

Correlation between self-reported adherence to hemodialysis and serum phosphate levels in patients with end stage renal disease

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Objective: To determine the correlation between adherence to hemodialysis and serum phosphate levels in patients with end stage renal disease.

Methodology: This cross-sectional study was carried out from January to February 2019 at Pak Emirates Military Hospital, Rawalpindi. We enrolled patients with end stage renal disease, on maintenance hemodialysis for more than 12 months using consecutive sampling technique. Those on infrequent dialysis, admitted and unwilling patients were excluded. Patients' disclosure about number of dialysis sessions missed during the last four weeks was noted. Serum phosphate levels were measured in pre-dialysis samples from the midweek session.

Results: There were 137 patients with a mean age of 49.82 ± 13.40 years. Majority were males (79.56%) and on twice a week hemodialysis schedule (67.15%). Nearly one fourth (24.09%) had missed hemodialysis sessions. Serum phosphate levels were 1.48 ± 0.70 mmol/L. There was a poor correlation between compliance to hemodialysis and phosphate levels (Linear R^2 : 0.004, $p=0.482$).

Conclusion: Self-reported adherence to hemodialysis did not affect serum phosphate levels in our study population. (Rawal Med J 202;45:269-272).

Keywords: Hyperphosphatemia, patient compliance, renal replacement therapy.

INTRODUCTION

Abnormal regulation of electrolytes is a cardinal feature of end stage renal disease (ESRD). Poorly functioning kidneys are unable to excrete many electrolytes, including phosphate. Hyperphosphatemia is a potent stimulator for parathyroid hormone release and leads to mineral and bone disease. High quality evidence is now available to suggest a relationship between hyperphosphatemia and mortality in patients with ESRD.¹ Considering this, the 2017 Kidney Disease Improving Global Outcomes Chronic Kidney Disease- Mineral and Bone Disease Guidelines suggest lowering elevated phosphate levels towards the normal range.² Interventions aimed at reducing phosphate levels can be grouped into three categories: limiting dietary intake, oral phosphate binders and removal through hemodialysis.

A four hours session of hemodialysis can remove approximately 900mg of phosphate, with increasing yields for more frequent or prolonged sessions.³ Patients getting 18-30 hours of dialysis per week no longer require phosphorus binders, though such rigorous schedules are rarely used in clinical

practice.⁴ Controlling phosphate levels in ESRD still remains a challenging task. Many of our patients are not fully compliant with hemodialysis schedule. They may miss sessions for financial constraints, logistic problems and administrative issues. We therefore planned this study to evaluate the relationship between adherence to hemodialysis and serum phosphate levels in patients undergoing maintenance hemodialysis at out setup.

METHODOLOGY

This cross-sectional study was carried out at Department of Nephrology and Hemodialysis, Pak Emirates Military Hospital, Rawalpindi from January to February 2019. Approval from Hospital Ethics Review Committee was obtained and an informed consent was taken from all patients. We recruited patients using consecutive sampling technique. Patients with ESRD on hemodialysis for more than 12 months were included. Exclusion criteria included patients on infrequent dialysis (less than twice a week, irrespective of reason) and admitted patients.

Basic demographics and frequency of hemodialysis

were recorded. Patients were also asked about the number of dialysis sessions that they had missed during the last four weeks. Blood sample for serum phosphate levels was drawn for the arterial port of the dialyser tubing immediately on start of the mid-week hemodialysis session.

Statistical Analysis: Data analysis was done using SPSS version 20. Linear regression was used to determine the correlation between number of dialysis sessions missed and serum phosphate levels.

RESULTS

There were 137 patients with mean age of 49.82 ± 13.40 years. Most of them were males (109; 79.56%) and on twice a week hemodialysis schedule (92; 67.15%). Others were getting dialysed three times a week. A significant number of patients (33; 24.09%) admitted missing hemodialysis sessions (Fig. 1).

Fig 1.
Compliance to hemodialysis sessions.

