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Characteristics and Laboratory Profiles of Hemodialysis Patients in Saudi Arabia: Identifying Areas for Improvement

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Abstract— **Introduction**: End-stage kidney disease (ESKD) is a global health challenge that contribute to substantial patients' morbidity and mortality. Optimizing the management of ESKD complications is a critical role of the dialysis care-team. In this study, we aim to explore the state of anemia and electrolytes control among our hemodialysis patients in order to facilitate initiatives to optimize the management and outcomes of this population. **Methods**: in this observational study,we examined the characteristics and laboratory profiles ofhemodialysis patients at a large tertiary hospital in Saudi Arabia.Data were analyzed and described using Microsoft excel analytic functions.**Results**: A total of 258 HD patients were included in this study. The mean age was 53.5±16.6, and 62% were male. Diabetes was the leading cause of ESKD (52%), followed by hypertension (21%). Half of the patients were using catheters as hemodialysis access. Forty-one percent of the patients had a hemoglobin level within the guidelines target (10 – 12 g/dL), while 44% had lower levels.For phosphate, only 34% of patient had a normal (target) phosphate level, with majority having hyperphosphatemia (58%).**Conclusion**: Anemia and hyperphosphatemia managements are suboptimal among our HD population, with unacceptable high rate of catheter use as a dialysis access. More efforts are needed to optimize the management ofhemodialysis patients, ideally through a multidisciplinary contentious quality improvement program.

Keywords: kidney disease, global health challenge.

Introduction

Chronic kidney disease (CKD) remains a worldwide health problem that pose huge challenges to patients, caregivers, and healthcare systems, given its association with substantial morbidity and mortality[1-3].Over the last couple of decades, CKD prevalence has increased by 29.3%, with an estimated global prevalence of 9.1% as of 2017[4]. In Saudi Arabia, there are over 21000 patients on dialysis, of which 19,522 are on Hemodialysis (HD) [5].End stage kidney disease (ESKD) patients are at risk of several complications, including cardiovascular disease, which has remained the leading cause of death among patient on HD [6-8]. Moreover,anemia and hyperphosphatemia are other major contributors to morbidity and mortality among these group of patients, making optimal control of these factors a major goal for dialysis units. In a large international study involving 12 countries, and over 11000 patients on HD, the risks of hospitalization and morality declined by 5% to 6% per 1-g/dL increased in patient baseline hemoglobin level[9]. Several studies have also demonstrated that higher phosphate levels were significantly associated with mortality in HD patients [10-13].

Data on detailed characteristics and laboratory profiles of hemodialysis patients in Saudi Arabia are limited. In this study, we aim to explore the state of anemia and electrolytes control in our unit in order to understand where we stand in the treatment of these important factors, which will ultimately facilitate future initiatives aiming to optimize the management and outcomes of hemodialysis patient in this region of the world.

Method

This was an observational, cross-sectional stud. Out of total of 293 adult patients, 258 hemodialysis patients were included in this analysis from the period of October 1 to December 30, 2020, who were on hemodialysis at a large tertiary hospital in the eastern province of Saudi Arabia. Patients who were 18 years or older, on maintenance hemodialysis for longer than 3 months were included. We excluded patients with missing data,ongoing bleeding or major surgeries/vascular intervention within last 2 months. Patients with active malignancies, hemoglobinopathies,or non-compliance to dialysis were excluded as well. Data, including baseline characteristics (gender, age, cause of ESKD, comorbidities, dialysis duration, and vascular access), in addition to laboratory profiles (hemoglobin, phosphate, potassium, and calcium), and medicationsused (phosphate binders, erythrocyte stimulating agent (ESA), vitamin D analogues, and cinacalcet) were collected from the patients'medical charts. All the participants in this study had been provided an informed consent for being included in the study according to the declaration of Helsinki and the ethical committee of the Institutional Review Board at King Fahd hospital.For statistical analysis, values for continuous variables were given as mean ± SD; for categorical variables, as percentage. Data were analyzed and described using Microsoft excel spreadsheet analytic functions.

