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RESEARCH ARTICLE

EFFECT OF NUTRITIONAL EDUCATIONAL PROGRAM TO CONTROL HYPERKALEMIA, HYPERPHOSPHATEMIA AND PHOSPHATE ON BINDER HEMODIALYSIS PATIENTS

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ABSTRACT

Background*:* Hyperkalemia and Hyperphosphatemia are common among Hemodialysis (HD) patients. It is caused by the excessive ingestion of potassium and phosphate-rich foods. Dieting helps reduce this increase in blood serum also they use an oral phosphate binder medication can to help lower phosphate absorption. However, some characteristics of using phosphate binders are associated with poor adherence. Additionally, the hemodialysis patients mentioned some side effects of the medication. Monitoring nutritional parameters is an important factor for treating hemodialysis patients. Nutritional intervention by a dieticianis key when managing hyperkalemia and hypophosphatemia. The aim of this study was to evaluate the effect of the dietician educational program to control hyperkalemia, hypophosphatemia and phosphate binder among HD patients in the hemodialysis charity center (Hisham Attar Dialysis Center), Jeddah, Kingdom of Saudi Arabia. ***Methods****:* a comparison was made between HD patients before and after a nutritional educational program. A group of 190 patients was assessed using medical history, hemodialysis status, An thropometric measurements including [height, weight after a dialysis session and body mass index (BMI, kg/m2)]. Plus, biochemical measurements including (Potassium and Phosphate) levels were examined. Furthermore, groups of HD patients received teaching sessions by a dietician. An individual meeting with each one of the HD patients or with his/her family was held in a dietician clinic room. Next, data were collected before and after the nutritional educational program. ***Results:*** a significant decrease has been found in the average levels of potassium from before the program as compared to 1to 3 months following the program. The laboratory results for phosphorus levels showed a significant increase in Phosphorus after 1to 3 months from the nutritional educational program. A significant decrease of Phosphorus binder was observed after the nutritional educational programat ($P < 0.05$). Interventions involving the nutritional educational program supported the adherence of dietary recommendations additionally, positive changes and improvements to HD patient health status were found. This study suggested that repeated, personalized nutritional educational program is an effective way to improve patient care as well as to prevent abnormal potassium and phosphate parameters and reduce the use of phosphorus binder medicine.

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INTRODUCTION

Hyperkalemia is common among Hemodialysis (HD) patients, it is caused by the excessive ingestion of potassium-rich foods (Fukuoka *et al*., 2017), and is potentially life threatening. A patient focused lower potassium diet can reduce the risk of hyperkalemia and diet related anxiety (Stevenson *et al*., 2017). Hyperphosphatemia is usually caused by increased intake of phosphate from meats, fishes, beans, and dairy products (Fukuoka *et al*., 2017), Greater attention to additives and preservatives; low phosphorus diet and early use of oral phosphorus binders can reduce phosphorus absorption and return serum phosphate to the normal range (González-Parra, 2013). The treatment of hyperphosphatemia by oral phosphate binder medication (Cupisti *et al*., 2012) which helps lower phosphate absorption in the intestines by binding to and sequestering phosphate in the gastrointestinal tract, and forming insoluble products that are not readily absorbed (Hutchison, 2009). Patient tolerance of different phosphate binders varies and reported side effects lead to discontinuation of these medications (Wang *et al*., 2014). Some factors are characteristic of phosphate binders associated with poor adherence as well as hemodialysis patient reported side effects or complaints regarding the medication. These include: pill burden, large tablet size, unpalatable taste, medication regimen complexity (Ghimire *et al*., 2015), the enormous costs associated with the use of phosphate binders in dialysis, socioeconomic status, lack of marital support, unemployment, potential side effects of phosphate binders (Karamanidou *et al*., 2008; Umeukeje *et al*., 2018), some of these factor were found in our hemodialysis patients. Nutrition is considered an important part of treatment in HD patients. Therefore, poor nutrition leads to decrease in quality of life and increased complications and mortality in these patients (Lim *et al*., 2018). Monitoring nutritional parameters is an important part of the care of patients under hemodialysis (Garagarza *et al*., 2015), educational interventions that include both individual and group participation may improve knowledge, self-management, and patient outcomes (Lopez-Vargas *et al*., 2016).

