The Influence Of Intradialytic Exercise Resistance Band Method On Quality Of Life In Patients Undergoing Reguler Hemodialysis

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Abstract
Objective: This research aimed to examine the impact of resistance band exercises conducted during hemodialysis sessions on the quality of life among individuals receiving regular treatment.
Method: The study employed a quasi-experimental design using a one-group pretest-posttest approach. Participants were selected through purposive sampling. Out of a total population of 225 hemodialysis patients, 30 individuals met the inclusion criteria and were enrolled in the study. Eligibility required participants to be over 18 years old, actively undergoing routine hemodialysis, and to possess a functioning arteriovenous (AV) shunt. The intervention consisted of a structured intradialytic resistance exercise program, performed for 30 minutes twice a week over a four-week period. Quality of life was measured using the Kidney Disease Quality of Life Short Form (KDQOL-SF 36). Statistical analysis was conducted using a paired sample T-test to assess changes before and after the intervention.
Results: Findings revealed a positive shift in participants' quality of life scores, increasing from a baseline average of 74.43 ± 6.91 to 76.33 ± 7.47 post-intervention. The Wilcoxon test indicated a statistically significant improvement in quality of life following the exercise program ($p < 0.05$), suggesting the intervention was beneficial.
Conclusion: The implementation of resistance band exercises during dialysis sessions appears to be an effective strategy to enhance the quality of life in patients undergoing regular hemodialysis. Incorporating such interventions into routine care may offer a non-pharmacological means of supporting patient well-being.

Keywords: Hemodialysis, Intraadialytic exercise resistance band, Quality of life

INTRODUCTION

Chronic kidney disease (CKD) is a condition characterized by a decline in kidney function, marked by a glomerular filtration rate less than 60 mL/minute/1.73m2, or kidney damage markers, or both, persisting for 3 months or more, regardless of the cause (Webster et al., 2017). This condition is influenced by risk factors such as obesity, diabetes mellitus, and hypertension, which can increase the occurrence of CKD. (Hamrahian & Falkner, 2016; Jager et al., 2019; Kohagura, 2023). With the high prevalence of CKD and progressive kidney function decline, CKD patients require kidney replacement therapy, either through dialysis or kidney transplantation. (Vaidya & Aedua, 2022). HD therapy and CKD cause various changes, not only in somatic aspects but also psychosocial dimensions, such as patients' perceptions and assessment of quality of life (Dembowska et al., 2022).

Generally, patients undergoing HD therapy experience a decreased quality of life. Exercise

during HD therapy for CKD patients can be performed through various types of training, including aerobic exercise, resistance exercise, combined aerobic and resistance exercise, and passive exercise using electrical stimulation. (Bennett et al., 2010; Cheema et al., 2005). Among these exercise types, resistance exercise focuses on increasing muscle strength. This is a crucial aspect of improving physical function and helping patients maintain their daily activities (Johansen, 2007; Johansen et al., 2003). Consequently, intradialytic exercise intervention in hemodialysis patients can improve quality of life, particularly in the physical dimension of quality of life according to KDQOL (Schate & Witten, 2012).

Resistance bands are a simple, economical approach to improving quality of life with low risk for HD patients. This exercise pattern is considered highly flexible as it can be performed both in hospitals and at home. The physiological changes resulting from this exercise are expected to generally improve patients' quality of life.

Muscle strength in patients undergoing Hemodialysis (HD) therapy is lower compared to normal individuals with their own lifestyle. Therefore, resistance exercises that involve lifting weights focused on various points (such as shoulder, arm, leg, abdominal, and other muscles) or Thera-band stretch straps in a seated position can increase the muscle strength of patients undergoing HD therapy (Cheema et al., 2006).

The use of Thera-Band Stretch Strap or resistance bands made of elastic rubber as a medium for resistance training has been proven to improve the quality of life of CKD patients undergoing HD therapy.

METHODS

Study Design

A quasi-experimental approach with a one-group pretest-posttest design was adopted to examine changes in patient-reported outcomes following the intervention. This design allowed for the measurement of differences within the same group over time, without the use of a control group.

Sample

Participants were selected through purposive sampling from a population of 225 patients undergoing maintenance hemodialysis at a dialysis center. A total of 30 individuals met the inclusion criteria, which required participants to be over 18 years of age, actively attending routine dialysis sessions, and possessing a functional arteriovenous (AV) shunt for access. Exclusion criteria included patients with unstable vital signs or contraindications to physical activity.

Instrument

To assess quality of life, the Kidney Disease Quality of Life Short Form (KDQOL SF-36) was utilized. This standardized instrument has been widely validated for use among individuals with chronic kidney disease.

