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RESEARCH

Evaluation of demographic, clinical characteristics and cost of immigrant patients with end-stage renal failure

Son dönem böbrek yetmezliği olan göçmen hastaların demografik ve klinik özellikleri ile maliyetinin değerlendirilmesi

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Abstract

Purpose: Due to wars and disasters, people migrate forcibly due to their need for safe housing and health care. In our study, we aimed to the demographic and clinical typical of immigrants with end-stage renal disease and to make a cost analysis.

Materials and Methods: Our study is single-center and retrospective. Migrant patients who have end-stage renal disease who met the study criteria were included in the study. Demographic data, clinical data, laboratory data and treatment cost data of the cases were added to the previously created form.

Results: Our study was conducted with 696 patients. 64.2% of the cases were female and the median age was 67 years. 65.5% of the cases were of Syrian nationality. Hemodialysis was applied to all of the cases, of which 47% were urgently. 55.2% of these cases were hospitalized and mortality was observed in 13.2% of all cases. Age was statistically higher in cases with mortality. Urea and creatinine in patients with mortality were significantly higher; pH, HCO3 and GFR were statistically lower. Mortality was statistically higher in cases requiring urgent hemodialysis and hospitalized in the ICU. The cost of health was statistically higher in surviving cases. Again, in patients who were hospitalized, both the time allocated for care and the cost of health were statistically higher than in outpatients.

Conclusion: Establishing routine dialysis programs by identifying immigrant cases with end-stage renal disease will both reduce mortality and morbidity for patients, reduce health costs in countries, and reduce emergency department densities.

Keywords: Immigrants, end-stage kidney disease, costs, health policy

Öz

Amaç: Savaşlar ve afetler nedeniyle insanlar güvenli barınma ve sağlık hizmetlerine olan ihtiyaçlarından dolayı zorunlu olarak göç etmektedirler. Çalışmamızda son dönem böbrek hastalığı olan göçmenlerin demografik ve klinik özelliklerini ve maliyet analizini incelemeyi amaçladık.

Gereç ve Yöntem: Çalışmamız tek merkezli ve retrospektif bir çalışmadır. Acil servise son dönem böbrek hastalığı semptomları ile başvuran ve çalışma kriterlerini karşılayan hastalar çalışmaya dahil edildi. Olguların demografik, klinik, laboratuvar ve tedavi maliyeti verileri önceden oluşturulan bir forma eklendi.

Bulgular: Çalışmamız 696 hasta ile yapılmıştır. Vakaların %64,2'si kadındı ve ortanca yaş 67 idi. Olguların tamamına hemodiyaliz uygulandı, bunların %47'si acil olarak gerçekleştirildi. Bu vakaların %55,2'si hastaneye yatırıldı ve tüm vakaların %13,2'sinde ölüm görüldü. Mortalite olan olgularda yaş istatistiksel olarak daha yüksekti. Mortal seyreden hastalarda üre ve kreatinin düzeyleri anlamlı olarak daha yüksekken, pH, HCO3 ve GFR düzeyleri istatistiksel olarak daha düşüktü. Acil hemodiyaliz ve yoğun bakım gerektiren olgularda mortalite oranı istatistiksel olarak daha yüksekti. Hayatta kalan olgularda sağlık maliyetleri istatistiksel olarak daha yüksekti. Ayrıca, hastanede yatan olgularda yatış süresi ve sağlık maliyetleri ayaktan hastalara göre istatistiksel olarak daha yüksekti.

Sonuç: Son dönem böbrek hastalığı olan göçmen vakaların belirlenerek rutin diyaliz programlarının oluşturulması, hastalar için hem mortalite ve morbiditeyi azaltacak hem de ülkelerdeki sağlık maliyetlerini azaltacak ve acil servisler üzerindeki yükü hafifletecektir

Anahtar kelimeler: Göçmenler, son dönem böbrek yetmezliği, maliyet, sağlık politikası

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INTRODUCTION

Throughout history, social conflicts and crises have led individuals and even communities to move away from their places of origin. The United Nations High Commissioner for Refugees estimates that in 2015 alone, approximately 65 million people were displaced and forced to migrate due to conflicts and persecution[1]. In 2015, the number of migrants and refugees who migrated to Europe exceeded one million, and in 2016, this number was reported to be approximately 347,000[2]. In our country, these figures were around 147,000 in 2015 and approximately 175,000 in 2016[3,4]. The provision and management of healthcare services for receiving communities is quite challenging. There are dilemmas regarding the cost of medical treatments and whether these treatments will cover immigrants or refugees. The increase in the number of immigrants or refugees with end-stage renal disease requiring renal replacement therapies will increase the demand for these treatments nationwide. In this context, the increase in renal replacement therapies poses ethical questions and challenges in countries due to the lifelong care needs and financial difficulties. A study in the literature has stated that dialysis-dependent refugees account for only 1.5% of the dialysis population[5]. However, despite this seemingly low rate, it has been observed that the density of dialysis units increases between 20% and 50% in areas with a high number of immigrants or refugees[6]. This leads to problems, particularly in large centers. One of the problems is that immigrants who cannot access dialysis or face financial difficulties often resort to emergency departments, leading to overcrowding in these departments.