Results

A total of 258 HD patients who fulfilled our inclusion criteria were included in this study. The mean age was 53.5±16.6, and 62% were male. Diabetes was the most common cause of ESKD (52%), followed by Hypertension (21%). Out the included patients, 36% were known to have ischemic heart disease. Thirty-nine percent of patients were on HD for more than 2 years, 38% were on HD for 1 to 2 years, and 23% less than 1 year. Majority of the patients (87%) were prescribed a minimum of 12 hours dialysis per week, while the remaining were on less than 12 hours weekly. In terms of laboratory profiles, 41% of the participants had a hemoglobin level within the guidelines target (10 – 12 g/dL), while 44% had levels below 10 g/dL. For phosphate, only 34% of patient had a normal (target) phosphate level, with the majority having hyperphosphatemia (58%). Most of the patients had normal calcium and potassium levels at 87% and 78%, respectively. Patient characteristics and laboratory profiles are summarized in Table 1. The rates of utilization of common dialysis medications are shown in Table 2. The vast majority of patients (93%) were on phosphate binders, 73% were on ESA, 68% were on vitamin D analogues, and 20% were using cinacalcet. In terms of hemodialysis access, only 54% of patients were using arteriovenous fistula and graft as a dialysis access, while the remaining (46%) were using tunneled catheters as shown in Figure 1.

Discussion

This study investigated the characteristic and laboratory profiles of HD patients in Saudi Arabia, in order to understand where we stand in terms of management, and to identify areas for improvement in carefor this group of patients. Unaspiringly, Diabetes and hypertension were the leading cause of ESKD in these patients (52%, and 21%, respectively). Although anemia and hyperphosphatemia management are extremely essential in dialysis patients, only 41% of patients had hemoglobin levels within the guidelines target. Moreover, phosphate control was suboptimal in the majority of patients with only 34% being on target levels. This highlights the need to formulate a multidisciplinary contentious quality improvement (CQI) program, including nephrologists, nurses, pharmacists, and dietitians to review the patients' laboratory results and medications on regular bases in order to optimize the management and control of these important predictors of morbidity and mortality. It is fundamental for every dialysis unit to have a CQI program in place. The role of such programs in optimizing the management of hemodialysis patients has been well demonstrated in previous studies[14-16].

It was noteworthy that around half of the patients hadcentral venous catheters as a dialysis access, as opposed to fistulas or grafts. Such high rate of catheter use is concerning, giving that clinical guidelines recommend an arteriovenous fistula as the optimal vascular access for hemodialysis [17, 18]. In a systematic review that included 62 cohort studies comprising 586,337 participants, patients that were using catheters had significantly higher risks for all-cause mortality (risk ratio=1.53, 95% CI=1.41–1.67), fatal infections (2.12, 1.79–2.52), and cardiovascular events (1.38, 1.24–1.54) compared to those with fistulas. Here comes again the role of CQI program in regularly reviewing the vascular access of every single patient to explore the reasons of such high rate of catheter use and to improve the rate of fistula utilization within the dialysis unit.

One of the underestimated factors that is highly prevalent among HD patients, that could contributeto the suboptimal management of anemia and electrolytes is non-adherence to medications. HD patients are at high risk of medications non-adherence given the large number of medications and the overwhelming weekly schedule of dialysis sessions. Several studies have demonstrated that medications non-adherence is common among HD patients, and that itassociates with increased risk of hospitalization, morbidity, and mortality[19-24]. Dialysis care team should be aware about the importance of medications adherence in improving patients' outcomes, along with the role of phycological support and patient educations in optimizing the adherence to medications.

Although this study has provided an insight to the state of anemia and electrolyte management among hemodialysis patients in Saudi Arabia, we do acknowledge several limitations in this study. The observational nature of the data in this single-center study is a factor that may affect the generalizability of this study. Moreover, this study was confined to Saudi population, and the finding may not be generalizable to other countries with different populations and ethnicity backgrounds. Further multi-center prospective studies with a larger sample size in this region of the world are therefore needed.

