

Perspective of 20 Years Hemodialysis Registry in Iran, on the Road to Progress

Mohsen Nafar,^{1,3} Mohammad Aghighi,² Nooshin Dalili,^{1,3}
Behrang Alipour Abedi³

¹Department of Nephrology, Labbafinejad Medical Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
²Department of Transplantation and Special Diseases, Ministry of Health and Medical Education, Tehran, Iran
³Chronic Kidney Disease Research Center (CKDRC), Shahid Beheshti University of Medical Sciences, Tehran, Iran

Keywords. hemodialysis, hemodialysis center, registry

End-stage renal disease (ESRD) is a foremost health issue with major consequences in various parts of the world. In Iran, the prevalence/incidence of ESRD has increased during the past decades. The economic burden of ESRD treatment on patients, their families, and the whole healthcare system is huge as well. Hence ESRD is considered emerging public health problem in developing countries, including Iran, requiring short- and long-term changes in healthcare policies. Developing a national registry system for dialysis patients in Iran now enables us to summarize certain clinical characteristics of these patients and compares the present situation with the late 1990s when dialysis services just began to expand in the country. In this paper, the authors provide information regarding the process of establishing dialysis registry in Iran along with the report of the output of such a registry. Focusing on such an important measure in the whole country of around along with the data that it has produced is a gateway to further progress.

IJKD 2020;14:95-101
www.ijkd.org

INTRODUCTION

The incidence of ESRD is rising around the world. According to USRDS report, since 2011 the crude rate had risen in United States and the unadjusted incidence rate reached 373.4 per million/year in 2016.¹ During the past 30 years, the number of patients with ESRD treated by hemodialysis in United States has sharply increased either. The prevalence of ESRD is 242 per one million populations worldwide and it increases about 8% annually.² In industrialized countries, the prevalence of renal failure increases with age and its incidence is nearly 6–10 times higher in patients between 70 - 90 years compared with those between 30 and 50 years.³ These findings may be the result of the rising prevalence of diseases causing end stage kidney disease such as hypertension and diabetes in the elderly.⁴ This trend similarly exists in developing countries. In Iran, the scenario is

the same and annually more than 4000 additional cases join the ESRD pool. Although the prevalence and incidence of ESRD are also significantly increasing in Iran in recent years, the incidence of ESRD in Iran is still lower when compared with developed western countries.⁵ The mean Iranian population age is lower than in many Western countries, as the incidence of ESRD is higher in older populations, the lower ESRD incidence in Iran could be explained. Considering the high rate of kidney transplantation in Iran, fortunately, the prevalence of patients on hemodialysis is also not as high as in other parts of the world. The number of patients on hemodialysis increased from 587 (106.7 pmp) in 1991 in Tehran to 12,500 (179 pmp) in 2006 in Iran and still on the growing trend.⁶ A better understanding of the scope and extent of hemodialysis would help in making policy decisions and develop strategies for more

promising care. This report focuses particularly on the HD registry and provides a summary of hemodialysis status during the past two decades in Iran. The Iranian hemodialysis registry system was developed gradually and completed over more than two decades. The project was done to fulfill the overgrowing needs of prevention and therapeutic measures regarding this considerable part of the at-risk population.

MATERIALS AND METHODS

Extracted results of different provinces in Iran are summarized to draw data from the country as a whole. Presented data are collected based on information from dialysis center surveys that started in 1997, conducted by trained physicians in each center to cover over 500 dialysis centers around the country. To ensure the security of the patients' personal information, the program was accessible only to designated dialysis staff with appropriate encryptions. Survey forms requesting information such as the number of patients, age, duration on dialysis, and hepatitis C and B status. The data were sent back to the Dialysis and Organ Transplantation Center of Ministry of Health and Education to assess different aspects of ESRD care including parameters during the past twenty years. This would enable us to conclude whether any significant changes occurred in: 1) number of dialysis patients per million population (pmp), 2) new cases added to hemodialysis pool of patients every year, 3) dialysis session frequency in a week, 4) age of patients, and 5) hepatitis status among Iranian patients on hemodialysis. In this report, we calculate the point prevalence and incidence

