

Haemodialysis services in Iraq in 2012: situation analysis, epidemiology and infrastructure

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ABSTRACT

INTRODUCTION: Chronic kidney disease and end stage renal disease (ESRD) are serious threat to life and wellbeing. There is no Iraqi national renal registry. The prevalence rates of treated ESRD show the actual burden on health care resources.

OBJECTIVE: To determine the prevalence of Iraqi patients with ESRD on regular haemodialysis and some of their demographic features and virology status. In addition, we are reporting the infrastructure of haemodialysis units in Iraq; number of haemodialysis units, haemodialysis machines and human resources throughout Iraqi provinces and comparing them with international figures.

METHODS: a descriptive cross-sectional study conducted during January 2012, in which the authors visited all haemodialysis units in all health directorates of Iraqi provinces. Demographic data of the patients with ESRD whom they are on haemodialysis were extracted into a form designed for this purpose, including the virology status for HBV and HCV. Human resources and infrastructures of haemodialysis units were also reported. Data were shown by frequencies and ratios. Prevalence of the patient with ESRD on haemodialysis were calculated.

RESULTS: The total number of patients with ESRD patients on regular haemodialysis at January 2012, was 2,445; a point prevalence of 74/Million. Male to female ratio was 1.28:1. The highest number of ESRD patients in Iraq was in the age group (51–60) years (565, 23.1%). Eighty-one percent of the patients were tested negative for viral hepatitis B and C. The total number of haemodialysis machines was 557 with a patient to machine ratio of 4.4: 1. The ratio of haemodialysis units to population was 1.08: 1,000,000, while haemodialysis machine to Population was 16.7: 1,000,000. The ratio of working staff to Patient was 3.3: 10.

CONCLUSION: The reported prevalence of Iraqi ESRD-HD patients is still underestimating the actual prevalence of problem in Iraq. The delivered haemodialysis services couldn't meet the patients and community needs. Renal registry program will be the best effort to have clear Iraqi renal data.

Key words: End Stage Renal Disease, Haemodialysis, Epidemiology, Infrastructure, Iraq.

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INTRODUCTION

Chronic Kidney Disease (CKD) is defined as the presence of kidney damage, manifested by abnormal albumin excretion or decreased kidney functions, and it is quantified by the measured or estimated glomerular filtration rate (GFR) < 60 ml/min that persists for more than 3 months.¹ End-Stage Renal Disease (ESRD) is a medical condition in which person's kidneys cease functioning on a permanent basis leading to the need for renal replacement therapy

to maintain life, in form of regular long-term dialysis or a kidney transplant.² Early diagnosis of CKD and ESRD permits early intervention to reduce the risks of cardiovascular events, which are the main cause of death.³

The impact of chronic kidney disease (CKD) on the global burden of diseases is probably underestimated by current methods of evaluation. However, CKD are emerging as a major health problem. The costs of renal replacement therapy are exceedingly high and are consum-

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ing a significant proportion of health care budgets of developed countries; however the costs in developing countries are out of reach.⁴

Data from the national registries around the world show rapidly increasing numbers of ESRD.⁵ Still there is a wide variation in prevalence rate, expressed as number of patients per million populations, among countries. The prevalence rate of ESRD is strongly related to per capita income and governmental infrastructure which can influence the availability and quality of dialysis and transplantation services.⁴ The rising prevalence, poor outcomes, and high costs of chronic kidney disease have led to its recognition as a public health threat. Fundamentally, this recognition represents a paradigm shift in the perception of kidney disease, especially for nephrologists, from a life-threatening condition affecting few people who require treatment by dialysis or transplantation to a common condition that needs prevention, early detection, and management not only by nephrologists but general physicians and public health agencies as well. In Iraq, the prevalence of diabetes mellitus and hypertension which are considered the main risk factors of ESRD is highly prevalent, 10.4 and 40.4 %⁶ respectively; however, we failed to find any previous Iraqi data related to ESRD.

