Health Science Monitor
2023; 2(2): 73-79
Published online (http://hsm.umsu.ac.ir)

Original Article

The epidemiological study of end-stage renal disease among patients admitted to hemodialysis wards of Ayatollah Taleghani and Imam Khomeini hospitals in Urmia city of Iran, in the 2020's second half

Bita Solahae Kahnamouii [1], Azam Mivefroshan[2], Leila Ravanyar[3], Rana Hosseini*[4]

[1] *Department of Community Medicine, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran*
[2] *Department of Internal Medicine, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran*
[3] *Social Determinant of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran*
[4] *Social Determinant of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran*

***Corresponding author:** Rana Hosseini , **Address**: Social Determinant of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran, **Email**: hosseini.r@umsu.ac.ir, **Tel**: +984432770397

Abstract

***Background & Aims*:** Chronic kidney disease (CKD), mainly its final stage, known as end-stage renal disease (ESRD), is one of the major challenges for the healthcare system in Iran, and deserves more reflections. Against this background, the present study aimed to elucidate the epidemiology of ESRD among the patients, undergoing permanent treatment, admitted to the hemodialysis (HD) wards of the selected hospitals in Urmia, Iran .

***Materials & Methods*:** In this descriptive-analytical study, using the census method for sampling, we investigated patients experiencing permanent treatment and admitted to the HD wards of the selected hospitals in Urmia, Iran, from October 2020 to March 2021. The criteria for entering the study are the availability of medical record and ESRD cases. On the other hand, the cases receiving intermittent HD were excluded. Furthermore, a checklist was utilized to collect the required data .

***Results*:** The ESRD patients' mean age was 60.63. Also, 59.6% of the cases were male, and the rest (40.4%) was female. Besides, 54.7% of these patients had degrees below high school diplomas, and 72.8% was living in urban areas. The most frequently occurring blood type was O, and the majority of the patients were the Rhesus positive. The average level of serum creatinine was also 20.7 mg/dL. Moreover, the most common underlying diseases were hypertension (HTN) and diabetes mellitus (DM), respectively .

***Conclusion*:** The study findings reveale that monitoring and controlling chronic diseases, such as HTN and DM, as well as raising more awareness among the patients with low literacy, could significantly contribute to managing CKD and its progress .

***Keywords*:** Chronic Kidney Disease, End-Stage Renal Disease, Epidemiology, Hemodialysis

Received 08 August 2022; accepted for publication 19 February 2023

Introduction

Chronic kidney disease (CKD) and its final stage, known as end-stage renal disease (ESRD), are serious challenges for the healthcare system in Iran and requires the special attention of decision makers in the field of health and special diseases (1). As a long-term syndrome, CKD is often characterized by the persistent structural and functional changes in the kidneys, causing numerous problems in individuals' health conditions. Cysts, tumors, malformations, or atrophies, identified on imaging, are some examples of the structural disorders. The functional disorders are further presented by hypertension (HTN), edema, changes in urine quantity/quality, and childhood growth problems. Irrespective of the etiology and the primary diseases that result in CKD, the most frequent pathological manifestation is renal fibrosis (2).

In accordance with the criteria established by the Kidney Disease: Improving Group Outcomes (KDIGO) in 2012, ESRD is defined by a reduced glomerular filtration rate estimated below 15 ml per minute per 1.73 square meters of the body surface area (3). The most important underlying conditions, giving rise to CKD, particularly in developing nations, are diabetes mellitus (DM) and HTN. In people with DM, the prevalence rate of this disease is 30-40%; however, the main cause of this disease in diabetic people, diabetes itself or microvascularization caused by diabetes, is unknown.

