PHOSPHATE BINDERS AS A SUPPLEMENT-ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE AMONG ESRD PATIENTS ON MAINTENANCE HEMODIALYSIS IN A TERTIARY CARE TEACHING HOSPITAL IN SOUTH INDIA

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Abstract

Objectives: To assess the Knowledge, Attitude and Practice regarding phosphate binders among ESRD patients on maintenance hemodialysis in South India. And also, to assess its adverse effects and the impact on the gastrointestinal system. Methods: We conducted a cross sectional prospective study at nephroplus and vakula dialysis center in SVIMS, Tirupati for a period of 6 months. A total 226 patients were included in the study, who are on hemodialysis between November 2021 to April 2022. The study involved interviewing the patients, reviewing their medical records to assess the patients Knowledge, Attitude, Practice regarding these phosphate binders and to understand the impact of these binders on the GI system. Results: We included 226 patients in our study. 73:27 was the male and female ratio. The prevalence of prescribing calcium phosphate binders was 37%, non-calcium phosphate binders was 14% and combination of both binders was 49%. Most patients showed adequate to good attitudes towards phosphate balance. Calcium based phosphate binders had more effect on GI system when compared to the patients using non-calcium-based phosphate binders. Conclusion: Patients receiving hemodialysis mostly use phosphate binders. Binders negative impact on GI system is more due to low awareness level. Additionally, they claimed that nutrition restrictions during dialysis were not implemented with sufficient care and had poor compliance procedures. Further, we recommend efficacious patient counseling programs need to carried out to improve the awareness and knowledge of these phosphate binders among hemodialysis patients to minimize adverse effects.

Keywords: maintenance hemodialysis, phosphate binders, end stage renal disease, renal diet, gastrointestinal system.

INTRODUCTION

Chronic kidney disease (CKD) is distinguished by an interstitial fibrosis that gradually replaces the normal renal architecture over the course of months or years.1 According to WHO, CKD holds nearly 1 trillion loss of life globally, and a forthright source of 1 out of 57 lethal consequences. It remains through a small number of increasing sources of fatality which make CKD, the 13th dominant origin of lethality in 2013 correlated to grading 27th in 1990, signified the elevation of 134% during this phase.4 The mortality with CKD patients in 2019 were 56% larger than that of not having CKD, being patients due to CKD phases 4-5, the accommodated fatality rate is 76% higher.5 It exists an ongoing condition with not at all curative and immense fatality and lethality mostly develops normally through representative adult residents, specifically in an individual with diabetes and hypertension.2

International guidance describes the disease as declined renal consequences presented by at least 3 months period, despite the undetected causation.3 It comprises of 1 or high number of consecutive are: (1) A maximum GFR of 1.73 m2 at 60 mL/min; (2) Not less than or equal to 30 mg/24 hours of urine albumin; (3) The deformities in cytology, urine residues, or illustration implicative of renal destruction; (4) renal tubule ailments; or (5) past records renal grafting.39 Identified sources of CKD: globally consists of Hydronephrosis, High blood pressure, High blood sugar and hereditary conditions like polycystic renal syndrome.6 The utmost CKD has gradual hazards components are: (1) perceptivity factors, comprises of Hereditary, Geriatrics, decreased-birth weight infant, decreased renal mass, (2) Initiatory factors, comprises of hypertension, high blood sugar, UTI, renal calculi and therapeutic lethality, (3) progressive factors, comprises of elevated levels of protein in urine, tobacco
consumption, (4) Termination factors, comprises of anemia, low serum albumin level, delayed referral and less frequent dialysis dosing.

The medical Management of CKD can delay its development to the final stage of kidney disease and set for the final stage of renal disease. The utmost CKD patients were without symptomatic, diagnosis is dominant to immediate identification of condition. A renal profile analysis which comprises of estimating both creatinine levels in serum for evaluating GFR and urine ACR has been advanced by the National Kidney Foundation.

The methods applied to decrease the continuation of renal disease are: Patients with albuminuria more than 500mg/24 hours should take ARB’s or ACEI’s. Final Stage Kidney Disease is described as a condition in which glomerular filtration rate not more than 15ml/min.