Chronic kidney disease CKD/ESRD and Haemodialysis (HD) represent immunological challenges to the patients with an increased risk of infections especially in developing countries where diseases like DM, viral hepatitis are endemic with limited adoption of infection control procedures.⁷ Haemodialysis is one of three renal replacement therapies, the other two are kidney transplant and peritoneal dialysis. It is an extracorporeal procedure that can be accomplished using a machine and a dialyzer through a vascular access. It achieves the extracorporeal removal of waste products such as creatinine and urea and excess fluid as well as correction of abnormalities of the electrolytes and acid-base disturbances.⁶

The recommended number of patients is four per a haemodialyzer, the distribution and definition of the welfare budget may vary depending on welfare environment and circumstances of each country. However, national welfare policies, schemes, and laws on the regulation and management of dialysis centre

operation and ESRD patient care are crucial for improving public health.⁸

This study was designed to measure the prevalence of patients with ESRD on Haemodialysis in Iraq and in each province. Distribution of those patients with regards to age, gender, and virology status were also measured. The study has also measured the infrastructures of haemodialysis in Iraq by calculating the human resources working in this field, number of haemodialysis units, and haemodialysis machines; types and operating systems throughout Iraqi provinces.

METHODS

Settings and study design: A descriptive cross-sectional study was conducted at Technical Affairs Directorate, Ministry of Health in Iraq to measure some epidemiological parameters about patients with ESRD whom were treated by Haemodialysis in all Iraqi provinces in January 2012.

Ethical consideration: the study was approved by the Iraqi Ministry of Health and a written permission to access the records was taken.

Definition of the cases, inclusion and exclusion criteria: all dialysis units in all Iraqi Health Directorates were included in this study. The total number of the dialysis unites were 36. Dialysis units of private hospitals were excluded from the study. All Patients who were diagnosed as ESRD on regular haemodialysis for more than three months in these units were enrolled.

Retrieving data: the authors have designed a form to extract data from the records. The form has included two parts, the first contained some details about the patients recorded in the units like age, gender, virology status of viral hepatitis B and C. The second part of the form has included data about human resources working in these units, in addition to the number of the haemodialysis units in each province, number of haemodialysis machines in the unites and their functional status. Manufacturers of the machines available and their operating systems were also notified.

Procedure: the forms were filled by the authors themselves through field visits to all haemodialysis units. The patients' data including their virology status of hepatitis virus B and C were

taken from their records. Data about the human resources working in the units were taken from their administrative records, while the number of dialysis machines, their functional status, manufacturers and operating systems were taken directly by the authors with the help of the persons in charge in these units.

Data analysis: Microsoft Excel sheet 2010 was used for data entry and analysis. The data were shown in tables by frequencies and ratios. For calculation of prevalence of patients with ESRD whom were on haemodialysis schedule in Iraq and in each province in 2012 was calculated by the following formula: Number of patients with ESRD on regular haemodialysis/ population size and the results were shown per a million. Data about the population size of the Iraq in general and each province were taken from Ministry of Planning, Central statistical Organization.⁹ Similarly, we calculated the ratios of haemodialysis units per million of population and haemodialysis machine per a million of population. Ratios of patients to machine in each province were calculated as a number of patients in each province/ number of haemodialysis machine available in it.

RESULTS

The total number of patients having ESRD on regular haemodialysis program in January 2012, throughout the country was 2,445 patients with a prevalence of 74 per a million of population (pmp). The least number of ESRD patients on regular haemodialysis was seen in Thi-Qar province 38 (1.55%), while the highest number was reported in Baghdad 593 (24.25%). However, Diwaniya province has shown the highest prevalence which was 152 patients per a million population (pmp) followed by Al-Muthana and Karbalaa. While Thi-Qar has shown the least prevalence, 21 pmp, followed by Salah-Eldeen and Basrah. **Table 1**

Figure 1 shows the distribution of the patients with ESRD on haemodialysis according to their gender. It is slightly more common in male with a male to female ratio of 1.28:1.

