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BLENDED EDUCATION AND ICE CUBE SIPPING INTERVENTION IN FLUID RESTRICTION MANAGEMENT FOR PATIENTS WITH CHRONIC KIDNEY DISEASE (CKD)

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ABSTRACT
Fluid restriction is a crucial component in the management of patients with Chronic Kidney Disease undergoing hemodialysis. However, adherence to fluid restriction remains a significant challenge due to limited patient understanding and the frequent occurrence of excessive thirst. Health education and non-pharmacological interventions, such as ice cube sipping, are considered potential strategies to help patients better manage fluid intake. This literature review aims to analyze the effectiveness of blended education and ice cube sipping interventions in managing fluid restriction among CKD patients. The study employed a systematic review approach based on PRISMA 2020. Literature searches were conducted through Scopus, PubMed, Google Scholar, ProQuest, and ScienceDirect using relevant keywords. Inclusion criteria included full-text articles published between 2016 and 2026 in Indonesian or English. A total of 983 articles were identified from five databases. After the screening and critical appraisal process, 8 eligible studies met the inclusion criteria and were analyzed. The findings indicate that health education interventions significantly improve patient knowledge and adherence to fluid restriction while reducing interdialytic weight gain (IDWG). Additionally, ice cube sipping has been shown to effectively reduce thirst levels, thereby supporting better compliance. Overall, integrating technology-based education with simple thirst-management strategies has strong potential to enhance adherence and improve quality of life in CKD patients.

Keywords: blended education; chronic kidney disease; fluid restriction; hemodialysis; sipping ice cube; thirst management

INTRODUCTION
Chronic Kidney Disease is a major global health problem with a continuously increasing prevalence, contributing significantly to morbidity and mortality across countries. CKD is characterized by a progressive decline in kidney function, resulting in the inability of the kidneys to maintain optimal fluid and electrolyte balance. In patients with CKD, particularly those undergoing hemodialysis therapy, fluid restriction is a critical component of treatment management to prevent complications such as edema, hypertension, heart failure, and increased interdialytic weight gain (Mailani et al., 2021).

Fluid restriction in CKD patients often poses a challenge, as it can lead to intense thirst, xerostomia (dry mouth), and discomfort, which may result in non-adherence to therapeutic recommendations. Non-adherence to fluid restriction increases the risk of serious complications, worsens clinical conditions, and reduces patients' quality of life (Mahyuvi & Hasina, 2021). Therefore, effective educational strategies and interventions are needed to help patients understand the importance of fluid restriction while also managing the associated thirst during treatment.

One widely developed approach is health education through innovative learning methods such as blended education. Blended education combines face-to-face learning with digital or technology-based media, enabling a more interactive, flexible, and effective educational process in improving patient knowledge and adherence to therapy. Several studies have shown that educational interventions on fluid management can enhance the understanding of hemodialysis patients and improve adherence to recommended fluid restrictions (Parker et al., 2019).

In addition to educational approaches, non-pharmacological interventions are also necessary to help patients cope with thirst resulting from fluid restriction. One intervention that has gained increasing attention is sipping ice cube therapy. This approach provides a cooling sensation and stimulates saliva production, thereby reducing thirst without significantly increasing fluid intake. Several studies have demonstrated that ice cube sipping therapy significantly reduces thirst levels in CKD patients undergoing hemodialysis (Anggraeni et al., 2023).

Other studies have also reported that ice cube sipping is effective in lowering thirst levels and helping control daily fluid consumption in hemodialysis patients. The intervention has been shown to significantly reduce thirst scores after treatment compared to baseline conditions (Apriyani et al., 2025). Furthermore, innovations in health education combined with ice cube sipping techniques delivered through digital media, such as e-booklets, have been proven to improve patient knowledge regarding fluid restriction and support self-management in CKD patients (Sari & Bayhakki, 2026).

Although various studies have highlighted the effectiveness of health education and non-pharmacological interventions separately, comprehensive research integrating blended education with ice cube sipping interventions in fluid restriction management among CKD patients remains limited. The integration of these approaches has the potential to provide more optimal outcomes by enhancing patient knowledge while simultaneously offering practical strategies to manage thirst associated with fluid restriction.