ESRD is also called as Renal Failure. Generally, the ESRD symptoms appear in stage 4 and 5 CKD where the GFR is less than 30ml/min. ESRD present with signs and symptoms which include of anemia, mineral and bone disorders and metabolic disorders consisting of hyperkalemia, hypo/hypercalcemia, hyponatremia, hyperphosphatemia and metabolic acidosis.

ESRD is a progressive condition which requires Renal Replacement Therapy.

In final stage kidney disease, increased phosphorus levels are unavoidable outcome and the appearance of that correlated with elevated lethality and fatality. In chronic renal disease, efficacious management of a phosphorus metabolic process, possibly essential for prophylactic in the development of cardiovascular condition and vascular calcification. The limitation phosphorus diet consumption may be not adequate to keep correct phosphorus levels in renal patients as it can aggravate protein and energy undernourishment.

An accumulation of calcium and phosphorus all over the body due to increased phosphorus levels, it develops in calcified vessels and arterial sclerosis, generates in systolic blood pressure, dilated pulse strain, and following LVH. Eye related indications comprises of calcific band keratopathy, cataracts, conjunctivitis. Thus, in CKD patients, phosphate binders are used in the treatment of hyperphosphatemia. Phosphate binders are advised as a standard regimen in dialysis. These agents are used to reduce, absorption of dietary phosphate from intestine to control phosphate levels in blood. Mostly, patients are using these agents to attain a balance in phosphorus level.

Classification of phosphate binders are primarily divided into 3 categories: They are calcium-based binders, Aluminium based binders and Non-calcium binders (Sucroferric oxyhydroxide, Sevelamer and Lanthanum) are significantly high cost. In CKD patients, phosphate binders result up to 50% pill load and having persistent side-effects (specifically GI intolerance), it occurs with less drug tolerance.

The mechanism of action of phosphate binders is to prevent dietary phosphorus absorption by binding it within the gastrointestinal lumen. Phosphate-binding agents, binds in the gut and limit its absorption, accumulation and stops secondary hyperparathyroidism from developing.

Phosphate binders containing calcium are considered as 1st choice in patients with renal disease (calcium carbonate and calcium acetate), as it is indicated for hypocalcemia which is frequently observed with hyperphosphatemia, when correlated with other phosphorous binders. They are highly efficient when consumed with food (as it limits calcium absorption). GI upset, especially constipation is the most frequent side effect of calcium binders. Calcium containing phosphate binders were widely utilized due to its low cost and relatively good efficacy.

For lowering serum phosphorous levels, the two calcium-containing binders that are most frequently employed are calcium carbonate and calcium acetate. The efficacy of Calcium acetate is greater than calcium carbonate, as it has lower calcium load compared to carbonate. The adherence and acceptability of calcium acetate was found to be effective, by exhibiting a great decrease in serum phosphorous levels, contrasted with a similar dose of calcium carbonate.
Other calcium-based binders which are poorly utilized comprises of calcium acetate (12%) and calcium alginate (25% elemental Ca). A semi-artificial version of glutamic acid, calcium ketoglutarate has the ability to bind phosphates while without appearing to elevate calcium levels.

The advantages of calcium carbonate include: It lacks aluminum, show medium effect, average pill burden, less expensive (Table 1.1). The advantages of calcium acetate include: lower calcium load than carbonate, and pH dependent.

The adverse reactions of calcium containing phosphate binders are GI irritation, difficulty in passing stools, elevated serum calcium levels, extra-skeletal calcification.

Calcium containing phosphate binders are frequently ordered to decrease gastrointestinal absorption of phosphate and to reduce the seriousness of secondary hyperparathyroidism. Physicians and researchers had extensive assumption that, in dialysis patients, calcium shows useful effects on bone.

Calcium phosphate binders would be the main form of treatment for hyperphosphatemia (calcium acetate or calcium carbonate). The vascular calcification brought on by the calcium-containing binders increases the risk of cardiovascular illnesses by causing hypercalcemia (Table 1.1). As a consequence, the medicines which are known to be effective in both hyperphosphatemia, simultaneously do not cause hypercalcemia are preferred. The calcium free binders like Sevelamer or lanthanum are the preferred drugs which are having more beneficial safety profile.

