165 (55%) males, and 135 (45%) females. The mean age of the entire cohort was 53 ±16 years. Old aged patients (≥ 56 years). Middle aged patients (36-55 years) made up 35% of the sample. Young adults (17-35 years)

made up the smallest present of the sample. The overall mean BMI for the sample was 26.9 ±6.7, with 30.2% were obese. Nearly 82% of the patients in this study had hypertension and 57% had DM. 90% of patients demonstrating at least one or more co-morbidities (Table 1).

3.2 Clinical and Lab Characteristics of Patients with End Stage Renal Diseases

As shown in Table 2, 52% of patients had both DM and hypertension together, while 46.0% had two complications and only 10% of patients reported an infection such as HCV (3.7%) or HBV (1.0%). Similarities in rates between male and female patients were found for prevalence of DM, hypertension, number of complications, and rate of infections. There were only a statistical significance among infected patients due to gender (p=0.037).

Patient laboratory results are presented in Table 3. More than half of patients demonstrated normal results for Phosphorus, Calcium, and Albumin (51.3%, 56.7%, and 58.0%, respectively). However, 166 patients (55.3%) demonstrated high values for Parathyroid hormone, whereas lower results were observed for Calcium (37.7%) and Albumin (42%).

Table 1. Demographic and clinical profile of patients with end-stage renal disease

Characteristics		n.	%
Gender	Male	165	55.0
	Female	135	45.0
Age group (years)	Young (17-35)	54	18.0
	Middle (36-55)	105	35.0
	Old (≥ 56)	141	47.0
Body mass index	Normal	101	33.9
	Underweight	29	9.7
	Overweight	78	26.2
	Obese	90	30.2
Clinical profile	Hypertension	245	81.7
	Diabetes Mellitus	171	57.0
	State of Complications	270	90.0
	State of Infection	30	10.0

Table 2. Clinical characteristics of patients with end stage renal diseases

Characteristics	Total	Male	Female	P value
	n. (%)	n. (%)	n. (%)	
State of risk factor among ESRD				
Diabetes Mellitus	14 (5.1)	7 (4.7)	7 (5.6)	0.659
Hypertension	103 (37.6)	55 (37.2)	48 (38.1)	
Diabetes Mellitus and Hypertension	142 (51.8)	80 (54.1)	62 (49.2)	
Others	15 (5.5)	6 (4.1)	9 (7.1)	
State of complications				
No Complication	30 (10.0)	17 (10.3)	13 (9.6)	0.197
One Complication	101 (33.7)	61 (37.0)	40 (29.6)	
Two Complications	138 (46.0)	67 (40.6)	71 (52.6)	
Three or more Complication*	31 (10.3)	20 (12.1)	11 (8.1)	
State of infection				
No Infection	270 (90.0)	148 (89.7)	122 (90.4)	**0.037**
With Infection	30 (10.0)	17 (10.3)	13 (9.6)	
Type of infections				
HCV	11 (3.7)	6 (3.6)	5 (3.7)	0.448
HBV	3 (1.0)	3 (1.8)	0 (0.0)	
Other Infection**	6 (2.0)	4 (2.4)	2 (1.5)	
Multiple Infection***	10 (3.3)	4 (2.4)	6 (4.4)	

**Patient having complications on diabetic, hypertension, cardiovascular disease, and or neurological disorder.*
***Other Infections (i.e., Diabetic foot ulcer, urinary tract infection).*
****Multiple Infections (patients with 2 or more infections including HVC and HBV)*

Table 3. Clinical laboratory characteristics of patients with end-stage renal disease

Characteristics	Mean	Low	Normal	High
		n. (%)	n. (%)	n. (%)
State of associated diseases among ESRD				
Phosphorus (normal =2.32-4.70 mg/dl)	4.4	27 (9.0)	154 (51.3)	119 (39.7)
Parathyroid hormone (normal=66-462pg/ml)	616.7	9 (3.0)	125 (41.7)	166 (55.3)
Calcium (normal =8.82-10.02mg/dl)	8.9	113 (37.7)	170 (56.7)	17 (5.7)
Albumin (normal =3.5-4.8g/dl)	3.5	126 (42.0)	174 (58.0)	0 (0.0)

3.3 Association of ESRD Characteristics with Age Category

Association of ESRD characteristics with age is illustrated in Table 4. Male and female gender were equal for the old age group. While although it did not show statistical significant, males were more prevalent than females for both young and middle-aged patients (59.3% vs. 40.7% and 59.0% vs. 41.0%, respectively, both p>0.05). As for BMI, the young aged adults showed the highest prevalence of normal body size and the lowest obese rate (41.5%, 11.3%, respectively), whereas obesity rate was highest among the old age group (35.0%, p=0.003). The presence of risk factors among ESRD showed old age groups were more prone to diseases such as DM and hypertension than young age (75.2%, p<0.001, 85.8%, p=0.044, respectively). Nevertheless, all age categories were observed to have developed complications (90.0%), whereas few of them developed infection (10%);however, there were no statistically significant associations between ESRD and complications nor infection (both p>0.05).

