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Mini Review

Times in Range and Nutrition of Individuals on Hemodialysis and Diabetes

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Abstract

Individuals with diabetes and hemodialysis present a challenge in metabolic control and nutritional adjustment with high nutrient demand. Traditional blood glucose measurement controls, such as self-monitoring, glycated hemoglobin (A1C), and fructosamine, remain uncertain as they do not present the entire picture of glycemic incursions. This review seeks to collect evidence on the efficacy of continuous glucose monitoring, nutritional adjustment, and adequate metabolic control in people with diabetes and hemodialysis. Currently, continuous glucose monitoring plays an essential role in the metabolic control of these individuals, as well as in glycemic variability. No individual standard is exclusive to these conditions concerning the values of the times in range. However, the American Diabetes Association does allow the identification of the average values for high-risk populations and comorbidities associated with diabetes, such as kidney disease. Synchronous metabolic control and nutritional monitoring go hand in hand in people with diabetes and hemodialysis, this being a pillar in comprehensive management to reduce complications and improve the quality of life of these individuals.

Keywords: hemodialysis; diabetes; nutrition; Glycemic control.

INTRODUCTION

With a staggering 537 million people worldwide living with diabetes, it is alarming to note that 30-40% of them also have kidney disease, as per the latest report from the International Diabetes Federation (IDF). This translates to approximately 161-215 million [1]. individuals globally. What's more, about 10-20% of these individuals are on hemodialysis, making it a significant concern in the healthcare landscape.

The evolution of time ranges in glycemic control for individuals with diabetes has led to a crucial monitoring tool-continuous glucose monitoring [2]. For individuals with diabetes on hemodialysis, this is not just a trend, but a necessity [3]. Continuous glucose monitoring is an indispensable tool, a need that cannot be overlooked for better control of this condition. It has been proven that continuous glucose monitoring is a superior way to improve metabolic control [4]. This tool empowers individuals undergoing replacement therapy, helping them synchronize many factors to achieve adequate control [5]. These factors include food intake, protein load with the phosphorus ratio, adequacy of low-potassium foods, and the introduction of complex carbohydrates. They may need to limit sodium in foods and drinks, foods high in phosphorus, the fluid they drink, and even the fluid found in foods. Fluid builds up in the body between hemodialysis treatments [6].

In chronic or advanced kidney disease, there is a decompensation in the patient's general nutritional status. It is possible to observe alterations in catabolism in some patients, as well as caloric and protein malnutrition. Likewise, this nutritional state is usually accompanied by a general inflammation of the patient, increasing complications in other organs or organ systems of the patient. Therefore, a high morbidity and mortality rate is characteristic of chronic renal patients, more precisely in those who are receiving dialysis. That is why it is necessary to thoroughly optimize the metabolic and nutritional status of patients receiving dialysis [6,7]. This optimization is best achieved through the integration of multidisciplinary nutrition teams, providing comprehensive and individualized care.

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In these individuals, protein-calorie malnutrition and inflammation are associated with increased mortality, including a high risk of cardiovascular disease (CVD) [8]. The factors influencing protein-calorie malnutrition are poor dietary intake secondary to associated comorbid conditions and psychosocial factors, particularly lack of adherence to established treatment. Anemia, persistent uremia, glucose intolerance, and altered insulin secretion and degradation influence appetite and the metabolism of these macronutrients [9]. The presence of inflammatory states related to transient vascular access, infections, prolonged hospitalizations, or unscheduled surgical interventions contributes to these alterations not being resolved [10].

This review aims to identify critical aspects in standardizing time in range, treatment adjustment, intake, and achieving or maintaining adequate glycemic control.

DISCUSSION

Individuals undergoing this treatment must adjust their lives to incorporate dialysis treatment sessions into their routine. It can be challenging to adjust the time invert during dialysis sections. There is a need to change work or family life, and some activities and responsibilities have to be given up. Accepting these changes can be difficult for the patient and his or her family. The patient must change what he or she eats and drinks [11].

