

COMPARISON OF CLINICAL AND BIOCHEMICAL VARIABLES BETWEEN PATIENTS ON TWICE A WEEK DIALYSIS REGIME HAVING DIFFERENT RESIDUAL RENAL FUNCTION – A JACK IN THE BOX

AFZAL A\*, RAFIQUE Z, GULZAR A, RAUF MA, TALAL A

Department of Nephrology, Services Institute of Medical Sciences, Services Hospital Lahore-Pakistan

\*Correspondence author email address: [aurangzebafzal@gmail.com](mailto:aurangzebafzal@gmail.com)

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**Abstract:** In resource limiting counties, it is a general observation that patients with chronic kidney disease have undergone twice a week dialysis even though they need thrice a week dialysis regime. This not only increases the burden on hospital emergencies but also affects the quality of life of the patients. The current analysis aims to assess the quality of life, biochemical variables, and adverse events in patients on twice a week dialysis having renal urea clearance less than 2 mL/min/1.73 m<sup>2</sup> (Kr < 2 mL/min/1.73 m<sup>2</sup>) as compared to those undergoing twice weekly dialysis having renal urea clearance Kr greater than 2 mL/min/1.73 m<sup>2</sup>. This investigation was carried out at the Department of Nephrology, in Services Hospital Lahore. The study involved a total of sixty participants. They were then split into two separate groups. Thirty participants in Group A were on twice a week dialysis and had Kr > 2 mL/min/1.73 m<sup>2</sup>, whereas in Group B, participants with the same age and sex were also on twice a week dialysis regime but had Kr < 2 mL/min/1.73 m<sup>2</sup>. According to the 2006 Kidney Disease Outcome Quality Initiative (KDOQI) Clinical Practice Guidelines, individuals with renal urea clearance (Kr) less than 2 mL/min/1.73 m<sup>2</sup> should undergo thrice-weekly hemodialysis. Therefore, Group B was not following the recommended weekly dialysis schedule. The primary objective of the study was to assess the difference in biochemical variables and the last six-month emergency visits and the second goal was to determine the quality of life by using the Sf-12 QoL questionnaire. The trial involved a total of sixty participants receiving twice-weekly dialysis. Males made up 59% of the study's participants. The participants' average age was 42.18 ± 18.10 years. Group A had a mean age of 38.9 ± 17.6 years, while group B had a mean age of 41.2 ± 14.9 years. Systolic blood pressure was significantly higher in group B compared to group A (p=0.04). The biochemical examination revealed that group B had significantly lower levels of albumin (p=0.001) and higher levels of urea and calcium (p=0.01 and 0.046, respectively) than group A. It was discovered that group B had significantly more hospital visits than group A (p=0.003). Using the SF-12 to measure quality of life, there was no discernible difference between the groups. The patients were on twice a week dialysis despite their renal urea clearance of less than 2 mL/min/1.73 m<sup>2</sup> having compromised clinical and biochemical parameters. In addition, they also had greater number of emergency visits. Thus, we can conclude that thrice a weekly dialysis is a recommended regime for effected patients having Kr less than 2 mL/min/1.73 m<sup>2</sup>.

**Keywords:** Renal failure, Quality of life, SF-12 QoL, chronic kidney disease, Dialysis

### Introduction

According to various estimates, 150,000 individuals in Pakistan suffer from chronic kidney disease each year, with 15,000 people dying of renal failure (Kassim-Lakha, 2012). The majority of CKD patients who suffer from total renal failure are from low-income families (Tonelli and Dickinson, 2020). Owing to the highly specialized and expensive machinery, high labour expenses, the requirement for particularly trained physicians, nurses, and paramedical staff, and the long-term nature of the therapy, dialysis may be rather costly and not in access to everyone easily (Maake, 2017). With limited resources in government dialysis centres providing free dialysis facilities, it is not possible to

