RESEARCH

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Fluid and dietary restriction's efficacy on chronic kidney disease patients in hemodialysis

Eficácia das restrições hídrica e dietética em pacientes renais crônicos em hemodiálise

Eficacia de las restricciones de agua y de la dieta en pacientes renales crónicos en hemodiálisis

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ABSTRACT

Objective: to identify self-care measures to manage fluid and dietary restrictions and assess their effectiveness. **Method:** descriptive-correlational study and cluster analysis with 254 chronic renal failure patients on regular hemodialysis program, handled by hemodiafiltration. We evaluated the effectiveness of self-care by interdialytic weight gain (IWG) and by potassium and phosphorus serum pre-dialysis serum levels. **Results:** several self-care measures were significantly correlated with a lower IWG and a lower level of pre-dialysis phosphorus. Patients most often use measures to reduce salt consumption than measures to restrict potassium and dietary phosphorus. The spouse provides important support dietary management. Subjects who use more often the self-care measures are mostly female, are older, less IWG and have a higher Kt/V. **Conclusion:** these results can contribute to the nursing educational support.
Key words: Renal Insufficiency, Chronic; Self Care; Haemodialysis.

RESUMO

Objetivo: identificar as medidas de autocuidado usadas na restrição hídrica e dietética e para avaliar a eficácia do autocuidado. **Método:** estudo descritivo-correlacional e análise de clusters com 254 pacientes renais crônicos tratados por hemodiafiltração. A eficácia do autocuidado foi avaliada pelo ganho de peso interdialítico (GPI) e pelos níveis de potássio e de fósforo pré-diálise. **Resultados:** várias medidas de autocuidado estavam significativamente correlacionadas com o menor GPI e um nível baixo de fósforo. Os sujeitos usam mais vezes as medidas para reduzir o consumo de sal do que as medidas para restringir o potássio e o fósforo da dieta. O cônjuge presta importante apoio na gestão da dieta. Os sujeitos que usam mais vezes as medidas de autocuidado são maioritariamente do sexo feminino, têm mais idade, menor GPI e maior Kt/V. **Conclusão:** estes resultados podem contribuir para o aconselhamento de enfermagem.
Descritores: Doença Renal Crônica; Autocuidado; Hemodiálise.

RESUMEN

Objetivo: identificar medidas de autocuidado utilizados para gestionar restricciones de líquidos y dietéticas y evaluar la eficacia del autocuidado. **Método**: estudio descriptivo-correlacional e análisis de clustrers, con 254 pacientes con insuficiencia renal crónica tratados en hemodiafiltración. Se evaluó la efectividad del autocuidado por la ganancia de peso interdiálisis (GPI) y niveles séricos de potasio y fósforo pre diálisis. **Resultados:** varias medidas de autocuidado se correlacionaron significativamente con la menor GPI y el menor nivel de fósforo pre diálisis. Los pacientes utilizan más veces medidas para reducir la sal, que medidas para reducir el potasio y el fósforo en la dieta. Se evidencia la importancia del cónyuge en la gestión de la dieta. Los sujetos que utilizan con más frecuencia las medidas de autocuidado son en su mayoría mujeres, más viejos, tienen menor GPI y mayor Kt/V. **Conclusión:** estos resultados pueden contribuir a un mejor asesoramiento de enfermería.
Palabras clave: Insuficiencia Renal Crónica; Autocuidado; Hemodiálisis.

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INTRODUCTION

Chronic Kidney Disease (CKD) is a public health problem due to continuous increase of patients, the complexity of the treatment and its high costs. In the last stage of CKD evolution it is necessary a renal replacement treatment (RRT). Hemodialysis (HD) remains the most common RRT modality, but it is very expensive[1]. Portugal has an high prevalence of patients on RRT. Between 2007 and 2014 there was an increase of 25.6% in the number of people with CKD on HD regular program[2]. CKD patients on regular HD program face a complex treatment regimen and many of them have difficulty to manage fluid and diet restrictions, which is associated with high risk of mortality and the increase of health care budgets. Nephrology nurses help patients with CKD to manage their treatment, advising them about self-care measures related to changes in their health. To understand how patients deal with treatment and what are the most effective self-care measures to manage fluid and diet restrictions in renal patients under HD, can contribute to a better nursing advice. Literature suggests many actions to manage fluid and dietary restrictions, but its therapeutic value remains unknown. This study aims to identify: the self-care measures used by CKD patients under HD to manage fluid and dietary restrictions imposed by treatment regimen; and analyze the effectiveness of those self-care measures to manage these constraints determined by the treatment.

