STUDY OF RISK FACTORS FOR END-STAGE RENAL DISEASE AND THEIR RELATION TO SOME VARIABLES IN TWO HEMODIALYSIS CENTERS IN BAGHDAD CITY

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ABSTRACT

Background: End-Stage Renal Disease (ESRD) is a significant public health concern, characterized by the permanent loss of kidney function requiring dialysis or transplantation. Various risk factors contribute to the development of ESRD, including demographic, lifestyle, and medical conditions. Identifying these risk factors is crucial for prevention and management. **Aim**: This study aimed to assess the risk factors associated with ESRD among patients undergoing hemodialysis in two major centers in Baghdad and to evaluate their demographic and clinical characteristics. **Method**: A cross-sectional study was conducted on 240 ESRD patients undergoing dialysis at Baghdad Teaching Hospital and AL-Kadhymia Teaching Hospital from January 1 to April 31, 2012. Data collection involved structured questionnaires, direct interviews, and medical record reviews. Risk factors such as gender, smoking, obesity, diabetes mellitus, hypertension, renal diseases, family history, and NSAID use were analyzed. **Results**: The highest ESRD prevalence was observed in the 60–69-year age group (mean: 56.6 years). Males accounted for 63.7% of cases. Most patients were married, lived in rural areas, and had low educational levels. The duration of dialysis ranged from 1 to 12 years, with half receiving dialysis for less than three years. Smoking was prevalent (32.8% smoked ≥40 cigarettes/day), primarily among males. Obesity and overweight were found in 33.8% of patients. Additionally, 38.3% were hypertensive, 43.3% had diabetes, and 48.3% had recurrent UTIs. More than one-third had cardiovascular disease (34.2%) or kidney stones (35%). A significant proportion had a positive family history of ESRD (41.3%), and NSAID use was widespread. **Conclusion**: Older age, male sex, family history, smoking, obesity, and recurrent UTIs were key risk factors for ESRD. Preventive strategies should include early screening, public health education, and lifestyle modifications. Improving dialysis services is essential for better patient outcomes. Further research is needed to explore additional risk factors and preventive measures.

KEYWORDS: End-Stage Renal Disease, hemodialysis, risk factors, smoking, obesity, hypertension, diabetes, NSAIDs, cardiovascular disease.

INTRODUCTION

End-Stage Renal Disease (ESRD) is an irreversible deterioration in renal function, often developing over several years. Initially, ESRD manifests as a biochemical abnormality but eventually results in the loss of the excretory, metabolic, and endocrine functions of the kidney.[1] ESRD represents the final stage of Chronic Kidney Disease (CKD), a progressive disorder characterized by a reduction in nephron number and a subsequent decline in renal function. According to the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines, CKD is classified into five stages based on the glomerular filtration rate (GFR). ESRD corresponds to stage five, where the GFR is <15 ml/min per 1.73 m² for three months or longer.[2] As the disease progresses, renal function deteriorates, necessitating renal replacement therapy, either through dialysis or kidney transplantation.[3] Chronic kidney disease is classified into five stages, ranging from normal kidney function to complete kidney failure.[4] The most severe manifestation is ESRD, which often requires medical intervention such as hemodialysis or peritoneal dialysis. The risk factors for ESRD are multifactorial, including aging, male gender, smoking, obesity, diabetes mellitus,

hypertension, recurrent urinary tract infections (UTIs), kidney stones, cardiovascular diseases, family history of ESRD, and prolonged use of nonsteroidal anti-inflammatory drugs (NSAIDs).[5] Among these, diabetes mellitus and hypertension are the leading causes of ESRD, accounting for 20–40% and 5–25% of cases, respectively.[6] Other contributing factors include glomerular diseases, interstitial nephritis, congenital and inherited conditions such as polycystic kidney disease, and renal artery stenosis.[6] ESRD has become a significant global public health concern, with increasing prevalence rates worldwide. In developed nations, ESRD cases have been rising by approximately 5–8% annually.[7] The United States reports a high prevalence of ESRD, with 336 new patients per million per year undergoing dialysis.[8] In the United Kingdom, the prevalence is lower, with 93 new cases per million per year, primarily among elderly patients.[7] The incidence is also rising in developing countries due to increasing risk factors such as diabetes, hypertension, and obesity.[9] In the Middle East, the prevalence varies, with Saudi Arabia reporting 462 cases per million, Egypt 235, and Yemen 320 per million.[10] The aim of this study is to identify and analyze the risk factors associated with End-Stage Renal Disease (ESRD). These factors include older age, male sex, smoking, obesity, diabetes mellitus, hypertension, a history of recurrent urinary tract infections (UTIs) and kidney stones, cardiovascular disease, a family history of ESRD, and prolonged use of nonsteroidal anti-inflammatory drugs (NSAIDs).

