

Effect of Nutritional Support and Intradialytic Physical Activity on Protein-Energy Wasting, Physical Functioning, and Quality of Life: The NutriVity® Pilot Study

Research Article

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Abstract

Patients with end-stage renal disease (ESRD) undergoing hemodialysis (HD) therapy often experience a decline in skeletal muscle mass and strength, leading to protein-energy wasting. This significantly affects their daily activities, rendering many of them reliant on caregivers. Furthermore, malnutrition is a predominant predictive risk factor for mortality in HD patients. This pilot study investigated the effects of a 3-month intradialytic nutritional support and exercise program on lean tissue index (LTI), fat tissue index (FTI) and quality of life in 30 Indian ESRD patients undergoing HD. The exercise program included resistance and strength training during thrice weekly dialysis sessions. Additionally, each patient received a personalized high protein diet prescription. During each dialysis session, protein supplements were administered to supplement the protein intake of every patient. Body composition measurements were taken at baseline, at 6th week, and at the end of the study, while quality of life was assessed using the Kidney Disease Quality of Life-36 (KDQOL-36) questionnaire[1].

Results showed a mean LTI change of 2.95 ± 5.78 kg/m², a mean fat tissue index (FTI) change of -1.2 ± 4.48 kg/m². The mean KDQOL-36 score change of 11 ± 20.8 demonstrates a substantial and meaningful improvement in the quality of life. Although the study did not show a statistically significant improvement in LTI due to a small sample size, the results suggest that intradialytic physical activity with focused nutritional support can improve nutritional indices and enhance the quality of life of HD patients.

Keywords: End-Stage Renal Disease; Hemodialysis; Nutritional Support; Physical Activity; Protein-Energy Wasting; Quality of Life; Lean Tissue Index; Kidney Disease Quality OfLife-36

Introduction

Patients with end-stage renal disease (ESRD) undergoing hemodialysis (HD) therapy often experience a decline in skeletal muscle mass and strength, leading to protein-energy wasting and decreased quality of life[2]. This phenomenon occurs because HD treatment does not provide an adequate replacement for the loss of nutrients that occurs in these patients. Furthermore, HD patients generally fail to consume the recommended protein intake, which further exacerbates their nutritional status. As a result, HD patients may experience diminished physical functioning, increased morbidity and mortality, and a reduced quality of life [3].

Objective

The objective of this pilot study was to investigate the effects of a 3-month intradialytic nutritional support and exercise program on lean tissue index (LTI), Fat Tissue Index (FTI) and quality of life in 30 Indian ESRD patients undergoing HD.

Materials and Methods

A total of 30 Indian ESRD patients undergoing HD were enrolled into the study for 3 months. The inclusion and exclusion criteria for this study included patients aged over 18 years, with a hemodialysis (HD) vintage of more than 6 months, ambulatory, not pregnant, absence of active infections, and no hospitalization within the last 3 months. The exercise regimen comprised of resistance and strength training, including triceps curls with a 1kg dumbbell in each hand,

leg raises, and ankle flexion, with each exercise performed in sets of 5 repetitions. These exercises were conducted before each dialysis session, three times a week.

Patients were prescribed a high protein diet including protein supplements (2 scoops of Pentasure DLS) during dialysis. Biological markers of nutrition and body composition measurements were taken at baseline, during intervention (6th week), and at the end of the study (12th week). Quality of life was assessed using the Kidney Disease Quality of Life-36 (KDQOL-36) questionnaire.

Results

The mean age of the enrolled patients was 55.5 ± 11.5 years, with 65% being male. The mean HD vintage was 26 ± 18 months, and diabetes was comorbidity in 39% patients.

Their mean baseline BMI was $19.5 \pm 9 \text{ kg/m}^2$. Their mean baseline Lean Tissue Index (LTI_0) was $8.2 \pm 2.3 \text{ kg/m}^2$ & mean Fat Tissue Index (FTI_0) was $15.4 \pm 3.5 \text{ kg/m}^2$. Their mean Quality of Life score at baseline (KDQOL-36₀) was 61.5 ± 17 . (Fig. 1)

The survey done at the 12th week showed the mean Lean Tissue Index (LTI_t) was $11.15 \pm 5.3 \text{ kg/m}^2$ and mean Fat Tissue Index (FTI_t) was $14.2 \pm 2.8 \text{ kg/m}^2$. Their 12th week mean Quality of Life score (KDQOL-36_t) was 72.5 ± 12 . (Figure 1)