Patient education with family involvement and assisting patients to identify and manage difficulties with lifestyle changes related to HD are essential elements in promoting compliance (Lee, 2002).Dietitians and Nutritional management play an essential role in the management of patients and the Patient Education process (14), caring for people undergoing hemodialysis, and the practical and culturally appropriate nutritional advice to enhance patient care (Stevenson *et al*., 2017). The dietician can help with the management of hyperkalemia or hyperphosphatemia by nutrition education. Identifying foods high in phosphorus and potassium (Kalantar-Zadeh, 2013), is essential due to the limited clearance of phosphate and potassium by dialysis (Lim *et al*., 2018). The aim of this study is to evaluate the effect of the dietician-led education program of phosphate and potassium to control for hyperkalemia, hyperphosphatemia and phosphate binder among patients undergoing hemodialysis in a single- charity hemodialysis center.

MATERIALS AND METHODS

Design: We compared subjects before and after a nutrition education.

Setting: This study was a conducted in a hemodialysis charity center (Hisham attar dialysis center) operated by Albir society in Jeddah. King Saudi Arabia, from August 2017 to November 2017.

Patients: One hundred and ninety hemodialysis patients who had been receiving dialysis for more than three months and who were older than 18 years of age. Our exclusion criteria were as follows: patients with liver cirrhosis; and Hepatitis. All Patients consented to participate and complete this study.

Intervention: Teaching sessions by a lecturer in a classroom to a small group of patients for 1 hour in Hisham attar dialysis center, all patients received the teaching session within 4 days. The lecture included reviewing the most important food items rich in potassium and phosphorus, identifying appropriate dietary alternatives, and the effect and symptoms of an increase in health and body (Cupisti *et al*., 2018; Beto *et al*., 2016; D'Alessandro *et al*., 2015). The dietician had an individual meeting with each of patients or with their family in a Dietician clinic room (19), the education consisted of 15-minute face-to-face education sessions and also received information booklets. All patients completed a before-and-after knowledge test and gave blood samples. After the education sessions, at the short-term (at one month after education) and long-term (at two and three months after education) we assessedpatient laboratoryprofiles (Potassium and phosphorus), we obtained a phosphorus binder intake assessment, and reviewed their electronic medical records and medication list (Lim *et al*., 2018). We assessed baseline medical history, duration hours on hemodialysis session, and period time on dialysis maintenance. We also recorded anthropometric measurements including height, weight after a dialysis session, body mass index (BMI, kg/m2), and percentile of Intradialytic weight gain (%IDWG).

Statistical analysis: Data are presented as means with standard deviations for continuous variables and as numbers with percentages for categorical variables. Where use paired t-test to examine differences, evaluate the effect of nutritional education baseline with laboratory result (potassium, phosphorus) and phosphorus binder prescription after the 1st, 2nd and 3rd months, (respectively). We used the p-value for the interactions of intervention and temporal changes and considered P< 0.05 to be significant (Jo *et al*., 2017).

RESULTS

The baseline characteristics among the 190 patients include: the average age of patients was 50.65 years (SD=14.11), more than half of them (64.7%) were male shown in Table 1. Were under HD from 8.02(SD=6.55) years, and 3.74(SD=0.39) hours/session Table 2. Among the patients, 29.5 % had Diabetes (DM), 96% had Hypertension (HTN), while most patients had both. The cause of renal failure HTN 39.5% (Table 3). The mean BMI was 24.74±5.06 kg/m2, and % IDWG 3.77±1.15. To examine the changes in the laboratory results after nutritional education by lecture and counseling over time, baseline parameters were compared with the measurements after the 1st, 2nd and 3rd months (Tables 4).