entertain all CKD patients on recommended frequencies of dialysis (Abdu et al., 2019; Abdu et al., 2020; Gordon et al., 2015; Siddique et al., 2019). Lee *et al*, believe that thrice-weekly dialysis is recommended as minimum frequency in the initial weeks regardless of renal function test (Lee et al., 2018). Recently the Work Group recommended that thrice-weekly hemodialysis as a minimum frequency level was no longer applicable but clinical Practice Guidelines assert that twice-weekly hemodialysis is not suggested for patients with renal urea clearance (Kr) <2 mL/min/1.73 m<sup>2</sup> (Ndinya, 2016). The aim of the current study was to evaluate the clinical parameters and biochemical characteristics of patients receiving twice-weekly dialysis with Kr < 2



mL/min/1.73 m<sup>2</sup> to those receiving twice-weekly dialysis with Kr > 2 mL/min/1.73 m<sup>2</sup>. We also compared the quality of life between the two groups. For the results of the study, we were able to evaluate the factors and the necessity of switching the patients to a three times weekly dialysis.

### Methodology

This study was conducted at the nephrology department of services hospital, Lahore from January 15, 2022, to September 17, 2022. The institutional review board of the hospital gave its approval to this study. After obtaining individual informed consent, a total of sixty subjects were added to the study. The participants in this study were both male and female, aged 18 to 60 years, and undergoing maintenance twice weekly hemodialysis for at least a year. Patients who refused to participate in the study, were taking anti-anxiety medications, had a serious chronic disease (such as AIDS, severe autoimmune disease, Parkinson's disease and hearing loss), or had a mental disorder (such as delirium, dementia, amnesia, or depression), were also not eligible to participate and excluded from the study.

They were then split into two separate groups. Thirty individuals in Group A were receiving twice-weekly dialysis and had Kr values greater than 2 mL/min/1.73 m<sup>2</sup>, while individuals in Group B were receiving twice-weekly dialysis and were of the same age and sex but had urea creatinine clearance less than 2 mL/min/1.73 m<sup>2</sup>. The 2006 Kidney Disease Outcome Quality Initiative (KDOQI) Clinical Practice Guidelines recommended that the individuals with renal urea clearance (Kr) less than 2 mL/min/1.73 m<sup>2</sup> should undergo at least thrice-weekly hemodialysis instead of twice-weekly dialysis regime. Therefore, Group B was not following the advised weekly dialysis schedule. The primary goal of the study was to evaluate the difference in biochemical variables and the last six-month emergency visit for different complaints. The biochemical variables were noted after including the patients in the study. The sample was taken and sent before the start of dialysis in the hospital laboratory and results were noted for further analysis. We also checked the record of the patients and noted their emergency hospital visits due to any emergency condition like shortness of breath, vertigo, persistent vomiting, hypertensive crisis etc.

The Sf-12 QoL questionnaire was used to gauge quality of life in the second step. The SF-12 was created to assess overall health from the perspective of the patient. This questionnaire assesses the physical and mental health through specially designed questions. The Physical Component Summary (PCS) and the Mental Component Summary (MCS) are two meta-scores used to express results. A high score on the SF-12 implies improved physical functioning. The PCS and MCS scores were computed using an internet toolset (Free Online SF-12 Score Calculator - OrthoToolKit). The frequency of the qualitative variable was shown along with the mean and standard deviation for the continuous variables. The chi-square and t-test were used to compare the two groups where appropriate. With the help of SPSS software version 22, the data were examined. A *p*-value of 0.05 or lower is considered statistically significant in this study.

### Results

A total of sixty patients on twice weekly dialysis were selected and included in the study. 59% of the study participants were found to be males (Figure 1). The mean age of the total participants was 42.18 ± 18.10 years. The mean age of participants who were on recommended frequency of dialysis (group A) was 38.9 ± 17.6 years and that who were not on recommended regimen of dialysis (group B) was 41.2 ± 14.9 years. The clinical data showed that the systolic blood pressure (SBP) was significantly greater in group B when we matched it with group A (*p* = 0.04). The biochemical analysis showed the urea, and calcium levels were considerably higher in group B (*p* = 0.01 and 0.046 respectively), whereas albumin levels were found significantly lower in group B as compared to group A (*p* = 0.001). The number of hospital visits of group B was found to be significantly greater than group A (*p* = 0.003) (Table 1). The quality of life when calculated by using the SF=12. The physical component summary showed no statistical difference between the groups (Group A 46.22 ± 6.87, Group B 48.76 ± 7.33, *p* = 0.26). Similarly, the Mental component summary of the SF-12 questionnaire showed no significant difference between the two groups. (Group A 48.59 ± 6.18, Group B 48.87 ± 8.16, *p* = 0.86) (figure 2,3).