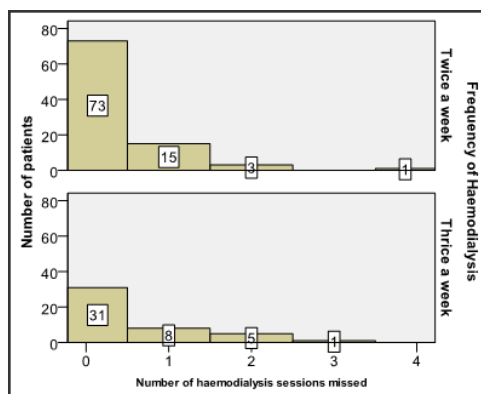
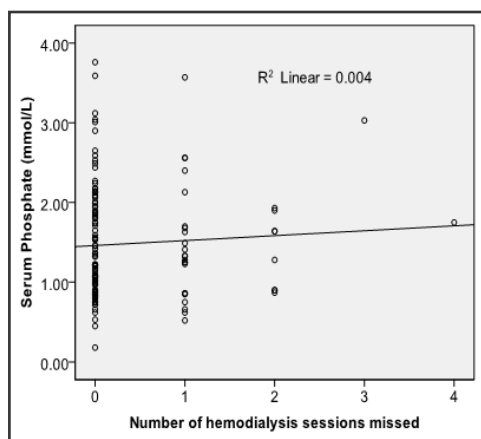


Fig 2.
Correlation between serum phosphate and compliance to hemodialysis.



Mean serum phosphate levels were 1.48 ± 0.70 mmol/L. They were lower in patients on thrice a

week hemodialysis as compared to those dialyzing twice a week (1.54 ± 0.74 vs. 1.36 ± 0.61), though the difference was not statistically different ($p=0.121$). Linear regression analysis revealed a poor correlation between compliance to hemodialysis and phosphate levels (Fig. 2). The regression model did not predict the serum phosphate levels significantly well ($p=0.482$).

DISCUSSION

During the last decade or two, life expectancy in ESRD has improved significantly, attributed largely to better hemodialysis techniques and enhanced water quality. Mineral and bone disease results from changes in serum calcium and phosphate levels and the resultant secondary hyperparathyroidism. Hyperphosphatemia causes pruritis, which can be quite difficult to treat. It is also associated with cardiovascular complications. An increase in phosphate levels of 1 mg/dl pushes up the risk of coronary artery calcification equivalent to an additional 2.5 years for hemodialysis.⁵ Achievement of normal phosphate levels in dialysis dependent population is not universal. A recently published quality improvement project from Canada reported achievement of phosphate control targets in only 46% patients.⁶

It is generally believed that most of the patients on maintenance hemodialysis lose residual renal function in twelve months. It was for this reason that we selected patients on dialysis for at least a year. In this way, we were able to remove the impact of residual renal function on phosphate control in our study population.

Nearly one in every four patients admitted to missing at least one dialysis session. Our center is providing free of cost hemodialysis but still have to bear expenses for travelling between the hospital and their homes. This study was not designed to determine the causes for poor adherence to treatment, but the important implication is that the actual rates of poor compliance could even be a bit worse. Numbers similar to ours have been reported from Unites States, where 23.42% patients missed three or more dialysis sessions in one year.⁷ A Saudi study⁸ reported figures of 36%, whereas another study from Palestine reported figure of 52%.⁹

There was no association between compliance with hemodialysis and serum phosphate levels in our patients. Chan et al described similar results in Malaysian population.¹⁰ This could most likely be because of a small overall number of non-compliant patients in our cohort, especially those who had missed greater number of dialysis sessions. It has previously been reported that conventional hemodialysis alone is not enough for controlling phosphorus levels due to the kinetics of phosphorus removal.¹¹ The contribution of other factors involved in regulation of serum phosphate levels might have been more important in this particular cohort. It is extremely difficult to quantify the dietary habits and the oral phosphate load consumed by our patients. This could have easily confounded the results of this study.

In addition, we did not collect data on prescription patterns of phosphate binders and compliance to these drugs. The primary reason for this was the fact that the answers to medication adherence are generally inaccurate considering the complex manner of dispensing drugs for these patients.⁹ This again could have impacted our findings. We depended on patient reported adherence to dialysis sessions, rather than objective evidence. Obtaining the latter becomes a bit more cumbersome in absence of electronic patient medical records. Nevertheless, the disparity between the two measures of non-adherence is well recognized.¹² A link between markers of malnutrition (especially serum albumin) and phosphate levels in hemodialysis patients is well known.¹³ Unfortunately, we did not evaluate our patients for hypoalbuminemia and malnutrition as a part of this study due to limited resources.

The most important implication of this study is that hemodialysis patients must comply with both dietary phosphorus restriction and phosphate binders to control hyperphosphatemia and thus reduce the risk of adverse clinical outcomes.

CONCLUSION

Adherence to hemodialysis was not related to pre-dialysis serum phosphate levels in our patients. This highlights the importance of dietary restrictions and phosphate binders in management of end stage renal disease.

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Conception and design: Abdul Rehman Arshad, Salahuddin
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Critical revision of the article for important intellectual content: Abdul Rehman Arshad, Salahuddin
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