Based on this background, a literature review is needed to analyze existing studies on blended education and ice cube sipping interventions in fluid restriction management for CKD patients. This review is expected to provide a comprehensive overview of the effectiveness of these approaches and serve as a foundation for developing more innovative and effective educational interventions to improve adherence to fluid restriction and enhance the quality of life of CKD patients.

METHOD

Study Design

This study employed a scoping review approach based on the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist and explanation (Tricco et al., 2018).

Data Sources and Search Strategy

The literature search was conducted electronically through Google Scholar, PubMed, Scopus, ProQuest, and ScienceDirect to identify relevant national and international articles. The keywords used included “chronic kidney disease,” “CKD,” “hemodialysis,” “fluid restriction,” “fluid management,” “thirst management,” “blended education,” “blended learning,” “patient education,” “ice cube therapy,” “sipping ice cube,” and “sucking ice cube.” These keywords were combined using Boolean operators (AND, OR), with publication limits set between 2016 and 2026. A total of 983 articles were initially identified from the five databases. After the screening, eligibility assessment, and critical appraisal process using the Joanna Briggs Institute Critical Appraisal Tools, 8 eligible articles were finally included and analyzed in this scoping review.

The search strategy was further structured using the PICO framework (Population, Intervention, Comparison, Outcome) to ensure focused identification of relevant studies. The population consisted

of CKD patients undergoing hemodialysis. The interventions included blended education and sipping ice cube therapy. The comparison involved standard care or conventional education, while the outcomes included adherence to fluid restriction, reduction in thirst levels, improvement in patient knowledge, and better fluid management. This approach ensured that the literature search process was systematic and well-directed.

Table 1.
Literature Search

No	Database	Keywords	Articles Retrieved
1	Science Direct	*("chronic kidney disease" OR hemodialysis) AND ("fluid restriction") AND ("patient education" OR "blended learning") AND ("ice cube" OR thirst)*	25
2	Scopus	*("chronic kidney disease" OR hemodialysis) AND ("fluid restriction") AND ("patient education" OR "blended learning") AND ("ice cube" OR thirst)*	0
3	Proquest	*("chronic kidney disease" OR hemodialysis) AND ("fluid restriction") AND ("patient education" OR "blended learning") AND ("ice cube" OR thirst)*	738
4	PubMed	*("chronic kidney disease" OR hemodialysis) AND ("fluid restriction") AND ("patient education" OR "blended learning") AND ("ice cube" OR thirst)*	0
5	Google Scholar	*("chronic kidney disease" OR hemodialysis) AND ("fluid restriction") AND ("patient education" OR "blended learning") AND ("ice cube" OR thirst)*	220

Eligibility Criteria

Articles included in this review were primary research studies published between 2016 and 2026, available in full text, and written in either Indonesian or English. The selected studies involved patients with Chronic Kidney Disease, particularly those undergoing hemodialysis, and were related to fluid restriction management. The included articles examined health education interventions related to fluid restriction, including blended education or other technology-based educational approaches, as well as sipping ice cube interventions aimed at reducing thirst. In addition, the studies were required to report relevant outcomes, such as adherence to fluid restriction, thirst levels, improvement in patient knowledge, self-management, or changes in interdialytic weight gain (IDWG). Articles were excluded if they did not meet these criteria, including studies published outside the 2016–2026 period, those not available in full text, or those not written in Indonesian or English. Studies that did not focus on CKD patients or were unrelated to fluid restriction were also excluded. Furthermore, publication types such as editorials, opinion pieces, brief reports, conference abstracts, and review articles were not included, as this study only considered primary research. Duplicate articles identified across multiple databases were removed during the initial screening stage.

Quality Appraisal

Articles that passed the selection stage were subsequently subjected to methodological quality appraisal to assess the validity and reliability of the studies included in the literature review. The quality assessment was conducted using the Joanna Briggs Institute Critical Appraisal Tools, which provides appropriate instruments for evaluating different study designs, such as quasi-experimental, cross-sectional, and other observational studies. The appraisal considered several methodological aspects, including the clarity of research objectives, the appropriateness of the study design, sample characteristics and selection, data collection methods, the validity and reliability of research instruments, and the suitability of data analysis techniques. Studies with very low methodological quality were excluded from the final synthesis to ensure that the review findings were based on credible scientific evidence.

