Original Article

Effect of Visual Learning Media and Guidebooks on Fluid Restriction Compliance Among Hemodialysis Patients

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Abstract

Background: Hemodialysis is vital for patients with end-stage renal disease, and adherence to fluid restrictions is crucial for preventing complications and improving quality of life. However, many patients struggle with fluid intake control due to limited understanding.
Objective: This study aimed to assess the impact of visual learning media and guidebooks on fluid intake control, measured by Interdialytic Weight Gain (IDWG), in hemodialysis patients. Methods: A quasi-experimental design involved 26 participants in the intervention group, who received visual media and guidebooks, and 26 controls. IDWG was used to measure fluid restriction compliance. Data were analyzed using t-tests and multiple linear regression.
Results: The intervention group showed a significant reduction in IDWG ($p < 0.001$), indicating improved compliance. Regression analysis found that education level ($R^2 = 0.353$, $p = 0.008$) was a significant predictor of fluid restriction compliance.
Conclusion: Visual learning media and guidebooks significantly improve fluid restriction adherence in hemodialysis patients, leading to a reduction in IDWG. These tools are effective for enhancing patient education and improving clinical outcomes.

Keywords: Compliance, Education, Fluid Restriction, hemodialysis, IDWG

INTRODUCTION

Chronic Kidney Disease (CKD) is a growing global health challenge and is recognized as one of the leading non-communicable diseases alongside diabetes mellitus, cardiovascular disease, and hypertension (1). It is estimated that approximately 13% of the world's population is affected by CKD, with its prevalence and mortality rates steadily increasing each year, particularly in low- and middle-income countries where access to early diagnosis and management remains limited (2). According to the World Health Organization (WHO), CKD accounts for nearly 850,000 deaths annually, positioning it as a significant contributor to the global burden of disease (3).

For individuals with end-stage renal disease (ESRD) undergoing hemodialysis, adherence to fluid intake restrictions is a critical aspect of disease management. Failure to comply with prescribed fluid limits can result in severe complications, including fluid overload, hypertension, heart failure, and interdialytic weight gain (IDWG), which collectively worsen clinical outcomes and diminish quality of life (4,5). Despite the clear importance of fluid management, maintaining adherence remains a persistent challenge among hemodialysis patients, highlighting the need for effective interventions to support behavioral change (6).

Educational interventions have emerged as a promising strategy to enhance patient compliance. Numerous studies have demonstrated that structured education can improve patient knowledge, foster behavioral modification, and consequently reduce fluid-related complications (4,5). However, the method by which educational content is delivered significantly influences its effectiveness. Audiovisual media, by integrating visual and auditory stimuli, can enhance comprehension, retention, and engagement, particularly in populations with varying levels of health literacy (7). Meanwhile, printed guidebooks offer tangible, revisitable resources that reinforce learning and provide continuous support outside of the clinical setting (8).

Emerging evidence suggests that combining different educational modalities may maximize learning outcomes by catering to diverse patient needs and learning styles. However, despite the theoretical advantages, there remains limited empirical research directly comparing the impact of multimodal educational interventions specifically the integration of audiovisual media and guidebooks on fluid restriction compliance among hemodialysis patients. Furthermore, while cognitive factors such as health beliefs, self-efficacy, and perceived control have been recognized as mediators of adherence behaviors (9,10), few studies have systematically incorporated practical behavioral tools such as fluid intake charts alongside educational interventions. Integrating psychological support with educational and practical strategies may offer a more comprehensive approach to promoting sustainable behavior change.

While previous research has independently established the benefits of audiovisual media and guidebooks in patient education, there remains a critical gap in evaluating their combined impact specifically on fluid restriction adherence among hemodialysis patients. To date, no study has comprehensively investigated whether integrating these two educational modalities can synergistically enhance knowledge, reinforce behavioral change, and improve clinical outcomes in this vulnerable population (11). Therefore, the present study aims to fill this gap by examining the effectiveness of a combined audiovisual and guidebook-based educational intervention on fluid restriction compliance among hemodialysis patients. By adopting a multifaceted educational approach, this study seeks to provide novel insights into optimizing patient education strategies, with the ultimate goal of improving adherence, preventing complications, and enhancing the overall quality of life for patients undergoing hemodialysis.

METHODS

Study Design

This study employed a quasi-experimental, pretest-posttest control group design to evaluate the effectiveness of combined visual learning media and guidebooks on fluid restriction compliance among hemodialysis patients.