Conclusion

Anemia are hyperphosphatemia managements are suboptimal among our HD population, with unacceptable high rate of catheter use as a dialysis access. More efforts are needed to optimize the management or these patients, ideally through a multidisciplinary CQI program.

Declarations

Competing interests

The authordeclare that he has no competing interests.

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Authors' contributions

The manuscript was prepared by a single author, who analyzed and interpreted the data, and wrote the manuscript.

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Table 1. Patient characteristics

Characteristics	N (%) Total=258
Age, years (53.5±16.6)	
18 – 39	60 (23%)
40 - 60	101 (39%)
More than 60	97 (38%)
Gender	
Male	160 (62%)
Female	98 (38%)
Comorbidities	
Diabetes mellitus	166 (64%)
Hypertension	203 (78%)
Ischemic heart disease	93 (36%)
Cause of end-stage kidney disease	
Diabetes mellitus	135 (52%)
Hypertension	54 (21%)
Glomerulonephritis	17 (7%)
Obstructive uropathy	15 (6%)
Polycystic kidney disease	7 (3%)
Others	9 (3%)
Unknown	21 (8%)
Years on HD	
Less than 1	60 (23%)
1 - 2	98 (38%)
More than 2	100 (39%)
Dialysis hours/week	
Less than 12 hours	34 (13%)
12 hours and more	224 (87%)
Hemoglobin g/dL	
Less than 10	115 (44%)
10 – 12	106 (41%)
More than 12	37 (15%)
Phosphate mmol/L	
Less than 0.9	20 (8%)
0.9 – 1.39	87 (34%)
1.4 – 2	90 (35%)
More than 2	61 (23%)

Corrected calcium mmol/L	
Less than 2	31 (12%)
2 – 2.6	224 (87%)
More than 2.6	3 (1%)
Potassium mEq/L	
Less than 3.5	7 (3%)
3.5 – 5.4	202 (78%)
5.5 – 6	25 (10%)
More than 6	24 (9%)

Table 2. The utilization of dialysis medications

Medications	**N (%) Total=258**
erythrocyte stimulating agent	188 (73%)
Vitamin D analogues	176 (68%)
Phosphate binders	241 (93%)
Cinacalcet	51 (20%)

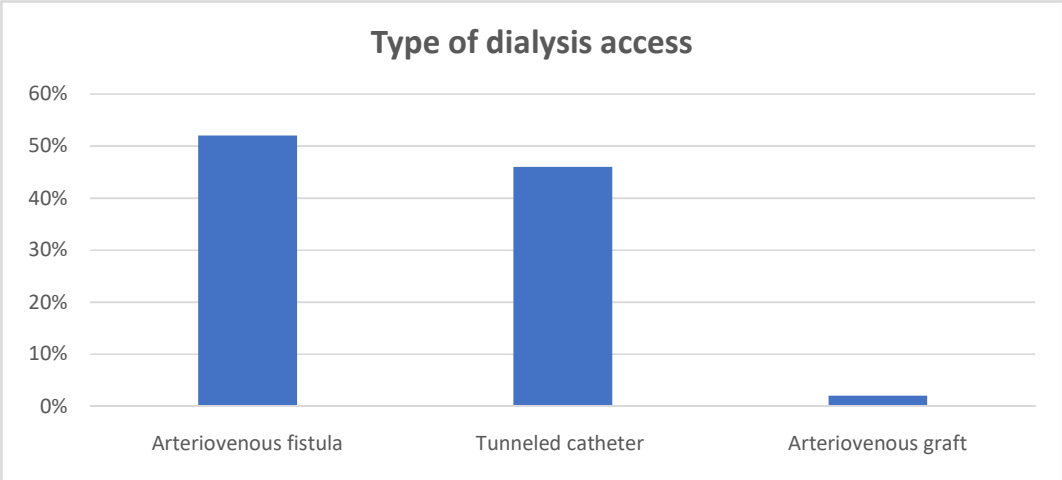

Figure 1. Type of dialysis access