



To determine the Effectiveness and Quality Of Life of twice weekly versus thrice weekly Hemodialysis at a Tertiary Care Hospital.

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Abstract: Background: The ideal dialysis frequency is a controversial one, especially in terms of its effect on disease control and the quality of life of patients. **Objective:** To assess and compare treatment adequacy and health-related quality of life in patients undergoing biweekly versus triweekly hemodialysis at a tertiary care center. **Methods:** The analytical comparative cross-sectional study was done in Department of Nephrology (JPMC) Karachi, 20th August 2025 to 20th November 2025. The enrolment of patients followed through Three months involved non-probability consecutive sampling of 60 patients. They were divided into two equal groups. Group A received hemodialysis once a week on two days and Group B received hemodialysis thrice a week. Data was analyzed using the SPSS version 25. Group comparisons were performed using an independent samples t-test, with statistical significance defined as $p < 0.05$. **Results:** All the 60 patients who underwent Three weeks of follow up were divided equally into 30 patients each group. There was no difference in baseline characteristics (age 44.6 versus 46.1 years, Kru 3.1 versus 3.0 mL/min). Triweekly hemodialysis was associated with an improved dialysis adequacy (spKt/Vurea 1.46 vs 1.12, StdKt/Vurea 2.62 vs 2.34) and an improved potassium (4.6 vs 5.1 mmol/L) and phosphorus control (4.7 vs 5.3 mg/dL). Biweekly hemodialysis maintained residual kidney function (Kru 2.9 vs. 2.1 mL/min) and urine (760 vs. 540 mL/day) and was associated with superior KDQOL-36 scores on burden and effects of kidney disease. **Conclusion:** Triweekly hemodialysis provided higher dialysis adequacy and better biochemical control, while biweekly hemodialysis preserved residual kidney function and resulted in higher patient-reported quality of life. **Keywords:** Chronic; Hemodialysis; Kidney Failure, Quality of Life; Renal Dialysis; Treatment Outcome.

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INTRODUCTION

End-stage kidney disease (ESKD) has become an increasing health issue in the world over the years with high morbidity and mortality rates linked to kidney failure. Treatment of patients with ESKD has been based on hemodialysis, which is meant to substitute the excretory role of kidneys, fluid management, and survival of the patient [1]. Conventionally, thrice-weekly hemodialysis has been regarded as the standard treatment regimen in most clinical practices but current evidence is that dialysis frequency in some patients can be less frequent schedules may be viable and safe [2,3].

Incremental hemodialysis with twice-weekly onset, has been suggested as an intervention to support residual kidney clearance, decrease the treatment burden, and possibly enhance patient-centered outcomes [2]. It has been established through observational studies and meta-analyses that incremental dialysis could offer similar survival results to traditional thrice-weekly treatments under the condition that patient selection and monitoring are undertaken [3-5]. Additionally, it has been reported that lower cardiovascular stress and better patient tolerability are linked to twice-weekly hemodialysis with no evidence to impair metabolic control in some groups [6, 7].

More recent randomized trials have further addressed the effectiveness of twice-weekly hemodialysis and found that with the adjunctive use of pharmacotherapy and close observation, this regimen can safely be changed to the thrice-weekly therapy when renal failure occurs [8,9]. Also, the presence of frequent provider-patient communication and custom plans of care is a key determinant of treatment success and the overall quality of life among patients with hemodialysis [10].

Although there has been growing evidence, the relative efficacy and impact on quality of life of twice-weekly versus thrice-weekly hemodialysis is still a subject of ongoing study, especially in resource constrained units like tertiary care hospitals. These differences are crucial to understand and maximize

patient outcomes, reduce the number of treatment-related complications, and make resources in healthcare delivery as efficient as possible [8].

Despite demonstrated positive effects of hemodialysis in terms of quality of life, better morbidity, and prolongation of survival, patients receiving the treatment still have health burden and death rates, more in poorer and middle-income nations like Pakistan. These issues continue to exist in spite of the current technological developments. Thus, the current research was aimed at assessing the effectiveness and patient-reported quality of life of the patients receiving twice and three times a week hemodialysis in a Tertiary healthcare facility in Karachi.