The age distribution of patients with ESRD on regular haemodialysis revealed that the highest number of ESRD patients in Iraq was in the age group (51 – 60) years (565, 23.1%); the

Table 1: Frequency, Gender distribution, and Prevalence of patients with ESRD on haemodialysis in all Iraqi provinces, January 2012

Province	Patients No.	Male	Female	Total Population	Prevalence
Baghdad	593	349	244	7046029	84
Ninawa	308	168	140	3258180	95
Basrah	73	44	29	2526957	29
Erbil	120	59	61	1609937	75
Sulaymania	167	72	95	1875893	89
Dohuk	95	48	47	1125260	84
Kirkuk	133	74	59	1391647	96
Salah-Eldeen	40	22	18	1400317	29
Diyala	60	31	29	1435641	42
Anbar	85	50	35	1553320	55
Babil	121	70	51	1811123	67
Wasit	86	46	40	1205512	71
Karbalaa	135	80	55	1062934	127
Najaf	87	51	36	1281763	68
Diwaniya	172	101	71	1129295	152
Missan	40	30	10	968801	41
Al-Muthanna	92	57	35	714991	129
Thi-qar	38	23	15	1829284	21
Total	2445	1375	1070	33226884	74

lowest was in the age group (≤ 20), (177, 7.2%) years as shown in **figure 2**.

Out of the total patients on haemodialysis, 1982 (81.1%) patients were tested negative for viral hepatitis B and C, 326 (13.3%) of them were positive for HCV, 112 (4.6%) were positive for HBV, and 25 (1%) were seropositive for both HBV and HCV as shown in **figure 3**. **Figure 4** shows the virology status of patients with ESRD on Haemodialysis in each Iraqi province.

The total numbers of haemodialysis units (HDU) were 36, distributed in all 18 Iraqi provinces. The total number of haemodialysis ma-

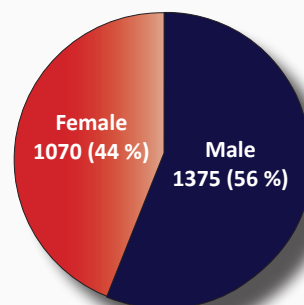
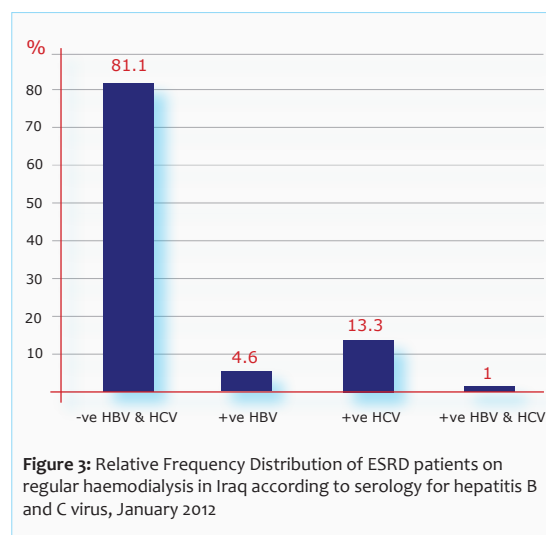
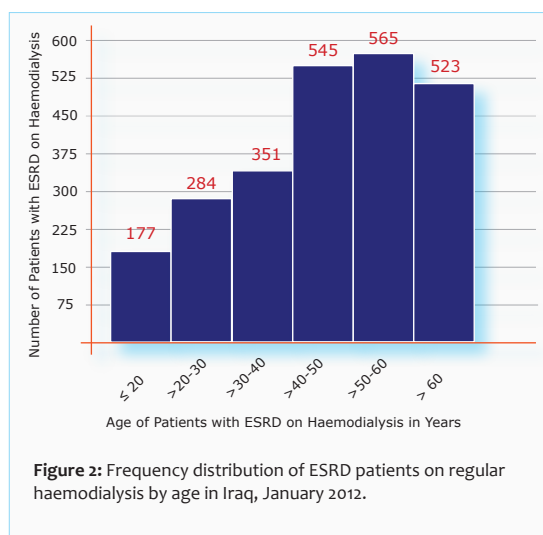