Table 5 shows there were no associations between laboratory tests for phosphorus, parathyroid hormone, calcium, and albumin for each age category (all p>0.05). In general, the age categories did not show differences regarding readings for different laboratory elements in this study. However, for phosphorus and parathyroid hormone readings, they demonstrated higher levels than calcium in all the age groups.

3.4 Univariate and Multivariate Analysis

The associations between hypertension and characteristics for patients with ESRD were assessed. Univariate analysis showed no significant association between ESRD and gender, DM, complications, or infection. However, hypertension was likelihood higher among young ESRD patients (OR=2.689, 95% CI = 1.077 - 6.715, p=0.034) and those underweight (OR=3.456, 95% CI=1.296 - 9.217, p=0.013). While in the multivariate regression analysis, underweight was the likelihood predictor to have occurred among ESRD hypertensive patients (AOR=3.798, 95% CI=11.485 - 9.709, p=0.005).

The associations between DM and characteristics of patients with ESRD were assessed. Univariate analysis showed that ESRD patients with DM were likely to be middle and old age patients (OR=7.593, 95% CI=3.050-18.900, p<0.001 and OR=17.821, 95% CI=7.103-44.712, p<0.001, respectively) as well as overweight (OR=2.149, 95% CI=1.077-4.289, p=0.030). However, gender, hypertension, complications, and infection showed no significant associations. Similarly, multivariate regression analysis showed age (young and middle) and overweight were predictors of ESRD among DM patients (AOR=7.368, 95% CI=2.980-18.220, p<0.001, AOR=16.867, 95% CI=6.830-41.655, p<0.001, AOR=2.118, 95% CI=1.066-4.207, p=0.032, respectively) (Table 7).

4. DISCUSSION

This study was conducted in King Abdullah's Dialysis Care Project in Riyadh, Saudi Arabia with the aim to assess the factors most predictor for developing ESRD among dialysis patients. In this study the prevalence of ESRD in males was higher than females which was consistent with findings from international and local studies where ESRD was found with higher prevalence in male patients [4,14-19]. In contrast, a study from Japan showed lower prevalence of males compared with females in patients with ESRD (43.5% vs. 56.5%) [15].

Table 4. Association between age category and general characteristics of ESRD

Characteristics	Age category			P value
	Young	Middle	Old	
	n. (%)	n. (%)	n. (%)	
Gender				
Male	32 (59.3)	62 (59.0)	71 (50.4)	0.313
Female	22 (40.7)	43 (41.0)	70 (49.6)	
Body mass index				
Normal	22 (41.5)	32 (30.5)	47 (33.6)	0.003
Underweight	12 (22.2)	12 (11.4)	5 (3.6)	
Overweight	13 (24.1)	26 (24.8)	39 (27.9)	
Obese	6 (11.3)	35 (33.3)	49 (35.0)	
State of risk factor among ESRD				
Hypertension	38 (70.4)	86 (81.9)	121 (85.8)	0.044
Diabetes Mellitus	7 (13.0)	58 (55.2)	106 (75.2)	<0.001
State of complications/infection				
With Complication	49 (90.7)	95 (90.5)	126 (89.4)	0.613
With Infection	5 (9.3)	10 (9.5)	15 (10.6)	0.940

Table 5. Association between age category and laboratory profile of ESRD

Characteristics		Age category			P value
		Young	Middle	Older	
		n. (%)	n. (%)	n. (%)	
Phosphorus	low	5 (9.3)	7 (6.7)	15 (10.6)	0.614
	Normal	27 (50.0)	60 (57.1)	67 (47.5)	
	High	22 (40.7)	38 (36.2)	59 (41.8)	
Parathyroid hormone	low	2 (3.7)	2 (1.9)	5 (3.5)	0.936
	Normal	22 (40.7)	43 (41.0)	60 (42.6)	
	High	30 (55.6)	60 (57.1)	76 (53.9)	
Calcium	low	19 (35.2)	43 (41.0)	51 (36.2)	0.898
	Normal	31 (57.4)	57 (54.3)	82 (58.2)	
	High	4 (7.4)	5 (4.8)	8 (5.7)	
Albumin	low	20 (37.0)	48 (45.7)	58 (41.1)	0.553
	Normal	34 (63.0)	57 (54.3)	83 (58.9)	
	High	0 (0.0)	0 (0.0)	0 (0.0)	

The mean age of patients with ESRD has been commonly reported in some studies elsewhere as approximately 50 years, [14,18] which is consistent with the present study. However, a study from the United States showed a higher mean age of ESRD patients (61 years) [20]. Upon stratifying patients in this study by age ranges of young, middle and old age, these data suggest a gradual increase in prevalence of patients with ESRD as age increase (18%, 35%, and 47%, respectively) The present observations were consistent with others who have reported the prevalence of ESRD increases with age, particularly after 50 years, [18,21] which is a logical corresponance to the accummulated years of exposure to the underling risk factors to develop ESRD.

