Issues in Renal Nutrition

Ann Cotton, Contributing Editor

Focus on Nutritional Care for Nephrology Patients

Diabetes, Dialysis, and Nutrition Care Interaction

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Diabetes is present in the majority of patients who dialyze. If comprehensive care is to be delivered, the enormity of diabetes and its non-renal complications need to be appreciated. These influences on the treatment process, medical nutrition therapy, and glycemic control all interact with one another to determine dialysis adequacy, nutritional status, and degree of glycemic control. By gaining a further understanding of these dynamics, care management strategies can be improved and more thorough patient education provided to achieve better outcomes for this high-risk population.

In 2007, the National Kidney Foundation's (NKF) Kidney Disease Outcomes Quality Initiative (K/DOQI™) released its evidence-based clinical practice guidelines for diabetes mellitus (DM) (NKF, 2007). These guidelines emphasized the management of DM for patients with chronic kidney disease (CKD) Stages 1 to 4, stating that evidence for management in Stage 5 was lacking or addressed in other guidelines. Practitioners in the dialysis setting may find themselves in a quandary since more than 50% of the dialysis population has DM (U.S Renal Data System [USRDS], 2005), although diabetic kidney disease may not have caused the kidney failure. The demands of dialysis have considerable implications on outcomes, since patients with DM have the lowest survival rate, poorest rehabilitation potential, highest incidence of hospitalizations, and a greater total cost of care (Locatelli, Pozzoni, & Del Vecchio, 2004; Lok, Oliver, Rothwell, & Hux, 2004; Pupim, Heimburger, Qureshi, Ikizler, & Stenvinkel, 20005). If comprehensive care is to be delivered, the enormity of DM and its non-renal complications need to be appreciated. These influences on the treatment process, medical nutrition therapy, and glycemic control all interact with one another to determine dialysis adequacy, nutritional status, and degree of glycemic control. This article provides insight into some of these issues to enhance practitioner perspectives.

Glycemic Control

Although good glycemic control in CKD Stage 5 cannot undo the kidney damage, it can slow the progression of retinopathy, neuropathy, and possibly macrovascular disease (American Diabetes Association [ADA], 2008; NKF, 2007). Studies by Oomichi et al. (2006) and Kalantar-Zadeh et al. (2007) associated worse prognosis and higher death risk with poorer glycemic control. Hyperglycemia triggers thirst, contributing to volume overload with adverse impact on cardiac status and less stable blood pressure dynamics. The KDOQI guidelines advocate using the ADA goals for glycemic control (glycosylated hemoglobin [HbA1C] less than 7.0%, preprandial capillary plasma glucose 70 to 130 mg/dL [3.9-7.2 mmol/L], and peak post-prandial capillary glucose less than 180 mg/dL {less than 10.0 mmol/L}), while individually considering any adverse effects of hypo- and hyperglycemia (ADA, 2008; NKF, 2007).

Glycemic control is best assessed by combining results of HbA1C and self-monitoring of blood glucose (SMBG) (ADA, 2008). Despite accuracy concerns regarding its use, HbA1C is deemed a reliable marker for the dialysis population, and monitoring this 2 to 4 times per year allows goal determination (ADA, 2008; NKF, 2007). HbA1C, the primary predictor of complications, is a weighted value of all glycemic changes over several months, and reaching the target goal may not be synonymous with consistently meeting pre- and post-prandial goals. Recent infection could skew the HbA1C value higher, and poor food intake could lower it. SMBG facilitates control by showing how food, exercise, and medication impact glycemia to enable adjustments. SMBG is especially useful to detect and deter asymptomatic hypo- and hyperglycemia. Post-prandial monitoring is helpful when the HbA1C goal is not being met or in determining insulin dosing with gastroparesis, and post-prandial glucose reduction may lessen cardiovascular risk (ADA, 2008; NKF, 2007). Unfortunately, glycemic monitoring in patients with end stage renal disease (ESRD) is still inadequate, based on frequency of A1c testing (USRDS, 2007) and prescribed diabetic test strips (USRDS, 2006). This signifies an opportunity for making a difference by promoting these tools to physicians, explaining relevance of results to patients, and encouraging patients to regularly do SMBG.

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The **Issues in Renal Nutrition** in Nephrology Nursing department is designed to focus on nutritional issues for nephrology patients. Address correspondence to: Ann Cotton, Contributing Editor, Nephrology Nursing Journal; East Holly Avenue/Box 56; Pitman NJ 08071-0056; (856) 256-2320. The opinions and assertions contained herein are the private views of the contributors and do not necessarily reflect the views of the American Nephrology Nurses' Association.

Pre-Diabetes

Insulin resistance exists in CKD Stage 5 but has not commonly been labeled in the renal literature as pre-diabetes. This official ADA (2008) term is defined as impaired fasting glucose (fasting plasma glucose 100 mg/dL [5.6 mmol/L] to 125 mg/dL [6.9 mmol/L]) and impaired glucose tolerance (2-hour plasma glucose 140 mg/dL [7.8 mmol/L] to 199 mg/dL [11.0 mmol/L]). Both are risk factors for future development of DM, cardiovascular disease (CVD), and stroke (ADA, 2008; Centers for Disease Control and Prevention [CDC], 2005); and lifestyle intervention may be warranted, including dietary modifications and exercise.

