

Psychosocial Factors That Create Barriers to Managing Serum Phosphorus Levels in Pediatric Dialysis Patients: A Retrospective Analysis

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Objective: Abnormal phosphorus homeostasis is among the medley of metabolic disturbances commonly associated with chronic kidney disease. We sought to determine the psychosocial factors that create barriers to controlling serum phosphorus levels in children on dialysis and to evaluate the perceptions of children and caregivers on the ease or difficulty of following a dietary phosphorus restriction and taking phosphorus binder medications.

Design: Single center cross-sectional study.

Setting: Pediatric dialysis unit at a children's hospital.

Subjects: Forty-eight patients on chronic hemodialysis or peritoneal dialysis (mean age: 11.03 ± 6.88 years; 69% male).

Main Outcome Measure: Serum phosphorus levels were recorded from electronic health records and converted to a mean phosphorus standard deviation score (SDS) for each individual. Mean phosphorus SDS values were compared to each independent categorical variable using an analysis of variance test, continuous variables were analyzed using linear regression, and logistic regression was used to determine odds ratios.

Results: There was a significant relationship between age and phosphorus SDS ($P < .001$), with patients over 13 years of age having the highest prevalence of hyperphosphatemia (88%). Patients and caregivers who identified phosphorus levels as "controlled" had lower phosphorus SDS values compared to the other subjects ($P = .003$). However, of the patients and caregivers who reported that serum phosphorus levels were "controlled," 46% were hyperphosphatemic. Furthermore, 73% and 87% of patients and caregivers reported that following a phosphorus-restricted diet and taking phosphorus binders were "easy"; yet, 40% and 49% of these patients were hyperphosphatemic, respectively.

Conclusion: In the present study, elevated serum phosphorus levels were most common in adolescent dialysis patients. There also appears to be a disconnect between the perceived ease of following a phosphorus-restricted diet and taking phosphorus binders and the achievement of normal serum phosphorus levels. These data further emphasize the importance of ongoing education regarding dietary and medical management requirements.

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Introduction

ABNORMAL PHOSPHORUS HOMEOSTASIS is among the medley of metabolic disturbances commonly associated with advanced chronic kidney disease (CKD). An elevated serum phosphorus level (hyperphosphatemia) is a known risk factor for cardiovascular disease, the leading cause of death in children receiving dialysis.¹ Yet, despite the devastating long-term consequences of chronic hyperphosphatemia, patients often remain nonadherent to their doctor's advice regarding the importance of following a phosphorus-restricted diet and taking phosphorus binders with meals and snacks. In fact, an international study with data derived from centers in 24 countries recently found that 81% of adolescent peritoneal dialysis patients were hyperphosphatemic despite receiving recommendations regarding dietary and medical management of phosphorus.²

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Often not considered when examining adherence to a demanding dietary and medication regimen are the psychosocial stressors that contribute additional challenges for the patient and/or caregivers. Being unmarried, suffering from depression, and experiencing a lack of social support have all been linked to higher rates of nonadherence to prescribed medical treatments.^{3,4} However, studies examining adherence in the dialysis population have most often focused on adult patients. Therefore, in this study, we sought to determine the psychosocial factors that create barriers to managing serum phosphorus levels in children on dialysis and to understand the perceived difficulties children and their caregivers face when prescribed a phosphorus-restricted diet along with the administration of phosphorus binders with meals and snacks.

Materials and Methods

Patients

Outpatient dialysis records were reviewed for children who received chronic dialysis at Children's Mercy Hospital (Kansas City, Missouri) between January 1, 2009, and December 31, 2013. Subjects were included if they were on maintenance hemodialysis or peritoneal dialysis, completed a 30-day, 90-day, or annual care plan and had at least one monthly serum phosphorus level drawn during the study period. This study was approved by the Institutional Review Board at Children's Mercy Hospital (1390280).