In low- and middle-income countries, CKD can be further associated with infectious diseases, glomerulonephritis, and inappropriate medication use, e.g. taking non-steroidal anti-inflammatory drugs. Besides, low birth weight (typically described as babies who are born weighing less than 2500 g), which often occurs due to intrauterine growth restriction or premature birth, is connected with CKD at an older age (4, 5). The leading cause of ESRD in the United States is DM, which now accounts for 45% of the new cases. Moreover, about 30% of ESRD patients are burdened with HTN, but other common causes can be glomerulonephritis, polycystic kidney disease, and obstructive uropathy. The mortality rate of ESRD patients in Europe and Japan is the lowest, but it is very high in developing countries due to the limited access of these countries to hemodialysis (HD). In the United States, the mortality rate of the patients undergoing HD has slightly diminished, even though its prevalence rate is still high, and the five-year survival rate is approximately 35-40%. Of note, deaths are mainly caused by cardiovascular diseases and infections (around 40% and 10% of the cases, respectively). Old age, male gender, non-black ethnicity, DM, malnutrition, and heart disease are also the key predictors of death (6). In this respect, reports by the Global Burden of Diseases (GBD) indicate an upward trend in the burden and cost of CKD over the past 20 years, wherein DM plays an important role (7).

Previous research on ESRD has further spotted some risk factors, such as old age, proteinuria, DM, HTN, African American ethnicity, and increased level of creatinine, or reduced estimated glomerular filtration rate for this condition. Studies have also demonstrated overweight and obesity as the risk factors for ESRD. Some other factors, such as smoking and the history of urinary stones, can also be introduced as the potential risk factors (8, 9). A low hemoglobin count, a high uric acid level, the family history of kidney problems, and the oral history of nocturia have been additionally taken into account in some studies as the risk factors for this disease (10). Likewise, the prevalence rate of CKD is predicted to increase with regard to the demographic, economic, and lifestyle changes in Iran (1). On the other hand, many patients are not aware of their disease before reaching the end stage (11). Extensive efforts for prevention, early diagnosis, examination, and treatment of kidney failure disease can prevent the complications caused by the decrease in the kidney function and lead to the reduction of the progression of chronic kidney disease to the final stage and its side effects. The present study was designed with the aim of epidemiological investigation of end-stage renal disease in patients hospitalized in the Hemodialysis Departments of Ayatollah Taleghani and Imam Khomeini hospitals in Urmia. With such studies, a step can be taken for the prevention and reduction of

complications and death rate, as well as the proper treatment of this disease.

Materials & Methods

This descriptive-analytical study, using the census method for sampling, examined patients underwent permanent treatment and admitted to the HD wards of the selected hospitals in Urmia, Iran, from October 2020 to March 2021. The criteria for entering the study were the availability of medical record and ESRD cases. The cases undergoing intermittent HD, i.e. those suffering from acute renal failure, were excluded. As there were no interventions in this study, all information was obtained from the patients' medical records, complying with the principle of anonymity. In addition, the principle of confidentiality of patients' identity information was taken into account. The present study was initiated after obtaining the code of ethics from the Ethics Committee of Urmia University of Medical Sciences, Urmia, Iran. As the information of patients was incomplete, and differentiation between the onset and delay of causative diseases or associated diseases was impossible, to overcome these problems, we excluded these cases from the study process. The patient's data were further collected by a checklist made up of two parts: (a) patients' demographic characteristics and (b) ESRD and HD. The demographic characteristics information included the place of residence (both urban and rural), age, gender, education level, blood group and Rhesus (Rh), and the ESRD-related information was associated with the level of serum creatinine, blood urea nitrogen, co-morbidities such as DM, HTN, hepatitis, human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), and heart disease, registered by the researcher once retrieved from the patients' medical records. If information on ethnicity or HTN or DM duration was available, it was also noted.

Results

In this study, the epidemiology of ESRD was assessed in 360 patients, undergoing permanent treatment, admitted to the HD wards of Ayatollah Taleghani and Imam Khomeini Hospitals in Urmia in the second half of 2020. The mean ± standard deviation (SD) of ESRD patients' age was 60.63 ± 15.58, with the minimum and maximum ages of 14 and 97 years old, respectively. In addition, 59.6% of the cases were male, and the rest were female (40.4%). Moreover, 72.8% of the patients were living in urban areas, and 27.2% in rural residents. Most of the patients held high school diplomas or below, and 40.2% of the cases were illiterate. The demographic characteristics information of the ESRD patients is illustrated in Table 1.