Conceptual framework

CKD is characterized by a glomerular filtration rate (GFR) decreasing eventually with renal parenchyma lesions, for more than three months[1]. CKD progression can be assessed by GFR, and when the GFR is less than 15 ml/min./1.73m^2 renal impairment is severe and requires RRT[3]. In Portugal, most part (60.69%) of renal patients under RRS follows a regular HD program[2]. The prevalence of patients on HD with more than 65 years is high (3162.6 pmp) and represents 57,6% of HD patients[2]. The most part (89.6%) of HD patients is treated in peripheral units and 61,3% is treated with hemodiafiltration (HDF)[2], This purifying method has an high dialysis efficiency, more than the minimum recommended of a Kt/V of 1.2[4]. The treatment regimen of CKD patients under HD includes fluid and diet restrictions, which are the main difficulties reported by patients[5-6]. Usually the patient can drink 500 ml of fluids plus the diuresis volume, meaning that anuric patients have more difficulty to manage their thirst. Poor management of fluid restriction can cause high interdialytic weight gain (IWG), resulting in increased cardiovascular mortality and morbidity[7]. IWG is used to evaluate how patient manages its fluids intake, which is calculated in kilograms or as a percentage of the patient dry weight[5,8]. Dietary restrictions prevents hyperkalemia, hyperphosphataemia and protein energy malnutrition[5]. Hiperkalémia can cause severe arrhythmia and cardiac arrest, so it is important to moderate eating foods with high level potassium[8]. Phosphorus dietary restriction prevents hyperparathyroidism and ectopic calcification[7].

Adults have the potential to ensure their own health and for those who depend on you, taking responsibility to care for the health and well-being and to ensure a normal development[9]. Self-care is defined as an deliberated action undertaken by the individual to maintain life, health and welfare[10]. The self-care behavior is influenced by cultural practices, scientific knowledge about health, the person's roles and by the patient's decision to participate or not in self-care actions[10]. The nursing support implies meet the health needs of the person who can't, doesn´t know, can't or do not want to carry out self-care requirements. In this sense, Orem[9-10] proposes three nursing systems: wholly compensatory system, partially compensatory and support-education system. The support-education system is suitable to help patients who need guidance or instruction[10] to adapt to the demands of treatment.

Self-care measures about fluid restriction are focused on two dimensions: reduce salt intake and control fluid intake[11-13]. Dietary restriction focuses mainly on reduction of rich-food potassium and phosphorus[7,14-15]. Self-care efficacy can be measured by the IWG and by serum potassium levels and pre-dialysis phosphorus. The nutritional status may influence IWG and not clearly reflect the fluid overload. As phosphorus is very common in diet, low serum phosphorus levels can lead to malnutrition. So it is important assess nutritional status, for example through serum albumin[16].

METHOD

We developed a descriptive and correlational study to describe the relationships between variables and cluster analysis in order to identify homogeneous groups that help to evaluate the dimensionality of the data matrix[16]. We studied patients with CKD undergoing regular hemodialysis program treated on four hemodialysis centers of Lisbon region. We have chosen centers from the same company to ensure uniformity of the data's treatment processes. Inclusion criteria were: over 18 years; be more than a year in HD; having hemodiafiltration's modality; communicate in Portuguese; accept and cooperate voluntarily in the study. We excluded patients with a history of mental illness, not oriented or debilitated, and admissions for less than three months. T The convenience sample included 254 subjects from four HD centers of Lisbon region, corresponding to 84.7% of the study population.

Based on the literature review we built a questionnaire with three parts. The first part characterized the sample. The second part included laboratory data from clinical process. The third section had 77 questions: 46 on self-care measures to manage fluid restriction (31 on actions to control fluid intake and 15 on salt reduction) and 31 measures to manage the dietary restrictions (15 of potassium restriction, 10 over phosphorus restriction 6 and general measures to manage the diet). The frequency of self-care measures was assessed using a 5 points Likert scale, with scores from 1 (almost never / 0 days per week) to 5 (almost always / 7 days a week). We consider an IWG between 3% and 5% of the dry weight as self-care efficacy criterion to the fluid restriction[15]. Self-care efficacy regarding diet restrictions was evaluated using the pre-dialysis potassium levels between 3.5 and 6.5 mEq/L[5,7] and pre-dialysis phosphorous between 5 to 7 mg/dl[7].