of hemodialysis in Iran

RESULTS

Incidence and Prevalence of ESRD and Hemodialysis

The incidence of ESRD in Iran is currently estimated to be 380 pmp. Considering the growing number of patients with ESRD in the past 10 years, annually; the mean number of 4000 cases is estimated to add to ESRD patients' pool in a constantly progressive manner. Most recent data from the Iranian Ministry of Health and Medical Education shows that the ESRD prevalence incidence has increased to 380 pmp (30,284 patients) in 2016 with a steep slope in recent years. The registered number of patients in Iran with ESRD treated by dialysis was 5945 in 1997, and it is expected to surpass 90,000 by 2021 (Figure 1). The annual increase in the rate of ESRD prevalence in Iran is about 5% to 6% from 1997 to 2016 (Figure 2). In 2006, 4588 new patients entered maintenance hemodialysis (94 pmp). The number of patients who entered hemodialysis increased, thereafter. The number of new patients underwent hemodialysis in 2010 was 5165 (68 pmp). In 2011, 5315 patients entered maintenance hemodialysis and a total of 6679 new patients began dialysis in 2016, as compared with only 954 cases in 1997 (Figure 3).

Age Distribution in Hemodialysis Patients

In the late 1990s, 79% of Iranian hemodialysis patients were older than 30 years. Our recent findings, in 2017; show that 97% of patients on hemodialysis are over 30. Moreover, patients over 60 years of age constituted 62% compared to only 21% in the late 1990s (Table 1).

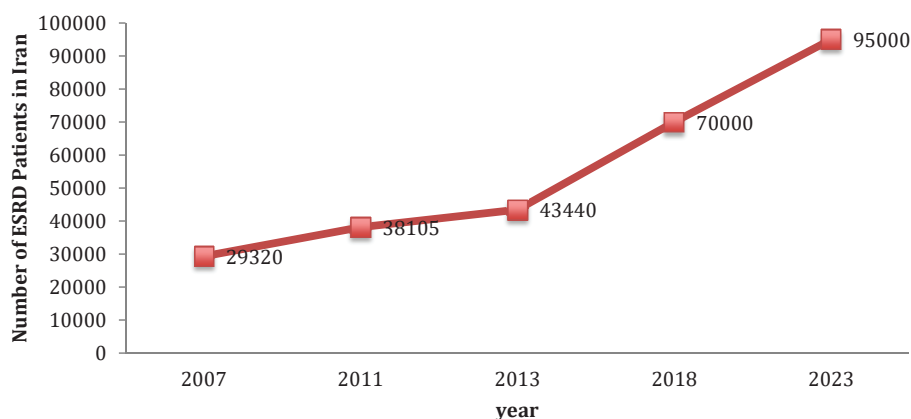


Figure 1. It shows trajectory of ESRD in Iran.

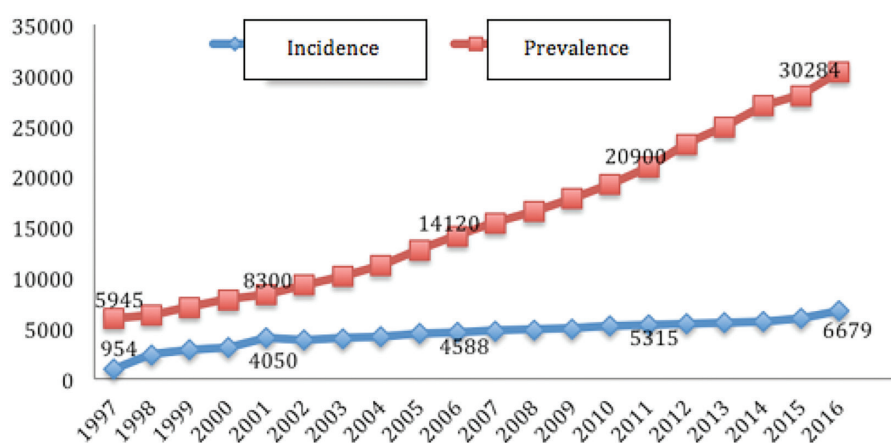


Figure 2. It demonstrates incidence and prevalence of HD patients in Iran during the past 2 decades.

