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FREQUENCY OF FASTING DURING THE MONTH OF RAMADAN AMONG DIABETIC PATIENTS ON REGULAR HEMODIALYSIS IN EGYPT: A MULTI-CENTER OBSERVATIONAL STUDY

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ABSTRACT

Background: There is an enormous number of studies concerning fasting Ramadan in diabetic patients but still, there is a scarce number of studies that argue the wellbeing of fasting Ramadan for diabetic patients on hemodialysis (HD). **Aim of the work:** We aimed to assess the frequency and safety of fasting during Ramadan among diabetic patients on HD. **Material and methods:** This prospective study was conducted on 412 diabetic patients on chronic HD from 25 centres in six governorates all over Egypt during the year 2016 where fasting hours were around 16 hours. The patients who experienced fasting were motivated to fast Ramadan against medical advice. The total studied groups are divided into group 1: patients who fasted most days of Ramadan, group 2: patients who fasted the days of dialysis or fasted infrequently, and group 3: patients who did not fast. Mortality events during Ramadan and for one month after the end of Ramadan, 6 months and one year including the month of Ramadan were estimated. **Results:** The current study included 412 diabetic patients with CKD on HD, 139 (33, 7%) of those patients were fasting during Ramadan. There was higher blood hemoglobin (Hb) level in diabetic HD patients with fasting most of Ramadan. The number of patients with various viral serologies was comparable in the three studied groups There were more hypertensive patients in group 1 than other studied groups; conversely group 1 had the least number of patients having IHD and the least morbidity during HD sessions. Furthermore, the least number of the mortality after one month, six months, and one year including the month of Ramadan were recorded in that group fasting most of the holy month of Ramadan. **Conclusion :** Some diabetic hemodialysis patients could fast Ramadan safely, but this could need strict medical supervision.

Keywords: Diabetic hemodialysis patients, Egypt, Fasting

INTRODUCTION

Fasting during the month of Ramadan is of spirited importance amongst Muslims. Every year during the 9th month of the Muslim calendar - the month of Ramadan - a Muslim is compulsory to fast every day from the beginning of dawn until dusk. Fasting during the holy month of Ramadan is the fourth pillar of Islam that is considered mandatory for all healthy adult Muslims. A person is required to abstain from any oral intake including medications. While Islam does arrange for its followers with serious illnesses to avoid fasting, many diabetics would choose to fast. The International Diabetes Federation (IDF) and Diabetes and Ramadan (DAR) International Alliance Practical Guidelines (2017) for the management of diabetes during Ramadan categorizes diabetic patients on chronic hemodialysis (HD) or chronic kidney disease (CKD) stage 4 & 5 as a very high-risk category that must not fast (1). In previous research, we reported that Diabetic HD patients had a trend to practice fasting less frequently than their non-diabetic counterparts. According to Megahed and colleagues (2019), many diabetics (35.8%) insisted to fast at least part of the holy month of Ramadan (2). However, diabetic patients on HD are suitable for exemption from fasting. Although, there is a huge number of researches concerning fasting Ramadan in diabetic patients; however, there is a scanty number of researches that discuss the safety of fasting Ramadan for diabetic patients on HD.

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The aim of the work

We aimed to assess the frequency of fasting during Ramadan in diabetic patients on HD together with clinical and laboratory characters and to identify the mortality events in the studied groups.

MATERIAL AND METHODS

This cross-sectional observational study was conducted on 412 diabetic patients on chronic HD from 25 centers in six governorates all over Egypt during the year 2016 during which fasting hours were around 16 hours. Data concerning the frequency of fasting during Ramadan were obtained by direct questionnaire to the patients and nursing staff. Duration of dialysis, morbidity, and associated comorbidities (hypertension, ischemic heart disease (IHD), and previous kidney transplantation), as well as viral serology status, were recorded. Patients' clinical parameters especially pre-dialysis blood pressure and dry body weight, as well as laboratory investigations including blood hemoglobin(Hb), blood urea, serum creatinine, serum albumin, calcium, phosphorus, potassium, iron studies, and parathyroid hormone level in addition to urea reduction ratio (URR), were studied before and after Ramadan. We have used the term morbidity to simplify any complaints including intradialytic hypotension (IDH) and hypoglycemia that happened during HD sessions in the month of Ramadan (Intradialytic attacks of both hypotension and hypoglycemia, defined subjectively by reporting symptoms suggestive of hypoglycemia or hypotension) The studied group is the diabetic subgroup that was utilized in a previous original article organized by the same authors and published in the Saudi Journal of kidney diseases and transplantation named Status of fasting in Ramadan of chronic hemodialysis patients all over Egypt: A multicenter

