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**ORIGINAL ARTICLE**

# Predictor of Mortality in Patients Undergoing Urgent Versus Planned Dialysis. A Study from DHQ Hospital, Faisalabad

MUHAMMAD USMAN[1], YASIR HUSSAIN[2], SALMAN SHAKOOR[3]
[1]*Senior Registrar Nephrology FMU/DHQ hospital Faisalabad, Pakistan*
[2]*Senior Registrar Nephrology, Ameer-ud-Din Medical college, Lahore general hospital, Pakistan*
[3]*Senior registrar medical unit 2, Allied hospital Faisalabad, Pakistan*
*Correspondence to: Muhammad Usman, Email: Dr khan1224@yahoo.com, Cell: 03336156677*

## ABSTRACT

**Objective:** Outcomes for urgent versus planned dialysis patients vary according to the literature. The current study aims to study the clinical outcomes of patients undergoing urgent dialysis compared to planned dialysis in a single center at the nephrology department of the DHQ hospital in Faisalabad.

**Methodology:** In this analysis we selected sixty patients who meet the inclusion criteria from September 2019 to September 2021 and further divided the selected patients into two groups. The urgent dialysis group (Group UD) and the Planned dialysis group (Group PD) according to the pre-defined criteria. Each group had the equal number of age and sexed match patients (thirty patients each group). The follow up period after the initiation of dialysis was six months. The co morbid conditions, laboratory parameters and deaths in six months follow up period was noted in both groups.

**Results:** The mean age in Group UD was 57.5 years and in Group PD was 62.5 years. The male in Group UD was 21 as compared to group PD consisted of 19 males (p=0.17). The most common cause of urgent renal dialysis was found to be volume overload (52%). The UD group did not have the history of proper nephrologist consultation and zero percent of participant had AV fistula at the time of first dialysis. During the follow-up period, there was significantly higher death rate in Group UD as compared to the Group PD (43.3% versus 26.6%, p= 0.003). The urgent initiation group had considerably lower levels of albumin, hemoglobin, and hematocrit but significantly greater levels of phosphorus and C-reactive protein. Multivariable logistic regression analysis found urgent dialysis initiation to be an independent risk factor for survival (HR 2.96; 95% CL 1.48–4.64; P = 0.01). Similarly, the older age, lower albumin, elevated levels of CRP and absences of vascular access were also found the significant predictor of mortality.

**Conclusion:** Based on the results of our study we can conclude the urgent initial of dialysis may be the independent risk factor for one year mortality along with older age, higher CRP, and lower albumin levels. we also noted that the lack of nephology care and volume overload was the main reason of urgent dialysis.

**Keywords:** Urgent Dialysis, mortality, Risk factors, hemodialysis, end stage renal disease.

## INTRODUCTION

The glomerular filtration rate (GFR) can be used as a guide to know when to start dialysis, even though the early onset of dialysis does not promote a positive prognosis (1). For those suffering from chronic kidney disease (CKD), the ideal time to start dialysis is still unknown (2). In clinical practice, it is determined by the patient's way of life and factors such as uremic symptoms of end-stage renal failure (ESRD), including malnutrition (3, 4).

The start of dialysis should ideally go smoothly and on schedule; however, some patients need to start their treatments immediately (3, 5, 6). Unexpected rapid deterioration of renal function, inadequate nephrological treatment, volume overload, certain systemic disorders, difficulties in diagnosing the patient's disease and other factors all contribute to this urgency (7-10). It is well known that delayed renal referral is related to poor outcomes and that early planned dialysis improves the quality of life of patients with ESRD (11). However, until now, there have not been many articles demonstrating risk factors of mortality and outcomes of planned dialysis as compared to the patients receiving urgent dialysis.

The goal of the current study was to assess the clinical outcomes of ESRD patients who started their dialysis treatment on a scheduled versus an urgent basis.

## METHODOLOGY

This cohort study included a total of sixty patients, who had dialysis started between September 2019 to September 2021 at nephrology unit of District Headquarter Hospital (DHQ) Faisalabad. The study was approved by the ethical committee of the hospital. The patients were further divided into groups.