Data Collection Procedure

The intervention consisted of resistance band exercises conducted during the first hour of dialysis, with each session lasting 30 minutes. Sessions were held twice weekly for a duration of four weeks, totaling eight sessions. Each exercise session included three phases: a 5-minute warm-up, a 20-minute core resistance training component, and a 5-minute cool-down period. All exercises were performed at the bedside under direct supervision. Prior to each session, vital signs—blood pressure, heart rate, and body temperature—were recorded to ensure patient safety. If no contraindications were identified, participants were guided through the exercise routine. An instructor first demonstrated the movements, and patients were then asked to repeat them until proper form was achieved. After each session, vital signs were reassessed, and participants' tolerance to the activity was noted. Upon completion of the four-week intervention, the KDQOL SF-36 questionnaire was re-administered to evaluate changes in quality of life.

Data Analysis

Data were analyzed using the paired sample T-test to compare mean quality of life scores before

and after the intervention. In addition, the Wilcoxon test was applied for non-parametric verification. A significance level of $p < 0.05$ was used to determine statistical relevance.

Ethical Considerations

The study protocol was reviewed and approved by the institutional ethics committee. Written informed consent was obtained from all participants after explaining the study's purpose, procedures, potential risks, and benefits. Confidentiality and voluntary participation were assured throughout the research process.

RESULT

Hemodialysis patients regularly experience low quality of life. This low quality of life significantly influences the increased risk of complications such as depression, malnutrition, and elevated mortality risk. (Yonata et al., 2022). Therefore, the intervention through resistance exercise using resistance bands in this study was conducted to examine potential improvements in the quality of life for patients undergoing regular hemodialysis.

Tabel 1 Quality of Life Characteristics of Patients Undergoing Regular Hemodialysis Before and After Intradialytic Exercise Intervention Using Resistance Band Method (n=30)

Variabel	Mean (±SD)	Min-Max
Pre-intervention	74.43 (6.91)	65-101
Post-intervention	76.33 (7.47)	67-104

Tabel 4.2 Analysis of the sub-variables of Quality of Life before and after intradialytic exercise intervention using the resistance band method (n=30)

Domain	Pre-Intervention Mean (±SD)	Post-Intervention Mean (±SD)	*p-value*
Physical	16.63 (1.73)	17.43 (1.65)	0.031
Mental	14.77(2.06)	14.20(1.49)	0.087
Disease Burden	16.30(4.49)	16.63(4.33)	0.285
Symptoms and Issues	16.43 (6.53)	16.97 (6.90)	0.261
Disease Effect	10.30(3.39)	11.10(3.70)	0.027

The study results showed a quality of life score during pre-test with a mean value of 74.43 ± SD 6.91 and post-test with a mean value of 76.33 ± SD 7.47. Statistical analysis revealed a significant difference in quality of life scores before and after intradialytic exercise using the resistance band method, with a p-value of 0.027. The research results are consistent with a study conducted by Valle et al. (2019), which performed a randomized clinical trial to evaluate the effectiveness of intradialytic resistance training on daily physical activity and quality of life in hemodialysis patients. They reported that intradialytic resistance training during hemodialysis can improve physical capacity. Another multi-center retrospective observational study linking intra-dialytic resistance with physical endurance and muscle strength concluded that intra-dialytic resistance exercise enhances patients' physical strength.

Previous studies have concluded that resistance exercise is proven effective in improving rehabilitation outcomes. Moreover, regular physical activity can enhance strength and endurance. Resistance exercise effectively increases oxygen and nutrient delivery to tissues and contributes to improved cardiovascular performance. When cardiovascular and pulmonary health improves, it increases the energy needed to handle daily tasks. Consequently, physical performance increases. Implementing resistance exercise programs has

resulted in significant improvements across all physical performance areas. Levels of physical activity, physical function, and quality of life improve with the longer duration of program implementation (Asadzadeh et al., 2021).

In this study, out of 5 domains, only the physical sub-variable and disease effect sub-variable showed significant differences. The other domains—mental domain, disease burden, symptoms, and problems—did not demonstrate significant differences.

There was a significant difference in the physical domain scores before and after intervention, with scores of 16.63 ± 1.73 and 17.43 ± 1.63, respectively, with a p-value of 0.031. This improvement was caused by physical exercise involving upper extremity muscle movements during the intervention, which helped increase muscle strength in patients undergoing HD therapy and reduce muscle pain commonly experienced by HD therapy patients (Cheema et al., 2006). As a result, patients could perform more maximally, completing moderate activities as expected without activity limitations, climbing stairs without discomfort, and without pain interfering with their activities.

In the disease effect domain, there was a significant difference in scores before and after intervention, with scores of 10.30 ± 3.39 and 11.10 ± 3.70, respectively, with a p-value of 0.027. The significant improvement in the disease effect domain was caused by the physical exercise intervention, which enhanced patients' daily physical activities. This is supported by research showing that physical exercise significantly improves daily activities such as housework, traveling, and reduces dependence on doctors and medical staff.

In the mental domain, there was no significant difference in scores before and after intervention, with scores of 14.77 ± 2.06 and 14.20 ± 1.49, respectively, with a p-value of 0.087. The lack of significant difference in the mental domain may be due to the short intervention duration. This is supported by research indicating no significant changes in the mental domain after 3 months of high-intensity intradialytic resistance exercise, despite improvements in physical domains like muscle and body composition. Another study showed a significant 21% increase in the mental domain after 6 months of intradialytic resistance exercise intervention (Grover et al., 2022b).