observational study, 2019 (2). The total studied groups are divided into group 1: patients who fasted most days of Ramadan, group 2: patients who fasted the days of dialysis or fasted infrequently, and group 3: patients who did not fast. The patients who experienced fasting were motivated to fast Ramadan against medical advice. Mortality frequencies that occurred during Ramadan and for one month after the end of Ramadan as well as six months and one year including the month of Ramadan were recorded.

Statistical analysis

After the collection of data, they were analyzed using the statistical package of social science (SPSS, IBM) software version 24. Categorical data were expressed as numbers and percentages and were analyzed by the Chi-square test. Normality was tested using Shapiro Wilkinson or Kolmogorov-Simiranov tests, as appropriate. Scale data were expressed as means ± SD or medians (IQ) as appropriate. Parametric data were analyzed using one-way ANOVA, while Kruskal-Wallis tests were used to analyze non-parametric data. P-value was considered significant if it was < 0.05.

RESULTS

The current study included 412 diabetic patients with CKD on HD, 139 (33, 7%) of those patients were fasting during Ramadan. Group one included 50 patients (12%) fasting 15 days or more; group 2 included patients who were fasting days off dialysis or infrequently; groups' pre and post Ramadan. There was a higher Hb level post-and group 3 patients were not fasting. Table 1 showed comparable Ramadan in diabetic HD patients with fasting most of Ramadan than patients with infrequent fasting or non-fasting with statistically significant value, while the difference did not reach a statistically significant level in pre-Ramadan values. There was a non-significant difference in other laboratory data between the studied groups as; pre and post-Ramadan; serum ferritin, Transferrin saturation, serum albumin, URR, blood urea level, serum creatinine, serum potassium, calcium, phosphorus, and parathyroid hormone level (Table2). The number of patients with various viral serologies (positive HCV antibody, positive HBsAg, and positive both HCV-Ab & HBs-Ag) were comparable in the three studied groups (Table2). Three patients had parathyroidectomy and ten patients received cinacalcet (Data were not shown). Table 3 showed Morbidity, co-morbidity, and mortality in the studied groups. There were more hypertensive patients in group 1 than other studied groups; however, group 1 had the least number of patients having IHD. The diabetic HD patients fasting most of Ramadan had the least morbidity during HD sessions and the least number of mortality after one month, six months, and one year including the month of Ramadan. Mortality from the total studied group was 63 deaths (15.3%). Figure (1) showed the frequency of both gender and their ages in the three groups, while Figure (2) showed the variances of blood Hb between the studied groups; pre and post Ramadan in each group with its statistical impression. Figure (3) showed the change of serum potassium during the four weeks of observation in the three planned groups.