Data Collection

Data were collected retrospectively from care plans and electronic medical records. Care plan data collected included demographic information, dietary patterns, social factors, and perceptions of patient/caregiver on ease or difficulty of restricting dietary phosphorus intake and taking phosphorus binding medications (Fig. 1). Data were obtained from the earliest care plan available, and serum phosphorus levels were obtained from the electronic medical record during the subsequent 12 months.

Statistical Analysis

A mean serum phosphorus level was determined for each patient based on up to 12 monthly observations. Because of the age-related differences in the normal serum phosphorus values, the results were expressed as an age-based standard deviation score (SDS) to allow for comparisons between age groups. A phosphorus SDS between -2 and $+2$ was considered normal. Therefore, mean levels greater than $+2$ indicate that the patient was hyperphosphatemic, whereas levels less than -2 indicate the patient was hypophosphatemic (low serum phosphorus level). Mean phosphorus SDS values were compared to each independent categorical variable using an analysis of variance test. If significant, a post hoc analysis was performed and adjusted using Tukey's Honest Significant Difference test. Income (a continuous variable) was analyzed using linear regression. Because of limited sample size, age was considered a categorical variable and was grouped accordingly (<6 years, 6–12 years, ≥ 13 years). Logistic regression was

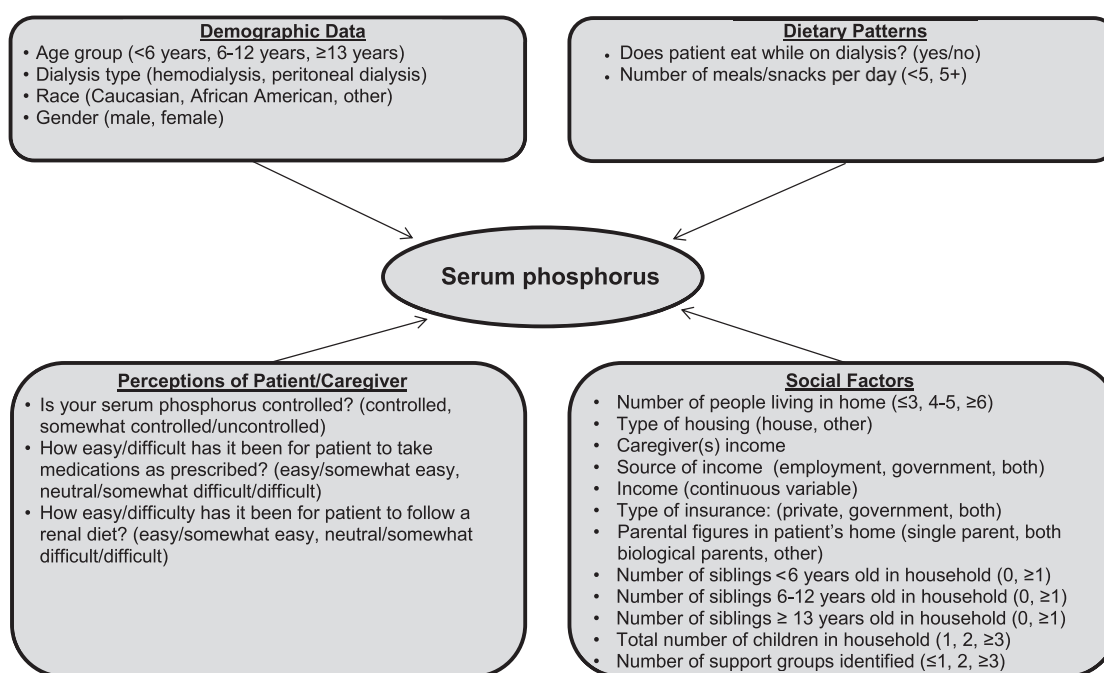


Figure 1. Study design and categories of demographic data, dietary patterns, perceptions of patient/caregivers, and social factors.

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