Table 1. Demographic finding in the study patient

Characteristics		
Age by years (*M*±*SD*)		50.65±14.11
Gender (%)	Male	64.7%
	Female	35.3%

Table 2. Hemodialysis Status (Mean ±SD)

Characteristics	
Total years on HD.	8.02±6.55
Duration Hours	3.74±0.39

Table 3. BMI, %IDWG and Medical status:

Characteristics		
BMI (kg/m2) (*M*±*SD*)		24.74±5.06
%IDWG (*M*±*SD*)		3.77±1.15
DM (%)		29.5
HTN (%)		96.3
Cause of renal failure (%)	DM	14.2
	HTN	39.5
	HTN & DM	3.7
	Renal stone	1.1
	Systemic lupus erythematosus	2.1
	Other	31.1
	Unknown	8.4

The results of paired t test revealed a significant decrease in the mean of potassium before the nutrition education (M= 5.62, SD= 0.72) than after 1 months from nutrition education (M= 5.40, SD= 0.97);t (189) = 3.074, p= .002, after 2 months from nutrition education (M= 5.13, SD= 0.62);t (189) = 9.410, p= .000, and after 3 months from nutrition education (M= 5.29, SD= 0.73);t (189) = 5.843, p= .000 (Table 4). When examined, phosphorus level laboratory results showed no significant difference between before nutrition education and after 2 months, but showed a significant increase between laboratory results of Phosphorus before the nutrition education (M= 5.57, SD= 1.69) than after 1 months from nutrition education (M= 5.93, SD= 1.69);t (189) = -2.86, p=. 005, and after 3 months from nutrition education (M= 6.01, SD= 1.75);t (189) = -3.36, p= .001 (Table 4). As for phosphorus binder, we observed significantly decreased dose between before nutrition education (M= 1.54, SD= 1.83) than after 2 months from nutrition education (M= 1, SD= 1.47);t (189) = 4.44, p= .000, and after 3 months from nutrition education (M= 0.93, SD= 0.10);t(189)=4.97, p=.000 (Table 5).

Table 4. Sample Descriptive Using Paired t-test Effect of nutrition education on the biochemical parameter

Laboratory result	Before Education	After Education (1 month)	*P*-value	After Education (2 months)	*P*-value	After Education (3 months)	*P*-value
Potassium	5.62±0.72	5.40±0.97	0.002*	5.13±0.62	0.000*	5.29±0.73	0.000*
Phosphorus	5.57±1.69	5.93±1.69	0.005*	5.58±1.67	0.949	6.01±1.75	0.001*

*P < 0.05

Table 5. Sample Descriptive Using Paired t-test Effect of nutrition education on Phosphorus binder

Medication	Before Education	After Education (1 month)	*P*-value	After Education (2 months)	*P*-value	After Education (3 months)	*P*-value
Oral phosphate binders tablet/day	1.54±1.83	1.41±1.75	0.25	1±1.47	0.00*	0.93±0.10	0.00*

*P < 0.05

DISCUSSION

The present study aimed to investigate the effect of nutrition education to control potassium and phosphorus food intake on laboratoryresults(potassium and phosphate) and oral phosphate binder intake among patients undergoing hemodialysis. The findings of this study signified the effect of nutrition education on a significant decrease in potassium level on the 1st, 2nd, and 3rd months after nutrition education. Repeated dietary education significantly reduced or prevented abnormal hyperkalemia (http://internationalscholars journals. org/ download.php?id=285962908376662888.pdf&type=applicatio n/pdf&op=1), evaluate the impact of personalized nutritional counseling by Garagarza *et al*. (2015) this resulted in a significant decrease in the prevalence of hyperkalemia after 6 months (Garagarza *et al*., 2015), also Lim *et al* (2018) and Guida *et al* (2011) results of dietary education on high potassium foods for 3 months in chronic hemodialysis patients was a significant decrease in serum potassium levels (Lim *et al*., 2018; Guida *et al*., 2011). The study by Ghavidel in (2014) showed that decreased blood potassium levels occur due to following correct nutrition and diet patterns after educational intervention (Ghavidel *et al*., 2014).