Tables

Table (1): Clinical data in the studied groups

		Group 1 (N=50)	Group 2 (N=89)	Group 3 (N=273)	P
Gender	Female N (%)	19(38%)	41(46.1%)	130(47.6%)	0.455
	Male N (%)	31(62%)	48(53.9%)	143(52.4%)	
Age	N	50	89	273	0.77
	Mean *(St.dev)	57.48(10.22)	56.78(12.058)	57.83(11.15)	
	Min – Max.	32-75	18-86	21-86	
	N	19	36	111	
Body mass index	Mean *(St.dev)	26.27(8.43)	27.16(5.11)	26.0893(5.66)	0.433
	N	50	87	262	
Duration of dialysis	Mean *(St.dev)	38.38(37.54)	44.74(44.17)	37.45(39.68)	0.343
	Min – Max.	1 – 188	1 – 194	1 – 238	
Dry Bodyweight Pre Ramadan	N	50	87	266	0.676
	Mean *(St.dev)	74.99(19.35)	77.56(15.43)	76.04(17.82)	
Dry Bodyweight Post Ramadan	N	50	87	263	0.79
	Mean *(St.dev)	76.62(17.33)	77.18(15.66)	75.77(17.75)	
Diastolic Blood pressure Pre dialysis –session Pre Ramadan	N	50	88	264	0.26
	Mean *(St.dev)	81.6(11.84)	83.92(11.07)	81.17(11.28)	
Diastolic Blood pressure Pre dialysis -session Post Ramadan	N	50	87	236	0.596
	Mean *(St.dev)	81.6(17.42)	81.49(10.51)	80.21(11.24)	
Systolic Blood pressure Pre dialysis –session Pre Ramadan	N	49	88	264	0.468
	Mean *(St.dev)	132.85(22.82)	136.62(25.95)	133.19(22.67)	
Systolic Blood pressure Pre dialysis-session Post Ramadan	N	49	87	236	0.142
	Mean *(St.dev)	131.83(25.71)	135.17(20.79)	129.93(20.22)	

*St.dev: standered deviation

Table (2): Laboratory data in the studied groups

		Group 1	Group 2	Group 3	P
Hemoglobin Pre Ramadan	N	49	85	265	0.248
	Mean *(St.dev)	9.88(1.72)	9.64(1.73)	9.44(1.83)	
Hemoglobin Post Ramadan	N	49	82	263	0.011
	Mean *(St.dev)	10.2(1.71)	9.989(1.67)	9.5(1.86)	
Ferritin Pre Ramadan	N	14	30	75	0.46
	Mean *(St.dev)	428.28(282.02)	566.67(340.004)	521.57(351.94)	
Ferritin Post Ramadan	N	5	9	24	0.733
	Mean *(St.dev)	634(191.644)	491.82(323.63)	579.23(379.05)	
T.Sat Pre Ramadan	N	11	17	30	0.444
	Median (Q1-Q3)	28 (21-32.7)	31 (23.5-38.2)	24 (18.75-36)	
	Min – Max.	14-48.5	13-75.5	0-99.7	
Albumin Pre Ramadan	N	40	54	183	0.21
	Mean *(St.dev)	3.6(0.66)	3.756(0.64)	3.82(0.73)	
Albumin Post Ramadan	N	37	40	109	0.893
	Mean *(St.dev)	3.69(0.66)	3.65(0.5)	3.7(0.71)	
URR Pre Ramadan	N	38	71	217	0.377
	Mean *(St.dev)	0.58(0.12)	0.616(0.09)	0.6(0.09)	
URR Post Ramadan	N	40	73	204	0.774
	Mean *(St.dev)	0.59(0.1)	0.6(0.09)	0.59(0.099)	
Blood urea Pre session Pre Ramadan	N	39	73	231	0.323
	Mean *(St.dev)	120(36.93)	126.8(31.67)	120.59(31.14)	
Blood urea Pre Session Post Ramadan	N	40	74	229	0.18
	Mean *(St.dev)	115.95(34.31)	128.31(31.91)	122.89(35.05)	
Serum Creatinine Pre Ramadan	N	41	76	229	0.99
	Median (Q1-Q3)	7 (5.5-8.9)	7.1 (5.4-8.8)	7 (5.5-8.85)	
Serum Creatinine Post Ramadan	N	41	77	228	0.915
	Mean *(St.dev)	7.52(2.8)	7.6(2.57)	7.46(2.42)	
Serum Calcium Pre -Ramadan	N	22	59	172	0.382
	Mean *(St.dev)	8.6(1.09)	9.1(1.58)	8.95(1.36)	
Serum Calcium Post Ramadan	N	19	49	101	0.53
	Mean *(St.dev)	8.94(1.12)	8.83(1.26)	8.67(1.1)	
Serum Phosphorus Pre Ramadan	N	21	54	166	0.59
	Mean *(St.dev)	5.31(1.64)	5.31(1.55)	5.06(1.52)	
Serum Phosphorus Post Ramadan	N	17	47	95	0.38
	Mean *(St.dev)	5.82(2.72)	5.2(1.38)	5.28(1.45)	
PTH Pre Ramadan	N	13	20	61	0.583
	Mean *(St.dev)	264 (177-378.5)	274.5 (135.75-540)	210 (144.5-383)	
PTH Post Ramadan	N	12	14	52	0.802
	Median (Q1-Q3)	385.5 (65.18-694.3)	209.3 (56.8-710.5)	295.8 (129.7-482.9)	
	Min – Max.	34.6-1256	11-998	11-2503	
Serum potassium Pre Ramadan	N	14	22	48	0.335
	Mean *(St.dev)	4.65(1.43)	5.1(1.07)	5.21(1.27)	
Serum potassium 2nd week	N	11	17	34	0.726
	Mean *(St.dev)	4.8(1.45)	5.2(1.14)	5.16(1.39)	
Serum potassium 3rd week	N	9	15	31	0.193
	Mean *(St.dev)	4.4(0.87)	5.1(1.25)	5.2(1.17)	
Serum potassium Post Ramadan	N	13	32	79	0.607
	Mean *(St.dev)	4.46(0.86)	4.69(1.069)	4.76(1.002)	
Serology Negative	N (%)	30(60%)	56(62.9%)	165(60.4%)	
HCV-Ab Positive	N (%)	20(40%)	32(35.9%)	99(36.2%)	
HBsAg	N (%)	0	0	6(2.19%)	0.696
HBsAg& HCV-Ab	N (%)	0	1(1.12)	3(1.09%)	