Table 1. Demographic characteristics information of ESRD patients

Variables	Frequency (%)
Patient's age (mean ± SD)	60.63±15.58
Gender	
Male	214 (59.6)
Female	145 (40.4)
Place of residence	
Urban	257 (72.8)
Rural	96 (27.2)
Level of education	
Illiterate	133 (40.2)
High school diploma and below	181 (54.7)
Associate's degree	4 (1.2)
Bachelor's degree	11 (3.3)
Master's degree	2 (0.6)

As shown in Table 2, blood group O was the most frequent in the ESRD patients, followed by blood group A. Also, the Rh was positive in 89.4% of the patients. Most cases of the disease were further diagnosed in 2020.

Table 2. Frequency distribution of blood group and Rh in ESRD patients

Variables	Frequency (%)
Blood group	
A	119 (33.1)
B	64 (17.8)
AB	39 (10.8)
O	138 (38.3)
Rh	
Negative	38 (10.6)
Positive	322 (89.4)

The blood urea nitrogen means ± SD in these patients was 28.04 ± 102.04 mg/dL. Besides, the mean ± SD of the level of serum creatinine in the patients was 2.4 ± 7.20 mg/dL. The prevalence rate of DM in the patients was 40.9%, and HTN was observed in 62.2% of the cases. Moreover, 3.6% of the patients had hepatitis B, 0.8% of the cases experienced hepatitis C, and none suffered from HIV/AIDS. Additionally, 16% of the patients had substance use disorder, 38.6% of the cases suffered from DM before ESRD, and 53.3% of the patients reported HTN. Cardiovascular diseases were further reported as an underlying disease in 5.8% of the cases.

Discussion

In this study, the ESRD patients' mean age was 60.63, with the minimum age of 14 and maximum age of 97 years. Besides, 59.6% of the cases were male, and the rest (40.4%) were female. In a survey investigating the epidemiology of CKD in Iran, the patients' mean age was 51.6 year (12), which was less than the amount obtained in our study. This age difference is likely because that study has been conducted on patients with chronic kidney disease, while our study population is on end-stage renal disease (ESRD) patients. In addition, 61% of the patients were male, and the rest (39%) were female (12), resembling our results. In Nakai et al.'s study on the epidemiology of ESRD, samples were divided according to their age groups, and those in the 45-64 age groups had the highest frequency, the same as findings reported herein. Furthermore, 55.5% of the patients were male and 44.5% of the cases were female (13), which was consistent with the rates in the present study. Khajehdehi et al. estimated the prevalence and risk factors of CKD in Iran and concluded that older age was strongly correlated with the higher stages of CKD, supporting the results of the current study. In conflict with our results, they indicated that the female gender has a more significant effect on the higher stages of this condition (14). In the study by Hadian et al. conducted between winter 2010 and winter 2011 in the HD wards affiliated to the Lorestan University of Medical Sciences, Khorram Abad, Iran, 57.2% of the patients were male, and the rest were female, and the patients' mean age was 53.2 ± 16.4 (15), which are in harmony with our results. In the present study, 72.8% of the patients was urban residents, and the rest were living in rural areas. In the same survey, the census method exhibited that 63.2% and 36.8% of the patients were living in urban and rural areas, respectively (15), confirming the findings of the present study. In Alipour et al.'s investigation, about 70% of the patients admitted to one of the selected teaching hospitals in Tehran, Iran was living in the urban areas, and the rest was living in rural residents (16), which were in agreement with the results obtained in our study.

Most patients recruited herein held high school diplomas or below (54.7%), and 40.2% of the cases were illiterate. In Hadian et al.'s survey, the percentage of illiterate cases (60.6%) was significantly higher than that in the present study, possibly due to sociocultural reasons and less access to educational facilities (15). In the current study, 1.5% of the patients had higher education, which was significantly higher than the rate (1.2%) reported by Hadian and colleagues (15). It

seems that the level of education plays a significant role in reducing the prevalence rate of ESRD, because the majority of educated people pay much more attention to their health. The level of serum creatinine in our patients was 7.20 ± 2.4 mg/dL. This rate in the stage-four patients (based on the ultrasound echogenicity) with CKD was 7.9 mg/dL in the Siddappa et al.'s survey conducted in India in 2013 (17), which is in conformity with the result of and value obtained in the present study. The high levels of serum creatinine in these patients were normal, as expected, due to the poor function of the kidneys.