Planned dialysis group (PD):

The first group (Group PD) consisted of thirty patients who had dialysis started at a scheduled by the nephrologists. Patients considered by a doctor to need CKD therapy and whose timing of dialysis beginning was systematically decided were categorized as those receiving planned dialysis.

Urgent dialysis group (UD):

The second group (Group UD) were also comprised of age and sex matched thirty participants who undergone urgent dialysis. Patients who needed urgent dialysis were those who had imminent clinical symptoms including hypervolemia and electrolyte imbalance.

The patients included in the study through purposive sampling technique. The male and female of age ranging from 18 years to 60 years were included in the study. Patients with incomplete medical record, had renal transplant and shifted to peritoneal dialysis were excluded from the study.

We looked through patient records and gathered information on laboratory results, the cardiothoracic ratio (CTR), blood urea nitrogen, creatinine, estimated GFR (eGFR), calcium, phosphorus, alkaline phosphatase, and C-reactive protein, as well as background information on the patient such as cause of urgent initiation, and also followed the patients at least six months to record the deaths. On the basis of the patient's medical history and current medications, we were able to make the diagnosis of comorbidities including diabetes mellitus, hypertension, and dyslipidemia.

Using the Mann-Whitney U test, we evaluated the statistical significance of variations in mean values between two groups. To compare the percentages of categorical variables between the groups, the Chi-square test was used. To investigate the factors that predict death across all patients, we employed logistic regression models. Sex, age, comorbidities, and some of the laboratory data were included as covariates. The analysis was performed by using software SPSS version 25 and p value less the 0.05 was taken as statistically significant.

## RESULTS

There were sixty patients selected for the current study. The mean age in group UD was 57.5 years and in Group PD was 62.5 years. The male to female ratio was not significantly vary between the groups. The most common cause of urgent renal dialysis was

volume overload (52%) followed by rapid renal function disturbance (21%) and rapid appearance of uremic symptoms (18%). Figure 1

Table 1 displays the baseline patient characteristics and comorbid conditions. There were zero percent patients in the urgent initiation group got routine nephrology treatment prior to starting dialysis than those in the planned initiation group, and the proportion of patients with vascular access at dialysis commencement was significantly lower in this group (0%). During the follow-up period, there were a total of 21 deaths. There was significantly higher death rate in Group UD as compared to the Group PD (43.3% versus 26.6%, p= 0.003). The most common cause of death in each group was septicemia due to infection. The comparison of other reasons is shown in figure 2.

Table 2 displays laboratory data at the start of hemodialysis for the two groups. In terms of eGFR, there was no discernible difference between the two groups. The urgent initiation group had considerably lower levels of albumin, hemoglobin, and hematocrit but significantly greater levels of phosphorus and C-reactive protein.

Table 3 displays the outcomes of the multivariate studies to determine risk variables for death. Age (HR 1.96; 95% CL 1.24–3.35; P = 0.04) and urgent dialysis initiation (HR 1.96; 95% CL 1.24–3.35; P = 0.04) were still highly linked with mortality in the logistic regression analysis. The other factors significantly associated with the mortality were the higher levels of c- reactive protein (HR 1.96; 95% CL 1.24–3.35; P = 0.04), lower levels of albumin (HR 2.39; 95% CL 1.99–3.04; P = 0.008) and absence of vascular access (HR 2.32; 95% CL 1.54–3.18; P = 0.03)

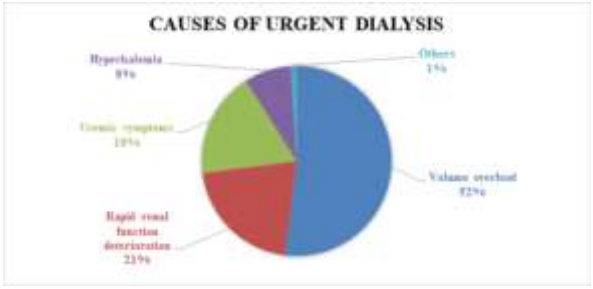


Figure 1:

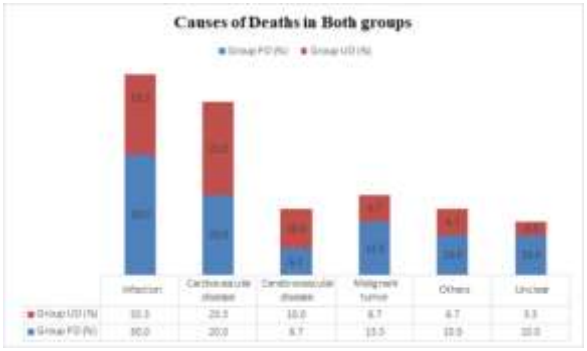


Figure 2:

Table 1: Demographic and co morbid condition of both groups

| Variables | Planned initiation | Urgent initiation | p- value |
|---|---|---|---|
| Age (mean ± S.D), Years | 62.5 (7.8) | 57.5 (9.8) | 0.58 |
| Sex (male), n (%) | 19 (63.3) | 21 (70) | 0.17 |
| Smoking (%) | 14 (46.7) | 12 (40.0) | 0.07 |
| Cardiothoracic ratio, % (range) | 42 (35–65) | 49 (41–69) | < 0.001 |
| Vascular access | 20 (65.5%) | 0 (0 %) | < 0.001 |
| No nephrology care (%) | 0 (0%) | 22 (73.3 %) | < 0.001 |
| Number of deaths (%) | 8 (26.6%) | 13 (43.3%) | 0.003 |
| Use of Erythropoietin | 24 (80%) | 5 (16.7%) | 0.006 |
| Agent | | | |
| Comorbidities (%) | | | |
| Hypertension | 27 (90.0) | 24 (80.0) | 0.15 |
| Dyslipidemia | 9 (30.0) | 8 (26.7) | 0.45 |
| Diabetes mellitus | 13 (43.3) | 18 (60.0) | 0.54 |
| Ischemic heart disease | 4 (13.3) | 4 (13.3) | 0.74 |
| Cerebrovascular disease | 4 (13.3) | 5 (16.7) | 0.09 |
| Peripheral artery disease | 2 (6.7) | 3 (10.0) | 0.14 |
| Malignant tumor | 5 (16.7) | 3 (10.0) | 0.95 |

Table 2: Comparison of laboratory parameters between the urgent versus planned dialysis groups.

| Variables | Planned initiation | Urgent initiation | p- value |
|---|---|---|---|
| Serum Creatinine levels (mg/dL) | 7.1 (6.0–9.1) | 7.8 (6.2–9.5) | 0.86 |
| eGFR (mL/min./1.73 m2) | 6.2 (4.1–6.9) | 5.1 (3.8–7.6) | 0.22 |
| Blood urea nitrogen (mg/dL) | 88 (66–104) | 99 (71–118) | 0.06 |
| Albumin (g/dL) | 3.8 (2.2–4.4) | 3.0 (2.2–3.9) | 0.03 |
| Hemoglobin (g/dL) | 9.2 (7.5–9.9) | 8.3 (7.8–10.5) | 0.01 |
| Hematocrit (%) | 25.5 (22.5–31.5) | 26.5 (24.5–27.5) | 0.02 |
| Adjusted calcium (mg/dL) | 9.3 (8.4–9.6) | 8.8 (8.2–9.7) | 0.04 |
| Phosphorus (mg/dL) | 5.2 (4.4–6.4) | 6.2 (4.4–8.4) | 0.01 |
| Alkaline phosphatase (U/L) | 247 (147–327) | 234 (202–310) | 0.06 |
| C-reactive protein (g/dL) | 1.8 (0.6–6.5) | 10 (3.9–18.5) | < 0.001 |
| Serum potassium levels (U/L) | 4.9 (4.2-5.5) | 5.9 (5.5-6.4) | 0.004 |

Table 3: Logistic regression model for assessment of factors associated with mortality:

| Risk factors | Hazard Ratio (HR) | 95% CI | P value |
|---|---|---|---|
| Sex (male) | 1.81 | 0.78–2.91 | 0.41 |
| Age | 4.01 | 1.72–7.45 | < 0.01 |
| Absence of vascular access | 2.32 | 1.54–3.18 | 0.03 |
| Diabetes mellitus | 1.25 | 0.64–2.14 | 0.64 |
| Urgent initiation | 2.96 | 1.48–4.64 | 0.01 |
| eGFR | 0.85 | 0.45–1.54 | 0.94 |
| BUN | 1.39 | 0.69-1.93 | 0.22 |
| Hemoglobin | 1.05 | 0.80–1.30 | 0.47 |
| Albumin | 2.39 | 1.99–3.04 | 0.008 |
| Phosphorus | 2.44 | 1.64–4.02 | 0.05 |
| C-reactive protein | 1.96 | 1.24-3.35 | 0.04 |