We obtained the favorable opinion of the Ethics Committee and the National Data Protection Commission. Subjects were informed about the survey and about their rights, and signed an

informed consent. The interviews took place between April and July 2014, with an average duration of 35 minutes. Clinical and laboratory data were provided by the HD centers. Dialysis efficacy was determined by online monitor clearance - OCM F5008.

To identify groups of variables/individuals with common characteristics that help to understand self-care, we conducted a cluster analysis which is a multivariate analysis technique able to produce homogeneous groups of individuals or variables, regarding one or more common characteristics[16]. We selected the Two Step Cluster method due to its ability to create clusters combining qualitative and quantitative variables and the capacity to automatically generate the optimal number of clusters[16]. The model quality was deemed acceptable (fair), with a profile with two end clusters. The degree of cohesion and separation ensures the homogeneity between the elements of each group and heterogeneity between the elements of the both groupings.

RESULTS

The average age of the subjects was 65.19 years (± 13.6) and nearly 59% of the sample was 65 years old and over, which shows an aging population. Most (56.3%) patients were male. An important part (44.5%) lived only with their spouse, while another 11.0% included spouse in the household, and 19.3% were living alone. Most subjects who lived only with their spouse were men, while the majority of patients who lived alone were women.

Most (57.1%) of the subjects had up to 60 months of HD and 14.5% of patients were under HD for more than 120 months. The study showed that 41.4% of subjects were preparing their own meals, mostly women. In contrast, men were the large majority of those 35.0% of patients receiving spouse's help to prepare meals.

Only 25.6% of patients was diabetic, close to 27.8% of Portuguese renal patients under RRT in 2014[2]. Regarding diuresis 31.9% of the sample was anuric and 26% had a diuresis up to 250 ml.

During the last month of treatment, the IWG average was 1.94 kg (± 0.75) and only 8.5% of patients showed an IWG average greater than 3 kg. Most subjects (56.3 %) had a IWG up to 2 kg. The IWG average stood at 2.8% (± 1.12) of dry weight percentage, and 59.4% of the subjects presented a IWG up to 3% of dry weight; 30.3% had an IWG between 3 and 4%; 6.3% showed an IWG between 4% and 5%; and only 3.9% revealed an IWG above 5% of their dry weight. The pre-dialysis potassium level average during the last 3 months was 5.13 mEq/L (± 0.59), with 77.2% of subjects presenting potassium up to 5.5 mEq/L; 21.7% had a potassium between 5.5 and 6.5 mEq/L; and only 1.2% patients had a pre-dialysis potassium level above 6.5 mEq/L. The pre-dialysis serum phosphorus levels average during the last 3 months was 4.37 mg/dl (±1.10) and only 2.75% of the patients had values below 2.5 mg/dl, which usually meaning malnutrition. Most (78%) patients had levels of phosphorus between 3.5 and 7.0 mg/dl, and only a small percentage of 1.2% had phosphorus levels above 7.0 mg/dL. The pre-dialysis serum albumin average stood at 3.93 mg/dl (± 0.38) and 15% of subjects showed albumin level less than 3.5 mg/dl. The Kt/V average calculated through the OCM, was 1.99 (± 0.39). Most (57.1%) subjects showed values between 1.2 and 2; and 42.1% of subjects had a Kt/V greater than 2.

Table 1 present the mean scores of self-care measures to manage fluid restriction, organized in two dimensions. Measures to control fluid intake obtained a mean score of 2.55.

The most common self-care actions were: *avoid sun exposure* (4.72); *avoid eating spicy food* (4.65); *avoid foods with plenty of water* (4.64); *avoid candy* (4.09); *and avoid to exceed the amount of liquid daily allowed* (4.03). Among the 15 least frequent measures we found: *estimate the amount of fluid you can drink daily* (1.62); *control the liquid amount by symptoms* (1.40); *sucking ice cubes* (1.38); *rinse the mouth with warm water* (1.26); *chewing gum* (1.23); *drinking warm water* (1.23); *adjust the amount of liquid at diuresis* (1.19); and *to record the amount of liquid drunk during the day* (1.07).

Self-care measures to reduce salt consumption had a 4.20 mean score. The 12 most common measures included: avoid the instant food (4.97), avoid Asian food (4.94), avoid salt at table (4.81), reduce salt when cooking (4.68) avoid the sausage/smoked food (4.60) and avoid salty food (4;54). The less common measure was checking the amount of salt on product labels.