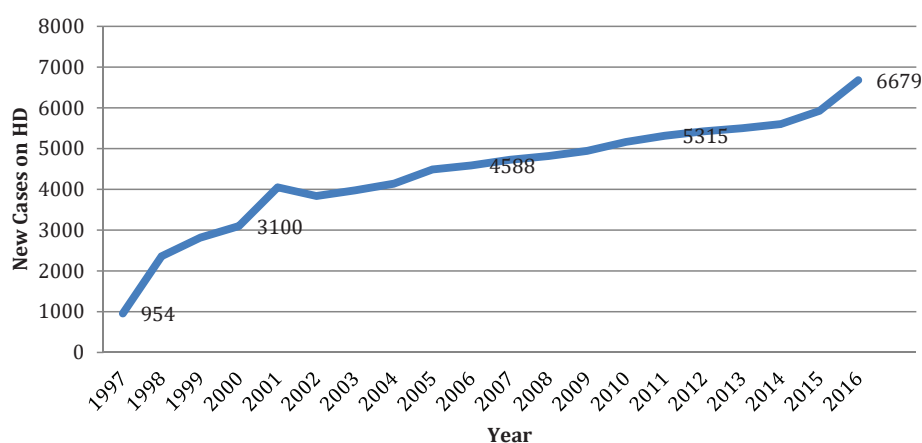


Figure 3. It mentions new patients added to maintenance hemodialysis pool.

Weekly Dialysis Sessions

One of the main quantitative indexes in the assessment of dialysis adequacy is the number of weekly sessions. Standard treatment is three times weekly, while patients with 1 or 2 sessions per week are considered under dialyzed. In 1997, roughly 10% of Iranian dialysis patients were treated with a once-weekly protocol while 52% had a twice-weekly regimen, however; in 2017, nearly 80% of our maintenance HD patients dialyzed based on a thrice-weekly schedule which could be a co-factor through achieving higher dialysis adequacy during recent years (Figure 4).

HBV and HCV Status Among Hemodialysis Patients

Unfortunately, we don't have accurate data about HCV positivity rate in the late 1990s and lacks of sufficient valid information in this period about HCV in hemodialysis patients hampers the possibility of making any comparison with the current situation. However recent information demonstrated that 98% of our patients were HCV Antibody negative in 2017. However, in 2017, 98% of patients were HCV antibody negative. On the other hand, HBs antigen prevalence has decreased from 4% in 1997 to 2% in the current

Table 1. Age Distribution of Hemodialysis Patients in Iran During 2 Decades Behind

Year	< 15 year [n (%)]	15 to 30 year [n (%)]	31 to 60 year [n (%)]	> 60 year [n (%)]	Total Patients (n)
1997	177 (3%)	1020 (18%)	3302 (58%)	1218 (21%)	5717
2017	657 (2%)	280 (1%)	10839 (35%)	19106 (62%)	30882

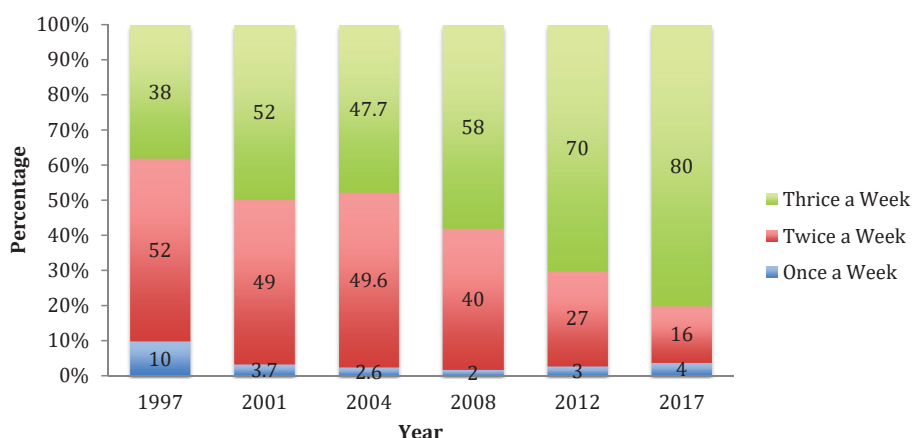


Figure 4. It shows weekly dialysis sessions in Iran between 1997 and 2017.