METHOD

A cross-sectional study was conducted in Baghdad City at two major dialysis units: Baghdad Teaching Hospital and AL-Kadhymia Teaching Hospital. The study was performed between January 1 and April 30, 2012. The dialysis unit at Baghdad Teaching Hospital, the oldest center in Iraq (established in June 1971), provides dialysis for up to 32 patients daily in two shifts. The AL-Kadhymia dialysis unit has the capacity to serve 20 patients per day. Patients undergoing maintenance hemodialysis for at least six months were included in the study.

Sample Size and Data Collection

A total of 240 ESRD patients participated in the study (98 from AL-Kadhymia and 142 from Baghdad Teaching Hospital). The study involved two visits per week, alternating between hospitals to ensure complete data collection. Direct interviews were conducted using a structured questionnaire, and additional data were obtained from medical records.

The questionnaire covered.
1. **Personal Data** – Age, gender, marital status, occupation, residence, and education level.
2. **Dialysis Information** – Frequency and duration of hemodialysis sessions.
3. **Smoking History** – Smoking status and cigarette consumption per day.

4. **Medical History** – History of diabetes mellitus (DM), hypertension (HT), and cardiovascular diseases.
5. **Renal History** – Presence of kidney stones, recurrent urinary tract infections (UTIs), or congenital kidney abnormalities.
6. **Family History of ESRD** – Occurrence of ESRD among first-degree relatives.
7. **Drug History** – Long-term NSAID use.
8. **Body Mass Index (BMI)** – BMI was calculated using the standard formula: weight (kg) / height² (m²), categorized based on WHO guidelines.

Ethical Considerations

Verbal consent was obtained from each participant after explaining the study's purpose and ensuring confidentiality.

Statistical Analysis

Data were analyzed using SPSS version 16. Descriptive statistics (frequencies, percentages) and the Chi-square test were used to determine associations. A significance level of $p<0.05$ was considered statistically significant.

Study Limitations

The study faced limitations due to a shortage of dialysis machines, requiring only two shifts per day, limiting access to three recommended dialysis sessions per week. Additionally, scheduling constraints led to delays in patient interviews.

RESULTS

The total study sample consisted of 240 patients diagnosed with End-Stage Renal Disease (ESRD). The participants' ages ranged from 18 to 73 years, with a mean age of 56.6 years. The majority of patients (60–69 years) represented the largest proportion of the study sample, whereas the smallest percentage (4.2%) comprised individuals below 30 years of age. Males accounted for approximately two-thirds (63.7%) of the total study population, while females comprised 36.3% of the sample. (Table 1) The marital status distribution showed that 63.8% of participants were married. Additionally, about two-thirds (63.5%) of the patients lived in rural areas, whereas 36.5% resided in urban locations. (Table 1). Regarding occupational status, the highest proportion of patients (28.3%) were retired, followed by government employees (22.5%). The lowest percentage (8.8%) consisted of unemployed individuals. (Table 1) Educationally, 36.1% of the participants could read and write, 24.6% had completed primary school, and 13.8% were illiterate. (Table 1)

The duration of hemodialysis varied between 1 and 12 years, with a mean duration of 2.9 years. Half of the study population (51.3%) had been on dialysis for less than three years. The frequency of dialysis was twice per week in 78.3% of patients (188 out of 240), whereas only 10.0% underwent hemodialysis once per week. (Table 2)

More than half (52.1%) of the participants had a smoking history before ESRD diagnosis. A notable proportion (32.8%) of ESRD patients reported smoking at least 40 cigarettes per day, and the same percentage (32.8%) had a smoking history lasting 20–29 years before ESRD development. (Table 3) Among the smokers, 67.3% were male, while 25.3% were female, with a statistically significant association between gender and ESRD development (p=0.0001). (Table 4)

At the time of dialysis initiation, 33.8% of the study subjects were classified as obese, while 31.7% were overweight. Extreme obesity was observed in 7.1% of cases. In contrast, 22.9% had normal weight, and 4.6% were underweight. (Table 5)

Among the study population, 38.3% had hypertension, 43.3% were diabetic, and 48.3% had a history of recurrent urinary tract infections (UTIs). Additionally, 35.0% had a history of kidney stones, and 34.2% had cardiovascular disease. Congenital kidney abnormalities were reported in 10.0% of cases. (Table 6)

A positive family history of ESRD was present in 41.3% of patients, particularly among first-degree relatives. (Table 7) Additionally, 46.7% of participants reported long-term NSAID use for various medical conditions before ESRD onset. (Table 8).