Traditional tests such as glycosylated hemoglobin and fructosamine do not allow the identification of glycemic variability, which are the peaks and nadirs of glycemia's incursion [12]. The American Diabetes Association has already introduced continuous glucose monitoring as an essential tool for people on hemodialysis and with diabetes [2]. In addition to the uselessness of A1C in anemia [13] and lack of standardization of fructosamine [14], the MCG with times in range and variability measurement is already part of integral control, providing reassurance and confidence in reducing complications in these individuals [15].

A randomized controlled trial has underscored the crucial role of CGM over A1C and fructosamine in identifying hypoglycemia and hyperglycemia [16,17]. The revelation that hyperglycemia, contrary to common clinical assumptions, is the primary concern for people on hemodialysis is a significant finding [18,19]. This does not, however, diminish the importance of the deleterious effects of hypoglycemia, which can lead to endothelial damage, cardiac rhythm disturbances such as arrhythmias, and sudden death. This underscores the need for effective hypoglycemia management [20-23], a key aspect of the audience's role in providing care.

The American Diabetes Association's recommendations are based on individualizing each case, but in particular, for people with diabetes on hemodialysis, a selection of times in range according to individual clinical characteristics, such as hypoglycemia throughout the day, is required. This approach values each patient's unique needs and ensures more personalized and effective diabetes management [Figure 1].

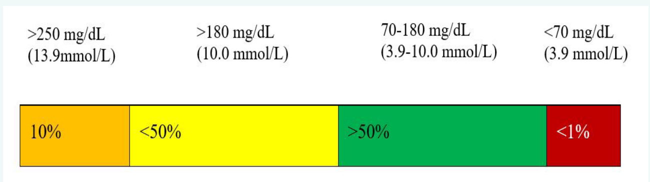

Figure 1: Representation of time ranges in fragile/high-risk people with diabetes.

Although specific timeframes are not universally applicable, especially in the context of renal failure, a distinct subset of individuals face unique challenges [25]. These are the individuals on hemodialysis with diabetes [Figure 1]. For them, continuous glucose monitoring is a vital tool [12]. It helps achieve adequate glycemic control and plays a crucial role in identifying postprandial glycemic incursions and preventing unnoticed hypoglycemia [26]. Reducing long-term complications can significantly enhance their life expectancy [27-29]. Another of the invaluable benefits of continuous glucose monitoring is the postprandial identification of the incursion of glycemia since hyperglycemia is persistent in this population [30]. It is essential to recognize the significant challenges individuals with diabetes and hemodialysis face in their diet, managing the carbohydrates they consume and the content of the micronutrients they contain [31]. This understanding can help healthcare professionals provide more effective care.

In many cases, the diversity of care in patient selection can lead to malnutrition due to misinformation about intake and the fear of worsening health. All hemodialysis units must constantly screen for nutritional risk, as this is vital for the proper management of the nutritional plan. This commitment to comprehensive care is essential for the well-being of our patients. Currently, different methods have been proposed to assess the nutritional status of patients on hemodialysis, such as modified subjective global assessment (MSGA) and the malnutrition and inflammation score (MIS), which evaluate altered parameters in these patients [32]. The Subjective Global Assessment (SGA) is a tool that identifies malnutrition by combining subjective parameters of nutritional assessment and clinical history, considering weight loss, muscle mass loss, and daily food intake [33]. Regarding the analytical parameter, the measurement of serum albumin in correlation with the C-reactive protein (CRP) value is a marker of nutritional status, being directly proportional to protein intake, and is included by the different consensuses as part of the diagnosis of protein deficiency [34]. Other tools available in the evaluation of nutritional status are the determination of total body composition through bioimpedance, this procedure being capable of measuring the hydration status, determining dry weight in dialysis, and therefore providing information on nutritional status through measuring lean mass and fat mass [7].