Sample

A total of 52 patients undergoing routine hemodialysis were recruited consecutively from the Hemodialysis Unit at RSUD dr. Chasbullah Abdul Madjid (RSUD CAM), Bekasi, Indonesia. Consecutive sampling was employed to ensure the enrollment of all eligible patients during the data collection period until the required sample size was achieved.

Inclusion criteria were as follows: (1) adult patients aged 18 years or older; (2) undergoing routine hemodialysis at least twice weekly for a minimum of three months; (3) fully conscious (compos mentis); (4) able to read and write in Bahasa Indonesia; and (5) willing to provide informed consent. Exclusion criteria included patients with (1) cognitive impairments or severe psychiatric disorders, (2) acute illness requiring hospitalization, or (3) concurrent participation in another educational intervention study.

The required sample size was determined using G*Power 3.1 software, assuming an effect size of 0.8 (large effect), an alpha level of 0.05, and a

statistical power of 0.80 for independent samples t-test. The calculation yielded a minimum of 26 participants per group. Therefore, a total of 52 participants were enrolled, divided equally into intervention (n = 26) and control (n = 26) groups, to ensure adequate power and account for potential dropouts.

Instrumentation

The educational intervention utilized two primary instruments: a visual learning video and a printed guidebook.

Visual Learning Video. The video was developed by a multidisciplinary team of nephrology nurses, patient education specialists, and audiovisual content creators. It contained approximately 10 minutes of visual content explaining fluid restriction strategies, potential complications of non-adherence, and practical behavioral tips. The video's content validity was evaluated by three nephrology experts and two educational media specialists, achieving a Content Validity Index (CVI) of 0.92.

Printed Guidebook. The guidebook, developed by the same team, consisted of 20 pages and included structured written information, illustrative images, fluid management charts, and tips for daily fluid intake regulation. The guidebook's content validity was established with a CVI of 0.95.

A pilot test with 15 hemodialysis patients assessed the internal consistency of the combined educational materials, yielding a Cronbach's alpha coefficient of 0.74, indicating acceptable reliability.

Measurement of Outcome

The primary outcome was compliance with fluid restriction, operationalized through interdialytic weight gain (IDWG). IDWG was calculated as the difference between a patient's pre-dialysis weight and post-dialysis weight from the previous session. IDWG data were routinely recorded by trained dialysis nurses using standardized procedures.

Procedure

Following ethical approval, eligible patients were screened and provided with study information. After obtaining written informed consent, participants were assigned to either the intervention or control group based on recruitment order to maintain equal group sizes. In intervention group, participants received a one-time, 60-minute education session conducted in small groups (4–5 patients). The session included the presentation of the visual learning video followed by distribution and explanation of the printed guidebook. Patients were encouraged to take the guidebook home and use it as a reference for daily fluid management. Follow-up support was provided during routine dialysis sessions. While, in control group**,** participants received standard care, which consisted of routine verbal advice regarding fluid intake provided by the dialysis nursing staff without additional structured educational intervention. Baseline data (demographic information and IDWG) were collected prior to the intervention. Follow-up IDWG measurements were obtained four weeks post-intervention. All data were collected by dialysis nurses who were blinded to group allocation to minimize potential bias.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to describe participant characteristics. Independent samples t-tests were performed to compare baseline variables and post-intervention outcomes between groups. Paired t-tests were used for within-group comparisons. Additionally, regression analysis was conducted to assess the association between intervention exposure and IDWG outcomes, controlling for potential confounders. Statistical significance was set at $p < 0.05$.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of Muhammadiyah Jakarta University (Approval Number: 0424/F.9-UMJ/IV/2023). All participants provided written informed consent prior to participation. Participants were assured of confidentiality, the voluntary nature of their involvement, and the right to withdraw from the study at any time without consequence to their treatment. All procedures were conducted in accordance with the ethical standards of the Declaration of Helsinki.

RESULTS

Table 1. Characteristics of Respondents (n = 52)

Variable	Intervention (n=26)	Control (n=26)	*p*-value
Gender (Male)	20 (76.9%)	16 (61.5%)	0.367
Education (Low)	17 (65.4%)	21 (80.8%)	0.348
Occupation (Working)	12 (46.2%)	15 (57.7%)	0.579
Age (years), Mean ± SD	46.5 ± 9.8	48.4 ± 10.1	0.398
Duration of HD (months), Mean ± SD	30.6 ± 22.3	24.5 ± 18.2	0.273

There were no significant differences between the intervention and control groups regarding gender, education level, occupation, age, or hemodialysis duration ($p > 0.05$). This indicates that the groups were comparable at baseline.