Table 2 shows the self-care measures to reduce potassium and phosphorus on diet. Mean score of actions to restrict potassium was 3.75 and the most common measures were: avoid eating dried fruits (4.96); avoid cooking vegetables or potatoes using microwave or pressure cooker (4.92); cooking potatoes after cutting in small pieces (4.74); avoid pulses (4.58); avoid food with high content potassium (4.46); avoid eating more than two pieces of fruit per day (4.43); and peel the potatoes before baking (4.40). The less often self-care measure was eating baked fruit (1.57).

The mean score for measures to restrict dietary phosphorus was 3.93. The results show that the most common measures were: *avoid eating viscera* (4.90); *oilseeds* (4.88); *whole grain products* (4.83); *milk flour* (4.81); *grains* (4.70); *and chocolate/cocoa* (4.70). Less frequent measures were: *reduce consumption* of *milk products* (2.80), *reduced milk* (2.63) *and bread* (1.30).

The six general measures to manage the diet (mean score of 2.50) were: *accept restrictions* (3.70); *follow the recommended diet* (3.30); *fractionate meals* (2.50); *eat everything, but in small quantities* (2.38); *eating potassium-rich foods immediately before dialysis* (1.58); and *seek information on the diet* (1.57).

Correlation analysis showed that age was negatively correlated with IWG in Kg ($r = -0.216$; $p < 0.01$), with pre-dialysis serum phosphorus ($r = -0.225$; $p < 0.01$) and with pre-dialysis serum albumin ($r = -0.397$; $p < 0.01$). Age was significantly and positively correlated with the Kt/V ($r = 0.227$; $p < 0.01$). IWG as percentage of dry weight was positively correlated with the pre-dialysis potassium ($r = 0.170$; $p < 0.01$) and negatively correlated with the pre-dialysis sodium ($r = -0.321$; $p < 0.05$) and Kt/V ($r = -0.142$; $p < 0.05$). Pre-dialysis serum potassium level appeared positively correlated with pre-dialysis serum phosphorus ($r = 0.237$; $p < 0.01$). Pre-dialysis serum phosphorus was negatively correlated with the Kt/V ($r = -0.177$; $p < 0.01$) and pre-dialysis sodium levels showed a negative correlation ($r = -0.362$; $p < 0.01$) with albumin pre-dialysis serum.

From correlational analysis between self-care measures and the HD efficacy indicators we highlight some significant results

Table 1 - Mean scores of self-care measures to manage water restriction

	Self-Care Measures	Mean Score (2.55)
Measures to control fluid intake	1. Avoid sun exposure	4.72
	2. Avoid eating spicy food	4.65
	3. Avoid foods with plenty of water	4.64
	4. Avoid candy	4.09
	5. Avoid to exceed the amount of liquid daily allowed	4.03
	6. Avoid drinking alcohol	4.00
	7. Eat thick soup	3.93
	8. Control blood glucose	3.66
	9. Reduce soup consumption	3.64
	10. Drink little at a time/small sips	3.48
	11. Drinking only half a glass or cup half	3.01
	12. Drink cold liquids	2.87
	13. Drink only at meals	2.82
	14. Distributing the allowed volume of fluids day along	2.74
	15. Use small glass or cup to drink	2.36
	16. Gargle with water without swallowing	2.35
	17. Fill a bottle with the allowed liquid volume for the whole day	2.00
	18. Drink just to take the tablets	1.98
	19. Control the weight at home	1.89
	20. Keeping busy not to think about drinking	1.84
	21. Estimate the amount of fluid you can drink daily	1.62
	22. Sucking hard candy	1.42
	23. Eat a piece of fruit to reduce thirst	1.42
	24. Control the fluid amount by symptoms	1.40
	25. Sucking ice cubes	1.38
	26. Sucking lemon slice	1.28
	27. Rinse the mouth with warm water	1.26
	28. Chewing gum	1.23
	29. Drinking warm water	1.23
	30. Adjust the amount of liquid according diuresis	1.19
	31. Record the amount of daily fluid intake	1.07
	Self-Care Measures	**Mean Score (4.20)**
Measures to reduce salt consumption	1. Avoid instant food	4.97
	2. Avoid soy sauce	4.96
	3. Avoid Asian food	4.94
	4. Avoid ketchup	4.92
	5. Avoid fast food	4.91
	6. Avoid pre-prepared sauces	4.85
	7. Avoid salt at the table	4.81
	8. Reduce salt when cooking	4.68
	9. Avoid sausage/smoked food	4.60
	10. Avoid salty products	4.54
	11. Avoid canned fish or meat	4.45
	12. Avoid using meat or fish broth to cook	4.39
	13. Use unsalted butter or margarine	2.56
	14. Use herbs when cooking	2.29
	15. Check the amount of salt on product labels	1.20