Hypertension represented the greatest risk factor for ESRD in the present study (82% prevalence amongst patients). Similar findings of high prevalence of hypertension among patients with ESRD were reported in studies conducted in other region of Saudi Arabia (Arar), Palastine and Canada (Tronto) (56.5%, 50.8%, and 68%, respectively) [22-24]. In contrast, a study conducted in Kuwait showed hypertension (6.3%) as the fourth most likely risk factor in patients with ESRD [25]. Varaiation in the prevalence of hypertention has also been demonstrated in studies from the United States among the Hispanic and Non-Hispanic (41.2% and 40.9%, respectively) [26] population as well as in Egypt (31.8%) [18].

Table 6. Predictors of ESRD among hypertensive patients using univariate and multivariate analysis

Characteristics		Univariate		P value	Multivariate		P value
		OR	95% CI		AOR	95% CI	
Gender	Female	Reference	-	-	-	-	-
	Male	1.021	0.553 - 1.886	0.946	-	-	-
Age group	Old	Reference	-	-	-	-	-
	Young	2.689	1.077 - 6.715	0.034			
	Middle	1.275	0.622 - 2.612	0.507	-	-	-
Body Mass Index	Normal	Reference	-	-	Reference	-	-
	Underweight	3.456	1.296 - 9.217	0.013	3.798	1.485 - 9.709	**0.005**
	Overweight	1.203	0.519 - 2.786	0.667	1.243	0.547 - 2.823	0.604
	Obese	1.545	0.689 - 3.462	0.291	1.447	0.668 - 3.134	0.349
Diabetes Mellitus	No	Reference	-	-	-	-	-
	Yes	1.300	0.632 - 2.672	0.476	-	-	-
Complication	No	Reference	-	-	-	-	-
	Yes	0.544	0.221- 1.344	0.187	-	-	-
Infection	No				-	-	-
	Yes	1.837	0.744 - 4.534	0.187	-	-	-

OR= Odds ratio, AOR= Adjusted odds ratio

Table 7. Predictors of ESRD among diabetes mellitus patients using univariate and multivariate analysis

Characteristics		Univariate		P value	Multivariate		P value
		OR	95% CI		AOR	95% CI	
Gender	Female	Reference	-	-	-	-	-
	Male	1.136	0.663 - 1.945	0.642	-	-	-
Age group	Young age	Reference	-	-	Reference	-	-
	Middle age	7.593	3.050 - 18.900	< 0.001	7.368	2.980 - 18.220	**< 0.001**
	Old age	17.821	7.103 - 44.712	< 0.001	16.867	6.830 - 41.655	**< 0.001**
Body Mass Index	Normal	Reference	-	-	Reference	-	-
	Underweight	0.481	0.170 - 1.359	0.167	0.486	0.174 - 1.359	0.169
	Overweight	2.149	1.077 - 4.289	0.030	2.118	1.066 - 4.207	**0.032**
	Obese	1.721	0.896 3.307	0.103	1.699	0.894 - 3.228	0.105
Hypertension	No	Reference	-	-	-	-	-
	Yes	0.783	0.381 - 1.609	0.506	-	-	-
Complication	No	Reference	-	-	-	-	-
	Yes	1.071	0.450- 2.550	0.876	-	-	-
Infection	No	Reference	-	-	-	-	-
	Yes	1.071	0.450 – 2.550	0.876	-	-	-

OR= Odds ratio, AOR= Adjusted odds ratio

Unexpectedly, body weight was the only important risk factor identified during regression analysis where it was significantly associated with the progression of renal disease among hypertensive patient. In this model, underweight patients were likely associated with the occurrence of hypertension among ESRD patients. Diabetes mellitus also presented as a significant risk factor of ESRD as this was prevalent in 57% of patients in this study. Prevalence of DM as a risk factor for ESRD has not been consistently reported in the literature, which may be attributable to the variables studied as well as study sample. Nevertheless, most studies in Saudi Arabia have reported lower rates compared with findings in this study (18.0%, 28.0% 44.9%) [14,17,23]. Studies conducted elsewhere have also shown lower rates of DM as a risk factor with ESRD (31.8%, 34.0%, 37.3%) [18,24,27]. Moreover, middle and old age as well as overweight were found as strong predictors of DM among ESRD.