It is relevant to highlight that the nutritional status of hemodialysis patients is crucial for their health since poor nutrition influences the decrease in mass and strength in skeletal muscle. This affects their quality of life, both physically and emotionally, raising mortality rates [35]. Complementing hemodialysis with specialists in nutrition and exercise

Table 1. Time in range in diabetes [24]:

Individuals with T1&2 DM	RECOMMENDED TIME-IN-RANGE	
	Recommended level of Blood glucose	**Required time**
Generalized	70–180 mg/dL or 3.9–10.0 mmol/L	>70% (>16 h 48 min)
	<70 mg/dL or <3.9 mmol/L	<4% (<1 h)
	<54 mg/dL or <3 mmol/L	<1% (<15 min)
	>180 mg/dL or >10 mmol/L	<25% (<6 h)
	>250 mg/dL or >13.9 mmol/L	<5% (<1 h, 12 min)
OLDER/HIGH RISK/FRAGILE INDIVIDUALS	70–180 mg/dL or 3.9–10.0 mmol/L	>50% (>12 h)
	<70 mg/dL or <3.9 mmol/L	<1% (<15 min)
	>250 mg/dL or >13.9 mmol/L	<10% (<2 h, 24 min)
Pregnancy Type 2/Gestational Diabetes mellitus	63–140 mg/dL or 3.5–7.8 mmol/L	>85% (20 h, 24 min)
	<63 mg/dL or <3.5 mmol/L	<4% (<1 h)
	<54 mg/dL or <3 mmol/L	<1% (<15 min)
	>140 mg/dL or >7.8 mmol/L	<10% (<2 h, 24 min)
PREGNANCY TYPE 1 DM	63–140 mg/dL or 3.5–7.8 mmol/L	70% (>16 h 48 min)
	<63 mg/dL or <3.5 mmol/L	<4% (<1 h)
	<54 mg/dL or <3 mmol/L	<1% (<15 min)
	>140 mg/dL or >7.8 mmol/L	<25% (<6 h)

Adapted from Saboo et al. (2021).

can achieve Functional, satisfactory results in improving patients' nutritional status and physical strength on chronic hemodialysis. The "Subjective Global Assessment" (SGA) is essential for evaluating a patient's nutritional status. It predicts future nutritional complications and helps determine whether the patient will improve or worsen [32].

Another tool is bioimpedance, which consists of a low-cost, noninvasive process using electrodes that allow the calculation and analysis of body composition; due to this, bioimpedance is considered helpful in assessing the patient's hydration status on hemodialysis. Its periodic performance, monthly or quarterly, or more frequently if the patient is unstable or requires weight adjustment, can help determine whether we are close to the patient's dry weight, which is the weight after hemodialysis [7].

On the other hand, subjective global assessment is a tool that uses structured clinical parameters to diagnose malnutrition. Its objective is to identify patients likely to benefit from nutritional intervention and, therefore, to identify people in whom inadequate nutrient intake or absorption explains the characteristics of malnutrition [36]. Since nutritional status affects health-related quality of life and that decreased health-related quality of life in hemodialysis patients is associated with mortality, complications, and lower treatment compliance, the use of subjective global assessment to measure nutritional status can be a tool to help identify dialysis patients with a lower health-related quality of life [37]. Highlighting the fact that there is a gap between a renal dietitian and a health professional working in a dialysis unit since there is a greater level of detail with the renal dietitian when calculating the amounts and proportions of nutritional requirements and metabolic adjustment.

CONCLUSIONS

The integration of continuous glucose monitoring in people with diabetes and on hemodialysis is the pillar of metabolic control in these individuals. It avoids future complications and improves quality and life expectancy.

Advice from a renal dietitian is essential when it comes to nutrition for hemodialysis patients, as the amount of protein, calories, and supplements will be adjusted depending on the patient's requirements. The specialist will plan the appropriate amounts of protein to maintain the patient's strength and lifestyle.

Integrating multidisciplinary nutrition teams in these individuals guarantees an adequate adjustment to avoid malnutrition and metabolic decompensation and a safe, individualized, and sufficient food intake.

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