Table 2 - Mean scores for self-care measures to reduce potassium and phosphorus on diet

	Self-Care Measures	Mean Score (3.75)
Measures to reduce dietary potassium	1. Avoid dried fruits	4.96
	2. Avoid cooking vegetables or potatoes using microwave or pressure cooker	4.92
	3. Cooking potatoes after cutting in small pieces	4.74
	4. Avoid pulses(legume)	4.58
	5. Avoid food with high content potassium	4.46
	6. Avoid eating more than two pieces of fruit per day	4.43
	7. Peel the potatoes before baking	4.40
	8. Reduce the consumption of raw vegetables	3.74
	9. Reduce the consumption of pulse (legume)	3.71
	10. Eat raw fruit shelled	3.63
	11. Avoid eating more than one piece of raw fruit per day	3.59
	12. Eat rice or pasta	3.27
	13. Soaking potatoes and vegetables before cooking	2.26
	14. Cook vegetables and potatoes twice	2.04
	15. Eating baked fruit	1.57
	Self-Care Measures	**Mean Score (3.93)**
Measures to reduce dietary phosphorus	1. Avoid eating viscera	4.90
	2. Avoid oilseeds	4.88
	3. Avoid wholegrain products	4.83
	4. Avoid milk flour	4.81
	5. Avoid cereals/grains	4.70
	6. Avoid chocolate/cocoa	4.70
	7. Eat small amounts of meat or fish with meals	3.77
	8. Reducing the consumption of milk products	2.80
	9. Reducing the milk consumption	2.63
	10. Reducing the consumption of bread and toasts	1.30

Table 3 - Correlations between self-care measures and effectiveness indicators

Spearman (rho)	IWG in Kg	IWG % Dry Weight	Pre-dialysis Phosphorus
Avoid eating spicy food	-0.229**	-0.141*	-
Eat thick soup	-	0.173*	-
Drink cold liquids	0.191**	0.127*	-
Drink just to take the tablets	-0.167**	-0.152*	-
Control the fluid amount by symptoms	0.135*	-	-
Avoid sun exposure	-0.153*	-	-
Avoid to exceed the amount of liquid daily allowed	-0.294**	-0.244**	-
Avoid drinking alcohol	-0.132*	-	-
Avoid salt at the table	-0.138**	-	-
Check the amount of salt on product labels	-0.141*	0.145*	-
Avoid chocolate/cocoa	-	-	-0.190**
Eat small amounts of meat or fish with meals	-	-	-0.156*
Follow the recommended diet	-0.244**	-0.171**	-0.153*
Seek information on the diet	-0.131*	-	-
Accept restrictions	-0.282**	-0.187**	-0.125*
Eating potassium-rich foods immediately before dialysis	-	-	0.129*

*Notes: ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed)*

(Table 3). To control fluid intake we noticed that a*void spicy meals* was negatively correlated with IWG in kg and as a percentage of dry weight; *eat thick soup* was positively correlated only with IWG as a percentage of dry weight; *drinking cold drinks* was positively correlated with IWG in kg and as a percentage of dry weight; *Control the fluid amount by symptoms* had positive correlation with the IWG in Kg, and *avoid sun exposure* and *avoid drinking alcohol* had a negative correlation with IWG in Kg.

Among the measures to reduce salt, we noticed that *avoid salt at table* was negatively correlated with IWG in kg; *check the amount of salt on product labels* had a negative correlation with the IWG. We found no significant correlations between measures to restrict dietary potassium and the efficacy indicators.

Regarding to dietary phosphorus restriction, *avoid chocolate and cocoa* and *eat small amounts of meat or fish with meals*, were negatively correlated with the pre-dialysis serum phosphorus. Among the general measures to manage the diet, we noted that *following the recommended diet* and *accepting restrictions* were both negatively correlated with IWG and pre-dialysis phosphorus. And *seek information about the diet* appeared negatively correlated with IWG in Kg. However, *eating foods rich in potassium immediately before dialysis* was significantly and positively correlated with the pre-dialysis blood phosphorus level.

Figure 1 shows the cluster analysis with sample characterization variables which generated two groups: group 1 (autonomy in preparing meals) with 164 subjects and the group 2 (spousal support in preparing meals) with 90 subjects.

