CPE The Frustrating Attempt to Limit the Interdialytic Weight Gain in Patients on Chronic Hemodialysis: New Insights Into an Old Problem

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A significant percentage of patients on chronic hemodialysis have an interdialytic weight gain (IDWG) above the recommended values. High IDWG has detrimental effects on survival, cardiovascular outcomes, and quality of life. High IDWG is secondary to poor adherence to fluid restriction and to excessive intake of fluids, due to thirst and xerostomia. Various strategies have been proposed to limit IDWG such as the reduction of dietary salt intake, behavioral interventions aimed at improving the adherence to fluid restriction, the improvement of xerostomia, and the use of lower dialysate sodium concentration. The present narrative review aims to evaluate the efficacy of each of such strategies.

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Introduction

INTERDIALYTIC WEIGHT GAIN (IDWG) should be lower than 4.0%-4.5% of dry weight.[1] Unfortunately, many patients have an IDWG greater than this value, and some have IDWG of 10%-20%.[2] High IDWG is associated with higher risk of all-cause and cardiovascular death and increased morbidity, such as ventricular hypertrophy and major adverse cardiac and cerebrovascular events.[3-9] In addition, it leads to supplementary weekly dialysis sessions with consequent deterioration of quality of life and increased costs.

High IDWG is secondary to an excessive intake of fluids and/or of foods, the former being more important. It has been estimated that 30%-60% of hemodialysis patients do not adhere to a fluid intake regimen.[10-17] Numerous barriers, psychological (low motivation) or social (insufficient support from family, friends, providers, and peers), lack of knowledge (lack of understanding of what they were taught), and lack of self-assessment (being unable to judge overall fluid status, fluid intake, or salt intake) have been shown to be related to failed adherence to fluid restriction.[14-17] However, the main causes of poor adherence to fluid restriction and of excessive intake of fluids are thirst and xerostomia defined as the subjective feeling of a dry mouth.[18]

The physiological basis of thirst is complex in healthy individuals as well in patients with acute and chronic diseases.[19,20] Schematically, thirst in patients on chronic hemodialysis is primarily osmometric[21]; following salt intake with the diet, osmolarity is increased in the extracellular fluid, and shrinking of the osmoreceptor cells in the hypothalamus follows, as well the urge to drink. Volumetric thirst, that is secondary to the loss of water and salt and is triggered when cardiac barorecptors sense low cardiac return volume, may occur at the end of the hemodialytic session and in the hours immediately following.[21]

Xerostomia is highly prevalent in patients on chronic hemodialysis (28.2%-66.7%) and various mechanisms contribute to its development. The salivary flow is significantly decreased in patients receiving hemodialysis and such reduction is mainly the result of atrophy and fibrosis of the salivary glands, frequently observed in such patients.[22] The restriction of fluid intake followed by patients on hemodialysis also contributes to the lower salivary flow.[22] In addition, hyposalivation and xerostomia may be the consequence of the use of medications such as antidepressants (tricyclic agents, serotonin agonists, norepinephrine reuptake inhibitors, serotonin reuptake inhibitors), antipsychotics (promazine, triflupromazine, mesoridazine, thioridazine, clozapine, olanzapine), antihistamines (azatadine, brompheniramine, chlorpheniramine, dexchlorpheniramine, dydroxyzine, phenindamine), antihypertensive agents (clonidine, methyldopa, β-blockers, angiotensin-converting-enzyme inhibitors), antimigraine agents (rizatriptan), aspirin (daily use), bronchodilators (salbutamol, salmeterol), benzodiazepines, hypnotics, opioids

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(clonazepam, lorazepam, tramadol, morphine), decongestants (ephedrine), and proton pump inhibitors (omeprazole).[22]

The present narrative review aims to evaluate the efficacy of the strategies used to limit IDWG in the routine clinical practice and tested in clinical trials.

Methods

The following databases were searched for relevant studies up to October 2014: Medline, PubMed, Web of Science, and the Cochrane Library. The search terms and mesh headings included "hemodialysis" OR "dialysis" AND "weight gain" OR "interdialytic" OR "interdialytic weight gain" OR "thirst" OR "xerostomia" OR "dialysate" OR "sodium dialysate concentration" Reference lists of relevant studies and previous systematic reviews were manually searched for additional articles. Studies were eligible for inclusion if they were English language articles published in a peer-reviewed journal and met the following inclusion criteria: research studies in adult patients (over 18 years of age), affected by end-stage renal disease and in chronic hemodialysis. Four hundred seventy manuscripts were reviewed, and 81 were included in the review.