In our study, unfollowed migrant patients with end-stage renal disease increase their costs and mortality rates due to frequent admissions to the emergency department. In this study, we present the demographic, clinical and cost evaluation of immigrant or refugee cases with end-stage renal disease (ESRD); It was aimed to reduce unnecessary time and economic losses and to contribute to the literature.

MATERIALS AND METHODS

Study setting ve study population

In our study, a retrospective and single-center evaluation was conducted on immigrant or refugee patients who presented to the Emergency Medicine Clinic of Erzurum Regional Training and Research Hospital between January 1, 2017, and January 1, 2022, and were diagnosed with ESRD.

Routine examinations and treatments of the cases presenting to the emergency department were performed by clinicians, and these cases were retrospectively collected. Patient data is recorded in the system and patient files during the physician examination and afterwards. Patient files are archived based on the application date and physician examination order when the patient evaluation is completed. Administrative permission is required to access these files. The hospital automation system and patient files were scanned to identify cases of ESRD in immigrant or refugee patients for the study. Among these cases, those who were 18 years of age and older, had ESRD, and had no missing data were included in the study. Excluded from the study were cases of patients under 18 years of age (38 cases), pregnant cases (13 cases), cases referred to another center (28 cases), cases presenting with trauma (19 cases), cases presenting with complaints other than kidney failure (e.g., cerebrovascular disease, coronary artery disease, etc.) (42 cases), cases with missing data (16 cases), and cases with untraceable outcomes (9 cases).

Power analysis was performed using G-Power 3.1.9.7 software. The minimum sample size required for the study, with an effect size of d=0.5, an alpha error rate of 0.05, and a power (1-Beta error rate) of 0.80, was determined to be 51 individuals. Since the number of cases screened within the specified date range exceeded the minimum number of patients determined for the study in the power analysis, the study was continued with the number of patients within the specified date range. After these evaluations, the study was conducted with 696 eligible patients.

Data collection

Ethics committee approval (dated 06.12.2021 and KAEK 2021/21-270 decision number) was obtained for our study from Erzurum Region Training and Research Hospital Ethics Committee. Due to the retrospective nature of the study, obtaining voluntary consent from the patients included in the study was avoided. Our study was carried out in accordance with the rules of "Helsinki Scientific Research Declaration" and "Declaration of Good Clinical Practices".

A total of 694 patients who met the inclusion criteria were included in our study. Demographic data of the cases (age and gender), chronic disease history [Hypertension (HT), congestive heart failure (CHF), coronary artery disease (CAD), diabetes mellitus (DM), malignancy and cerebrovascular accident (CVO)], clinical evaluations [dialysis need (urgent need for dialysis), dialysis treatment plan/frequency, hospitalization need, hospitalization location (service and intensive care unit (ICU)], treatment costs (if any, treatment costs during hospitalization) and laboratory tests were evaluated and The obtained data were added to the previously prepared study form.

The end-stage renal disease classification of the cases was made according to the KDIGO 2021 Consensus[7] (Table 1). The cost analysis in the study was determined from the hospital's invoices to the Social Security Institution and was calculated according to the average exchange rate of the Central Bank of the Republic of Turkey at the time of admission to the hospital.

Statistical analysis was performed after the study data were completed.

A total of 694 patients who met the inclusion criteria were included in our study. The demographic data of the cases (age and gender), chronic disease history [hypertension (HT), congestive heart failure (CHF), coronary artery disease (CAD), diabetes mellitus (DM), malignancy, and cerebrovascular events (CVE)], clinical evaluations [dialysis requirement (emergency dialysis requirement), dialysis treatment plan/frequency, need for hospitalization, hospitalization location (ward and intensive care unit (ICU))], treatment costs (if available, treatment costs during hospitalization), and laboratory investigations were evaluated, and the obtained data were added to the previously prepared study form.

The classification of end-stage kidney disease in cases was made according to the KDIGO 2021 Consensus[7] (Table 1). Cost analysis in the study was determined from the hospital's Social Security Institution (SGK) invoices and calculated based on the average exchange rate of the Turkish Republic Central Bank at the time of hospital admission.