Non-calcium-based phosphate binders are equitably or a little less efficacious compared with calcium containing binders and its usage doesn’t relate with increased levels of calcium resulting in decreased vascular calcification.

Among hemodialysis patients, use of these agents aims to decrease the progression of vascular calcification and improves the CKD-MBD (Chronic Renal Disease-Mineral Bone Disorder) condition.

Sevelamer is a non-absorbed polymer that binds phosphate efficaciously in ESRD patients. However, it is not related to the development of vascular calcification.

Sevelamer hydrochloride has been designed to be efficient in lowering phosphorous levels and (Ca × P) concentration in blood without causing hypercalcemia and soft tissue calcification in ESRD on hemodialysis with added benefits of cholesterol reduction. The mechanism involved in the reduction of phosphate concentrations in blood without altering calcium, aluminium or bicarbonate concentrations. Usage of Sevelamer is to control the hyperphosphatemia in CKD. The effects of such molecule identified as pleiotropic effects. Sevelamer connected with an enhancement of cardiovascular lesions and therefore, a reduction in mortality.

Sevelamer carbonate is non-absorbed carbonate buffered polymer amine anion interchange resin prepared as a replacement to Sevelamer hydrochloride with improved buffering capacity. Sevelamer carbonate reduces the phosphorous concentrations in blood by binding phosphorous in gastrointestinal tract and diminishing absorption.

In Hemodialysis patients, lanthanum carbonate is a calcium free or non-aluminium, which was allowed for maintaining phosphorous levels in serum. Lanthanum carbonate lowers absorption of phosphorous by shaping insoluble lanthanum phosphorous complexes that go through the dietary tract unabsorbed. By lowering gastrointestinal tract phosphorous absorption, both serum phosphorous and calcium phosphorous products are decreased. On short term follow-up of lanthanum carbonate in dialysis patients with ESRD, it’s efficacy in reducing the serum phosphorous levels and lowering the risk of cardiovascular calcification changing in bone morphology has been identified by long-term follow-up.

Sucroferric oxyhydroxide (SO) is newly found iron-based phosphate binder with an increased phosphorous binding capacity. It is prescribed as the management of hyperphosphatemia in maintenance dialysis patients. Sucroferric oxyhydroxide mechanism takes place by a binding of phosphorous happens by ligand exchange between alcohol groups/water in Sucroferric oxyhydroxide and phosphorous phosphate ions throughout a physiological pH range of dietary tract and by preventing its intake from blood.

The current study seems to be the first study done to focus on Knowledge, Attitude and Practice of phosphate binders among MHD undergoing ESRD patients in south India.
MATERIALS AND METHODS

A hospital-based cross-sectional study on hemodialysis patients at the Nephroplus and Vakula dialysis centers of the Sri Venkateshwara Institute of Medical Sciences, Tirupati, took place between November 2021 and April 2022. Raosoft, Inc. software was used to estimate that there were more than 200 dialysis inclusion patients, with a 95% confidence interval. The institutional ethics committee of SVIMS, Tirupati, granted its clearance. All participants provided written, fully informed consent for the study, which was carried out in accordance with ethical guidelines.

The inclusion criteria were: Patients who have been on maintenance hemodialysis for more than three months, those who use phosphate binders, whether they may be calcium- or non-calcium-based, those who undergo regular hemodialysis (three times per week), those who are eager to participate in research and those who have been diagnosed with acute kidney injury, nephrotic and nephritic syndrome, those who regularly take NSAIDs and sodium bicarbonate, and those who have a history of gastric or duodenal ulcer were omitted.

