

## Research Article

# Is Missing Haemodialysis Associated with Short Term Morbidity and Mortality in End Stage Renal Disease?

Abdul Rehman Arshad<sup>1</sup>, Muhammad Fahad<sup>2</sup>, Maryam Begum<sup>3</sup>, Toqeer Ahmad<sup>4</sup>, Imran Khan<sup>5</sup>

<sup>1-5</sup> Combined Military Hospital, Peshawar

### Abstract:

**Objective:** To determine the effect of missed haemodialysis sessions.

**Methods:** This cohort study was carried out from July to October 2019. Patients on maintenance haemodialysis were selected by consecutive sampling technique. Exclusion criteria included patients admitted to hospital during first month of study, haemodialysis for acute kidney injury, haemodialysis from multiple dialysis units, haemodialysis less than two times a week and unwilling patients. Data on haemodialysis sessions carried out during July 2019 was recorded to document attendance patterns. Patients were followed up for all-cause mortality, hospital admissions and need for haemodialysis in emergency over next three months.

**Results:** Appointments were given to 84 patients, aged  $59.27 \pm 14.09$  years, for 700 sessions during July. Amongst them, 24 (28.57%) missed 34 (4.86%) haemodialysis sessions. At least one haemodialysis session was missed by 14 (26.92%) males as compared to 10 (31.25%) females ( $p=0.670$ ). During follow up period, 12 (14.29%) patients died. Five of 24 patients missing dialysis died, as compared to seven out of 60 patients with good compliance ( $p=0.310$ ; relative risk: 1.992). Eight out of 24 patients missing dialysis required hospital admissions, as compared to 19 out of 60 patients with good compliance ( $p=0.883$ ; relative risk: 1.079). Seven out of 24 patients missing dialysis required emergency haemodialysis, as compared to 12 out of 60 patients with good compliance ( $p=0.364$ ; relative risk: 1.647).

**Conclusion:** There was a statistically insignificant greater trend towards mortality and need for emergency haemodialysis amongst poorly compliant patients.

**Corresponding Author** | Dr. Abdul Rehman Arshad, Classified Medical Specialist & Nephrologist, Combined Military Hospital, Peshawar **E-mail:** maj.abdulrehman@gmail.com

**Key Words:** emergencies, fatal outcome, patient admission, patient nonadherence

### Introduction

End stage renal disease (ESRD) is associated with significant morbidity and mortality<sup>1</sup>. Out of the three treatment modalities available for such patients, haemodialysis (HD) is the most widely practiced option in Pakistan. Prevalence of patients on maintenance HD is more than 2 million around the globe<sup>2</sup>. From the patient's perspective, getting this done is quite cumbersome. Problems with adherence are thus a significant issue the world over. In the Dialysis Outcomes and Practice Patterns Study, a wide variation was noted in

the incidence of missed HD sessions, ranging from <1% in Japan to 24% in USA<sup>3</sup>. This problem could be more marked in Pakistan, where dialysis centers may not be at easily approachable distances for many patients and universally free of cost/ state sponsored healthcare is not the rule<sup>4</sup>. Our hospital provides free services to the vast majority of patients. Even then, patients infrequently skip HD for multiple administrative and logistic issues. Transportation to and from dialysis units as well as dependence on close family members are the major impediments.

HD has an enormous financial impact. Such patients are up to ten times costlier to the American Medicare and have six times higher hospitalization rates as compared to other patient subgroups<sup>5</sup>. Care of ESRD patients is an important aspect from emergency department point of view as well. According to American estimates, such patients contribute to eight-fold volume of workload as compared to patients without renal failure<sup>6</sup>. Implementing steps to reduce this impact is thus of paramount importance for any health-care system.

It is generally believed that missed HD sessions are associated with poor outcomes, including increased risk for hospitalization and death<sup>7</sup>. Pakistani patients could have differences in demographic factors known to affect mortality in ESRD, such as level of education, socioeconomic status and different cultural determinants<sup>8,9</sup>. While the results from other countries might not be generalizable to our setup, data from Pakistan to support the negative impact of missed HD on outcomes is scarce. Local statistics would also provide additional help in motivating individual patients at our setups to improve compliance to HD treatment. We therefore carried out this study to determine the effects of missed HD sessions on short term outcomes in Pakistani population.

### Methods:

This cohort study was carried out at HD Unit, Combined Military Hospital Peshawar from July to October 2019. The study protocol was approved by Ethics Review Committee of the hospital. Patients undergoing maintenance HD for ESRD in outdoor were selected by consecutive sampling technique, subject to provision of consent. Exclusion criteria included patients admitted to hospital during July 2019, HD for acute kidney injury, HD from multiple dialysis units, HD less than two times a week and unwilling patients. As per the policy in vogue, appointments for HD sessions during July 2019 were already dished out to all regular patients during the last week of June 2019. We recorded data on HD sessions carried out during the month of July, focusing on attendance patterns of all included patients, and compared it with record of appointments. Patients were thus segregated into two groups: ones missing HD and those attending their appointments

regularly. All the patients were then followed up for three months. During this period, we recorded data on all-cause mortality, hospital admissions and need for HD in emergency.