**Table 1 Demographic, Clinical and Biochemical Variables**

Variable	GROUP A	GROUP B	P VALUE
Age (years)	38.9±17.6	41.2±14.9	0.30
SBP (mmHg)	150.19±13.59	160.05±17.47	0.04*
DBP (mmHg)	90.54±18.55	97.72±19.54	0.06

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Biochemical Variables			
Urea (g/dl)	49.17±8.68	57.74±10.58	0.01*
Creatinine (g/dl)	12.25±4.60	16.25±6.30	0.27
Potassium (mEq/L)	5.1±1.2	5.6±1.2	0.07
Bicarbonate (mEq/L)	20.65±6.6	21.20±5.5	0.62
Albumin (g/dl)	4.25±2.21	3.63±1.88	0.001*
Calcium (mg/dl)	8.2±2.50	8.8±1.49	0.046*
Emergency visits (last six months)	28.25±14.50	39.65±19.85	0.003*

DBP: Diastolic blood pressure, SBP: Systolic blood pressure, \*P<0.05.

### MALE TO FEMALE RATIO

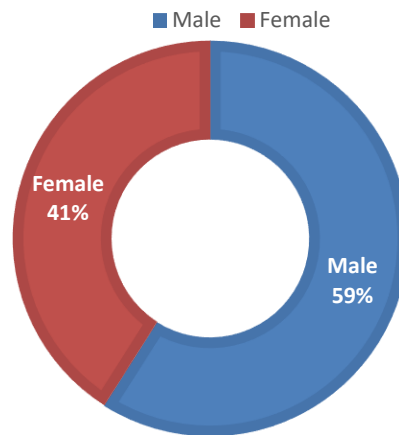


Figure 1 Male to female ratio in total population

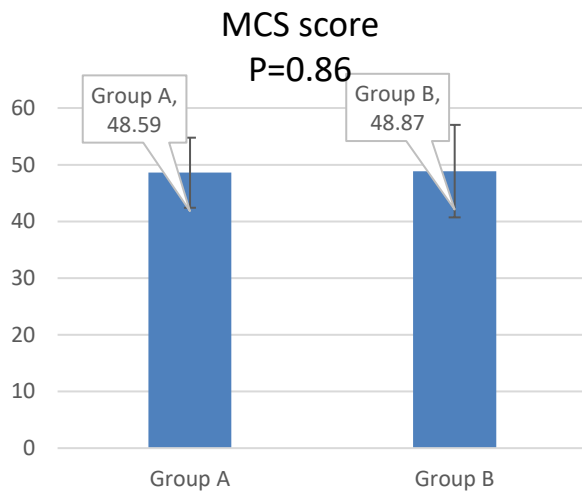


Figure 2 Comparing of Mental Component Summary (MCS)

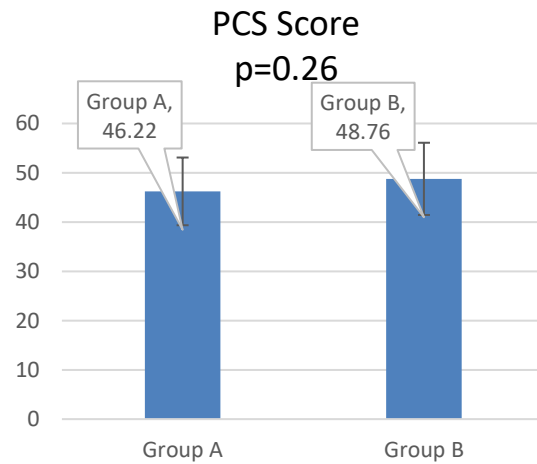


Figure 3 Comparing of Physical Component Summary (PCS)

### Discussion

In this study, we investigated multiple domains of patients on the recommended regime of dialysis and

compared them with those who were not on the recommended region of dialysis. To assess the frequency of weekly dialysis we followed a criterion according to the 2006 Kidney Disease Outcome Quality Initiative (KDOQI) clinical practice

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guidelines, which recommend that the twice-weekly hemodialysis is not suitable for patients with renal urea clearance less than 2 mL/min/1.73 m<sup>2</sup>.