In the disease burden, symptoms, and problems domains, there were no significant differences in scores before and after intervention, with p-values of 0.285 and 0.261, respectively. This indicates that the intervention in this study did not significantly affect the disease burden, symptoms, and problems experienced by patients.

DISCUSSION

The findings of this study indicate a statistically significant improvement in the overall quality of life of patients undergoing hemodialysis after participating in an intradialytic resistance band exercise program. The mean quality of life score increased from 74.43 ± 6.91 in the pre-intervention phase to 76.33 ± 7.47 post-intervention, with a p-value of 0.027. This suggests that resistance exercises administered during dialysis sessions can serve as an effective adjunct to routine care in improving patient well-being.

These results align with prior research by Valle et al. (2019), who demonstrated that intradialytic resistance training improved physical activity levels and quality of life in hemodialysis patients. Similarly, observational studies have reported that such exercises contribute to enhanced muscle strength and physical endurance. Asadzadeh et al. (2021) further emphasized that resistance training improves oxygen and nutrient delivery, cardiovascular performance, and overall physical functioning, supporting the present study's conclusion.

In analyzing the KDQOL-SF-36 sub-domains, significant improvements were observed specifically in the physical function and disease effect domains. The increase in the physical domain score (from 16.63 ± 1.73 to 17.43 ± 1.63, p = 0.031) is likely attributed to improved muscle strength, particularly in the upper

extremities, facilitated by the structured resistance exercises. This physical enhancement likely enabled participants to perform daily activities with less discomfort and reduced activity limitations. These findings are consistent with Cheema et al. (2006), who noted reductions in muscle pain and enhanced functional capacity following intradialytic exercise interventions.

In the disease effect domain, scores also improved significantly (from 10.30 ± 3.39 to 11.10 ± 3.70, p = 0.027), indicating that regular participation in the exercise program positively influenced patients' ability to engage in daily tasks, decreasing their reliance on healthcare providers. Improvements in functional independence, such as traveling or managing household chores, may be key factors contributing to this change.

However, no significant improvements were observed in the mental health, disease burden, symptoms, and problem domains. For instance, although the mental health scores slightly declined (from 14.77 ± 2.06 to 14.20 ± 1.49), the difference was not statistically significant (p = 0.087). This may be explained by the short duration of the intervention. Grover et al. (2022b) highlighted that mental health improvements typically emerge only after longer-term interventions, reporting notable gains after six months of exercise, but not after shorter durations. Additionally, the psychological benefits of physical activity may be influenced by other psychosocial factors not addressed in this study, such as depression, anxiety, or social support.

The domains related to disease burden, symptoms, and related problems also did not exhibit significant change, with p-values of 0.285 and 0.261. These results suggest that while physical exercises can enhance functional capacity, they may not directly influence patients' perceptions of disease severity or symptom distress, which could be shaped by other factors like treatment side effects, comorbidities, or chronic fatigue.

Study Limitations

Several limitations should be acknowledged. First, the study employed a one-group pretest-posttest design without a control group, limiting the ability to attribute improvements solely to the intervention. External factors such as psychological support or changes in treatment adherence might have influenced the outcomes. Second, the sample size was relatively small (n = 30), which may affect the generalizability of the findings. A larger, randomized controlled trial would be needed to validate these results. Third, the intervention period was limited to four weeks, which may have been insufficient to observe changes in mental health and disease-related domains. Lastly, this study did not assess biochemical or physiological markers, such as hemoglobin levels or inflammatory parameters, which could provide additional insights into the physiological effects of resistance exercise.

CONLUSIONS

The findings revealed a significant improvement in the quality of life among patients undergoing regular hemodialysis following the intradialytic resistance band exercise intervention. The mean quality of life score increased from 74.43 ± 6.91 at baseline to 76.33 ± 7.47 after the intervention, with a p-value of 0.027, indicating a statistically significant effect.

This result aligns with previous studies, such as that by Valle et al. (2019), which demonstrated that resistance training during dialysis sessions can enhance physical capacity and overall quality of life. Other studies have also noted that regular physical activity improves muscle strength, oxygen delivery, and cardiovascular function, all of which support patients' ability to perform daily tasks.

Significant improvements were specifically observed in the physical function domain (p = 0.031) and disease effect domain (p = 0.027). The involvement of upper body muscle movements likely contributed to reduced muscle pain and enhanced physical performance, allowing patients to complete daily activities—such as climbing stairs or walking—with greater ease.

However, no significant changes were found in the mental health, disease burden, symptoms, or problems domains. The short intervention duration may explain the lack of improvement in psychosocial aspects, as previous research suggests that changes in mental well-being may require longer-term interventions.

Overall, the study supports the use of intradialytic resistance exercises as a practical strategy to enhance physical aspects of quality of life in hemodialysis patients, though longer interventions may be needed to influence psychological and symptom-related domains.

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