SPSS 20 was used for data analysis. Qualitative data was expressed as frequencies and percentages. Normality of quantitative variables was assessed using Shapiro-Wilk test. Quantitative data with parametric distribution was described as mean  $\pm$  standard deviation, whereas non parametric data was described as median (and interquartile range). Significance of differences between groups was tested using independent samples t-test for variables with parametric distribution and Mann-Whitney U test for variables with non-parametric distribution. Different proportions were compared amongst the two cohorts using Chi-square test/Fischer's Exact test, considering p values  $\leq 0.05$  as significant. Relative risks for mortality, hospital admissions and need for emergency HD amongst patients missing HD were also calculated.

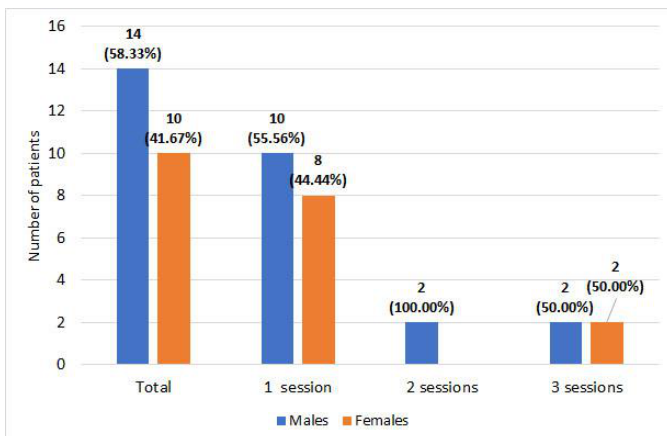
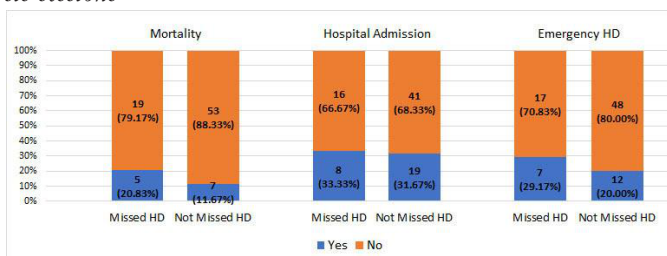
### Results:

There were 84 patients, including 52 (61.90%) males and 32 (38.10%) females, aged  $59.27 \pm 14.09$  years. Comorbid conditions amongst these patients are shown in Table 1. They were given appointments for a total of 700 sessions during July 2019. Amongst these patients, 24 (28.57%) missed 34 (4.86%) HD sessions. The remaining 60 (71.43%) patients were fully compliant to HD treatment. Amongst male patients, 14 (26.92%) missed at least one HD session as compared to 10 (31.25%) females. This difference was insignificant ( $p=0.670$ ). Patients who had missed dialysis were younger (mean age  $48.13 \pm 12.00$  years) as compared to people who did not miss HD (mean age  $63.73 \pm 12.35$  years;  $p<0.001$ ). HD vintage has a non-parametric distribution, with  $p<0.001$  on Shapiro-Wilk test. Median HD vintage was 2 years (interquartile range= 1.5 to 3 years) amongst patients missing HD and 2 years (interquartile range= 1 to 3 years) amongst those not missing HD. This difference was statistically insignificant ( $p=0.195$ ; Mann-Whitney U test).

Though none of our patients dropped out of HD program, 12 (14.29%) patients died during the three months follow up period. They were older than patients remaining alive at the end of the three-month

**Table 1.** Co-morbid conditions in the study population

| Disease                         | n (%)       |
|---------------------------------|-------------|
| Diabetes                        | 55 (65.48%) |
| Hypertension                    | 47 (55.95%) |
| Ischaemic heart disease         | 22 (26.19%) |
| Chronic liver disease           | 5 (5.95%)   |
| Nephrolithiasis                 | 3 (3.57%)   |
| Hypothyroidism                  | 2 (2.38%)   |
| Adult polycystic kidney disease | 1 (1.19%)   |

**Figure 1.** Relationship between gender and missed haemodialysis sessions**Figure 2.** Comparison of outcomes between the two cohorts HD= Hemodialysis

observation period ( $65.08 \pm 9.11$  vs  $58.31 \pm 14.58$  years;  $p = 0.042$ ). Hospital admissions were recorded on 35 occasions in 27 patients and 33 emergency HD sessions were carried out for 19 study participants. Differences between the two cohorts with regards to mortality ( $p = 0.310$ ), hospital admissions ( $p = 0.883$ ) and emergency HD sessions ( $p = 0.364$ ) were statistically insignificant. Details are shown in Fig 2. Relative risks of death, hospital admissions and need for emergency HD amongst patients missing HD were 1.992 (95% confidence interval: 0.564- 7.036), 1.079 (95% confidence interval: 0.394- 2.957) and 1.647 (95% confidence interval: 0.557- 4.869) respectively.

