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Nutritional Challenges and Interventions in Hemodialysis Patients: A Literature Review

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Abstract: ***Malnutrition is present in 20-70% of hemodialysis patients and results from undernutrition, metabolic disorder and factors related to dialysis. Nutritional supplements, intradialytic parenteral nutrition, and exercise interventions have also been promising. Some tools that are used for assessment include SGA and PEW scores, which are helpful in diagnosis. International variations in renal nutrition care make specialized care and standardized interventions a priority that will improve patient outcomes. This article reviews nutritional challenges among patients undergoing maintenance hemodialysis.***

Keywords: Hemodialysis, Malnutrition, Hypotension, Fluid overload, Electrolyte imbalance

1. Introduction

Hemodialysis is a life-saving treatment for patients with end-stage renal disease (ESRD), but it with this significant nutritional challenge. The rate of malnutrition in HD patients is startlingly high, with rates ranging from 20% to 70% depending on the population and assessment methods [1-3]. The emerging cases of malnutrition in HD patients is associated with increased morbidity, mortality, and decreased quality life

The pathogenesis of malnutrition in haemodialysis patients is multifactorial, encompassing impaired intake, metabolic derangements, inflammation, and the catabolic effects of the dialysis process itself. [4,5]. Nutrient intake will also be limited by some of the dietary restrictions imposed in the management of electrolyte imbalances and fluid overload. Furthermore, the dialysis process might exacerbate nutritional deficiencies [6] by causing nutrient losses.

In the recent years the importance of Nutrition Care in HD patients has been recognized. Research on a number of therapies, including exercise regimens, intradialytic parenteral nutrition (IDPN), and oral nutritional supplements (ONS), is now necessary as a result [7-9]. In addition, in order to manage the nutritional needs required for this complex group, there is an increasing focus on patient education and the use of specialised renal dietitians [10,11].

This article is a literature review of the recent studies done regarding the issues of nutritional problems and information on the measures that have been undertaken for such patients. This article reviews the practical aspects of how malnutrition has been defined and diagnosed, while reiterating its presence and cause, and analyses several intervention techniques for effectiveness.

2. Epidemiology of Malnutrition and Scoring System

Malnutrition is common among patients with end-stage renal disease worldwide, including those treated with HD [12]. The prevalence of malnutrition was substantially high in Vietnam (76.3 % [13]), compared to Poland, where 38.5 % patients were diagnosed as malnourished according to Subjective Global Assessment (SGA) [14]. A study from Palestine shows that 45.4% of the HD patients were at risk for malnutrition [15]. Standardised evaluation techniques are essential for identifying these variations.

Different tools are developed and compared to assess the nutritional status of patients with HD. Both the 7-point SGA (21.2%) and Protein Energy Wasting (PEW) score (40.0%) were considered to be clinically useful with the PEW score was proved to have more sensitivity and 7-point SGA showed more specificity [16]. The Geriatric Nutritional Risk Index (GNRI) and the Malnutrition-Inflammation Score (MIS) were identified as key all-cause mortality predictors in elderly hemodialysis patients [17].

3. Underlying Causes of Malnutrition:

There are several studies showing that the dietary habits of people on HD often lead to unsatisfactory protein-energy intake [18,19]. In China a cross sectional review was done that shows many maintenances hemodialysis (MHD) patients' consumption of protein and energy intake was inadequate. However, a study in the UK and China reported that overall protein and energy intake was poor in both populations [20].

4. Dialysis-Related Factors

There is dialysis related–reasons which lead to nutritional challenges. The need for mandated compensation is suggested by the recent identification of severe amino acid depletion during HD sessions as an unidentified and "non-reimbursed" contributor to PEW [21]. Another study reported positive correlations of normalized protein catabolic rate (nPCR),

serum albumin with Kt/V respectively as dialysis dose affects nutritional status [22].

Comorbidities include, but are not limited to, high blood pressure, recent operations, and related disorders (severe immunosuppression) that required concurrent treatment.

Nutritional status in HD patients has been associated with comorbidities. In Israel, adult patient with diabetes discovered an elevated BMI among those with diabetes, including those who were malnourished, in comparison to those who weren't [23]. Other review studies has connected malnutrition with the intensity of pain, indicating that treatment intervention in HD should target pain, nutritional status and comorbidities [24].