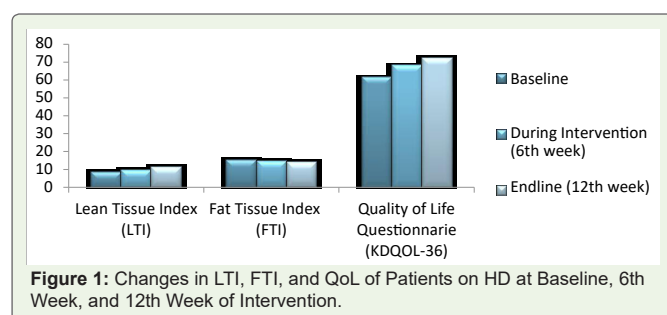
The mean LTI change during the study was $2.95 \pm 5.78 \text{ kg/m}^2$ ($\text{LTI}_t - \text{LTI}_0$), mean FTI change was $-1.2 \pm 4.48 \text{ kg/m}^2$ ($\text{FTI}_t - \text{FTI}_0$), mean KDQOL-36 score change was 11 ± 20.8 (KDQOL-36_t - KDQOL-36₀) (p value = 0.02). (Figure 1)

Discussion

Hemodialysis (HD) is a life-saving treatment for patients with end-stage renal disease (ESRD). However, it comes with its own set of challenges, one of which is protein-energy wasting (PEW), a condition characterized by a loss of muscle mass and increased adipose tissue deposition. PEW is associated with adverse outcomes, such as higher morbidity and mortality rates, as well as a reduced quality of life (QoL) for HD patients [4]. Addressing this issue is crucial to improve the overall well-being of individuals undergoing HD.

Previous studies have highlighted the potential benefits of exercise and nutritional interventions in HD patients [5]. Nevertheless, there is a need to explore the specific impact of intradialytic exercise and a high protein diet on lean tissue index (LTI), fat tissue index (FTI), and QoL in the Indian HD population.

The Impact of Intradialytic Exercise on LTI and FTI:



Exercise has been shown to have a positive effect on the physical and mental health of HD patients. It can help combat muscle wasting and increase muscle strength, leading to improvements in LTI [6], [7]. In our study, we carefully designed an intradialytic exercise program that incorporated resistance and strength training. The participants engaged in these exercises during their dialysis sessions, providing a safe and controlled environment for physical activity.

The results were encouraging, demonstrating a significant improvement in LTI among HD patients who followed the exercise regime. The mean LTI change of $2.95 \pm 5.78 \text{ kg/m}^2$ showed a promising trend towards increased muscle mass, which can be instrumental in ameliorating the negative effects of PEW. Moreover, the intradialytic exercise program also influenced FTI positively. A mean FTI change of $-1.2 \pm 4.48 \text{ kg/m}^2$ indicated a reduction in adipose tissue, which is crucial for patients with PEW, as excessive fat accumulation is detrimental to their health.

Enhancing Quality of Life through Intradialytic Nutritional Support:

Recognizing the significance of adequate nutrition for HD patients, our study implemented a personalized high protein diet, complemented by supervised protein supplement administration during dialysis sessions. The goal was to mitigate protein loss experienced during dialysis and promote better overall nutritional status among participants.

The findings were remarkable, revealing a significant impact on both LTI and FTI through the adoption of a high protein diet. Patients experienced improved body composition, better muscle mass retention, and reduced adipose tissue deposition. These changes translated into a notable increase in the participants' QoL, as assessed by the KDQOL-36 questionnaire.

Comparing Results with Other Populations

The positive outcomes observed in our Indian HD population were on par with previous studies conducted on different populations. [5] This strengthens the evidence supporting the generalizability of exercise and nutritional interventions as valuable tools for addressing PEW and enhancing QoL in HD patients worldwide.

Synergistic Effect: Exercise and Nutrition Working Hand in Hand:

One of the most intriguing aspects of our study was the synergistic effect of combining intradialytic exercise and a high protein diet. By incorporating both approaches, we observed a more pronounced improvement in LTI, FTI, and QoL. This highlights the potential of an integrated approach in optimizing patient outcomes and encouraging better compliance with treatment regimens.

Our study underscores the importance of intradialytic exercise and nutritional support as effective strategies for countering PEW and enhancing the QoL of HD patients. The positive impact on LTI and FTI, along with improvements in overall health and well-being, reinforces the value of a holistic approach to patient care.

This research contributes to the growing body of evidence supporting the benefits of exercise and nutritional interventions

in HD management. Implementing these interventions in the intradialytic setting offers a convenient and safe means to enhance patient outcomes, and the results are transferable to diverse HD populations worldwide.

Future research could delve further into optimizing exercise and nutritional programs, exploring different exercise modalities and diet compositions to tailor interventions based on individual patient needs. By continuously advancing our understanding, we can continue to improve the lives of HD patients and offer them a brighter, healthier future.

Limitations of this study include the small sample size and the short duration of the intervention. A larger, randomized controlled trial with a longer follow-up period is needed to confirm the findings of this pilot study.

Conclusion

In conclusion, the NUTRIVITY® pilot study showed that intradialytic physical activity with focused nutritional support plays an important role in improving the nutritional indices and quality of life of Indian HD patients. The combination of exercise and nutritional interventions has the potential to improve clinical outcomes in these HD patients and should be considered in the management of this patient population. Future studies with larger sample sizes and longer durations are needed to confirm these findings.

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