Figure 1: Relative frequency distribution of ESRD patients on regular haemodialysis by gender in Iraq, 2012



chines in Iraq was 557, 488 (88%) of them were functioning. (See table 2 and figure 5) The least number of haemodialysis machines was in Thi-qar province (6; 1%) and the highest number was in Baghdad province (192; 34%). The ratio of haemodialysis units (HU) to a million population was 1.08:1,000,000, while the ratio of haemodialysis machine to a million of population was 17.71:1,000,000. The ratio of patients to Machines was 8.6:1.

Figure 6 shows the distribution of the dialysis

machine according to their manufacturers and operating systems.

Out of the total number of haemodialysis machines, 403 (72%) were allocated for ESRD patients with –ve serology for hepatitis B and C virus, 88 (16%) for ESRD patients with +ve serology for hepatitis C virus, 51 (9%) for ESRD patients with +ve serology for hepatitis B virus, 15 (3%) for ESRD patients with +ve serology for hepatitis B and C virus as shown in figure 7.

The total number of working staff in the 36 hae-

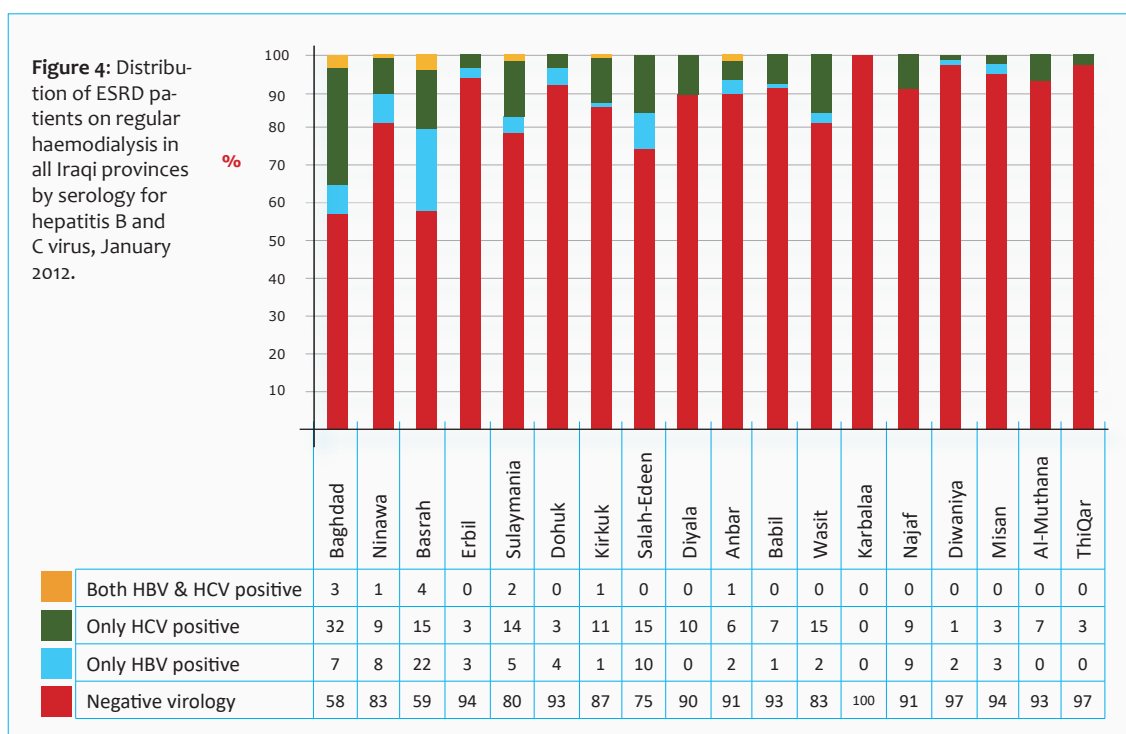


Table 2: Haemodialysis Units (HU), Haemodialysis Machine: Population ratio and Patients: Haemodialysis Machines Ratio in all Iraqi provinces, January 2012