The variable *who prepares meals* was the most important predictor (1.0) in this model, followed by *household* (0.47) and *gender* (0.46). Grouping 1 included mainly those patients who prepared their own meals, who lived with other relatives, women, younger patients, anuric and with greater Kt/V. Grouping 2 included mainly male patients, living with spouse, receiving spouse support for meals, older patients, with lower Kt/V, and with a diuresis between 500 and 1000 ml. Patients from grouping 1 performed more times the following measures, than the patients from grouping 2: *suck ice cubes* (U = -2.741;p = 0.006); *estimate the amount of fluid you can drink daily* (U = -2.408; p = 0.016); *control the fluid amount by symptoms* (U = -2.369; p = 0.018); and *avoid drinking alcohol* (U = -4.216; p < 0.001).

Cluster analysis with self-care measures also generated two groups: grouping 1 (the most common use of self-care measures) with 168 subjects and the grouping 2 (less frequent use of self-care measures) with 86 subjects. In this model, measures to reduce the salt have got great predictive value (1.0) followed by measures to restrict potassium (0.94) and by general measures (0.73). Figure 2 shows that patients from grouping 1 used most often all types of self-care measures than patients from grouping 2, although the difference was been more evident in the measures to reduce salt.

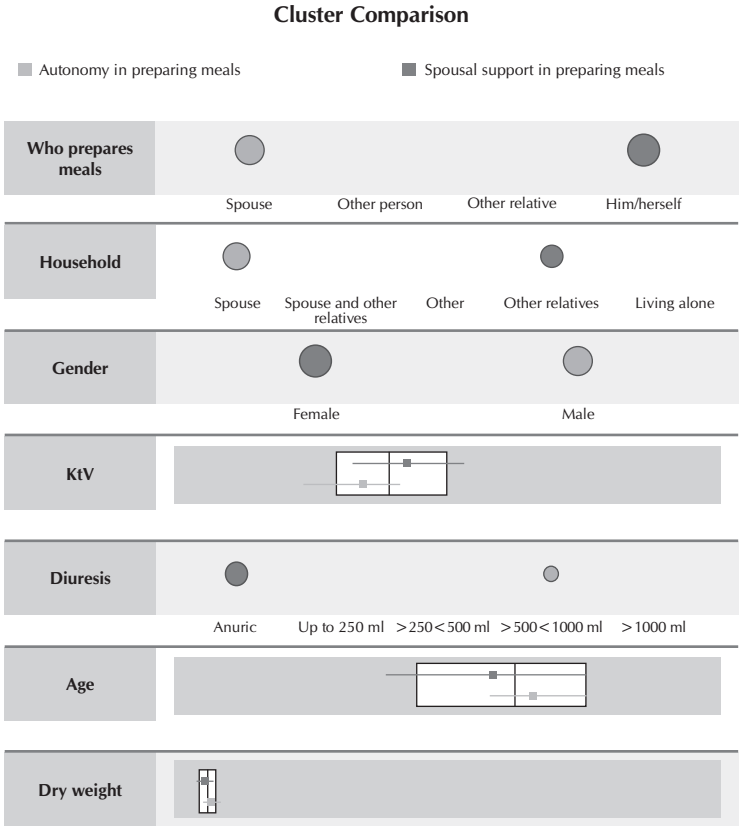

Figure 1 - Cluster comparison with the sample descriptive variables

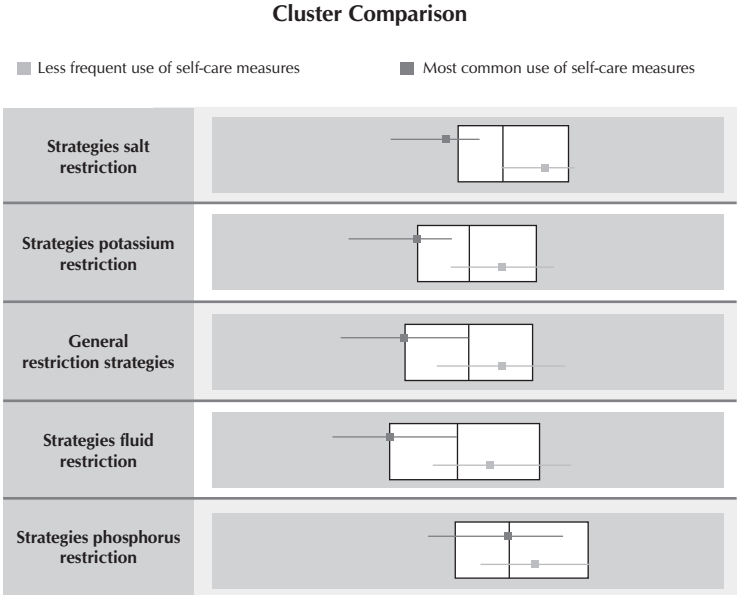

Figure 2 - Cluster comparison with self-care measures

We noticed that the patients from grouping 1 were older (U = -3,648;p < 0,001), had lower IWG in Kg (U = -4,5978;p < 0,001), had lower serum albumin (U = -2,989;p = 0,003), and greater Kt/V (U = -4,182;p < .0,001) than patients from grouping 2.

DISCUSSION

Data about preparing meals and from cluster analysis show the relevance of family and female spouse in dietary management. Most (57.9%) patients had a diuresis up to 250 ml, meaning they were facing difficult conditions to manage fluids.

According our criteria, just 3.9% of the sample was ineffective to manage fluid restriction, but it would increase to 10.2% with the 4% threshold suggested by the EDTNA/ERCA[15]. Considering pre-dialysis potassium levels, results suggest that most of the subjects (98.8%) manages effectively dietary potassium restrictions, since they didn´t exceed 6.5 mEq/L[5,7]. However, dialysis efficacy (Kt/V) and an effective glucose blood control on insulin-dependent patients, may contribute to these results. Results also show an effective phosphorus management, because only 4.0% of patients didn't comply with the performance criteria of this study. Those 15% of patients with pre-dialysis albumin bellow 3.5 mg/dl can mean nutritional deficit or with high protein catabolism[5,7,15]. Kt/V calculated by OCM show high dialysis efficacy, which can be explained by HDF treatment.