decade (Table 2). Of the prevalent patients in the year 2017, only 1.5% was HBs Ag positive and 2% were HCV Ab positive.

Hemodialysis Centers and Machines

Gradually, the increased number of patients on hemodialysis in Iran has been mirrored by an increased number of dialysis centers and machines. At the end of 1998, Iran had 180 HD centers (Figure 5) and 1028 HD machines, which reached 547 centers and 5700 machines at the end of 2016 (Figure 6). The ratio of patients per machine was 5.2, which is reaching toward the global standard of

4 to 1. There are a total of 570 dialysis centers and more than 5800 hemodialysis machines in Iran. In the late 1990s, approximately 12% of maintenance HD patients were admitted to private dialysis centers, but currently; about 17% of HD patients are treated in private dialysis clinics which all are under the coverage of basic insurances.

DISCUSSION

Fortunately, in the last two decades the hemodialysis registry program of Iran started to collect data from dialysis centers and patients through an online registry website.

Table 2. HBV and HCV Status in Iranian Hemodialysis Patients During Past 2 Decades

Year	HBs Ag+ [n (%)]	HBs Ag- [n (%)]	HCV Ab+ [n (%)]	HCV Ab- [n (%)]
1997	209 (4%)	5736 (96%)	0 (0%)	0 (0%)
2017	468 (1.5%)	29,334 (98%)	564 (2%)	29,233 (98%)

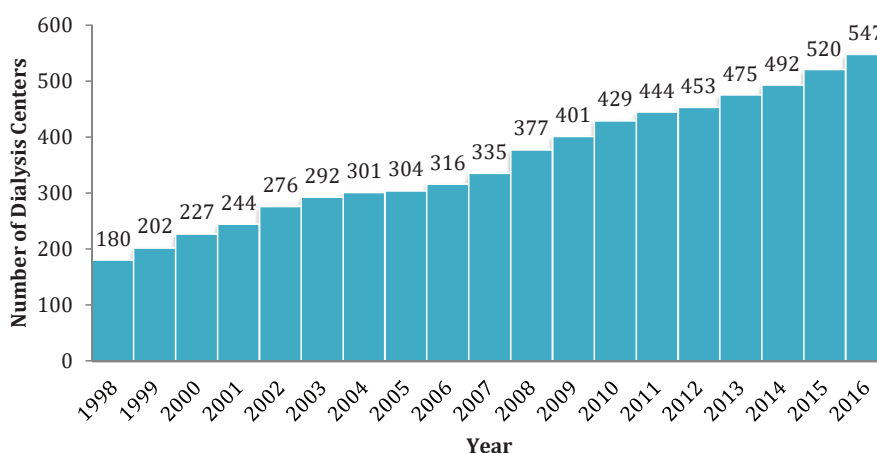


Figure 5. This figure demonstrates growing rate of dialysis centers in Iran within the past 20 years.