Province	Population	HD Units	Machines	HD units/ Pop	HD machines/Pop	Patients/Machine
Baghdad	7046029	10	192	1.42:1000000	27.25:1000000	3.09:1
Ninawa	3258180	2	46	0.61:1000000	14.12:1000000	6.70:1
Basrah	2526957	1	25	0.40:1000000	9.89:1000000	2.92:1
Erbil	1609937	1	28	0.62:1000000	17.39:1000000	4.29:1
Sulaymania	1875893	5	35	2.67:1000000	18.66:1000000	4.77:1
Dohuk	1125260	3	38	2.67:1000000	33.77:1000000	2.50:1
Kirkuk	1391647	1	12	0.72:1000000	8.62:1000000	11.08:1
Salah-Eldeen	1400317	1	25	0.71:1000000	17.85:1000000	1.60:1
Diyala	435641	1	13	0.70:1000000	9.06:1000000	4.62:1
Anbar	1553320	2	20	1.29:1000000	12.88:1000000	4.25:1
Babil	1811123	1	15	0.55:1000000	8.28:1000000	8.07:1
Wasit	1205512	1	13	0.83:1000000	10.78:1000000	6.62:1
Karbala	1062934	1	18	0.94:1000000	16.93:1000000	7.50:1
Najaf	1281763	2	29	1.56:1000000	22.63:1000000	3.00:1
Diwaniya	1129295	1	20	0.89:1000000	17.71:1000000	8.60:1
Missan	968801	1	11	1.03:1000000	11.35:1000000	3.64:1
Al-Muthanna	714991	1	11	1.40:1000000	15.38:1000000	8.36:1
Thi-qar	1829284	1	6	0.55:1000000	3.28:1000000	6.33:1
Total	33226884	36	557	1.08:1000000	16.76:1000000	4.39:1

modialysis units in all Iraqi provinces was 817. They are classified as follows: 111 (13%) are medical, 539 (66%) are paramedical, 87 (11%) technical and 80 (10%) are administrative as shown in **table 3**.

The working staff: patients ratio in Iraq were 3.3:10; the least ratio was seen in Al-Muthanna provinces 0.7:10, while the highest ratio in Sulaymania province 8.3:10 as shown in **table 4**.

DISCUSSION

The prevalence of treated ESRD patients in the general population shows a high global variation. Increasing global prevalence values of treated ESRD over the years indicate a general increase in the number of patients with kidney failure as well as a gradual improvement in the access to the treatment.¹⁰ This study may represent the first effort to build renal database in