Table 1 show that the measures most commonly used to control fluid intake are restrictive, revealing a strong adaptive effort of patients. Some diabetic patients did not evaluate blood glucose on dialysis days, relying on assessment carried out by the hemodialysis staff. Patients seem to be aware of the importance of avoiding spicy foods and candy, conditions that cause thirst. They also seem to respect the need to not exceed the daily amount of fluids allowed, to avoid alcohol and to reduce soup consumption. Weight control, estimate the amount of fluid daily intake and adjust the fluid intake according to diuresis, they were less used measures, perhaps because they are complex and impractical actions. Sucking ice cubes temporarily relieves thirst, but may increase the water intake if used very often.

Restrictive measures prevail among actions to reduce salt, stressing the limitations imposed by disease and by treatment. It is possible that patients are avoiding Asian food and fast food due to nutritional habits of Portuguese elderly people. High scores regarding avoid salt at table and when cooking, and avoiding smoked and salty food, suggest that patients are aware and make some effort to prevent thirst. Patients may also rarely check the salt content on labels due to visual problems, due to poor food diversification, or because labels do not always provide clear information. These results suggest that subjects perceive the importance of salt restriction to reduce thirst[11-13,17].

In order to reduce potassium from diet, patients can avoid dried fruits so often because they are mainly consumed during festive seasons. Patients show their commitment to restrict potassium in the diet when implementing so often those restrictive measures. However, it seems they follow less often recommendations as soaking potatoes and vegetables before cooking, bake them twice or eat cooked fruit. It is possible that those are impractical measures. Patients also can eat more bread and milk, because they are common and inexpensive food, and being well tolerated by people with difficulty in chewing. Eat less meat or fish meal may be due to the weak economic power of elderly people. Oilseeds consumption also can be less common because it is mainly consumed in festive seasons.

Testing different variables, we noted that the anuric patients and those with diuresis up to 250 ml were older than patients with urine output higher than 1000ml (H = 18.020; df = 4; p = 0.001). Treatment time of anuric patients was higher than patients with other diuresis values (M = 72.671; df = 4; p < 0.001). These results show that diuresis tends to decrease with increasing age and length of treatment. There was more men among patients who lived with a spouse, while there was more women among those patients living alone or with other relatives ($\chi^2 = 32.597$; df = 4; p < 0.001). Women were more common among those patients who preparing their own meals, while men were most subjects who got meals prepared by the spouse ($\chi^2 = 88.535$; df = 3; p < 0.001).