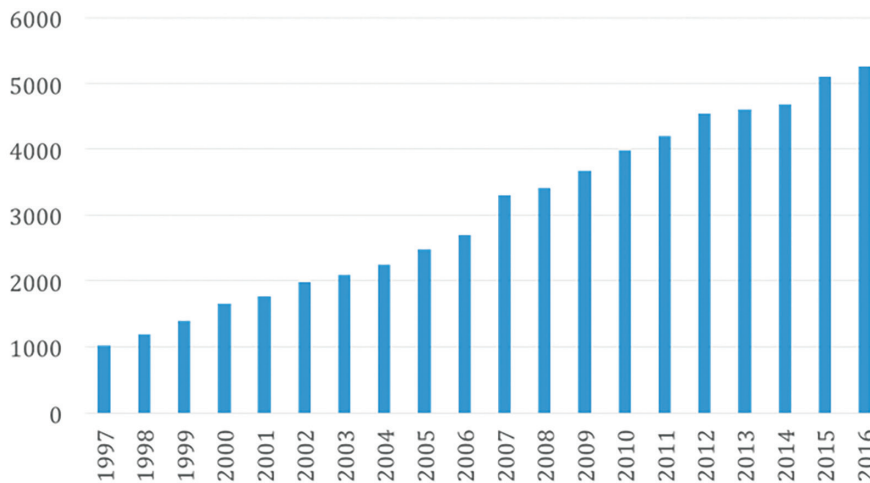


Figure 6. It shows growing number of dialysis machines.

The aims and importance of the patient registry and statistical evaluation of dialysis status can be summarized as follows: 1) to obtain the demographic data and distribution of patients, 2) to know the characteristics of dialysis therapeutic strategies and their pros and cons based on scientific evidence, and 3) to improve quality of dialysis and provide information for health administrators and the future health care planners.

Recently, because of the increased number of elderly and diabetic patients in Iran, the prevalence of ESRD and the incidence of patients needing hemodialysis have increased more rapidly than those in many other developing countries, this upward trajectory is consistent with the trend observed in other parts of the world (Figure 7).

In the last 5 years, the United States Renal Data System has noted continued growth in the number of ESRD patients on hemodialysis. Since 1999, however; the incidence rate of ESRD has been relatively stable, ranging from 331 pmp in 1999 to a peak of 343 pmp in 2002, to 339 pmp in 2004.⁷

Whereas according to the Iran dialysis registry report, in 2016; the ESRD incidence in Iran reached a record high of 380 pmp, which represents a steady increase from 1997. Although the rapid increase in the number of patients may be due in part to the gradual maturity of the registry system, it must also reflect an increase in the actual number of patients in Iran. The most common causes of ESRD in Iran are diabetic nephropathy, hypertensive nephrosclerosis, and chronic glomerulonephritis

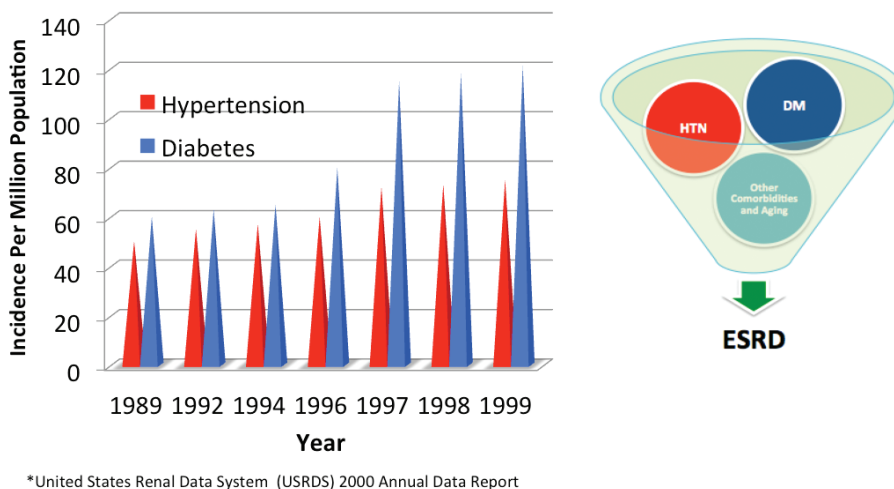


Figure 7. This figure shows growing number of ESRD, considering the increasing cases of DM and HTN as the most underlying disorders worldwide.