*St.dev: standered deviation

Post-Ramadan Transferrin saturation has been omitted from the above table because the total number of valid cases is 5. **N=No, of available data**

Group 1: patients who fasted most days of Ramadan, Group 2: patients who fasted the days of dialysis or fasted infrequently, Group 3: patients who did not fast.

Table (3) Morbidity, co-morbidity, and mortality in the fasting groups

			Group 1 (N=50)	Group 2 (N=89)	Group 3 (N=273)	P
HTN		Yes	38(76%)	51(57.3%)	149(54.6%)	0.019
IHD		Yes	13(26%)	24(27%)	106(38.8%)	0.048
Pr. Ktx		Yes	0(0%)	1(1.1%)	2(0.7%)	0.756
Morbidity		Yes	1(2%)	7(7.9%)	36(13.2%)	0.039
Mortality month Ramadan)	(one after	Yes	0(0%)	4(4.5%)	9(3.3%)	0.338
Mortality months Ramadan)	(Six after	Yes	1(2%)	7(7.9%)	36(13.2%)	0.039
One Mortality	year	Yes	3(6%)	9(10.1%)	50(18.5%)	0.026

Group 1: Patients who fasted most days of Ramadan, Group 2: patients who fasted the days of dialysis or fasted infrequently, Group 3: patients who did not fast.

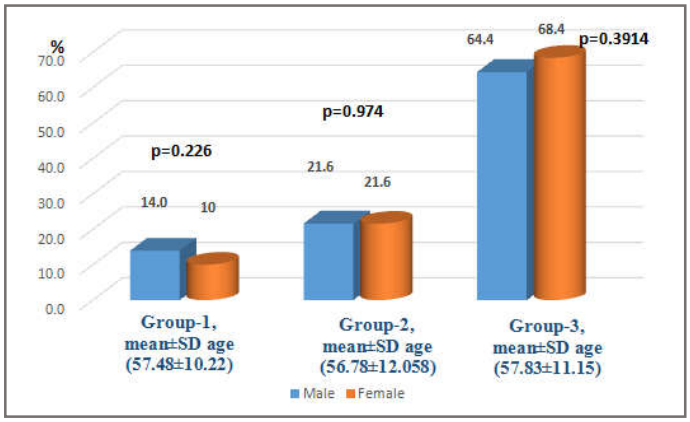

Figure 1: Frequency of gender and its mean age in the three studied groups.

Group 1: patients who fasted most days of Ramadan, Group 2: patients who fasted the days of dialysis or fasted infrequently, Group 3: patients who did not fast.