Data Extraction

Data from articles that met the inclusion criteria and passed the quality appraisal stage were systematically extracted using a standardized data extraction form. The extracted information included the authors and year of publication, study location, research design, number and characteristics of participants, type of intervention, measured variables or outcomes, research instruments used, and the main findings of each study. This process facilitated comparison across

studies and enabled the identification of similarities and differences in findings related to the effectiveness of blended education and ice cube sipping interventions in fluid restriction management among patients with Chronic Kidney Disease.

Data Analysis

The extracted data were analyzed using a narrative synthesis approach. This method was chosen due to the potential variation among the reviewed studies in terms of research design, intervention methods, duration of intervention, and reported outcome variables. The analysis was conducted by categorizing the articles based on the type of intervention examined, namely blended education-based interventions, sipping ice cube interventions, or a combination of both in fluid restriction management. Subsequently, the findings were compared to identify consistent patterns, evaluate the effectiveness of each intervention in improving adherence to fluid restriction, and assess their impact on reducing thirst levels among patients with Chronic Kidney Disease. The synthesized results were then used to provide a comprehensive overview of the role of blended education and ice cube sipping interventions as strategies to enhance fluid restriction management in CKD patients.

RESULT

Search Results

A total of 983 articles were identified from five databases. After removing duplicates, 971 articles were screened based on titles and abstracts, of which 947 were excluded. Subsequently, 24 articles underwent full-text screening; however, 16 were excluded due to accessibility issues, inappropriate study design, irrelevant outcomes, and unclear research methods.

A total of 8 articles were then subjected to critical appraisal using the Joanna Briggs Institute Critical Appraisal Tools, and all were deemed eligible. Therefore, 8 articles were ultimately included in this scoping review (Figure 1).