(35.2%, 19.2%, and 11.3%; respectively).⁸

There are several possible explanations for the growth in the number of patients: 1) raising awareness of the disease among the public and the medical profession, 2) accessibility to medical care facilities, 3) a massive increase in DM as the cause of renal failure, and 4) increasing the population age. The change in age distribution between hemodialysis patients in Iran is clearly marked and is in keeping with trends seen internationally. In the European countries in 1977, patients over 65 years accounted for only 9%,⁹ and in 1992; it rose to 38% (increased life expectancy is another reason for the growth in the number of patients). The consequence of this rise in dialysis incidence would result in higher healthcare cost, hence; there is an urgent need to encourage transplantation or use more modern dialysis machines to reduce the morbidity and mortality in this population. The concept of dialysis in Iran changed to adequacy of dialysis in comparison with other countries instead of just descriptive absolute numbers.

Urea kinetic modeling with the introduction of the single pool Kt/V_{urea} ($\text{spKt}/V_{\text{urea}}$) index as a surrogate for removal of low molecular weight uremic retention solutes became widely applied represents adequacy of dialysis. On the basis of this consideration, the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines recommended in 2006 a target spKt/V of 1.2.^{10,11} Among Iranian hemodialysis patients in 2005, the mean Kt/V was 1.43 and 88.2% of patients reached the target of Kt/V 1.2. Although the percentage of patients with $Kt/V > 1.2$ increased during the past five years from 43.3% in the study by Amini *et al.*¹² to 58.4%, less than 30% of dialysis patients in Iran had reached the target of 1.4; which is far less than expected.

One of the barriers to deliver adequate dialysis is short dialysis sessions. As the length of dialysis plays an even more important role in the removal of middle molecules or other solutes that are difficult to remove by standard HD, such as phosphorus; treatment time seems particularly important to maintain a neutral phosphate balance.¹³ Differences in mean dialysis duration can thus explain differences in outcome among countries. It is clear that extending treatment time is associated with increased economical prices and that these modalities are affordable only when costs per treatment can be reduced. The report of

the QUality European STudies (QUEST) initiative, which compares clinical performance indicators between renal registries in Europe; showed that the proportion of patients who received 12 h/week varied between countries from 3% to 51%. In the past 2 years, the number of patients on twice-weekly dialysis has been reduced in Iran. In Tehran province, it was shown that the duration of each dialysis treatment was 234.0 ± 17.4 minutes. The mean Kt/V , as a representative marker of dialysis adequacy; was 0.97 ± 0.25 . By reaching the standard of care dialysis protocols to three times weekly in more than 80% of patients in 2017, we are tiptoeing in the right track of achieving higher dialysis adequacy in Iranian HD patients.

In 2003, data showed that 21% of HD patients in Tehran were HCV seropositive.¹⁴

The majority of infected persons might not be aware of their infection because they are not clinically ill.¹⁵ It appears that the overall prevalence is decreasing largely due to decreasing blood transfusions. This drop may have occurred partly due to vaccination at the population level, or improvement in social and nutritional status. The results suggest that early transplantation and avoidance of blood transfusion, as much as possible; are the two most important practical interventions to reduce the HCV exposure rate in patients on maintenance hemodialysis. Regarding the rapidly growing number of ESRD patient pool in Iran without taking any preventive strategies into consideration, it is supposed that the number of ESRD patients would be multiplied by three just within a decade in the future. The prevalence of dialysis therapy for kidney failure is increasing much faster than population growth.¹⁶ Worldwide, there has been a 165% increase in dialysis treatments for ESRD over the past two decades. The findings indicate that the significant growth in dialysis therapy is strikingly out of proportion to population growth for a majority of regions in the world. There is only one logical way to confront the disaster in the world and in Iran as well: education, notification and screening of CKD from the very first level of community.¹⁷ Hence the need to collect epidemiological data of hemodialysis is mandatory in order to organize and set-up the necessary services properly.

CONCLUSION

ESRD is a common life-threatening disease.