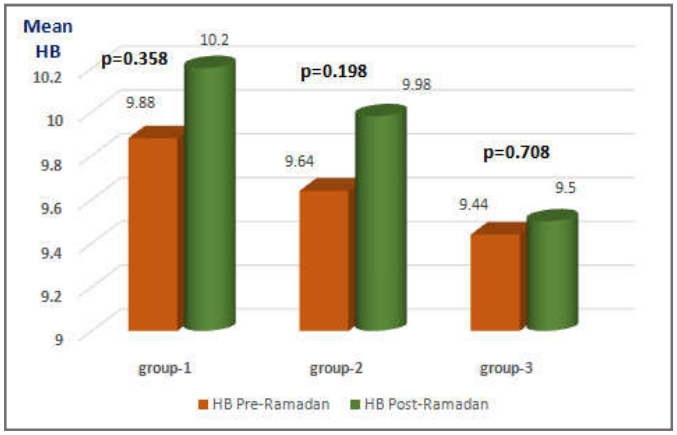

Figure (2): the difference of serum Hb between the three studied groups, pre and post-Ramadan in each group with its significance.

Group 1: patients who fasted most days of Ramadan, Group 2: patients who fasted the days of dialysis or fasted infrequently, Group 3: patients who did not fast.

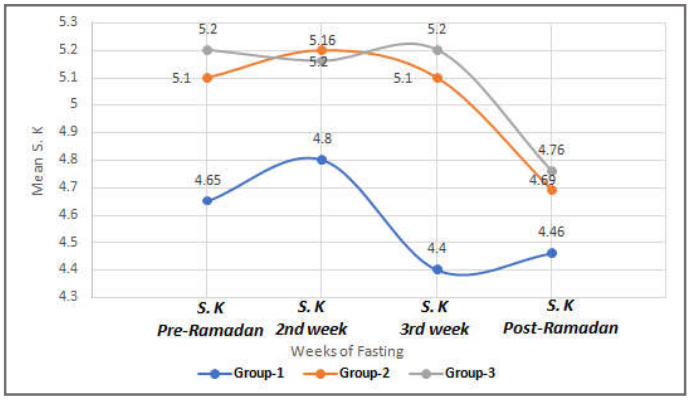

Figure (3): the difference in serum potassium between the three studied groups during the four weeks of observation.

Group 1: patients who fasted most days of Ramadan, Group 2: patients who fasted the days of dialysis or fasted infrequently, Group 3: patients who did not fast.

DISCUSSION

The IDF and DAR International Alliance Practical Guidelines (2017) for the management of diabetes during Ramadan categorize diabetic patients on HD or CKD stages 4 & 5 as a very high-risk category that must not fast (1). In spite of this recommendation, frequent diabetic patients insist to fast against medical advice. In the current studied group constituting diabetic hemodialysis patients, there is one-third of the total group fasted either frequently or infrequently during the month of Ramadan. However, the group of fasting has better hemoglobin levels, lower frequency of IHD, and morbidity while they were mostly hypertensive. This provides a suggestion that these patients have a better sense of the health-related quality of life so they insist to share the Islamic community in one of the most beloved pillars. This is supported by many researches. Mafauzy *et al.,* (1990) concluded that diabetic patients could be possible fast in the month of Ramadan and could be associated with an improvement in diabetic control which is most probably related to a decrease in the total calories intake and the following weight reduction (3). In the same context, the EPIDIAR study (2004) found that the large proportion of both type 1 and type 2 diabetic patients who fast during Ramadan represents a challenge to physicians to provide more concentrated instructions before fasting and highlights the need for close monitoring of blood glucose (4). Additionally, our previous study showed that many diabetic hemodialysis patients were motivated to fast at least part of the holy month of Ramadan (2).The patients fasted in the current studied group against medical advice, this is a common behavior of Muslim patients as regard fasting Ramadan so it is better to avoid missing follow up with this group of patients and allow them to converse how they can fast instead of giving instruction, that makes them fast without discussion with their doctors and otherwise notifies to the nurses. This is reinforced by many studies that explore the misconnection between patients and their physicians as regard fasting Ramadan. They reported that among the physician population, medical knowledge of fasting among diabetic patients was low, leading to medically unwarranted negative advice for fasting while there is increasingly accepted multiple approaches to the