Table 2. Interdialytic Weight Gain (IDWG) Pre and Post-Intervention

Group	Pretest Mean ± SD	Posttest Mean ± SD	Mean Difference ± SD	t-value	p-value
Intervention (n=26)	7.38 ± 2.72	2.49 ± 0.87	4.89 ± 2.71	9.19	<0.001
Control (n=26)	6.76 ± 2.59	7.29 ± 2.88	-0.52 ± 1.69	-1.58	0.0126

The intervention group showed a significant decrease in IDWG after receiving the educational intervention ($p < 0.001$), whereas the control group experienced a slight but significant increase ($p = 0.0126$). This demonstrates the effectiveness of the visual media and guidebook intervention in improving fluid intake control.

Table 3. Compliance with Fluid Restriction Pre- and Post-Intervention

Group		Compliant f (%)	Non-Compliant f (%)
Intervention (n=26)	Pre	0 (0.0%)	26 (100.0%)
	Post	20 (76.9%)	6 (23.1%)
Control (n=26)	Pre	0 (0.0%)	26 (100.0%)
	Post	0 (0.0%)	26 (100.0%)

Before the intervention, all patients in both groups were non-compliant. After the intervention, 76.9% of patients in the intervention group became compliant, while none in the control group showed improvement. The educational intervention successfully increased fluid restriction compliance.

Table 4. Educational Intervention on Compliance Level (Chi-square Test)

Group	Odds Ratio (OR)	95% CI	*p*-value
Intervention vs Control	0.188	0.1–0.4	<0.001

Patients in the intervention group had a significantly higher chance of achieving fluid restriction compliance compared to the control group (OR = 0.188, $p < 0.001$). This indicates a strong association between the educational intervention and improved compliance.

Table 5. Predictors of Compliance (Multiple Linear Regression)

Variable	β Coefficient	Standard Error (SE)	t-value	*p*-value
Education	0.353	1.010	2.757	0.008
Duration of HD	0.253	0.022	1.978	0.054
Gender	0.073	0.992	0.562	0.577

Higher education level and longer duration of hemodialysis were associated with better fluid restriction compliance. Education was a significant predictor (p = 0.008), while duration of hemodialysis showed a borderline significance (p = 0.054). Gender did not significantly affect compliance.

DISCUSSION

This study evaluated the impact of educational interventions using video media and booklets on fluid restriction compliance among hemodialysis (HD) patients. The results indicate that the intervention was highly effective. Specifically, the intervention group exhibited a significant decrease in Intradialytic Weight Gain (IDWG), with a mean reduction from 7.38 (SD = 2.72) to 2.49 (SD = 0.87), which was statistically significant (p < 0.001). In contrast, the control group showed a slight but significant increase in IDWG from 6.76 (SD = 2.59) to 7.39 (SD = 2.88) (p = 0.0126) (Table 2). Moreover, 76.9% of patients in the intervention group became compliant with fluid restrictions after the intervention, while none of the control group patients showed any improvement (Table 3). This finding demonstrates the effectiveness of multimedia educational interventions in enhancing patient adherence to fluid intake control. Furthermore, the intervention group had a significantly higher likelihood of achieving fluid restriction compliance compared to the control group (OR = 0.188, p < 0.001) (Table 4).

The results of this study contrast with previous research, which found no significant differences in IDWG before and after educational interventions. (12). This discrepancy may be attributed to differences in the types of educational media used. Unlike more traditional approaches, the combination of video and guidebooks in this study likely provided more engaging and accessible methods for conveying critical information to the patients. Multimedia-based education can be a powerful tool for improving patient understanding, making it easier for patients to adhere to treatment protocols, including fluid restriction. (13,14).