After completion of the study data, statistical analysis was performed.

Table 1 Functional and structural criteria for kidney diseases and disorders by KDIGO consensus

	AKI	**AKD**	**CKD**	**NKD**
Duration	Within 1 Week	≤ 3 Months	≥3 Months	
Functional Criteria	Increase in SCr by 50% within 7 days Or Increase in SCr by 0.3 mg/dL (26.5 mmol/L) within 2 days Or Oliguria for upper than 6 hours	AKI Or GFR<60 mL/min/1.73 m^2 Or Decrease in GFR by ≥35% Or Increase in SCr by >50%	GFR <60 mL/min/1.73 m^2	GFR >60 mL/min/1.73 m^2
And/or		And/or	And/or	And
Structural Criteria	No defined	Marker of kidney demage (albuminuria, hematuria, or pyuria are most common)	Marker of kidney demage (albuminuria are most common)	No kidney demage

AKD: Acute Kidney Disease**; AKI;** Acute Kidney Injury; **CKD:** Chronic Kidney Disease**; GFR:** Glomerular Filtration Rate; **NKD:** No Kidney Disease; **SCr**: Serum Creatinine

Statistical analysis

Statistical analysis was performed using the SPSS 26.0 for Windows® statistical program (IBM Inc. Chicago, IL, USA). Number, percentage, median and quartile values were used in the presentation of the descriptive data obtained in the study. Whether the data were normally distributed or not was examined with the Kolmogorov-Smirnov Test. Pearson chi-square test was used to compare categorical data (gender, hospitalization need, chronic disease status,

need for dialysis, hospitalization in the service and intensive care unit of the survive and mortality cases). If the data did not fit the normal distribution, the Mann Whitney U test was used to compare two independent quantitative data (age, urea, creatinine, pH, HCO3, GFR, length of service, and costs).

For the results, it was considered significant at $p<0.05$.

RESULTS

Our study was conducted with 696 patients. 64.2% of the cases were female, and the median age was 67 years. Among the cases, 63.9% had HT (hypertension), 48.6% had DM (diabetes mellitus), 39.7% had CAD (coronary artery disease), 10.1% had CHF (congestive heart failure), 2.7% had malignancy, and 10.9% had a history of CVO (cerebrovascular events). It was found that 15.5% of the cases underwent dialysis twice a week, while 84.5% had a history of dialysis three times a week. In the laboratory tests performed at the time of application, the median urea value was 133.85 mg/dL, the median creatinine value was 5.94 mg/dL, the median pH value was 7.12, the median HCO3 value was 14.32, and the median GFR value was 7.4 ml/min. Emergency hemodialysis was planned for 47% of the cases. 55.2% of the cases were hospitalized. Among the hospitalized cases, 20% were admitted to the ICU (intensive care unit), and 80% were admitted to the general service. The median length of stay in the ICU was 3 days, and the median value for service hospitalization was 2 days. The average hospital healthcare cost for the patients was $3060.55 (Table 2).

Table 2. Examination of the demographic, clinical and laboratory data of the cases

Parameter		**n (%) / Median (IQR)**
Age (year)		67 (59-75)
Gender	Male	249 (35.8)
	Female	447 (64.2)
History of Comorbid Disease	HT	445 (63.9)
	DM	338 (48.6)
	CAD	276 (39.7)
	CH	70 (10.1)
	Malignancy	19 (2.7)
	CVO	76 (10.9)
Dialysis Frequency	2 per week	108 (15.5)
	3 per week	588 (84.5)
Urea (mg/dL)		133.85 (124.7-142.3)
Creatinine (mg/dL)		5.94 (5.12-7.01)
pH		7.19 (7.14-7.22)
HCO_3 (mmol/L)		14.32 (12.60-15.58)
GFR (ml/min)		7.4 (2.8-14.1)
Dialysis Need	Urgent	327 (47.0)
	Elective	369 (53.0)
Hospitalization	Pozitive	384 (55.2)
	Negative	312 (44.8)
Place of Hospitalization	ICU	77 (20.0)
	Services	307 (80.0)
ICU Hospitalization Time (days)		3 (2-6)
Sevices Hospitalization Time (days)		2 (0-5)
Mortality	Negative	604 (86.8)
	Pozitive	92 (13.2)
Costs	$	2060.55(1140.36-3022.47)

HT; Hypertension, DM: Diabetes Mellitus; CAD: Coronary Artery Disease; CHF: Congestive Heart Failure; CVO: Cerebrovascular Incident; ICU: Intensive Care Unit; Min: Minute; HCO_3: Bicarbonate; GFR: Glomerular Filtration Rate; IQR: Interquarter Rate;