The number of patients with ESRD accepted for renal replacement therapy including hemodialysis increases each year in developed and developing countries and imposes a major social and economic burden on these countries. HD registries are important tools for the collection of data on patients undergoing renal replacement therapy. They are important sources of data on epidemiology, which are relevant for resource allocation, and on clinical patterns associated with different patient outcomes. The prevalence of patients undergoing RRT in Iran is similar to that of some Eastern European countries, such as Poland, but it is still far below the high-prevalence rates recorded in the USA, Japan, and other Western countries. Increased demand for RRT and an increasing proportion of older and sicker patients will pose increasing clinical and economic challenges to the Iranian healthcare system. Although an increased number of dialysis facilities had been outstanding in the last two decades and showing us in the direction of improvement, we still have a long way to go. There is a necessity for considering strategies such as screening programs in the high-risk populations before encountering a tremendous burden caused by the aged Iranian population with hypertension and DM.

ACKNOWLEDGMENT

We thank all of the dialysis centers throughout Iran for their great effort and support.

REFERENCES

1. 2018 USRDS Annual data report, Volume 2: ESRD in the United States. Chapter 1.
2. Dienstag JL, Stevens CE, Szmuness W. The epidemiology of non-A, non-B hepatitis: emerging patterns. In: Gerety RJ editor. Non-A non-B Hepatitis. New York: Academic Press; 1981. pp. 119–37.
3. McGeown MG. Prevalence of advanced renal failure in Northern Ireland. *BMJ*. 1990; 301: 900–903.)
4. Kurokawa K, Nangaku M, Saito A, Inagi R, Miyata T. Current issues and Future perspectives of chronic renal failure. *J Am Soc Nephrol*. 2002; 13:S3-S6
5. Mousavi SS, et al. Epidemiology of ESRD in Iran: a review article. *Saudi J Kidney Dis Transpl*. 2014 May;25(3):697-702
6. Mohammad Aghighi, et al. Dialysis in Iran. *IJKD* 2008;2:11-5
7. United States Renal Data System Annual Data Report. *Am J Kid Dis* 1997; 30 (Supp 1).
8. Ali Nobakht Haghghi, Behrooz Broumand .The epidemiology of end stage renal disease in Iran in an international perspective .*Nephrol Dial Transplant* (2002) 17: 28–32
9. Valderrabano F, Jones E, Mallick P. Report on Management of Renal Failure in Europe XXIV 1995. *Nephrol Dia. Transplant* 1995; 10 (Supp 5):1-25.
10. Clinical practice guidelines for hemodialysis adequacy. *Am J Kidney Dis* 48: S2–S90, 2006
11. Couchoud C, Kooman J .From registry data collection to international comparisons: examples of hemodialysis duration and frequency. *Nephrol Dial Transplant* 24: 217–224, 2009
12. Amini M, Aghighi M. Hemodialysis adequacy and treatment in Iranian patients: a national Multicenter study. *Iran J Kidney Dis*. 2011; 5(2): 103–9. [PubMed: 21368388].
13. Mohsen Nafar, Dialysis Adequacy, Dialyzer Clearance, and Strategies to Achieve Target: A Nationwide Multicenter Study. *Nephrourol Mon*. 2017 January; 9(1): e42769.
14. Seyed Moayed Alavian, Prevalence of hepatitis C virus infection and related risk factors among Iranian hemodialysis patients, *Nephrology* 2003;8, 256–260
15. Mohammad Hossein Somi. Risk Factors of HCV Seroconversion in Hemodialysis Patients in Tabriz. *Hepatmon*. 2014 June; 14(6): e17417
16. Seyed Seifollah Beladi-Mousavi. Long-term Survival of Patients With End-stage Renal Disease on Maintenance Hemodialysis A Multicenter Study In Iran. *Iranian Journal of Kidney Diseases*, Volume 6, Number 6, November 2012
17. Hossein Esmaili. Dialysis adequacy and necessity of implement health education models to its promotion in Iran. *International Journal of Medical Research & Health Sciences*, 2016, 5, 10:116-121

Correspondence to:

Nooshin Dalili, MD
Nephrology Department, Labbafinejad Hospital, Boostan 9th St.,
Pasdaran Ave, Tehran, Iran
Tel: 0098 21 2258 0333
E-mail: drn.dalili@sbmu.ac.ir

Received September 2019

Revised November 2019

Accepted January 2020