## DISCUSSION

The results of our study showed the difference in the laboratory parameters such as albumin, hemoglobin, calcium, phosphorus, c-reactive protein and potassium levels were significantly different between the groups. Investigations of patients receiving scheduled hemodialysis have found similar results in terms of better haemoglobin, calcium, and albumin parameters and lower, urea, creatinine, and phosphate levels (12-14).

In our study, we had zero percent patients went on urgent dialysis with vascular access or had regular follow up with nephrologists, that is much less than the previous studies. In a study the patients went on urgent dialysis were lower ratio of vascular access and the regular follow up of nephrologist (15). But we did not find any study present such low levels of vascular access. In under develop countries there are many reasons for such a low number of vascular access and nephrologist regular follow up. Although we strongly advised that vascular access be established beforehand before dialysis was started for our patients and their families, some patients demonstrated a desire to put off surgery as much as possible, and others were unsure whether to opt for hemodialysis or peritoneal dialysis until dialysis was actually started (16). Even if the vascular access was prepared beforehand, it may still not operate at the start of dialysis because of failure or because it is not developed sufficiently for dialysis usage (17).

In our study the use of erythropoietin was significantly low in urgent dialysis groups as compared to the planned group (16.7% versus 80%, p= 0.006). This unusually low use of erythropoietin

stimulating agents as compared to the other studies can be explain due to the fact that a large number of patients had not received nephrology care prior to dialysis initiation (18-20).

We found significantly higher frequency of death in urgent dialysis group as compared to the planned dialysis (43.3% vs 26.6%, p=0.003). Similar results were found in the study of Metcalfe et al. The results of their study showed that the mortality in urgent dialysis were 3.6 times higher compared to the planned dialysis group (20)

In our study we found age, Absence of vascular access, low albumin levels and Urgent dialysis as a significant risk factor of mortality. Our study showed older age was significantly associated with mortality, contrary to a study in which the patients' age was not associated with increased mortality (p = 0.73 0.95–1.07). Comorbidities have frequently been shown to have a higher impact on older dialysis patients' short survival than age. In a cohort of 221 older patients, the North Thames Dialysis Study examined clinical outcomes, quality of life, and expenses. In patients aged 70-74, 75-79, and 80 years, the authors reported 1-year survival rates of 80 percent, 69 percent, and 54 percent, respectively (p = 0.008) (21).

Absences of vascular access is also a risk factor for mortality in urgent dialysis patients in our study and previous research also showed similar results. For example, Dialysis beginning patterns had an impact on the results, according to one prospective research. Time of the development of the vascular access in that trial, the patients were split into three groups. In comparison to the group whose vascular access was established prior to urgent dialysis commencement, this group without vascular access had a higher risk of premature mortality. These studies reported infection and septicemia as the major cause of mortality in patients without vascular access (22).

Above all in our regression model urgent dialysis was found to be the independent risk factor of mortality and can increase the risk of mortality upto 2.96 times as compared to the planned dialysis patients. A study done by Collins et al. reported that the mortality in urgent dialysis group was lower in the first month of urgent dialysis, than reached its peak in 1 to 3 months after that it started to decrease (23).

This study has a number of shortcomings that must be noted. Its retrospective nature comes first. The second issue is that the term "urgent dialysis start" is not well defined. Even though this study was retrospective, it would be challenging to establish a randomized dialysis start-up pattern that would guarantee the diversity of ESRD patients. at the last the sample size of our study is also low and a single centered analysis so we can't to extend the results of our study to the general population of Pakistan.

## CONCLUSION

As a result, we found that patients who started their dialysis on an emergency basis fared worse in terms of survival than patients who started their dialysis on a scheduled basis. Future objectives in clinical practice should concentrate on figuring out how to lower the likelihood of urgent commencement and how to enhance the prognosis for patients who need it throughout chronic dialysis.

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