According our correlational study, older patients appear to have lower IWG and a higher Kt/V, this means older patients seem to have a better fluid restriction management and have a better dialysis efficacy. However, older patients tend to have lower levels of albumin and phosphorus pre-dialysis, which may mean a worse nutritional status, since 20.8% of the subjects had levels of phosphorus below 3.5 mg/dl and 15% had a serum albumin less than 3.5 g/dl. Correlation between IWG and pre-dialysis potassium suggests that patients with higher IWG also fail to manage potassium restrictions, reducing dialysis efficacy. The negative correlation between IWG and sodium pre-dialysis level may be due to sodium dilution during fluid retention.

The positive correlation between pre-dialysis potassium and phosphorous suggests that patients with difficulty in managing potassium restrictions also have difficulty to manage phosphorus, needing nursing support. The negative correlation between pre-dialysis phosphorous and Kt/V indicates that patients with high level of serum phosphorous have a less effective dialysis. The negative correlation between pre-dialysis sodium and albumin indicates that patients who ingest more protein (more milk, meat or fish) can retain more liquid and causing sodium hemodilution.

The correlational study between self-care measures and efficacy indicators show that avoid spicy food helps to reduce thirst. Eat thick soup was positively correlated with IWG. We notice that some patients are thickening the soup joining bread instead removing liquid, revealing self-care deficit and need for nursing support[10]. It is also possible that patients who drink cold beverages so often end up gaining more weight. Control the fluid intake by symptoms seems to have no therapeutic value. On contrary, avoid sun exposure, avoid alcohol and check the amount of salt on product labels, seems have therapeutic value to fluid controlling. In the same way, the more one avoids salt, the lower the IWG, which is consistent with Tomson's study[13].

This study suggests that avoid chocolate, eat small portions of meat or fish, Follow the recommended diet, and accept restrictions, these are efficient measures to reduce phosphorous

from diet. On contrary, eat potassium-rich foods immediately before dialysis reveals no therapeutic value[10].

Cluster analysis (Figure 1) reinforces the importance of spousal support to manage fluid and diet restrictions, justifying their inclusion in plan care. Cluster analysis including self-care measures (Figure 2) suggests that older patients have a good fluids management and have an effective dialysis. However, older patients seem to have worse pre-dialysis albumin levels, needing evaluation of nutritional status.

CONCLUSIONS

This study with 254 CKD patients undergoing regular HD program, under hemodiafiltration in four outlying clinics in Lisbon, aimed to identify the self-care measures commonly used by patients to control fluid and dietary restrictions, and to evaluate the efficacy of these measures. Limitations of this study include the exclusion of patients treated at central hospitals (generally more unstable and under conventional HD), geographical limitations of the sample and the lack of consensus on criteria to assess the self-care efficacy.

Results show that patients use more often measures to reduce the salt than other measures to manage fluid and diet restrictions. The most common measures to manage weight gain, included avoid spicy food and not exceed the volume of liquids allowed per day. To reduce salt, most patients avoided the can food and products, Asian food, salt at the table and reduced salt when cooking. The most commonly used measures to reduce dietary potassium include baked potatoes cut into pieces, avoid rich potassium food, eat no more than 2 pieces of fruit per day and peel the potatoes before cooking. To reduce dietary phosphorus, patients avoid especially eating viscera, milk flour, cereals and chocolate, but they also prefer eat small amounts of meat and fish. The correlation study showed that measures like avoid spicy food, The correlation study showed that measures like avoid spicy food, not exceed the amount of fluid allowed per day, avoid alcohol and salt at the table, follow the recommended diet and accept the constraints of the treatment, were significantly correlated with a lower IWG, showing their therapeutic value. On the contrary, measures like drinking cold liquids and control water restriction by the symptoms were correlated with a higher IWG. Regarding diet, measures such avoid chocolate and cocoa, follow the recommended diet, accept dietary restrictions and eat small amounts of meat or fish with meals, were significantly correlated with pre-dialysis phosphorus low levels. These self-care measures appear to be effective in the management of food restrictions and should be valued in nursing advice. The vast majority of the patients seemed effectively manage the fluid and dietary restrictions imposed by the treatment, but it is possible that self-care efficacy also depends of hemodiafiltration effectiveness.

Cluster analysis highlighted the importance of the female spouse in supporting the diet restrictions, mainly food preparation, reinforcing the need to include these topics in education programs and in the care process. We also noticed that the patients who used more often self-care measures were older patients, with less IWG and with more dialytic efficacy (Kt/V). These results need to be confirmed by further studies and it seems relevant to assess the impact of hemodiafiltration over self-care efficacy.

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