In the first section, we analyzed the clinical parameters of both groups. On analysis, we found that systolic blood pressure was significantly high in group B (the noncompliance group for recommended frequency of dialysis). The constant increase in blood pressure can cause many complications in CKD patients such as constant headaches, cardiovascular events and retinopathies and increased hospital visits. This situation increases the emergency visit and increases the burden on nephrology emergencies. This is a well-established fact that noncompliance with the recommended frequency per week of dialysis causes constant high blood pressure (Jagodzińska et al., 2011; Lazarus et al., 1974; Sussman et al., 2020).

We compare the biochemical parameters between the two groups in the next section. Albumin levels were significantly lower in group B compared to group A, whereas urea and calcium levels were significantly greater. Urea has long been thought to be biologically inert (Lesaffer et al., 2000; Vanholder et al., 2018). However, some recent experimental results suggest that urea is dangerous at concentrations typical for CKD (Hagar et al., 2014; Seki et al., 2019; Ye et al., 2018). According to the latest research urea induces molecular changes in the body that influence insulin resistance, involved in the production of free radicals, programmed cell death, and the integrity of the intestinal barrier present between the epithelia. Raised urea levels also cause the creation of cyanate, ammonia, and carbamylated compounds which are all involved in the modification of biological processes in the body. In particular, carbamylation has been related to post-translational protein modifications associated with formation of atheroma and can also related to other functional abnormalities. In previous research the carbamylated compounds were linked to cardiovascular events. Thus, raised levels of urea due to less frequent dialysis instead of recommended regime led to dangerous events that can increase morbidity and mortality. It is also associated with the increased emergencies burden. Despite the fact that group B's creatinine, bicarbonate, and potassium levels were abnormal, we found no statistically significant difference between the groups. Similar results were also reported by the Chen *et al.* and also Koppe *et al.* (Chen et al., 2016; Colombo et al., 2019; Koppe et al., 2018).

In CKD patients who were non-compliant with recommended frequencies of dialysis had more visits to the nephrology emergencies that was statistically significant as compared to group A. "Non-compliance" is frequently characterized as resulting in increases in morbidity, hospital visits, and overall healthcare expenses, with barely 50% of patients in

developed nations adhering to the therapies recommended for them by healthcare professionals (Özkan and Taylan, 2022). Numerous non-compliance studies have been conducted; however, none have consistently found predictors of or remedies for patients' non-compliance (Naghavi et al., 2019). A study conducted by us also showed multiple factors that were associated with the refusal of the recommended regime of dialysis (GULZAR et al., 2022). So whatever the reason for refusal it impacts the healthcare system of the country and makes it difficult to deal with the increased number of emergencies (Rota-Musoll et al., 2021).

At the end of the trial, we used the SF-12 quality of life evaluation questionnaire to assess the participants' overall quality of life in both groups. Although neither the mental nor the physical component of our investigation revealed any appreciable differences. The SF-12 questionnaire has only been used in a small number of studies to evaluate life quality. Most research revealed that dialysis patients had lower quality of life than average patients (Shah et al., 2019; van Haalen et al., 2020). To our knowledge, this is the first study in our local population that compared the two groups on dialysis based on recommended frequencies of dialysis. This study has also some shortcomings such as it is a single-centered study, and the sample size is low to satisfy the power of the study. More multicentric studies with a large population size are needed to assess the stats of quality of life in CKD patients.

## Conclusion

The patients were on twice a week dialysis despite their renal urea clearance of less than 2 mL/min/1.73 m<sup>2</sup> having compromised clinical and biochemical parameters. They also have a greater number of emergency visits exerting extra burden on nephrology emergencies.

## Conflict of Interest

Authors declared no conflict of interest.

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