Table 3 Comparison of demographic, clinical and laboratory data according to the outcomes of the cases

Parameter		Survived Cases (n=604) n (%) / Median (IQR)	Exitus Cases (n=92) n (%) / Median (IQR)	p
Age (year)		63.0 (56.0-71.0)	71.0 (61.25-76.0)	**0.003** [m]
Gender	Male	209 (34.6)	40 (43.5)	0.098 [p]
	Female	395 (65.4)	52 (56.5)	
History of Comorbid Disease	HT	381 (63.1)	64 (69.6)	0.227 [p]
	DM	287 (47.5)	51 (55.4)	0.157 [p]
	CAD	246 (40.7)	30 (32.6)	0.138 [p]
	CH	59 (9.8)	11 (12.0)	0.516 [p]
	Malignancy	13 (2.2)	6 (6.5)	**0.017** [p]
	CVO	59 (9.8)	17 (18.5)	**0.013** [p]
Urea (mg/dL)		131.7 (121.7-142.3)	134.9 (128.6-142.4)	**<0.001** [m]
Creatinine (mg/dL)		5.63 (4.76-6.62)	6.27 (5.30-8.00)	**<0.001** [m]
pH		7.19 (7.17-7.21)	7.18 (7.08-7.23)	**<0.001** [m]
HCO_3 (mmol/L)		14.45 (13.39-15.84)	14.12 (12.02-15.44)	**<0.001** [m]
GFR (ml/min)		9.0 (3.2-15.1)	3.6 (2.7-11.3)	**0.019** [m]
Dialysis Need	Urgent	262 (43.4)	65 (70.7)	**<0.001** [p]
	Elective	342 (56.6)	27 (29.3)	
Hospitalization	Pozitive	292 (48.3)	92 (100.0)	**<0.001** [p]
	Negative	312 (51.7)	0 (0.0)	
Place of Hospitalization	ICU	0 (0.0)	77 (83.7)	**<0.001** [p]
	Services	293 (100.0)	15 (16.3)	
ICU Hospitalization Time (days)		3 (2-3)	6 (3-9)	**<0.001**
Sevices Hospitalization Time (days)		6 (4-6.25)	0 (0-0)	**<0.001**
Costs ($)		2316.7 (1141.3-3131.1)	660.8 (557.7-710.0)	**<0.001**

[m]: Mann Whitney U Testi; [p]: Pearson χ^2 Testi; HT; Hypertension, DM: Diabetes Mellitus; CAD: Coronary Artery Disease; CHF: Congestive Heart Failure; CVO: Cerebrovascular Incident; ICU: Intensive Care Unit; Min: Minute; HCO_3: Bicarbonate; GFR: Glomerular Filtration Rate; IQR: Interquarter Rate

Demographic, clinical, and laboratory data were compared according to the mortality status of the cases, and it was observed that the mean age of the cases with mortality was statistically higher. There was no statistically significant relationship between gender and mortality. Similarly, no statistically significant correlation was found between the nationalities of the cases and mortality. When examining the medical history of the cases, mortality was found to be statistically significantly higher in cases with a history of malignancy and CVO. When analyzing the initial laboratory data, it was found that the median values of urea and creatinine were statistically higher in the deceased cases (*p <0.001* for both); whereas the median values of pH, HCO3, and GFR levels were statistically lower (*p <0.001*, *p <0.001*, and *p = 0.019*, respectively). Mortality was observed to be statistically higher in cases requiring urgent hemodialysis due to delays and excessive accumulation of toxic products. Additionally, mortality was found to be statistically higher in patients hospitalized in the ICU. It was observed that the duration of hospitalization for patients who died in the ICU was statistically longer (p <0.001) (Table 3).

In our study, when the cost analyzes of the patients who were hospitalized and those who were not, were compared; the median cost of hospitalized cases was $3103.65; The median cost of patients who were not hospitalized was $1210.21 (Z=14,600; p<0.001) (Table 3).

DISCUSSION

The number of refugees in the world is over 20 million, and Syrian nationals make up the majority of this group[8]. The scope of health services for refugees varies from country to country. The United Nations High Commissioner for Refugees has allocated a significant amount of money in this regard. However, even this commission does not cover the costs of

treating many chronic diseases, including ESRD[9]. Additionally, studies dealing with disasters such as war have reported high mortality rates, a serious decrease in facilities, and significant workforce losses, which cause serious problems for ESRD cases in countries experiencing such disaster-related adversities[10,11]. For these reasons, most ESRD cases migrate to other countries.