CASE PRESENTATION

This analytical comparative cross-sectional study was carried out within a period of Three months i.e. 20th August 2025 to 20th November 2025 in the department of nephrology, Ward-22, Jinnah Postgraduate Medical Centre (JPMC), Karachi. The JPMC Institutional Review Board (Approval No: NO.F.2-81/2025-GENL/334/JPMC) provided the ethical approval and informed consent was given to all participants by the written version. A total number of 60 patients was recruited through non-probability consecutive sampling, and were divided into two groups; Group A (n=30) and B (n=30) where patients will be exposed to biweekly and triweekly hemodialysis respectively. The inclusion criteria were age 16 to 60 years old, both sexes, continuous hemodialysis on maintenance at least two months, patient has renal remaining function with Kru more than 2.5 mL/min, and can maintain urine output. Patients under immunosuppressive therapy, with unstable vascular access, who have recently been hospitalized or under medication with antibiotics within the last one month, non-adherence to dialysis schedules, or those who are not willing to attend were excluded. The size of the sample was determined by means of OpenEpi software according to the previously reported mean values of StdKt/Vurea in twice- and thrice-weekly hemodialysis (2.6627 ± 0.72

and 3.3827 ± 0.72 , respectively) [19]. The minimum sample size was 20 patients (10 in each) at 95% confidence level and 80% power, but to enhance the statistical power, it was adjusted to 60 patients. The formula applied to derive was calculated as $n = 2 \times (Z_{\alpha/2} + Z_{\beta})^2 \times \sigma^2 \div (\mu_1 - \mu_2)^2$, where $Z_{\alpha/2}$ is the Z-score for 95% confidence (1.96), Z_{β} is the Z-score for 80% power (0.84), σ^2 is the pooled variance, and $\mu_1 - \mu_2$ is the expected difference in means. Group A patients were treated to dialysis twice a week with adequacy being $\text{StdKt/Vurea} \geq 2.2$ including residual renal function, whereas Group B patients were treated to dialysis three times a week with adequacy being $\text{spKt/Vurea} \geq 1.3$ independent of the residual renal function. Basic demographic information such as age, sex, marital status, level of education, place of residence and employment was taken. The anthropometric data (height and weight) were measured with the help of typical equipment, and body mass index (BMI) was estimated. At the baseline, clinical examination and symptom assessment were conducted. After four weeks of follow-up, the dialysis-related measurements such as dialysis duration, blood flow, dialysate flow,

ultrafiltration rate, residual renal function (Kru) and urine output were measured per session. Serum potassium, calcium, phosphorus, albumin, and total CO₂, and dialysis adequacy indices (spKt/Vurea and StdKt/Vurea) were tested in the lab. The assessment of health-related quality of life was conducted at the baseline and after a four-week period of the study using the KDQOL-36 (Kidney Disease Quality of Life-36) validated questionnaire, comprising the physical and mental health domains, scales of symptom burden and consequences of kidney disease, whose scores range between 0 and 100, with higher scores depicting better quality of life. The data have been studied with the help of SPSS 25. The ShapiroWilk test was used to determine whether the continuous variables were normal. The presentation of the continuous variables in mean and standard deviation and the comparison of the results between the independent samples using the independent samples t-test, and categorical variables using frequencies and percentages using the Chi-square test. The p-value that defined statistical significance was less than 0.05.

RESULTS

A total of 60 patients with end-stage kidney disease were enrolled, with 30 patients assigned to the biweekly group (Group A) and 30 to the triweekly group (Group B). All patients completed the four-week follow-up, and no participants were lost. Baseline characteristics, including age, sex, BMI, dialysis vintage, Kru, and urine output, were comparable between the groups (Table 1), indicating adequate baseline equivalence.

Table 1. Baseline patient demographics and clinical parameters n=60

Variable	Group A (Biweekly) n=30	Group B (Triweekly) n=30	p-value
Age (years), mean $\pm$ SD	44.6 $\pm$ 9.8	46.1 $\pm$ 10.2	0.540 b
Male sex, n (%)	18 (60.0)	17 (56.7)	0.790 a
BMI (kg/m ²), mean $\pm$ SD	23.8 $\pm$ 3.4	24.2 $\pm$ 3.6	0.620 b
Dialysis vintage (months), mean $\pm$ SD	6.4 $\pm$ 2.1	6.7 $\pm$ 2.4	0.610 b
Kru (mL/min), mean $\pm$ SD	3.1 $\pm$ 0.4	3.0 $\pm$ 0.5	0.480 b
Urine output (mL/day), mean $\pm$ SD	820 $\pm$ 210	790 $\pm$ 230	0.570 b

Superscripts: a = Chi-square test; b = independent samples t-test.