5. Metabolic Disturbances

Among HD patients, metabolic acidosis is very high in prevalence and one study showed 94.7% [25]. Lower serum bicarbonate was linked in this earlier study to interdialytic weight gain, lower BMI, greater urea, and larger PTH and phosphorus levels [26]. This emphasizes the need for controlling acid-base balance in HD patients.

6. Nutritional Interventions:

6.1 Oral nutritional supplements (ONS)

A randomized trial has showed that ONS increased dietary protein and calorie intake, nutritional status (particularly fat-free mass) and some inflammation/oxidation markers in malnourished HD patients. The combination of probiotics could have synergized these biomarkers [27].

6.2 Intradialytic parenteral nutrition (IDPN)

Results have shown IDPN efficacy to ameliorate malnutrition. Additionally, 3-month IDPN nutritional supplementation markedly raised, in HD patients who are intolerant to oral nutrition supplements, serum albumin, body weight increase, spontaneous oral intake (SOI), and nutritional inflammatory score [28]. A trial comparing nutritional counselling, oral therapy, and IDPN demonstrated significant differences in serum albumin and anthropometric profiles between the groups receiving nutritional counselling and IDPN [29].

6.3 Exercise Interventions

RE intervention has been revealed in a meta-analysis of 9 studies to benefit the grip strength, 6-min walk distance, muscle mass, and serum albumin of MHD patients whereas showing no significant changes in haemoglobins and cholesterol levels by RE.

6.4 Dialysis Modifications

There has been research on protein intake and exercise during the intradialytic period in relation to toxin removal in uremia. Despite a moderate effect of protein ingestion on reducing the reduction ratios of both urea and indoxyl sulfate, it actually increased the removal of urea. Exercise in the period of hemodialysis resulted in increased removal of urea, creatinine, and phosphate [30].

The set temperature of 0.5°C lower than the patient's core body temperature for dialysate cooling resulted in fewer episodes of intradialytic hypotension without having any nonsignificant effects on nutritional and inflammatory markers after six months [31].

7. Micronutrient Considerations

Micronutrient deficiencies are often identified in patients with HD. A study found low intake of vitamin K was more significant on the days of dialysis and weekends, with high levels of non-carboxylated proteins as subclinical deficiency of vitamin K in both hepatic and vascular tissues [32]. Involvement of zinc and copper in erythropoiesis in HD patients also draws attention to the monitoring of both zinc and copper during supplementations to avoid copper deficiency with the treatment of hypozincemia [33].

8. Global Perspectives and Challenges

According to a global survey of 160 countries, renal nutrition care services are mostly absent in most countries, especially the low-income economies. Only 48% have specialist dietitians/renal dietitians in place, and a shocking 41% have no formal nutrition status assessment [34]. In Bangladesh, the condition of inadequate capacity and nutrition support of dialysis facilities was also faced; only 21% had their nutritionist available on site [35].

9. Patient Education and Adherence

Nutrition education helps manage nutritional status in HD patients. A systematic review encompasses nine aspects related to nutrition education and its outcome in HD patients, including biological markers, quality of life, cost of care, conformity with the recommended dietary, and behavioral changes. Indeed, an updated systematic review presents the adoption of novel methods with innovative technologic tools applied to apply theories of behavior change in management.

One cross-sectional study conducted in China examined knowledge, attitude, and practice (KAP) of nutrition support and management in patients undergoing haemodialysis and found mostly adequate knowledge, positive attitudes, and proactive practices but gaps in knowledge and misconceptions [36].

10. Conclusion

Malnutrition in HD patients remains one of the major problems and carries a multi-factorial etiology that also includes inadequate nutrient intake, dialysis-related factors, comorbidities, and metabolic disturbances. A variety of interventional strategies, ranging from ONS to IDPN, exercise, and modifications of dialysis, promise improvement in nutritional status. Again, because global disparities in nutrition care services are underscored by lack of access to specialized nutrition support, greater emphasis needs to be placed on improving access.

Future studies should focus on standardizing assessment tools, optimizing nutritional interventions, and addressing difficulties based on a particular patient population. Improved long-term outcomes in HD patients require the innovative approaches about patient education and adherence strategies as well.

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