We used a straightforward, practical sampling strategy. Structured data sheet that was adapted from the literature was given to patients to complete during a face-to-face interview. An expert reviewed and updated the questions, and internal consistency was checked. The questions were taken in English and translated into telugu. The initial set of queries were designed to discover the characteristics that the enrolled participants had in common. Patients were divided into two groups: those who used calcium-based phosphate binders and those who did not, based on whether using phosphate binders was a component of their treatment regimen or not. According to the percentage of correct responses to the questions about a diet high in phosphate, patients were categorized. A patient with a score of 5-7 was considered to have a strong understanding of the use of phosphate binders, whilst a patient with a score of 5-3 was considered to have a moderate understanding and a patient with a score of 3-0 had a poor understanding. (Table 1)

In addition, patients' reactions to inquiries about the balance of their phosphate levels directly evaluated their attitude toward phosphate binder medication. A patient's response was considered appropriate if they received a patient score of 1, but an unsatisfactory response was indicated by a patient score of 0. (Table 2)

The practice of phosphate binders was assessed using questions with regard to consumption of the restricted food only in recommended amount. The patient score 2-3 was designated as inadequate response and patient score 0-1 was designated as no response. (Table 3)

Statistical analysis: The summarized data set's coefficients were used to apply descriptive statistics. To summarize categorical variables, relative frequencies and percentages were employed. To ascertain associations between groups, all statistical analyses were carried out using tabulation as well as the Statistical Package for Social Sciences, revision 21.0.

RESULTS:

A prospective cross-sectional study was carried out for 6 months (Nov-2021 to April-2022) in the department of Nephrology (Vakula & Nephroplus dialysis units) in south Indian tertiary care hospital SVIMS, Tirupati. A total of 226 Maintenance Hemodialysis Patients were recruited into the study based on the inclusion criteria after the approval of IEC.
1. **GENDER:**

![GENDER WISE DISTRIBUTION]

Figure No: 1. Distribution of patients based on gender

2. **AGE**

![AGE WISE DISTRIBUTION]

Figure No: 2. Distribution of patients based on age
3. **EDUCATION:**

![Education Distribution Diagram]

Figure No: 3. Distribution based on education of patients

4. **MARITAL STATUS:**

![Marital Status Distribution Diagram]

Figure No: 4. Distribution based on marital status of patients
5. OCCUPATIONAL STATUS:

![Occupational Status Chart]

Figure No: 5. Distribution based on occupational status of patients

6. USAGE OF PHOSPHATE BINDERS:

![Usage of Phosphate Binders Chart]

Figure No: 6. Distribution based on usage of phosphate binders in patients
7. COMORBIDITY CONDITIONS OF PATIENTS:

![Pie chart showing comorbidity conditions of patients]

HTN: Hypertension; DM: Diabetes Mellitus.

Figure No: 7. Distribution based on Comorbid conditions of patients

8. FREQUENCY OF ADVERSE EFFECTS

![Bar chart showing frequency of adverse effects]

Figure No: 8. Distribution of frequency of adverse effects

Out of the 226 interviewed patients, males were 165 (73%), while females were 61 (27%). (Figure 1). The average age was 54.78 years old. (Figure 2) Among the patients, 199 were married (88%) whereas 18 were single (8%) and 9 were widows (4%). (Figure 4) Most of the patients were educated 156 (69%) and uneducated 70 (31%). (Figure 3) Most of the patients were workers 65 (29%), followed by Farmers 52 (23%), Housewife 32 (14%), and employees 23 (10%). (Figure 5)

Hypertension was the most common Comorbid condition observed in the patients 122 (55%), followed by Hypertension with Diabetes mellitus 56 (25%), Hypertension with Other comorbidities 24 (10%). (Figure 6) In our study, we found that Calcitriol with sevelamer are the most commonly prescribed phosphate binders. The high percentage of phosphate binders were Calcitriol and sevelamer 111 (49%), followed by Calcitriol 84 (37%) and sevelamer 31 (14%). (Figure 7)
More than half of the patients had poor knowledge 182 (80.39%) for what condition they receive phosphate binders. However, 177 (78.43%) had poor knowledge about what to prevent by the use of these phosphate binders, 168 (74.50%) patients had inadequate knowledge about how these phosphate binders work in dialysis, 13 (5.88%) patients had inadequate knowledge on usage of phosphate binders, 199 (88.23%) patients had poor knowledge about the side effects of phosphate binders, 129 (56.86%) patients had in adequate knowledge about what to do if they missed a dose and 155 (68.62%) patients had poor knowledge of foods/beverages which contains a lot of phosphorus. (Table 1) About half of the patients 120 (52.94%) had an inadequate response of phosphorus balance. (Table 2)