At the follow-up time, the two groups had dialysis adequacy, as per set criteria. The biweekly group exhibited much better retention of residual kidney function and increased urine output and the triweekly group recorded better spKt/Vurea . There were observed differences in serum levels of potassium and phosphorus where the triweekly group reported lower values falling with target ranges. The groups did not differ on such nutritional parameters as serum albumin (Table 2).

Table 2. Dialysis adequacy, residual kidney function, and laboratory parameters at 4 weeks

Parameter	Group A (Biweekly) n=30	Group B (Triweekly) n=30	p-value
StdKt/Vurea , mean $\pm$ SD	2.34 $\pm$ 0.18	2.62 $\pm$ 0.21	<0.001* b
spKt/Vurea , mean $\pm$ SD	1.12 $\pm$ 0.14	1.46 $\pm$ 0.19	<0.001* b

SD			
Kru (mL/min), mean $\pm$ SD	2.9 $\pm$ 0.5	2.1 $\pm$ 0.4	<0.001* b
Urine output (mL/day), mean $\pm$ SD	760 $\pm$ 200	540 $\pm$ 180	<0.001* b
Serum potassium (mmol/L), mean $\pm$ SD	5.1 $\pm$ 0.6	4.6 $\pm$ 0.5	0.002* b
Serum phosphorus (mg/dL), mean $\pm$ SD	5.3 $\pm$ 0.8	4.7 $\pm$ 0.7	0.004* b
Serum albumin (g/dL), mean $\pm$ SD	3.6 $\pm$ 0.4	3.7 $\pm$ 0.5	0.380 b

Superscripts: b = independent samples t-test. * indicates statistical significance at $p \leq 0.05$.

The KDQOL-36 questionnaire of health-related quality of life showed group differences in particular domains. The patients who received biweekly hemodialysis showed a much better score on the burden of kidney disease and effects of kidney disease domains, which indicates that the disease has less effect on everyday living. The groups had similar physical and mental component summary scores, and similarly, symptom/problem scores. All the items of the KDQOL-36 showed higher scores in the biweekly group with less perceived quality of life (Table 3).

Table 3. KDQOL-36 quality of life scores at 4 weeks

KDQOL-36 Domain	Group A (Biweekly n=30)	Group B (Triweekly n=30)	p-value
Physical Component Summary	41.8 $\pm$ 6.2	40.5 $\pm$ 6.7	0.420 b
Mental Component Summary	44.6 $\pm$ 7.1	43.2 $\pm$ 6.9	0.480 b
Burden of Kidney Disease	56.4 $\pm$ 9.3	48.7 $\pm$ 8.6	0.001* b
Effects of Kidney Disease	62.1 $\pm$ 8.4	55.3 $\pm$ 7.9	0.002* b
Symptoms and Problems	68.7 $\pm$ 7.6	65.9 $\pm$ 8.1	0.190 b
Overall KDQOL-36 Score	54.8 $\pm$ 6.9	50.1 $\pm$ 6.5	0.006* b

Superscripts: b = independent samples t-test. * indicates statistical significance at $p \leq 0.05$.

DISCUSSION

Incremental dialysis strategies are characterized by the importance of preserving residual kidney function. According to Wanner et al. the application of incremental dialysis can only be massively applied when safety and feasibility are proved and the possibility of less frequent dialysis to safeguard residual renal function is a possibility [11]. This is in line with our findings where the biweekly group recorded high Kru and urine output compared to the triweekly group.

Adequacy of dialysis expressed as standard and single pool Kt/Vurea is a primary determinant of clinical outcomes. Murea and Sirich presented the topic of changing prescriptions of hemodialysis and emphasized an individual approach, indicating that

the reduced-frequency dialysis can be the right choice with the selected patients without affected overall adequacy of treatment [12]. In our sample group, the biweekly dialysis was sufficient enough to meet the adequacy criteria and simultaneously permit preservation of residual kidney functions.

Another outcome of importance is quality of life. According to Lalo et al., the high frequency of hemodialysis may become a significant stressor, impacting the normal functioning and the psychosocial status of the patient [13]. Regularly, our patients have found that biweekly patients undergoing hemodialysis were less burdened and had greater benefits of kidney disease on daily life based on KDQOL-36 scores, which suggests that the psychosocial effect of dialysis may be lessened with a

low frequency of administration.