Complications of Diabetes

The *USRDS Annual Data Report* (2007) added information on disabilities, as defined by the decreased ability to perform activities of daily living (walking, eating, dressing, transferring, toileting, and bathing) and/or instrumental activities (cooking, shopping, and managing finances and medications). Four common disabilities in patients with ESRD are blindness, amputation, paresis or paralysis of one or more limbs, and dementia, and their risks are increased by DM's microvascular (retinopathy progressing to blindness, peripheral vascular disease leading to amputation, small vessel cerebral disease contributing to dementia) and macrovascular (stroke leading to limb paresis and dementia) complications (USRDS, 2007). These have implications regarding food intake and nutritional adequacy, medication adherence, transportation to treatment, and increased patients' needs, placing more demands on dialysis center staff. This also underscores the importance of regularly performing foot checks and advocating eye exams.

Diabetic neuropathy (autonomic and peripheral) affects multiple organ systems. The *ADA Standards of Care* (2008) address complications, and the *CDC Diabetes Fact Sheet* (2005) provides an overview of DM. The cardiovascular risk is detailed in the KDOQI guidelines. Gastrointestinal (GI) autonomic neuropathy may encompass the entire GI system, resulting in gastroparesis, gastroesophageal reflux disease, diabetic diarrhea, fecal incontinence, and constipation. Distal symmetric polyneuropathy treatment involves optimization and stabilization of glycemic control, although pharmacological management is usually required. Unfortunately, those medications may have anticholinergic, GI, and/or appetite side effects contributing to decreased food consumption with excessive fluid intake. Decreased salivary flow rates due to DM may also make the person more prone to symptoms of dry mouth.

Hemodialysis

Hemodialysis (HD) is the most common form of renal replacement therapy (RRT) for DM (USRDS, 2007). DM affects HD treatment due to:

- Advanced calcific atherosclerosis, leading to inadequate arterial flow, venous run-off problems, more likelihood of steal syndrome, and decreased survival of arteriovenous fistulas and grafts.
- Compromised adequacy due to vascular access management problems and increased frequency of intradialytic hypotension related to autonomic nervous system dysfunction, cardiac diastolic dysfunction, and susceptibility to over-hydration.
- Difficulty in achieving targeted dry weight, leading to poorer blood pressure control, cardiovascular accidents, and sudden death.

HD treatment, in turn, can affect glycemic control by disturbing the carbohydrate to medication balance and/or compromise nutritional status in the following ways.

- Treatment schedule may interfere with patient's usual routine, including meal time and administration of medications, especially insulin-dosing time, which is additionally compounded by prolonged insulin action (if used).
- Post-treatment fatigue may alter amount of food intake or food choices.
- Transportation factors may compound issues.

Actions to consider include:

- Patient education regarding signs and symptoms of hypo- and hyperglycemic and mechanisms of diabetes medications.
- Pre- and post-dialysis treatment blood sugar testing.
- Encourage P.O. intake before coming to treatment and afterwards.
- Medication review – determines what the patient is actually taking and when.
- Encourage regular habits and times for medications and food intake.
- Adjust doses of diabetes medication or convert more traditional split doses of insulin to regimens with greater flexibility such as basal bolus dosing.
- If the patient has poor intake, lean body mass could be decreasing and not be detected when the dry weight targets remains unchanged. Routinely evaluate dry weight to deter volume overload. This is especially indicated when the patient has poor intake, since lean body mass could be decreasing and not be detected when the dry weight targets remain unchanged.

Peritoneal Dialysis

Underlying DM may compound or exacerbate several problems associated with intraperitoneal exposure to high glucose. These include inflammatory state, hyperlipidemia, fibrosis, enhanced protein loss, intra-abdominal fat accumulation, increased risk of CVD, weight gain, obesity, and acute hyperglycemic. Glycemic control in patients on peritoneal dialysis (PD) can be improved by emphasizing sodium and fluid control to deter ultrafiltration and allowing the use of less concentrated glucose dwells to decrease glucose absorption. Intraperitoneal insulin

affords better glycemic control and does not necessarily increase risk of developing peritonitis. Calories absorbed from PD need to be considered as part of the person's total energy intake. In the future, continuous glucose monitoring may play a role to better capture blood sugar changes than SMBG affords.

Nutrition and Education Concerns

Modality choice drives the nutritional needs; with DM, there is extra emphasis on achieving a euglycemic state, minimizing dyslipidemia, and consuming a total energy intake that is appropriate for the personalized weight management goal. It is unlikely that one optimal mix of macronutrients exists. The key is balancing carbohydrate intake, including meal timing and spacing, while matching diabetic medications accordingly. Fluid and sodium control may have extra significance with patients with diabetes

A renal diabetic diet may seem like a jigsaw puzzle to many patients. They view the multiple and sometimes conflicting dietary restrictions and goals as separate pieces. They need to understand the why, what, and how, so they can put the separate pieces together and form a new, integrated way of eating. Health care providers should not assume that there is a good understanding of diabetes management and control just because an individual has long-standing diabetes. It is important to dispel any misconceptions that may exist and to instill the idea that all of this does matter.

Conclusion

More than half of those undergoing dialysis have diabetes. If nurses are to truly make a difference in the quality of their lives, nurses need to better understand the magnitude of diabetes, what glycemic control involves, nutritional issues, and the impact of dialysis impacts. This will enable nurses and other health care providers to improve management strategies and provide more thorough patient education, resulting in better outcomes for this high-risk population.

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