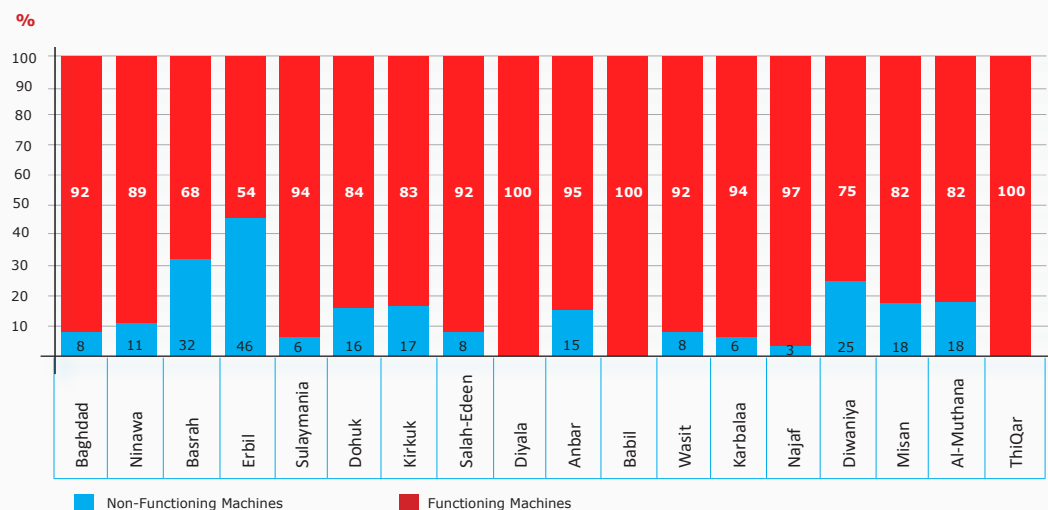


Figure 5: Distribution of Haemodialysis Machines by functioning status, in Haemodialysis Units in all Iraqi provinces, January 2012.

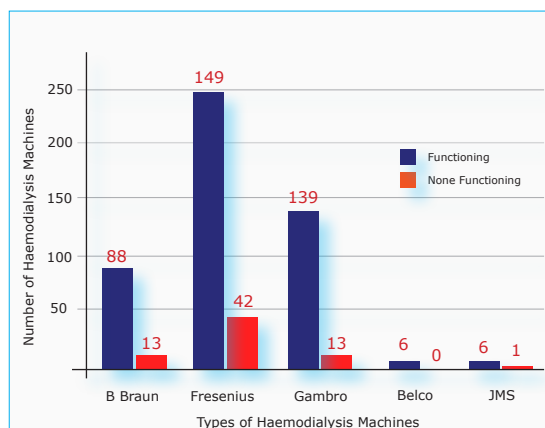


Figure 6: Distribution of Haemodialysis Machines by the operating system and functioning status, in Haemodialysis Units in all Iraqi provinces, January 2012.

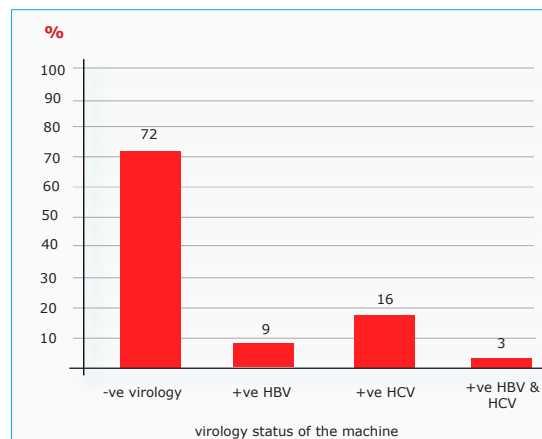


Figure 7: Distribution of Haemodialysis Machines according to serology of ESRD patients for hepatitis B or C virus, in Haemodialysis Units in Iraq, January 2012.

Table 3: Distribution of Human Resources by type in all Haemodialysis Units in Iraq, January 2012.

Staff working in all Haemodialysis Units in Iraq	Number	%
Medical	111	13
Paramedical	539	66
Technical	87	11
Administrative	80	10
Total	817	100

Table 4: Working staff: Patients ratio in Haemodialysis Units in all Iraqi provinces, 2012

Province	No. Working staff	No. Patients	Staff: Patients Ratio
Baghdad	244	593	4.1:10
Ninawa	50	308	1.6:10
Basrah	23	73	3.2:10
Erbil	38	120	3.2:10
Sulaymania	138	167	8.3:10
Dohuk	68	95	7.2:10
Kirkuk	22	133	1.7:10
Salah-Eldeen	5	40	1.3:10
Diyala	29	60	4.8:10
Anbar	20	85	2.4:10
Babil	25	121	2.1:10
Wasit	22	86	2.6:10
Karbalaa	20	135	1.5:10
Najaf	49	87	5.6:10
Diwaniya	19	172	1.1:10
Missan	20	40	5.0:10
Al-Muthanna	6	92	0.7:10
Thi-qar	19	38	5.0:10
Total	817	2445	3.3:10

Iraq.