In contrast, the study by Baraz *et al*. (2014) found no significant decrease in potassium following education (Baraz *et al*., 2009). We did not observe a declining decrement of the phosphorus level following the intervention in this study, this may be because the serum phosphorus was a little high compared with other studies in which many patients' phosphorus levels exceeded 4.5 mg/dL (10,25-26), whereas the mean in this study (5.57±1.69 - 6.01±1.75). We found the signified increase statistic in Phosphorus level on 1st, and 3rd months after intervention, according to a study by Caldeira *et al*. (2011) that education helped to reduce phosphorus levels, particularly in a hemodialysis patient after 4 months by Sensitivity analysis with follow-up and we did not find any benefit before this time (Caldeira *et al*., 2011). Where the study resulted in increased. The lack of serum phosphorus reduction in this study may be due to the fact the results were obtained in just 3 months, but in contrast Lim *et al* (2018) and Guida *et al* (2011) results of dietary education on high phosphorus foods for 3 months in chronic hemodialysis patients demonstrated a significant decrease in serum phosphate levels (Lim *et al*., 2018; Guida *et al*., 2011). The other study found the educational intervention led to significant decrease in the serum phosphorus among Hemodialysis patients receiving education by dieticians (Baraz *et al*., 2009; Karavetian *et al*., 2015; Shi *et al*., 2014). A study (2015) recommended that renal diet education, guided by dieticians, reduces serum P level (Tsai *et al*., 2015).

In our study, we showed the effect of Nutrition Education in reducing average oral intake of phosphorus binder from before and after the 2nd and 3rd months of nutrition education (1.54, 1, 0.93) respectively. A study (2017) found that better knowledge of phosphate dietary, dietary behavior change included high-intensity education, long duration of intervention, and individualized counseling by a dietician may reduce the serum phosphate levels and reduce using of phosphorus binder (Milazi *et al*., 2017), normalizing serum phosphate levels with phosphate binders is possible but this variability in meal phosphate intake with relatively fixed phosphate binder dosing may contribute to the poor phosphate control experienced by patients on dialysis (Leung *et al*., 2015). A study by Vrdoljak *et al* (2016) led to a significant reduction of phosphate binder therapy between education intervention and control group (Vrdoljak *et al*., 2016).

Conclusion

Based on this research, intervention involving nutrition education may support the adherence of dietary recommendations and improve health status. Those patients who received nutrition education showed positive changes, which may be helpful to reduce hyperkalemia, hyperphosphatemia, and the use of phosphorus binder. This study suggests that repeated dietary education is an effective way of improving patient dietary compliance and in preventing abnormal potassium and phosphate parameters.

REFERENCES

Baraz, S., Parvardeh, S., Mohammadi, E. and Broumand, B. 2009. Dietary and fluidcompliance: An educational intervention for patients having haemodialysis. *Journal of Advanced Nursing,66*(1), 60-68. doi:10.1111/j.1365-2648.2009.05142.x

Beto, J. A., Schury, K. and Bansal, V. 2016. Strategies to promote adherence to nutritional advice in patients with chronic kidney disease: A narrative review and commentary. *International Journal of Nephrology and Renovascular Disease,*21. doi:10.2147/ijnrd.s76831

Caldeira, D., Amaral, T., David, C. and Sampaio, C. 2011. Educational Strategies toReduce Serum Phosphorus in Hyperphosphatemic Patients With Chronic Kidney Disease: Systematic Review With Meta-analysis. *Journal of Renal Nutrition,21*(4), 285-294. doi:10.1053/j.jrn.2010.11.006

Cupisti, A., Ferretti, V., D'Alessandro, C., Petrone, I., Giorgio, A. D., Meola, M., Panichi, V., Conti, P., Lippi, A., Caprioli, R., Capitanini, A. 2012. Nutritional Knowledge in Hemodialysis Patients and Nurses: Focus on Phosphorus. *Journal of Renal Nutrition,22*(6), 541-546. doi:10.1053/j.jrn.2011.11.003

Cupisti, A., Kovesdy, C., D'Alessandro, C. and Kalantar-Zadeh, K. 2018. Dietary Approach to Recurrent or Chronic Hyperkalaemia in Patients with Decreased Kidney Function. *Nutrients,10*(3), 261. doi:10.3390/nu10030261