The improvement in fluid restriction compliance and IDWG reduction can be explained by both biological and behavioral factors. Biologically, kidney function deterioration in patients with chronic kidney disease (CKD) impairs their ability to regulate fluid intake effectively, making fluid restriction essential for maintaining health. (15,16). However, controlling fluid intake is not only a physiological challenge but also a behavioral one. Patients often struggle with thirst, which complicates adherence to fluid restrictions. Thirst and dry mouth are the main causes of non-compliance with fluid restriction in hemodialysis patients, leading to an increase in interdialysis weight gain (IDWG) above safe limits and increasing the risk of cardiovascular complications and decreased quality of life. (17). Meta-analyses showed that educational interventions significantly reduced IDWG compared to no intervention, although these reductions were considered clinically small (mean reduction 0.15–0.26 kg) (17).

Behaviorally, the use of video and booklet media likely engaged patients more effectively than traditional verbal or written instructions alone. Video media has been shown to improve comprehension, critical thinking, and motivation (F. Sari et al., 2020), while booklets are portable and can be referred to by patients as needed. Education using media such as booklets and videos increases patient knowledge, self-efficacy, and compliance, which has an impact on reducing IDWG (18). These combined tools provided a clearer, more actionable approach to managing fluid intake, which may explain the high rate of compliance observed in the intervention group. Moreover, continuous education is critical for maintaining long-term adherence to fluid restrictions. As shown in this study, patients with lower education levels were less likely to comply, highlighting the need for

healthcare providers to offer ongoing support and reinforcement, particularly for those with lower literacy levels (Table 5). Patients with low literacy often have difficulty understanding the long-term benefits, side effects, and correct use of drugs, so they need more interactive and easy-to-understand educational methods (19).

This study has several practical implications for improving patient care in hemodialysis settings. First, healthcare providers should consider incorporating multimedia educational interventions, such as video media and booklets, into routine care for hemodialysis patients. These tools can significantly improve compliance with fluid restrictions, which is essential for managing CKD. Tailoring these interventions to the patient's educational level and individual needs may further enhance their effectiveness (20).

Implication

This study demonstrates that multimedia educational interventions, such as video media and printed booklets, significantly improve fluid restriction compliance among patients undergoing hemodialysis. For nursing practice, these findings emphasize the critical role of multimedia education as an effective strategy to enhance patient adherence to fluid restrictions. Nurses, as primary educators in hemodialysis care, can utilize integrated audiovisual and printed resources to strengthen patient understanding, foster behavioral change, and ultimately reduce the risk of fluid overload-related complications. The incorporation of structured, multimedia-based education into routine clinical practice offers a practical and scalable method to support patient self-management. Future nursing research should investigate the long-term sustainability of behavior change, assess the cost-effectiveness of multimedia educational programs, and explore the potential benefits of tailoring educational interventions based on individual patient characteristics, learning preferences, and psychosocial factors among patients with chronic kidney disease (CKD).

Limitations

While the study provides valuable insights, there are several limitations to consider. First, the sample size was relatively small, which may limit the generalizability of the findings to the broader population of hemodialysis patients. Second, the study focused on short-term outcomes, and the long-term effects of the educational intervention on fluid restriction compliance and health outcomes remain unclear. Third, the study did not account for patient-specific factors, such as the severity of CKD, comorbidities, or other individual differences, which could influence fluid restriction adherence. These factors could introduce variability in patient response to the educational intervention.

CONCLUSION

This study demonstrates that multimedia educational interventions, such as video media and booklets, significantly improve fluid restriction compliance among hemodialysis patients. The intervention group showed a marked reduction in Intradialytic Weight Gain (IDWG) ($p < 0.001$) and 76.9% of patients became compliant, compared to no improvement in the control group. Statistical analysis confirmed a significantly higher likelihood of compliance in the intervention group (OR = 0.188, $p < 0.001$).

For nursing practice, these findings highlight the importance of integrating multimedia educational tools into routine care for hemodialysis patients. Nurses play a critical role in patient education and can utilize these resources to better communicate the importance of fluid management. By incorporating such interventions, nurses can enhance patient adherence, reduce complications, and improve overall health outcomes. Future nursing research should explore the long-term effects, cost-effectiveness, and personalized approaches to education for patients with chronic kidney disease (CKD).

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Author Contribution

SS : Conceptualization and Study Design, Methodology, Data Curation, Writing – Original Draft, Writing – Review & Editing
IN : Conceptualization and Study Design, Methodology, Formal Analysis,
DI : Data Curation, Writing – Review & Editing, Methodology, Formal Analysis

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. Data sharing is limited to de-identified information to ensure participant confidentiality.

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