The prevalence of patients on haemodialysis in Iraq for year 2012 was 74 pmp. **Table 5** shows the prevalence in Iraq compared to different communities for the years 2008-2010.

On comparing the national prevalence with the figures just mentioned above, a wide variation can be seen. Here the point prevalence was estimated, while many of the mentioned figures in other countries were calculated on the basis of the period prevalence. Accordingly, the total new cases including the deceased cases are included as well.¹⁷ Also, on comparing the population pyramid in Iraq with other societies, we can see that around 43.1% of Iraqi populations are below the age of 15 years,¹⁸ compared to 15.3% in Europe, 19.6 % in North America, 26.8 % in South America, 40.3 % in Africa, and lastly 25.1 % in Asia, meanwhile world population under 15

Table 5: The prevalence of ESRD in Iraq compared to different communities for the years 2008-2010

Country	ESRD Prevalence PMP
Iraq	74*
Jordan	456 (2010) ¹¹
Saudi Arabia	498 (2010) ¹²
Turkey	765 (2008) ¹³
Malaysia	812 (2010) ¹⁴
Egypt	483 (2008) ¹⁵
The United Kingdom	354 (2009) ¹⁶

* It represents number of with ESRD on regular dialysis and not the total patients with ESRD

years old represent 26.3% of total population.¹⁹

Another factor that may explain the lower prevalence in our society is the tendency in western societies to provide early renal replacement therapy (RRT) for patients with End-Stage Renal Disease, and thus increasing the number of patients receiving haemodialysis, meanwhile

Table 6: Haemodialysis unit and Haemodialysis machines to population ration in Iraq and neighbouring countries

Country	Haemodialysis Unit: Population Ratio	Haemodialysis Machines: Population Ratio
Iraq	1.08:1000000	12:100000
Jordan	12:1000000 ¹¹	124:1000000
Saudi Arabia	7:1000000 ¹²	177:1000000
Turkey	11:1000000 ¹³	202:1000000
Iran	4.24:1000000 ²⁰	305:100000

the availability of renal replacement therapies is limited in countries of low and middle income. Most patients with chronic kidney disease in the developing world will die from kidney failure without receiving dialysis or transplantation.³

In the western countries, the rate of provision of RRT (dialysis and transplantation) has been increased in the recent past. This was the result of improved care and the subsequent reduction in mortality of ESRD patients. Unfortunately, this had been counteracted by the ever increasing number of new CKD/ESRD patients.²⁰

In Iraq, the reason for this low prevalence is the poorly delivered renal services that can lead to high mortality rate. The service indicators showed a high patient: machines Ratio, low haemodialysis Units: population Ratio and low haemodialysis machines: population Ratio, as compared to some neighbours countries as in **table 6**.

In addition, haemodialysis units in Iraq were not distributed according to the population need. Most of these units are located at the centres of the major cities, which create an access problem for patients from the districts. Besides, the high percent of non-functioning haemodialysis machines will lead to poor quality services and poor patients' attendance to dialysis units. All these factors may explain the low ESRD prevalence in spite of the high prevalence

of major risk factors in Iraq especially hypertension and diabetes mellitus.²¹

Failure of the primary health care to early detect and record new cases of CKD in patients with diabetes mellitus and hypertension would add to the low calculated prevalence. This should be considered in the view of high prevalence of these health problems in Iraqi adults according²² to the report by the Step-wise Survey conducted in Iraq in 2006, where the prevalence of DM and hypertension were 10.4% and 40.4% respectively.²¹ The absence of proper national registries for primary care sector and specific renal registry system added to the complexity of having proper data.