Table 1: Characteristics of oral phosphate binders:14

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Calcium carbonate</th>
<th>Sevelamer hydrochloride</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanism of action</strong></td>
<td>Forms insoluble phosphate complicated inside the stomach.</td>
<td>An anion exchange resin.</td>
</tr>
<tr>
<td><strong>Form, strength</strong></td>
<td>Tablets which are chewed and swallowed, elemental calcium ranging 500 and 600 mg.</td>
<td>800 mg tablets.</td>
</tr>
<tr>
<td><strong>Initial dose</strong></td>
<td>A pill thrice a day with food.</td>
<td>1–3 pills per day with food.</td>
</tr>
<tr>
<td><strong>Maximum recommended dose</strong></td>
<td>A pill thrice a day with food.</td>
<td>0.3 g per kg per day.</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Shows medium effect, low cost.</td>
<td>Non-calcium, cholesterol-reducing effect.</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Hypercalcemia, for efficacious result higher doses are required, distasteful, potential vascular calcium deposits.</td>
<td>Costly, increased pill load, GI severe reactions (bloating).</td>
</tr>
</tbody>
</table>

GI - Gastrointestinal

I. KNOWLEDGE LEVELS OF PATIENTS REGARDING PHOSPHATE BINDERS:36

Table 2: Distribution of Knowledge levels of patients

<table>
<thead>
<tr>
<th>Knowledge level</th>
<th>No. of patients (n=226)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. For what condition do you receive phosphate binders?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. High serum phosphorus</td>
<td>31</td>
<td>13.72</td>
</tr>
<tr>
<td>b. Low serum phosphorus</td>
<td>13</td>
<td>5.88</td>
</tr>
<tr>
<td>c. Don’t know</td>
<td>182</td>
<td>80.39</td>
</tr>
<tr>
<td><strong>2. What would you want to prevent by phosphate binders in hemodialysis?</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. How do the phosphate binders work in hemodialysis?
   a. Lower the serum phosphorus levels  
      58 25.49
   b. Increase the serum phosphorus levels  
      0 0
   c. Don’t know  
      168 74.50

4. When should you take your phosphate binders?
   a. Without meal  
      67 29.41
   b. With each meal  
      146 64.70
   c. Don’t know  
      13 5.88

5. What might be symptoms of side effects of the phosphate binders?
   a. Nausea  
      22 9.80
   b. Vomiting  
      5 1.96
   c. Don’t know  
      199 88.23

6. What should you do if you have forgotten to take your phosphate binders?
   a. Take the next dose as normal with a meal  
      129 56.86
   b. It doesn’t matter if you forget a dose  
      66 29.41
   c. Don’t know  
      31 13.72

7. Which of these foods/beverages contains a lot of phosphorus?
   a. Cola  
      40 17.64
   b. Dairy products  
      31 13.72
   c. Don’t know  
      155 68.62

II. ATTITUDE LEVEL OF PATIENTS REGARDING PHOSPHATE BINDERS:

Table 3: Distribution of attitude levels of patients

<table>
<thead>
<tr>
<th>Attitude level</th>
<th>No. of patient (n=226)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is it necessary to keep the phosphorus balance?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Yes</td>
<td>120</td>
<td>52.94</td>
</tr>
<tr>
<td>b. No</td>
<td>102</td>
<td>45.09</td>
</tr>
<tr>
<td>c. Don’t know</td>
<td>4</td>
<td>1.96</td>
</tr>
</tbody>
</table>
III. PRACTICE LEVELS OF PATIENTS REGARDING PHOSPHATE BINDERS

Table 4: Distribution of practice levels of patients

<table>
<thead>
<tr>
<th>Practice level</th>
<th>No. of patients (n=226)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are you able to eat the correct amount of restricted foods like chicken, meat, sea foods per week?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. &gt;3×/week</td>
<td>120</td>
<td>52.94</td>
</tr>
<tr>
<td>b. &lt;3×/week</td>
<td>35</td>
<td>15.68</td>
</tr>
<tr>
<td>c. No</td>
<td>71</td>
<td>31.37</td>
</tr>
<tr>
<td>2. Does your family support you to follow the correct diet?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Always</td>
<td>195</td>
<td>86.27</td>
</tr>
<tr>
<td>b. Sometimes</td>
<td>22</td>
<td>9.80</td>
</tr>
<tr>
<td>c. Never</td>
<td>9</td>
<td>3.92</td>
</tr>
<tr>
<td>3. How many times do you eat outside food per week?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. &lt;3×/week</td>
<td>97</td>
<td>43.13</td>
</tr>
<tr>
<td>b. &gt;3×/week</td>
<td>27</td>
<td>11.76</td>
</tr>
<tr>
<td>c. No</td>
<td>102</td>
<td>45.09</td>
</tr>
</tbody>
</table>