Similar to many previous studies, our study displayed that DM and HTN were the main factors in the development of CKD (18, 19), and there were many patients with HTN (~60%) and DM (~40%). Herein, the most common underlying diseases, both before and after ESRD, were HTN and DM, respectively. Of note, DM is one of the primary causes of ESRD across the world so that 148.8 patients per one million people in 2004 was affected by this condition in the United States (20). In a previous study conducted on the HD patients in Guilan Province, Iran, HTN was reported as the most common cause of CKD (21), which was in line with our study. Moreover, Malekmakan et al. (2014) found that the leading causes of CKD in the HD patients in Fars Province, Iran, were HTN and DM (22). The difference in the status of diabetes and high blood pressure in Urmia compared to global statistics can be attributed to the increased prevalence of high blood pressure in the province or the earlier departure of diabetic patients from the group of chronic kidney disease patients. Another reason could be death or incomplete registration of information on the priority and delay of the patients' accompanying diseases.

In the present study, the percentage of the patients with kidney problems (viz. kidney stones and other urologic diseases) was 15.3%, but in a survey conducted by Hadian et al. in Lorestan Province, Iran, the prevalence rate of kidney stones was 6.9% (15), which was inconsistent with our result. This discrepancy could arise from the location of the city of Urmia on the kidney stone belt and also the possibility of not complying with the risk factors of kidney stone disease in patients referred to the HD department of Urmia University Hospitals. Studies have also reported the high statistics of unknown causes, which was 29.5% in Afshar's study (12), and in Nefer et al.'s study, they were at the top of the causes (23). According to a survey in the United Kingdom, 18% of the causes (risk factors for kidney stone disease) were unknown (24), while this value was 6.7% in our study, which could be due to the higher prevalence rates of DM and HTN across Iran, or owing to the discrepancy in taking faster diagnostic standards and treatment measures in these regions. In this study, the prevalence rate of each of the three diseases of hepatitis B, hepatitis C, and HIV/AIDS was 4.4%. In Hadian et al.'s investigation, HTN and DM were the most common underlying diseases, which is similar to the results of our study (15). Additionally, 5.97% of the patients in Hadian et al.'s study was infected with HIV/AIDS, as well as with the hepatitis B and C viruses (15), which were higher than the rate reported in our study due to the variation in the regions investigated in both studies.

Conclusion

The findings of the present study showed that the frequency of male patients was more than females. Also, most patients were illiterate or had below high school diplomas. The most common blood groups were O- and Rh-positive. HTN and then DM were the main underlying diseases occurring both before and after ESRD. In addition, among the kidney problems, kidney stone was the most common. Accordingly, timely monitoring and control of chronic diseases, such as HTN and DM, as well as raising more awareness of patients with low literacy, could significantly contribute to the management of the disease and its progress. Delay in visiting physicians, unwillingness to follow up the disease, arising from economic or cultural issues, along with some incomplete medical records in the HD wards, could thus be among the reasons for the possibility of errors in the prevalence

statistics. Undoubtedly, the pathological examination of the ESRD etiology could not be practically performed in the conditions where the patients had reached the end stage, except for some cases of kidney transplants.

Acknowledgments

The authors hereby extend their sincere appreciation to the officials and the staff in the Hemodialysis Wards of Ayatollah Taleghani and Imam Khomeini Hospitals, affiliated to Urmia University of Medical Sciences, Urmia, Iran, for their cooperation to fulfill this project by providing information and valuable opinions during the study.

Conflict of interest

The authors have no conflict of interest in this study.

Funding/support

None declared.

Data availability

The raw data supporting the conclusions of this article are available from the authors upon reasonable request.