In this study we also show that hypertensive patients presented with ESRD (37.6%) compared with DM (5.1%). Moreover, both comorbidities have been shown to contribute to the onset of ESRD (51.8%). A report from the Saudi Centre for Organ Transplant (2015) showed 31% of ESRD patients in Saudi Arabia demonstrated combined hypertension and DM. However, the independent contribution of hypertension or DM as a risk factor for ESRD was 28.0% and 13.0%, respectively [12]. Globally, a trend of doubling of the prevalence of DM associated with ESRD in many countries is expected to occur within the next 20 years [28].

Infection by different sources were reported in our study among them heptitis B virus (HBV) and hepatitis C virus (HCV) and others. Althogh, all patients were under regular dialysis with different machines in the centre, a very low prevalence of HBV and HCV was found in this study (1.0% and 3.7%, respectively). In comparison to other studies from India (Lucknow, Uttar Pradesh), Brazil (Porto Alegre) Europe and Asia, higher prevalence of HCV has been reported than in our study (6.99%, 21%, respectively) [29,30]. Reddy et al have reported that among patients on hemodialysis 5.9% were HCV positive which is little higher than what we had reported in this study, while 1.4% patients had HBV infection that is similar to our findings; [31] In contrary with his study who showed 3.7% of coinfection with HBV and HCV, our findings showed no coinfection of these viruses. In addition, SCOT report in 2015, presented a prevalence rate of HCV much higher of what we had reported in our study (15% vs. 3.7%) while close findings was reported in regard to HBV (3.0% vs. 1.%) [12].

The mean BMI in our study for patients with ESRD is consistent with reports of other (25.2, 26.3, 27.5 Kg/m^2) [32-34]. We also found the BMI occurred as an independent predictor of patients with hypertension or DM. However, underweight patients were also observed to strongly relate with the occurrence of hypertension among ESRD patients in this study. In this study clear explanation could not be established for the relation between underweight and hypertension as due to the absence of the base-line weight of our patients. Probably, some patients have decreased their body weight after they started the process of haemodialysis in our centre. In the contrary, overweight BMI were likely associated with DM among ESRD patients as it was found in other similar studies [35].

For instance, in our study the mean values of laboratory tests were found as: Albumin 3.5 g/dl, phosphorus 4.4 mg/dl, calcium 8.9 mg/dl, and for parathyroid hormone 616.7 pg/ml. Ganesh et al present similar findings for the mean laboratory values of serum albumin (3.8 g/dl), serum calcium (9.4 mg/dl), but not for serum parathyroid hormone (387 pg/ml) which was seen with lower mean in our study, also for mean phosphorus (6.2 mg/dl) which was much higher than our findings [36]. Other studies by Noori and Mutsert found the mean serum Albumin was closer to our mean findings in this study (3.8 and 3.3 mg/dl, respectively) [37,38]. Hyperphosphatemia (39.7%) and hypercalcemia (5.7%) in this study were a potential remarkable risk factor for promote arterial stiffening and vascular calcifications in end-stage renal disease [39-41]. In the other hand the majority of our patients found with hyperparathyroidism (55.3%) where the risk to developed renal osteodystrophy and progressive CVD was also high; this later has been reported by many authors as an important factor contributing to more than 50% of ESRD deaths [42-44]. Therefore, it seems that it become an important element to establish community-based awareness programs starting from primary health care services integrated with specialized clinics such as those for treating diabetes and hypertensive patients with the goal of modifying the renal risk factor.

5. CONCLUSION

These data suggest that chronic diseases such as hypertension and DM serve as major risk factors leading to ESRD in Riyadh, KSA. The high prevalence of hypertension identified in this study supports the need for future studies in this area to better understand medical care strategies for patients at-risk for developing ESRD. Continuous improvement of the registry system in the centre is required to improve the capture rate, to provide more extensive and accurate data to the health authority, and researchers. Availability of the data is an important bridge to reach to the reliable information and knowledge to the public as well as to enhance their awareness of the magnitude of this health problem.

6. LIMITATIONS

Like other cross-sectional studies based on secondary data, our study presented some limitations. Our data were restricted to one haemodialysis centre in Riyadh city from 187 centres distributed in the Kingdom of Saudi Arabia, hence, findings from our study might be interpreted carefully. Although data of the patients were entered in a computerized system, missing data was observed dominant and incompleteness. This condition is considered as barrier and thus information should be retrieved from the hard copy record in the centre. Moreover, some of the important information such as that related to the co-morbid state of the patient like DM and Hypertension or those related to his past exposure to some risky conditions was not documented too such as duration of patients' dialysis and others. some information was not, in particular those related to and diseases.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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