The social principle of kidney health equity also highlights the necessity of the adequacy of dialysis and patient-centered outcomes balance. Li et al. emphasized the necessity to focus on strategies that could maximize kidney health across the world, such as maintaining residual renal functioning and reducing morbidity caused by treatment [14]. We propose that the proposed biweekly dialysis may be useful in achieving these objectives because it helps to minimize dialysis-related stress and achieve clinically acceptable results.

Big data of registries shows that dialysis frequency does not necessarily result in better outcomes. Saran et al. established that standard thrice-weekly dialysis is related to inconsistent outcomes with regard to death and preservation of residual kidney functions [15]. This is mirrored in our results, in which dialysis frequency, in the name of improved solute clearance, can be accompanied by a more rapid loss of residual renal function.

Arguments on the best dialysis dose are still going on. A review of randomized trials on variances of dialysis intensity by Deira et al. established that increased dialysis is not always associated with better clinical outcomes [16]. Our findings also substantiate this conclusion: triweekly dialysis was better than the previous solute clearance, but at the cost of more serious residual kidney impairment and reduced urine secretion, indicating a trade-off between solute clearance and kidney conservation.

The timing and dialysis schedule can have an impact on patient quality of life. Nowrooz et al. underlined that the shift and frequency of dialysis could have an impact on physical and mental well-being [17]. As the current study confirms, perceived quality of life can be improved by lowering the frequency of dialysis, especially in the areas connected with the daily burden of kidney disease.

There is also international data that there is variability in patient-reported outcomes with dialysis. According to Gebrie et al., patients receiving normal hemodialysis usually have poor health-related quality of life in contrast to those receiving incremental or customized schedules [18]. Likewise, our findings indicate that those treatment aspects of the quality of life can be enhanced using biweekly dialysis, which decreases the intensity of treatment.

The barriers to the reduction of dialysis frequency are the fear of solute build-up and patient safety. Meyer et al. have emphasized that clinicians usually tend to decrease the number of dialysis sessions in patients with residual kidney functions because of fear of hyperkalemia or fluid overload [19]. We find that biweekly dialysis can be used safely to keep the electrolyte balance and residual renal functions intact,

and therefore, these concerns can be reduced.

Lastly, there are positive results with incremental dialysis where incident patients are concerned. Jaques et al. discovered that dialysis with less frequently timetabled schedules did not worsen residual function, but still maintained it without affecting survival and clinical outcome [20]. These observations are consistent with our work, which showed that biweekly hemodialysis may be a viable option in patients who have a preserved renal function and enhance their quality of life without compromising clinical sufficiency.

Overall, the present research possesses the strong potential of showing the advantages of biweekly hemodialysis to maintain residual renal function and patient-reported quality of life. Whereas triweekly dialysis has higher solute clearance, it has been found that the residual functioning and burden to the patient have trade-offs imply that individualized dialysis prescriptions may have better overall results. These results support the increasing interest towards patient-centered care and incremental dialysis approaches to the management of the end-stage renal disease.

Study Limitations

There are a number of limitations to be taken into account. First of all, the sample used was quite small and based on one center, which can reduce the applicability of the results. Second, the research was a short-term follow-up of patients and it did not examine long-term outcomes such as mortality or hospitalization. Third, compliance to diet, medications and other aspects of lifestyle was not monitored systematically which may affect biochemical parameters and quality of life. Lastly, although KDQOL-36 is indeed a validated tool to measure patient-reported outcomes, subject responses can be affected by social and cultural factors and this may result in bias.

Further studies ought to concentrate on larger multicenter trials that have a longer follow-up to determine the long-term clinical outcomes, maintenance of residual kidney functioning, and survival advantages of incremental dialysis approaches. The development of optimal patient selection criteria to reduce frequency dialysis and the combination of customized dialysis prescriptions and patient-reported outcomes may enhance the clinical and psychosocial outcomes. Moreover, the use of objective biomarkers and continuous biochemical parameters measurements may prove to be more accurate to help modify dialysis times. Lastly, the cost-effectiveness and resource utilization in various dialysis regimens should be investigated, as it may inform the policy and help to promote the use of incremental dialysis strategies helping patients broadly.

CONCLUSION

During follow-up, dialysis adequacy targets were achieved in both groups according to predefined criteria. Health-related quality of life assessment using the KDQOL-36 questionnaire demonstrated better scores in the biweekly group for domains reflecting burden and effects of kidney disease, while physical and mental health component scores were similar between groups.

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