IV. FREQUENCY OF ADVERSE EFFECTS WITH CALCIUM AND CALCIUM FREE PHOSPHATE BINDERS

Table 5: Distribution of frequency of adverse effects

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Adverse effects</th>
<th>No. of patients (n=226)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nausea</td>
<td>44</td>
<td>19.46</td>
</tr>
<tr>
<td>2</td>
<td>Vomiting</td>
<td>84</td>
<td>37.16</td>
</tr>
<tr>
<td>3</td>
<td>Heartburn</td>
<td>62</td>
<td>27.43</td>
</tr>
<tr>
<td>4</td>
<td>Abdominal pain</td>
<td>89</td>
<td>39.38</td>
</tr>
<tr>
<td>5</td>
<td>Headache</td>
<td>102</td>
<td>45.13</td>
</tr>
<tr>
<td>6</td>
<td>Breathlessness</td>
<td>89</td>
<td>39.38</td>
</tr>
<tr>
<td>7</td>
<td>Diarrhea</td>
<td>13</td>
<td>5.75</td>
</tr>
<tr>
<td>8</td>
<td>Constipation</td>
<td>53</td>
<td>23.45</td>
</tr>
</tbody>
</table>
V. IMPACT OF CALCIUM AND CALCIUM FREE PHOSPHATE BINDERS ON GI SYSTEM:

Table 6: Distribution of impact of calcium and calcium free phosphate binders on GI system

<table>
<thead>
<tr>
<th>S. No.</th>
<th>GI effects</th>
<th>Calcium containing phosphate binders (%)</th>
<th>Calcium free phosphate binders (%)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GI upset</td>
<td>31 (13.71%)</td>
<td>26 (11.50%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Headache</td>
<td>71 (31.41%)</td>
<td>44 (19.46%)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Abdominal Pain</td>
<td>62 (27.43%)</td>
<td>38 (16.81%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Heart burn</td>
<td>97 (42.92%)</td>
<td>75 (33.18%)</td>
<td>9.48</td>
</tr>
<tr>
<td>5</td>
<td>Breathlessness</td>
<td>84 (37.16%)</td>
<td>43 (19.02%)</td>
<td></td>
</tr>
</tbody>
</table>

GI: Gastrointestinal

Almost half of the patients 120 (52.94%) had adequate response to eat the correct amount of restricted foods, 195 (86.27%) patients had good response in family support to follow the correct diet, 102 (45.09%) patients had good response as they are not eating outside foods. (Table 3)

Over all, most of the patients had experienced adverse effects like headache 102 (45.13%) followed by abdominal pain 89 (39.38%), breathlessness 89 (39.38%), vomiting 84 (37.16%), heartburn 62 (27.43%), constipation 53 (23.45%), nausea 44 (19.46%) and diarrhea 13 (5.75%). (Table 4), (Figure 8)

Out of the patients, calcium based phosphate binders had more effect on GI system [heartburn 97 (42.92%), breathlessness 84 (37.16%), headache 71 (31.41%), abdominal pain 62 (27.43%), GI upset 31 (13.71%)] when compared to the patients using non-calcium based phosphate binders [heartburn 75 (33.18%) followed by breathlessness 43 (19.02%) and headache 44 (19.46%), abdominal pain 38 (16.81%) and GI upset 26 (11.50%)]. (Table 5) The correlation is estimated through a bivariate analysis model to explore the relationship between the calcium and non-calcium phosphate binders on GI system. However, there was no significant correlation between GI effects regarding the usage of phosphate binders.