Strategies to Limit IDWG

The strategy used to limit IDWG is based on the reduction of thirst and the improvement of motivation and knowledge to increase adherence to fluid restriction. The interventions used to reduce thirst in chronic hemodialysis patients are the reduction of dietary salt intake, the improvement of xerostomia, and the use of lower dialysate sodium concentration.

Reduction of Dietary Salt Intake

As clearly stated by the National Kidney Foundation Kidney Disease Outcomes Quality Initiative guidelines,[1] "attempts at water restriction commonly are futile if sodium limitation is not observed simultaneously. Reducing a patient's water intake alone is not prudent most of the time because the increased ECF osmolality caused by the excessive salt ingestion stimulates thirst, followed by water consumption and hence isotonic fluid gain. Advising patients to limit their water intake without curtailing their salt intake will cause suffering from unnecessary thirst. Some of these patients may even feel guilty if they fail to resist the urge to drink in the face of marked thirst".[23,24]

Salt intake for hemodialysis patients should be restricted to no more than 5.0 g/day (2 g of sodium).[1] The average daily salt intake among dialysis patients has been reported to be significantly higher, ranging from 7.9 to 14.1 g/day.[25–28] Salt intake of hemodialysis patients varies according to the country, being higher especially where the diet is rich in processed foods.[29]

Nephrologists routinely recommend restriction of salt, but unfortunately, it is difficult to obtain in daily clinical practice. Adherence to a low-salt diet of hemodialysis patients is poor[30] as well as in patients with other chronic diseases such as heart failure, hypertension, and cirrhosis.[31–37] Many factors contribute to such poor adherence such as lack of knowledge, interference with socialization, and lack of food selections.[32,37] Patients with lower education level have poorer adherence compared with patients with higher education levels. The same occurs to patients with lower socioeconomic status with respect to those with higher one.[31–36] It must also be considered that hemodialysis patients are continuously instructed to follow a restricted diet because of potassium and phosphorus concerns, and such further restrictions may lead to a diet poorly acceptable in terms of palatability and pleasantness.

The counseling studies about reduction in dietary salt intake were included in this paragraph (and in Table 1) because they specifically refer to salt intake, whereas in the following paragraph (and in Table 2), we include studies on counseling for restricted fluid intake in general. Overall, 2 strategies have been used to reduce salt intake, the prescription of a diet with low salt content or nutritional counseling. Sevick et al. have shown that nutritional counseling and social cognitive theory-based behavioral counseling failed to reduce dietary salt intake at 16-week intake, and consequently IDWG was not reduced.[41] The randomized controlled study of Rodrigues Telini et al. has shown that 2 g of sodium restriction on patients' habitual diet did not reduce IDWG.[40] Two small studies in 1999 demonstrated that adherence to a low-salt diet was reliable and was associated with reduced IDWG.[38,54] Similarly, a 48-month nutritional counseling resulted in a significant decrease of salt and water intake (from 13.3 ± 2.7 to 11.8 ± 2.4 g/day and 2528 ± 455 to 2332 ± 410 mL/day, respectively) as well as of IDWG (from 6.0 ± 0.7 to 5.3 ± 0.9%).[42] In the cross-sectional study of Kayikcioglu et al., which enrolled and compared patients from 2 dialysis centers, one practicing antihypertensive salt restriction–based strategy and one practicing antihypertensive drug-based strategy, the IDWG was significantly lower in the center with salt restriction.[39] Overall, it seems that efforts should be made to design adequate, randomized controlled studies to determine if salt restriction may reduce IDWG and define the entity of such restriction in terms of grams per day.

Behavioral Intervention

Strategies of behavioral intervention have been used to improve adherence to fluid restriction and limit IDWG (Table 2). These strategies aimed to improve motivation, knowledge, and education of hemodialysis patients.[43] The behavioral intervention was based on various approaches, such as behavioral contracting and weekly telephone contacts with patients, patient self-monitoring and behavioral contracting upon adherence, stepped verbal and written reinforcement, group-administered behavioral

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