D'Alessandro, C., Piccoli, G. B. and Cupisti, A. (2015). The "phosphorus pyramid": A visual tool for dietary phosphate management in dialysis and CKD patients. *BMC Nephrology,16*(1). doi:10.1186/1471-2369-16-9

Fukuoka, K., Sato, Y., Sakurai, H., Kawashima, S., Kaname, S. and Arimura, Y. 2017. A Dialysis Patient With Hyperphosphatemia, Hyperkalemia, and Azotemia Without an Excessive Intake. *Kidney International Reports*, 2(4), 770-773. doi:10.1016/j.ekir.2017.02.006

Garagarza, C. A., Valente, A. T., Oliveira, T. S. and Caetano, C. G. 2015. Effect of personalized nutritional counseling in maintenance hemodialysis patients. *Hemodialysis International,19*(3), 412-418. doi:10.1111/hdi.12260

Ghavidel, F., Mohammadzadeh, S., Ravangard, R., and Bahadori, M. 2014. The effectsof an interventional program based on self-care model on health-related quality of life outcomes in hemodialysis patients. *Journal of Education and Health Promotion,3*(1), 110. doi:10.4103/2277-9531.145899

Ghimire, S., Castelino, R. L., Lioufas, N. M., Peterson, G. M. and Zaidi, S. T. 2015. Nonadherence to Medication Therapy in Haemodialysis Patients: A Systematic Review. *Plos One,10*(12). doi:10.1371/ journal. pone.0144119

González-Parra, E., Gracia-Iguacel, C., Egido, J. and Ortiz, A. 2013. Phosphorus and Nutrition in Chronic Kidney Disease. *Clinical Nutrition*, 141-153. doi:10. 1201/ b16308-11

Guida, B., Piccoli, A., Trio, R., Laccetti, R., Nastasi, A., Paglione, A., Memoli, A., Memoli, B. 2011. Dietary phosphate restriction in dialysis patients: A new approach for the treatment of hyperphosphataemia. *Nutrition, Metabolism and Cardiovascular Diseases,21*(11), 879-884. doi:10.1016/j.numecd.2010.02.021

Hutchison, A. J. 2009. Oral phosphate binders. *Kidney International, 75*(9), 906-914. doi:10.1038/ki.2009.60

Idier, L., Untas, A., Koleck, M., Chauveau, P. and Rascle, N. 2011. Assessment and effects of Therapeutic Patient Education for patients in hemodialysis: A systematic review. *International Journal of Nursing Studies,48*(12), 1570-1586. doi:10.1016/j.ijnurstu.2011.08.006

Jo, I., Kim, W., Park, H., Choi, H., Lee, J. and Lee, S. (2017). Effect of Personalized Nutritional Counseling on the Nutritional Status of Hemodialysis Patients. *Clinical Nutrition Research*, 6(4), p.285.

Kalantar-Zadeh, K. 2013. Patient education for phosphorus management in chronic kidney disease. *Patient Preference and Adherence,*379. doi:10.2147/ppa.s43486

Karamanidou, C., Clatworthy, J., Weinman, J. and Horne, R. 2008. A systematic review of the prevalence and determinants of nonadherence to phosphate binding medication in patients with end-stage renal disease. *BMC Nephrology,9*(1). doi:10.1186/1471-2369-9-2

Karavetian, M., Vries, N. D., Elzein, H., Rizk, R. and Bechwaty, F. 2015. Effect of behavioral stage-based nutrition education on management of osteodystrophy among hemodialysis patients, Lebanon. *Patient Education and Counseling,98*(9), 1116-1122. doi:10.1016/j.pec.2015.05.005

Lee, S. and Molassiotis, A. (2002). Dietary and fluid compliance in Chinese hemodialysis patients. *International Journal of Nursing Studies, 39*(7), 695-704. doi:10.1016/s0020-7489(02)00007-x

Leung, S., Mccormick, B., Wagner, J., Biyani, M., Lavoie, S., Imtiaz, R. and Zimmerman, D. 2015. Meal phosphate variability does not support fixed dose phosphate binder schedules for patients treated with peritoneal dialysis: A prospective cohort study. *BMC Nephrology*,16(1). doi:10.1186/s12882-015-0205-3