management of fasting during Ramadan, including the international and/or national guidelines, providing fasting-detailed instruction and adjustment of treatment regimens, without acute complications (5)and(6). In the same semblance; Chowdhury, 2017 concluded that significant numbers of patients fasted regardless of medical advice (7). Despite the long duration of fasting, many patients fasted successfully for at least part of Ramadan, with few adverse outcomes. Fasting was through 2016 with a long duration and in summer (Chowdhury, 2017), which is similar to our group of diabetic hemodialysis patients who insist to fast in the same year (7). Patients who decide to fast need to be aware of the risks associated with fasting and how to practice to decrease these risks. There is less frequent Ramadan fasting among the female gender in the current studied groups. This could be clarified by many explanations including IHD, which was more symptomatic in the female gender (8). IHD is equivalent in frequency in females compared to males in the current study and could result in pushing them to break their fasting. Moreover, IDH is known to be more common in females (Sands et al, 2014) who do cannot continue fasting on the dialysis days (9). Another explanation of less frequent fasting in females than in males could be related to the habits of females to use the rule of exemption from fasting during menstruation, pregnancy, and lactation. The gender difference of fasting preference during Ramadan is still in need for more comprehensive study. In the current work, the frequency of fasting was found to be more in patients free of IHD manifestations and was associated with better blood hemoglobin levels. It was also found to be frequently associated with hypertensive. In this context; Chamsi-Pasha and Chamsi-Pasha (2016) advised that patients with cardiac conditions should be directed against ritual fasting, especially patients with acute cardiac illnesses, acute myocardial conditions, and acute coronary syndrome (10). Additionally, Patients with uncontrolled HTN and or severe congestive heart failure requiring multiple dosages during the daytime should also be instructed against fasting (10). On the other hand, patients with controlled HTN can safely fast Ramadan provided that they stick to their medications. Various factors could have an impact on the blood pressure during Ramadan, including feeding patterns, sleep, and activity variations, and changes in the timing of intake of medication; many studies showed that there are no differences between the mean BP before or during Ramadan, even it may be lower during Ramadan than either before or after (11),(12),(13)and(14). In accordance, our finding showed no difference in blood pressure. On the other hand, it has been advised that patients with anemia take the necessary precautions during the month of Ramadan, besides fasting can intensify the symptoms of anemia, and it may cause also dehydration as well as low blood sugar, which affect the body and brain function and can lead to feelings of weakness (15). Consequently; feelings of weakness that accompany the lower hemoglobin level could prevent those patients from fasting as occurred in our group. In the current study, there is no statistically significant difference in the blood hemoglobin level before and after Ramadan both in the fasting and non-fasting groups; this might be related to the usual improvement of diet constituents during the holy month of Ramadan in different living standards in Egypt. However, fasting suppresses insulin release; this together with the diminished response to epinephrine may be expected to contribute to the development of high potassium levels in fasting renal patients. Moreover, potassium-rich Food is habitually consumed in large amounts in Ramadan, which could aggravate the problem of hyperkalemia. In the current study, serum potassium was noticed to be within the normal range in all studied patients' groups during Ramadan whether fasted or not. This observation might indicate modification of ingestion of dietary potassium, being as strict orders from the treating physicians. This is in agreement with Alshamsi, et al (2016) who reported that dates and Arabic coffee are usually served during the time of breaking the fasts (16). Juices made from various citrus fruits as well as from apricots are consumed in abundance in Ramadan meals. All these are very rich in potassium and would be expected to raise the serum potassium levels in patients during fasting Ramadan. However, they did not observe any increase in serum potassium in their study. Cardiovascular diseases are the leading cause of death in the world (17). In this study, mortality was observed to be more in the non-fasting patients as those patients having more association with IHD and morbidities and this might be the motive of those patients to avoid fasting; due to intolerance to fast or feeling of fatigue during fasting. This current finding is reinforced by another studies, fasting during Ramadan is essentially a radical change in lifestyle for the period of one lunar month that may affect cardiovascular risk in patients with CAD (18). Additionally, IDH even asymptomatic is a predictor of mortality and non-fatal cardiovascular disease in hemodialysis patients (19),(20).