DISCUSSION:

The present investigation appears to be the first to concentrate on KAP of phosphate binders as a supplement and the assessment of gastrointestinal effects on intake of these phosphate binders among ESRD patients on MHD in South India.

Participants were mostly men. (Figure 1) Patients' clinical and demographic variables have a significant impact on their understanding, attitude, and use of phosphate binders in hemodialysis conditions. The mean age of patients who were a part of the study as a whole was 54.78. (Figure 2) According to the Dialysis Outcomes and Practice Patterns Study (DOPPS), the average age of individuals who took part in this research were lesser than that of several GCC countries, including Kuwait and the UAE, and was roughly comparable to the median age in Saudi Arabia.31

According to the study, hypertension was the most common comorbidity that participants reported having. It was found to be 13 (or 25%) more common than what was indicated in the GCC DOPPS. They claimed that among hemodialysis patients as in GCC, diabetes and hypertension impacted 41% and 19% of patients, respectively. (Figure 7) In contrast to a study on phosphate binders' use in Saudi Arabia, it demonstrated that 66.7% of married patients were from South India and that men made up the bulk of our patient population, 165 of our patients (73%) and 199 of them (88%) were married. (Figure 4) Being married can help patients improve their commitment to therapy and follow-up by providing additional support.
In contrast to the Ling et al study, which revealed individuals with low levels of education (illiterate or below), we discovered that the majority of patients had high educational backgrounds.32 This was an unexpectedly high degree of education with chronic renal disease. (Figure 3)

We discovered that a significant number of our patients received prescriptions for phosphate binders, including 111 (49%) for calcium phosphate binders and 84 (37%) for non-calcium phosphate binders.33 (Figure 6) This finding was completely at odds with the GCC report’s figure of 81%. The co-administration of non-calcium phosphate binder is practiced by more than one-fourth of calcium-based binder users. When treating hypocalemia that is accompanied by hyperphosphatemia, calcium phosphate binders were initially thought to be the best option. However, among hemodialysis patients who’ve been solely receiving calcium carbonate at greater doses, introducing a non–calcium phosphate binder has been the preferred alternative for preventing the development of the vascular calcification.34

Our investigation revealed a different level of understanding than what had previously been noted. Patients may have trouble understanding the condition for which they are prescribed phosphate binders, how phosphate binders function in hemodialysis, or how difficult it is to identify the side effects of phosphate binders’ interactions with other foods or beverages. These factors are among the potential causes of patients’ insufficient knowledge of phosphate binders. (Table 1) Furthermore, there aren't many media outlets that provide information about phosphates.

As a result, a combination of poor educational programmes, pharmacist counselling, and insufficient media advertisement or message-conveying is likely to blame for the patient's limited understanding, which leads to high serum phosphorus levels and calcium levels.

We envisioned that attitude level of patients regarding phosphate binders is challenging for several individuals with ESRD. Our evaluation of the patients' attitudes toward maintaining the phosphorus balance using their comprehension levels revealed that the majority of participants in the study had a good degree of understanding to do so. (Table 2)

Patients in the current study explained that correct amount of restricted foods is not maintained properly. They had reported consumption of meat three times per week. More importantly, the study found that families supported their members in consuming the proper diet.

The majority of participants claimed that the renal diet was not generally followed. Half of the patients had good practice 120 and the rest reported average practice 35. The majority of participants reported that their family follows the renal diet 195 and only few of them reported that they were only occasionally 22 or never supported 9. Less than a third reported that they bought outside food thrice a week 97. Here more participants did once per week 27 or never bought 102 (Table 3).35

CONCLUSION:

Hemodialysis patients mostly use oral phosphate binders to control serum phosphate levels. Almost half of the patients presented with poor knowledge regarding the usage of phosphate binders. Most patients had adequate to good attitudes towards the phosphorous balance. Additionally, they claimed that nutrition restrictions during dialysis were not implemented with sufficient care and had poor compliance procedures. Also, we noticed that the patients had negative impact on GI system, resulted in adverse effects like heartburn, breathlessness, and headache. Further effective patient counseling programs need to be carried out to improve the awareness and knowledge of the phosphate binders among maintenance hemodialysis patients to minimize adverse effects.

REFERENCES