Lim, E., Hyun, S., Lee, J. M., Kim, S., Lee, M., Lee, S., Oh, Y., Park, I., Shin, G., Kim, H., Morisky, D.E., Jeong, J. C. 2018. Effects of education on low-phosphate diet and phosphate binder intake to control serum phosphate among maintenance hemodialysis patients: A randomized controlled trial. *Kidney Research and Clinical Practice,37*(1), 69-76. doi:10.23876/j.krcp.2018.37.1.69

Lopez-Vargas, P. A., Tong, A., Howell, M. and Craig, J. C. 2016. Educational Interventions for Patients With CKD: A Systematic Review. *American Journal of Kidney Diseases,68*(3), 353-370. doi:10.1053/j.ajkd.2016.01.022

Milazi, M., Bonner, A. and Douglas, C. 2017. Effectiveness of educational or behavioral interventions on adherence to phosphate control in adults receiving hemodialysis. *JBI Database of Systematic Reviews and Implementation Reports,15*(4), 971-1010. doi:10.11124/jbisrir-2017-003360

NKF KDOQI GUIDELINES. (n.d.). Retrieved from http://kidneyfoundation.cachefly.net/professionals/KDOQI/guidelines_bone/guide3.htm

Phosphorus and Your CKD Diet. (2018, November 02). Retrieved from https:// www. kidney. org/atoz/content/ phosphorus

Reddy, V., Symes, F., Sethi, N., Scally, A. J., Scott, J., Mumtaz, R. and Stoves, J. 2009. Dietitian-Led Education Program to Improve Phosphate Control in a Single-Center Hemodialysis Population. *Journal of Renal Nutrition,19*(4), 314-320. doi:10.1053/j.jrn.2008.11.001

Repeated education improves diet compliance in maintenance (n.d.). Retrieved fromhttp://international scholarsjournals.org/download.php?id=285962908376662888.pdf and type=application/pdf and op=1

Shi, Y., Zhao, Y., Liu, J., Hou, Y. and Zhao, Y. 2014. Educational Intervention for Metabolic Bone Disease in Patients With Chronic Kidney Disease: Systematic Review and Meta-Analysis. *Journal of Renal Nutrition,24*(6), 371-384. doi:10.1053/j.jrn.2014.06.007

Stevenson, J., Meade, A., Randall, A., Manley, K., Notaras, S., Heaney, S., Chan, M., Smyth, A., Josland, E., Brennan, F.B., Brown, M. A. 2017. Nutrition in Renal Supportive Care: Patient-driven and flexible. *Nephrology, 22*(10), 739-747. doi:10.1111/nep.13090

Tsai, W., Yang, J., Luan, C., Wang, Y., Lai, Y., Liu, L. and Peng, Y. 2015. Additionalbenefit of dietitian involvement in dialysis staffs-led diet education on uncontrolled hyperphosphatemia in hemodialysis patients. *Clinical and Experimental Nephrology,20*(5), 815-821. doi:10.1007/s10157-015-1212-1

Umeukeje, E. M., Mixon, A. S. and Cavanaugh, K. L. 2018. Phosphate-control adherence in hemodialysis patients: Current perspectives. *Patient Preference and Adherence, Volume 12*, 1175-1191. doi:10.2147/ppa.s145648

Vrdoljak, I., Krbavčić, I. P., Bituh, M., Leko, N., Pavlović, D. and Margeta, T. V. 2016. The impact of education and cooking methods on serum phosphate levels in patients on hemodialysis: a 1 year study. *Hemodialysis International,21*(2), 256-264. doi:10.1111/hdi.12468

Wang, S., Anum, E. A., Ramakrishnan, K., Alfieri, T., Braunhofer, P. and Newsome, B. 2014. Reasons for Phosphate Binder Discontinuation Vary by Binder Type. *Journal of Renal Nutrition,24*(2), 105-109. doi:10.1053/ j.jrn.2013.11.004

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