Thus, the number of dialysis units and haemodialysis machines in Iraq are not compatible with the increasing population and the increasing number of the newly diagnosed cases of ESRD. This will lead to shorter dialysis time, in adequate dialysis, poor quality of life and higher mortality.

There was a wide variation in prevalence among Iraqi provinces. This couldn't be explained but it was found that the prevalence was low in the provinces with poor service indicators. Thi-qar province showed the lowest Haemodialysis Machine: Population Ratio and lowest Haemodialysis unit: Population Ratio when compared to the capital city of Baghdad. It also might be attributed to variation of access of patients particularly those residing in the districts borders who may seek haemodialysis services in the nearby provinces. Since ESRD is an age related disorder, we can anticipate a higher prevalence of ESRD in elderly people. The highest proportion was in the age group 51-60 years; this was consistent with registries in other countries.¹¹⁻¹³ This can be explained on the basis that this age group is associated with increased incidence of risk factors for End-Stage Renal Disease particularly hypertension and diabetes mellitus as compared with other Iraqi age groups.²¹ In the younger age group with early stages of chronic kidney disease the residual kidney function compensate and here is the time to interfere to retard the progression of CKD and to delay the onset of RRT.³

In Iraq the male proportion of ESRD patients is higher than female proportion, and this is applicable to all Iraqi provinces except Sulayma-

nia and Erbil provinces (female proportion was higher than male proportion). In general the national higher male proportion in Iraq is parallel to other countries like the nearby countries and others, as the males have higher risk for the two main risk factors of ESRD (hypertension and diabetes mellitus).¹¹⁻¹³

The proportion of patients with HBV and HCV seropositivity are parallel to that in other countries¹¹⁻¹³ except in Egypt¹⁵ where the prevalence of patients with HCV positive serology are much higher. In haemodialysis units cross contamination to patients via environmental surfaces, equipment, supplies and staff members may be responsible for viral transmission. Availability of vaccinations for HBV makes it less prevalent than HCV proportion. The use of erythropoietin led to reduced need for blood transfusion and the net result is less risk of hepatitis B and C virus infection.²³ The adoption of isolation strategy, implementation of strict infection control measures may help to concur such problem. Meanwhile the prevalence of hepatitis C virus still higher in haemodialysis patients in comparison to general population.⁸

Human Resources working in HD units are unequally distributed throughout Iraqi provinces. The qualification of most medical staff is less than global standard. According to the International Society of Nephrology Global Kidney Health Atlas project, the global nephrologist density is 8.83 per million population (PMP); high-income countries reported a nephrologist density of 28.52 PMP compared with 0.31 PMP in low-income countries. In Iraq, the density is far from such international standards with 1.03 PMP in the view of population and income.²⁴ This is another issue that may lead to poor quality of service offered to the ESRD patients. In Jordan, the total number of Nephrologists caring of ESRD patients was 51 with the average of 52 patients for each nephrologist.¹¹ In Saudi Arabia the total number of Consultant Nephrologists, Nephrology Specialists, General Practitioner and Nurses caring of ESRD patients was 172, 278, 246 and 3239 respectively in 2010.¹² Also in Turkey the number of Specialist Physicians, General Practitioner and Nurses caring of ESRD patients in 2008 was 733, 1051, and 4393 respectively.¹³

At the time of conducting this study there was no registry for renal transplants, there was

some variation between different provinces in the rate of renal transplant between different provinces that depends on many economic and social factors.²⁵

CONCLUSION

The reported prevalence (74/1000000) is still underestimated. The delivered haemodialysis services couldn't meet the patients and community needs. Renal registry program will be the best effort to have clear Iraqi renal data.

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Abbreviation list: Chronic Kidney Disease (CKD), Diabetes Mellitus (DM), End-Stage Renal Disease (ESRD), Glomerular filtration rate (GFR), Haemodialysis (HD), Haemodialysis units (HDU), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Per a million of population (pmp), Renal replacement therapy (RRT)

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