CONCLUSION

Some diabetic hemodialysis patients could fast safely particularly if they are not afflicted by IHD or having subjective symptoms during HD sessions. Research is needed to explore physician and patient concepts and practices to inform the evidence-based management of diabetes in the special group as HD patients while fasting.

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- Dr Huda Ahmed Mahmoud: Head of hemodialysis unit in El Agmy hospital and internal medicine consultant.
- Dr Emad Hamdy Ahmed: Nephrology specialist in hemodialysis unit in El Agmy hospital
- Ms. Shaimaa Mustafa: Head of nursing staff in hemodialysis unit in El Agmy hospital
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- Dr Marwa Mohamed Abd Elhafiez: Nephrology specialist in Alexandria fever hospital
- Ms. Hanan Mohamed Fawzi: Head of nursing staff in hemodialysis unit in Alexandria fever hospital
- Dr Ahmed Abdel Fattah: Nephrology consultant in Mansoura military hospital
- Ms. Huda Farag Mohamed: Staff nurse in hemodialysis unit in Mansoura military hospital
- Dr. Nahed Abdel Monem: Head of hemodialysis unit in Abu Qir hospital and nephrology consultant
- Mr. Mohamed Gamal Diab: Head nurse in hemodialysis unit in El Gomhrya hospital
- Ms. Elham Mohamed Hafez: Staff nurse in hemodialysis unit in Abo Qir hospital
- Ms. Hagar Hassan Mohamed: Staff nurse in hemodialysis unit in Abo Qir hospital
- Dr. Abeer Mohamed Abdel Tawab: Head of hemodialysis unit in Ras El Tein hospital and nephrology specialist
- Dr. Aida Helmy: Nephrology specialist in Ras El Tein hospital
- Dr. Emad Abdel Azim: Nephrology specialist
- Ms. Wadida Aly Mohamed: Head nurse in Ras El Tein hospital hemodialysis unit
- Dr. Lobna Elgamal: Head of hemodialysis unit in El Gomhrya hospital and nephrology specalist
- Ms. Maha Nassar: Head nurse in hemodialysis unit of El Gomhrya hospital
- Dr. Eman Ahmed Hussien: Nephrology consultant in El Amrya hospital
- Ms. Doaa Elsayed Mohamed: Head nurse in hemodialysis unit in El Amrya hospital
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- Ms. Heba Ahmed Mahdy: Head nurse in hemodialysis unit in Borg El Arb hospital
- Dr Rabab Taha Zakaria Hassan: Head of hemodialysis unit in El Minya general hospital
- Dr Eman Mohammed Taha Ali: Nephrology specialist
- Dr Mohamed Abd Elaziz Eldiasty: Internal medicine consultant
- Brigedone General Dr. Mohamed Shawky Ali Elmasry: Head of Mansoura military hospital
- Ms. Basma El Nagar: Head nurse in hemodialysis unit in Mansoura military hospital
- Dr Hany Helmy Saad Attia: Head of Hemodialysis unit in Shobra general hospital and nephrology consultant
- Dr Silvia Adel Ibrahim: Nephrology resident in Shobra general hospital
- Dr Essam Abd Elazim Elsayed Elsayed: Head of hemodialysis unit in Rod El Farag hospital and nephrology consultant
- Dr. Asmaa Mahmoud Fakhry: Head of hemodialysis unit in 6th October hospital
- Mrs. Khadra Abdullah Ibrahim: Head nurse of hemodialysis unit in 6th October hospital
- Mrs. Marwa Salah Ahmed: Staff nurse in hemodialysis unit of 6th October hospital
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- Dr Hazem Fouad Sadek: Nephrology specialist in El Mounira hospital
- Dr Dina Salah Abd Elaziz: Nephrology specialist in El Mounira hospital
- Ms. Mahasen Abd Ullah: Head nurse in hemodialysis unit in El Mounira hospital
- Dr Hanan Fouad: Nephrology specialist in El Mounira hospital
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- Dr Sherihan Mohamed: Nephrology resident in Dameitta general hospital

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