In this study, we investigated the effect of cases with a history of ESRD among immigrant patients on health economics and found that the average cost per patient per application was $2,060.55. Moreover, it was observed that immigrants with ESRD who do not have health insurance often seek emergency services because they face difficulties in obtaining routine follow-ups (53% of dialysis cases are elective). In the study by Isreb et al., it was reported that the cases experienced financial problems accessing dialysis procedures, leading to 25% of migrant patients missing at least one dialysis procedure per week due to financial reasons. Furthermore, the same study reported that ESRD cases suffered due to the lack of a system coordinating the financing and treatment of these cases[12]. Similar to our study and the literature, financially, ESRD poses challenges for both institutions and funders while causing harm to patients. Hence, similar problems in the healthcare of immigrants are prominent in all countries.

Long periods (> 1 week) without dialysis reach a life-threatening level, but it is dramatically somewhat typical for dialysis provision under limited resources[13]. In the study by Prasad and Vivekanand, in addition to immigrants, most underdeveloped or developing Asian countries cannot meet the need for dialysis even for their own people, leading to serious infections and complications in patients who do receive treatment[13]. In a study by Raghavan et al., which evaluated ESRD among immigrants, it was reported that cases faced financial problems accessing dialysis programs, resulting in their deterioration and subsequent admission to emergency services. Furthermore, in the same study, it was reported that emergency department admissions not only worsen patients' health due to irregular dialysis, but also contribute to increased emergency service density and economic losses due to evaluation costs and complications arising from delays or disruptions[14]. In a study by Cervantes et al. involving immigrant cases with ESRD, a comparison was made between patients who sought dialysis in the emergency department and those who received routine dialysis treatment in standard dialysis units. It was reported that mortality was significantly higher in patients who sought emergency department dialysis compared to those who followed the standard dialysis program[15]. Another study examined mortality in ESRD cases and found that annual mortality rates ranged from 10% to 11.2% between 2010 and 2018[16]. In our study, we observed a mortality rate of 13.2% among ESRD cases who were not under regular follow-up and resorted to the emergency department, with 70.7% of these patients being critically ill and requiring immediate hemodialysis. Given the high mortality rate in ESRD, it is crucial to develop and strengthen routine hemodialysis programs to reduce both mortality and morbidity.

Another problem arising from not adhering to the routine dialysis program in ESRD cases is that patients who miss their scheduled dialysis procedures or cannot undergo them due to financial reasons end up seeking treatment at emergency services with a worsened clinical condition, and some of these patients require hospitalization. In the study by Cervantes et al., it was reported that patients needing emergency hemodialysis spend ten times more time on treatment after hospitalization, leading to significant economic losses[15]. In our study, the average length of hospital stay and ICU stay for the cases was three days. Additionally, the median cost for hospitalized ESRD cases was $3,103.65, while the median cost for non-hospitalized cases was $1,210.21 ($Z=14,600$; $p<0.001$). These findings indicate that hospitalized patients incur higher care and costs, which aligns with the results of Cervantes et al.'s study. Furthermore, our study also revealed a significantly higher mortality rate in ESRD cases with a history of malignancy and CVO. We believe this can be attributed to the fact that kidney function deteriorates more rapidly in these cases due to excessive fluid intake or fluid loss, leading to worsened clinical outcomes

When our results are evaluated, it is evident that serious problems are encountered in immigrant cases with end-stage renal disease (ESRD) who are not included in the dialysis program or cannot receive dialysis treatment due to economic reasons. These ESRD cases either remain untreated or resort to emergency services. As a result of the cases' visits to the emergency department, it has been observed that there is an increase in the density of the emergency services, unnecessary economic losses occur, and mortality rates rise in cases unable to receive

treatment. Additionally, it has been observed that cases unable to receive dialysis treatment experience deteriorating general conditions, leading to hospitalizations in regular wards and intensive care units, resulting in further increased costs. To generalize the findings of our study, there is a need for a larger number of cases and comparative studies with a control group of patients receiving routine dialysis.

The topic discussed in our study is not specific to the nationalities of immigrant cases. The aim of this study is to highlight the deficiencies in the literature regarding health policies and management and to draw attention to the necessary solutions.

One of these limitations is that one of them is single-centered and can be extended to other health centers. Another limitation of ours is; The reason is that our study was retrospective and there were patients included in the study due to incomplete data entry by clinicians. The socio-cultural and economic classification of refugees is one of the limitations of the study. However, we do not think that these limitations will change our study results.

In conclusion establishing routine dialysis programs by identifying immigrant cases with ESRD will reduce mortality and morbidity for patients, reduce health costs in countries, and reduce emergency service densities.

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