### Discussion:

Our patient population had demographic features

related to cohorts described in national literature previously. For example, Sattar, et al quoted a similar mean age (58 years) and gender distribution (62% males) amongst patients on HD at two hospitals in Karachi<sup>10</sup>. Diabetes was the commonest cause for ESRD in these patients (85.3%), just like our cohort. In another study from Karachi, mean age of patients at enrollment was 47 years<sup>11</sup>. Though females (68.4%) outnumbered males (31.6%), this group only included patients on HD for more than 10 years. A study done on 354 HD patients from Peshawar and Rawalpindi described a median age of 42 years, with male preponderance (66.1%). Almost one third (35.6%) had chronic kidney disease for a year or two, and 42.4% were on hemodialysis for 1-2 years<sup>12</sup>.

Problems with adherence to HD sessions are understandable. Previous studies investigating the effect of missing HD on patient related outcomes have shown conflicting results. Tohme et al studied adherence behaviour of 286 patients and followed them up for 24 months<sup>13</sup>. Patients missing HD had increased mortality (hazard ratio: 2.36). In contrast, Ifudu et al failed to demonstrate a relationship between non-adherence and death in an American cohort of 430 patients<sup>14</sup>. Similarly, Dantas et al did not find an increase in all-cause mortality with reduced adherence (as measured by duration of HD sessions delivered) amongst Brazilian patients with ESRD followed up for a median of 4 years<sup>15</sup>.

We recorded a trend towards higher rates of mortality and need for emergency dialysis amongst poorly compliant patients, but this difference did not attain statistical significance. It is important to realize that our hospital is one of the major tertiary healthcare setups in a provincial capital. It ranks amongst hospitals with the greatest quantum of resources as well as workload in the region. Still, we believe that the most possible explanation for this study failing to detect a difference in outcomes is the small sample size. Another explanation for no difference in mortality could be the 15-year age gap between the two groups. Younger patients missing HD more frequently probably had lower than expected mortality because of better physical and mental reserves as compared to older people included in this study. Differences in rates of hospital admissions and emer-

agency HD sessions between the two groups could possibly have been biased by sicker patients dying early during the study period (survival bias). We studied the attendance patterns of our patients during the first month of this study only. Unfortunately, the study was designed in such a way that we did not document attendance irregularities during the next three months that they were followed up for different outcomes. It is difficult to comment on as to what extent this made the results biased. We are also not sure if the relatively short follow up period of three months had a negative effect on demonstrating the differences in outcomes.

We did not document reasons for skipping HD sessions as a part of this study. Still, it is surprising to note that quite a significant proportion (28.57%) of patients missed at least one session of HD during the one-month period. Direct comparison with other available regional/ national data might not be easy because of variable definitions of non-compliance and different observation periods. However, a study done at a leading nephrology setup of Pakistan documented poor adherence in 13.2% patients over one-year period<sup>16</sup>. Similarly, 12% HD sessions were missed over one-year period in another study conducted by Khattak et al<sup>17</sup>. There is some evidence to believe that mortality and hospital admissions are higher during the long interdialytic period of the week<sup>18</sup>. However, in this study, we did not correlate the outcomes specifically with particular days of the week.

The major strength of this study is prospective nature of data collection, which minimized incomplete/ missing data and that it highlights data from economically burdened healthcare system of a developing country. Nevertheless, we are aware of a couple of limitations of this study. We did not record data to guide as to whether non-compliant patients who died during the study period actually died after the missed HD session or in any of the subsequent inter-dialytic periods. Some of the patients missed more than one HD session. We could not correlate this with the frequency of poor outcomes amongst individual patients. So, we are not sure if missing multiple HD sessions has a greater negative impact.

Though the results of this study are negative, we in no way want to propagate the notion that missing HD is

absolutely safe and without any consequences. In any case, we would suggest multicenter studies with a longer follow up period to study the impact of missed HD sessions.

### Conclusion

Non-adherence to HD sessions was a significant problem amongst patients in this study. Though a greater proportion of poorly compliant patients experienced negative outcomes, the differences amongst the two cohorts did not attain statistical significance. This should be interpreted in context of the limitations discussed above. Improving adherence to HD sessions should thus possibly reduce the associated morbidity and mortality in ESRD.

**Ethical Approval:** Given

**Conflict of Interest:** The authors declare no conflict of interest.

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