Table 1: Distribution of the study sample according to some sociodemographic variables.

Age groups (years)	N (240)	%
< 30	10	4.2
30 - 49	46	19.1
50 - 59	51	21.2
60 - 69	76	31.7
= > 70	57	23.8
Gender		
Male	153	63.7
Female	87	36.3
Residence		
Urban	87	36.5
Rural	153	63.5
Marital status		
Married	153	63.8
Single	34	14.2
Divorced	27	11.3
Widowed	26	10.7
Occupation		
Governmental employee	54	22.5
Self employed	32	13.3
No job	21	8.8
Retired	68	28.3
Farmer	25	10.4
House wife	40	16.3
Level of education		
Illiterate	33	13.8
Read and write	87	36.1
Primary school	59	24.6
Secondary school	28	11.7
College	33	13.8

Table 2: Distribution of study sample according to duration and frequency Of hemodialysis.

Duration of hemodialysis (years)	N	%
< 3 year	123	51.2
(3 – 4) years	60	25.0
(5 - 6) years	22	9.2
=> 7 years	35	14.6
Frequency of hemodialysis (cessions/week)		
Once / WK	24	10.0
Twice/WK	188	78.3
Thrice/WK	28	11.7

Table 3: Distribution of the study sample according the habit of smoking.

	Cases (240)	
	N	**%**
Smoking		
Yes	125	52.1
No	115	47.9
Number of cigarettes/ day		
< 20	19	15.2
20 -29	29	23.2
30 - 39	36	28.8
40= >	41	32.8
Smoking duration (years)		
10<	26	20.8
10- 19	33	26.4
20 - 29	41	32.8
30= >	25	20

Table 4: Distribution of the study sample according to smoking habit and gender.

		Male		Female		Total	
		N	**%**	**N**	**%**	**N**	**%**
Smoking	Yes	103	67.3	22	25.3	125	52.1
	No	50	32.7	65	74.7	115	47.9
Total		153	100	87	100	240	100

X   =39.2; d.f. =1; P value = 0.0001*

Table 5: Distribution of the study sample according to their Body mass index.

Body Mass Index (BMI)	**N**	**%**
Under-weight (BMI<18.5)	11	4.6
Normal weight(BMI 18.5-24.9)	55	22.9
Overweight (BMI 25-29.5)	76	31.7
Obese BMI (30-39.9)	81	33.8
Morbid obesity (BMI =>40)	17	7.1
Total	240	100

*N=total number of cases.

Table 6: Distribution of the study sample by their medical history.

Patient's medical diseases	**N**	**%**
Hypertension	92	38.3
Diabetes mellitus	104	43.3
History of recurrent UTI	116	48.3
History of kidney stones	84	35.0
History of congenital abnormality of kidney	24	10.0
History of cardiovascular disease	82	34.2

Table 7: Distribution of the study sample by their family history of ESRD.

family history of ESRD	**N**	**%**
+ve family history of ESRD	99	41/3
-ve family history of ESRD	141	58.7
Total	240	100

Table 8: Distribution of the study sample by their drug history of NSAIDs intake.

History of intake of NSAIDs)	**N**	**%**
Take NSAIDs	112	46.7
Didn't take NSAIDs	128	53.3
Total	240	100

*N=total number of cases.