References

1. Murtagh FE, Glassock R. Symptoms in end-stage renal disease. Adv Chronic Kidney Dis. 2007 Jan;14(1):82-99.
2. Romagnani P, Remuzzi G, Glassock R, Levin A, Jager KJ, Tonelli M, et al. Chronic kidney disease. Nat Rev Dis Primers. 2017 Nov 23;3(1):17088.
3. Levin A, Stevens PE, Bilous RW, Coresh J, De Francisco AL, De Jong PE, et al. Kidney Disease: improving global outcomes CKD workgroup. Clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int Suppl (2011). 2013 Jan;3(1):1-150.
4. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, et al. Chronic kidney disease: global dimension and perspectives. Lancet. 2013 Jul 20;382(9888):260-72.
5. Stanifer JW, Kilonzo K, Wang D, Su G, Mao W, Zhang L. Traditional medicines and kidney disease in low-and middle-income countries: opportunities and challenges. Semin Nephrol. 2017 Mar;37(3):245-59.
6. Murtagh FE, Addington-Hall J, Higginson IJ. The prevalence of symptoms in end-stage renal disease: a systematic review. Adv Chronic Kidney Dis. 2007 Jan;14(1):82-99.
7. Kusiak A, Dixon B, Shah S. Predicting survival time for kidney dialysis patients: a data mining approach. Comput Biol Med. 2005 Apr;35(4):311-27.
8. Rosenberg M, Hsu C. Chronic kidney disease and progression. Int J Biol Sci. 2004;3(6):304-8.
9. Reynolds K, Gu D, Muntner P, Chen J, Wu X, Yau CL, et al. Body mass index and risk of ESRD in China. Am J Kidney Dis. 2007 Nov;50(5):754-64.
10. Hsu C-y, Iribarren C, McCulloch CE, Darbinian J, Go AS. Risk factors for end-stage renal disease: 25-year follow-up. Arch Intern Med. 2009 Feb 23;169(4):342-50.
11. Stats F, Azar G. National chronic kidney disease fact sheet. World Appl Sci J. 2017;21(5):755-61.
12. Afshar R, Sanavi S, Salimi J. Epidemiology of chronic renal failure in Iran: a four-year single-center experience. Saudi J Kidney Dis Transpl. 2007 Apr;18(2):191-6.
13. Nakai S, Shinzato T, Sanaka T, Kikuchi K, Kitaoka T, Shinoda T, et al. The current state of chronic dialysis treatment. Int J Artif Organs. 2002 Jul;35(7):1155-84.
14. Khajehdehi P, Malekmakan L, Pakfetrat M, Roozbeh J, Sayadi M. Prevalence of chronic kidney disease and its contributing risk factors in southern Iran: a cross-sectional adult population-based study. Iran J Kidney Dis. 2014 Mar;8(2):109-20.
15. Hadian B, Anbari K, Heidari R. Epidemiologic study of end-stage renal disease and related risk factors in patients under hemodialysis in Lorestan province. Iran Red Crescent Med J. 2015 Mar;16(3):e14451.
16. Alipour A, Shokri A, Yasari F, Khodakarim S. Introduction to Competing Risk Model in the Epidemiological Research. Int J Epidemiol Res. 2018;5(3):98-102.

17. Siddappa JK, Singla S, Mohammed Al Ameen S, Kumar N. Correlation of ultrasonographic parameters with serum creatinine in chronic kidney disease. J Clin Imaging Sci. 2013;3:52.
18. Alsuwaida AO, Farag YM, Al Sayyari AA, Mousa D, Alhejaili F, Al-Harbi A, et al. Epidemiology of chronic kidney disease in the Kingdom of Saudi Arabia (SEEK-Saudi investigators)-a pilot study. Saudi J Kidney Dis Transpl. 2010 Nov;21(6):1066-78.
19. Chadban SJ, Briganti EM, Kerr PG, Dunstan DW, Welborn TA, Zimmet PZ, et al. Prevalence of kidney damage in Australian adults: The AusDiab kidney study. J Am Soc Nephrol. 2003 Dec;14(12):131-8.
20. Foley RN, Collins AJ. End-stage renal disease in the United States: an update from the United States Renal Data System. J Am Soc Nephrol. 2007 Oct;18(10):2644-8.
21. Monfared A, Safaei A, Panahandeh Z, Nemati L. Incidence of end-stage renal disease in Guilan Province, Iran, 2005 to 2007. Iran J Public Health. 2009;10(2):20-6.
22. Malekmakan L, Haghpanah S, Pakfetrat M, Malekmakan A, Khajehdehi P. Causes of chronic renal failure among Iranian hemodialysis patients. Saudi J Kidney Dis Transpl. 2009;20(3):501-510.
23. Nafar M, Mousavi SM, Mahdavi M, Firouzan A. Burden of chronic kidney disease in Iran a screening program is of essential need. Int J Epidemiol Res. 2008;12(5):45-52.
24. Thomas PP. Changing profile of causes of chronic renal failure. Saudi J Kidney Dis Transpl. 2003;14(4):456-70.