DISCUSSION

End-Stage Renal Disease (ESRD) is a significant public health concern worldwide, with multiple risk factors contributing to its development. The present study identified several factors associated with ESRD, including age, gender, smoking, obesity, diabetes mellitus, hypertension, recurrent urinary tract infections (UTIs), kidney stones, cardiovascular disease, family history of ESRD, and prolonged use of nonsteroidal anti-inflammatory drugs (NSAIDs). These findings align with previous studies conducted in different countries, further validating the results. The study demonstrated that ESRD prevalence increased with age, with the highest percentage of patients in the 60–69-year age group. This observation is consistent with studies[11-14], which all reported a significant rise in ESRD cases among older adults. The primary explanation for this trend is age-related decline in renal function due to atherosclerosis and vascular deterioration.[15] A significant gender disparity was also observed, with males accounting for 63.7% of ESRD cases. Similar findings have been reported in other studies.[12,13,16] The higher prevalence of ESRD among males is attributed to the increased prevalence of risk factors such as smoking and cardiovascular diseases, which are more common in men. Additionally, lifestyle factors and occupational exposures may further contribute to this disparity. Marital status and residence were also linked to ESRD development. The majority of patients were married, similar to findings in Palestine (2011)[14], possibly due to the older age group predominating among ESRD cases. Additionally, a large proportion (63.5%) of patients resided in rural areas, consistent with findings from El Salvador (2009).[16] Rural patients often have lower socioeconomic status, limited access to healthcare, and poor water quality, all of which contribute to kidney disease progression. Occupational status played a significant role, with retirees forming the largest proportion of ESRD patients. This finding differs from a study in Palestine (2011)[14], which reported a higher percentage of ESRD patients among self-employed individuals. The discrepancy may be due to variations in workforce demographics and socioeconomic conditions. Furthermore, low education levels were significantly associated with ESRD, supporting previous findings from Palestine (2011).[14] Low literacy rates may contribute to a lack of awareness regarding kidney disease prevention and management. Hemodialysis duration and frequency varied among patients. The study found that the mean dialysis duration was 2.9 years, with half of the patients undergoing dialysis for less than three years. These results are comparable to other study[14], which reported a mean dialysis duration of 2.6 years. Most patients received dialysis twice a week due to resource limitations, despite medical recommendations for thrice-weekly sessions. Smoking was a major risk factor, with 52.1% of ESRD patients having a smoking history. A significant percentage (32.8%) smoked more than 40 cigarettes per day, confirming findings from Germany (2011)[17] and El Salvador (2009).[16] Studies have consistently shown that heavy smoking increases the risk of ESRD by accelerating kidney function decline. Obesity and overweight were prevalent among ESRD patients, aligning with studies conducted in Japan (2004)[18] and Northern California (2006).[19] Excess weight is an established risk factor for kidney disease, primarily due to its association with hypertension and diabetes mellitus.[20] Hypertension and diabetes mellitus were highly prevalent, affecting 38.3% and 43.3% of patients, respectively. These findings are consistent with studies in El Salvador (2009)[16], Japan (2011)[13], and the USA (2011)[11], all of which identified these conditions as leading causes of ESRD. Similarly, research from North Carolina (2002)[21] confirmed that high blood pressure is a strong independent risk factor for ESRD development. A history of recurrent UTIs was reported in 48.3% of patients, supporting findings from El Salvador (2009).[16] Rural living conditions, poor sanitation, and inadequate medical follow-up may explain this high prevalence. Additionally, 35% of ESRD patients had kidney stones, comparable to Palestine (2011)[14], where 33.2% of patients reported a history of kidney stones. Poor water quality and low fluid intake may contribute to this association. Congenital kidney abnormalities were identified in 10% of patients, a relatively low proportion, possibly due to misdiagnosis or underreporting. Cardiovascular disease was present in 34.2% of patients, in agreement with studies conducted in Japan (2000)[13] and Palestine (2011).[14] A strong association between cardiovascular disease and ESRD development has been established in multiple studies. A positive family history of ESRD was reported in 41.3% of patients, a higher rate than the 9.5% reported in California (2007).[22] The higher percentage in this study suggests a strong genetic component in ESRD development. The findings are consistent with those from the USA (2011)[11], which also highlighted a significant association between family history and ESRD incidence. Finally, NSAID use was reported in 46.7% of ESRD patients, corroborating findings from El Salvador (2009)[16] and Palestine (2011).[14] Long-term NSAID consumption has been linked to kidney damage and an increased risk of ESRD.

CONCLUSION

The study found that ESRD was most prevalent among males aged 60–69 years, with most patients being married and living in rural areas. Smoking, obesity, hypertension, diabetes, cardiovascular disease, kidney stones, and recurrent UTIs were significant risk factors. A positive family history of ESRD and long-term NSAID use were also common among patients. Most participants had low education levels, and the majority underwent hemodialysis for less than three years, typically twice per week.

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