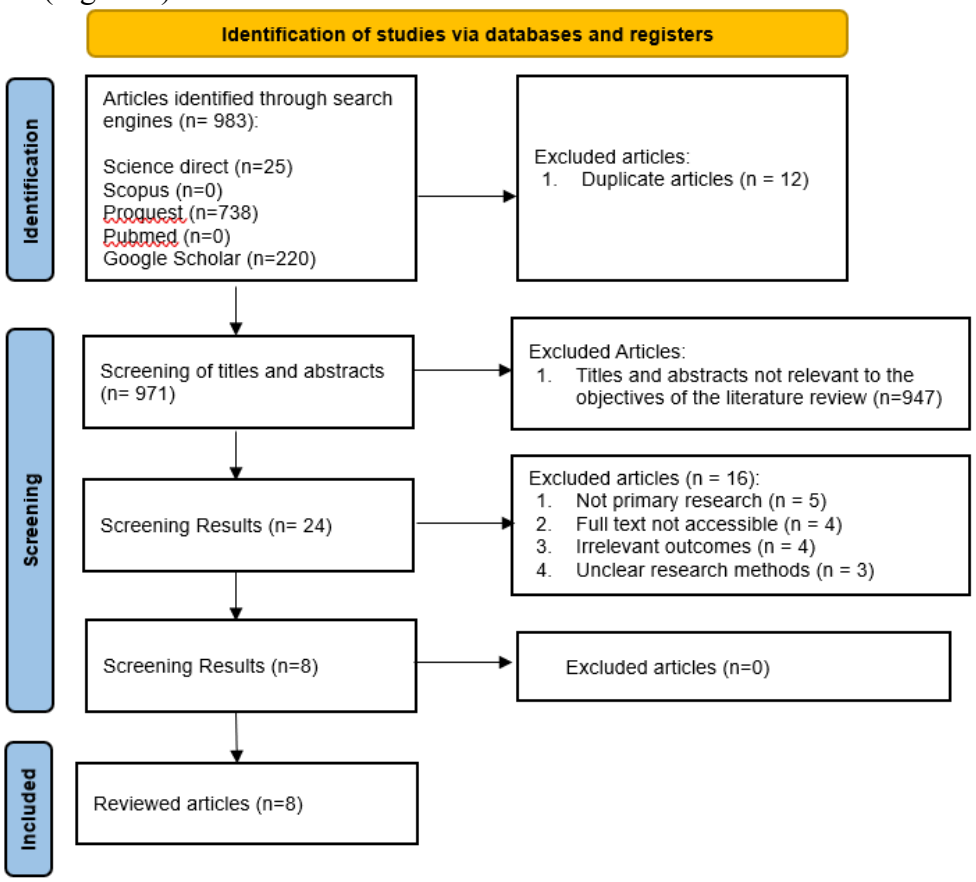

Figure 1. PRISMA Flow Diagram

Summary of Data Extraction Results

Based on the data extracted from the eight analyzed articles, the reviewed studies can be categorized into two main types of interventions: health education interventions related to fluid restriction and non-pharmacological interventions in the form of ice cube sipping to reduce thirst among patients with Chronic Kidney Disease undergoing hemodialysis. Overall, all studies indicate that both approaches play an important role in supporting effective fluid restriction management in hemodialysis patients.

Three studies specifically examined ice cube sipping as a method to manage thirst in hemodialysis patients. The findings demonstrate that slowly sucking on ice cubes can help reduce the intensity of thirst and improve patient comfort during fluid restriction. This intervention works by providing a cooling sensation in the oral cavity, which stimulates saliva production and helps maintain oral mucosal moisture without significantly increasing fluid intake. The results consistently show a reduction in thirst scores after the intervention, indicating that this method is effective as a simple strategy for thirst management in CKD patients.

Meanwhile, five other studies investigated the impact of health education on adherence to fluid restriction among hemodialysis patients. Various educational methods were applied, including the use of booklets, structured education programs, the teach-back method, digital-based education, and education accompanied by follow-up through phone calls or text messages. In general, the findings indicate that health education improves patients' knowledge regarding the importance of fluid restriction and promotes better behavioral changes in controlling fluid intake. Some studies also reported a reduction in interdialytic weight gain (IDWG) following educational interventions, reflecting improved adherence.

In summary, the findings suggest that health education enhances patient understanding and adherence to fluid restriction, while ice cube sipping helps alleviate thirst, which is often a major barrier to compliance. Therefore, these two approaches can complement each other in supporting fluid restriction management among CKD patients undergoing hemodialysis. The integration of effective educational strategies with simple thirst-control interventions has the potential to provide more optimal outcomes in improving patient adherence and quality of life.

Data Extraction Results

A total of eight articles that met the inclusion criteria were further analyzed through the data extraction process. The main characteristics of the studies, including authors, year of publication, study design, sample size, type of intervention, and key findings, are presented in Table 2.

Table 2.
Data Extraction

No	Author (Year)	Study Summary
1	Apriyani et al. (2025)	A pre-experimental study conducted in Indonesia involving 30 hemodialysis patients. The intervention used ice cube therapy, and thirst intensity was measured using a thirst intensity scale. The findings showed a reduction in thirst scores after the intervention.
2	Başer & Mollaoğlu (2019)	A quasi-experimental study in Turkey involving 78 hemodialysis patients. Patients received an education program using nutrition and fluid restriction booklets. The intervention significantly improved adherence to diet and fluid restriction.
3	Armiyati et al. (2019)	An experimental study in Indonesia involving 27 hemodialysis patients. The study compared sipping ice cube intervention with water rinsing and mouthwash for thirst management. The sipping ice cube group demonstrated better tolerance to thirst compared to other interventions.
4	Nadri et al. (2020)	A quasi-experimental study conducted in Iran with 50 hemodialysis patients. The intervention consisted of fluid restriction and dietary education. The study reported improved dietary adherence and reduced interdialytic weight gain (IDWG).

No	Author (Year)	Study Summary
5	Arad et al. (2021)	A randomized controlled trial in Iran involving 66 hemodialysis patients. The intervention combined patient education with follow-up through phone calls and SMS reminders. The findings showed improved therapy adherence, including fluid restriction adherence.
6	Anggraeni et al. (2023)	A quasi-experimental study in Indonesia involving 60 hemodialysis patients. Sipping ice cube therapy was used to manage thirst. The intervention group experienced a significant reduction in thirst levels compared to the control group.
7	Torabikhah et al. (2023)	A randomized clinical trial conducted in Iran involving 70 hemodialysis patients. Education was delivered through an mHealth application combined with face-to-face sessions. Technology-based education improved fluid restriction adherence and reduced IDWG.
8	Aliu et al. (2024)	A randomized controlled trial in Iran involving 60 hemodialysis patients. The teach-back education method on diet and fluid restriction improved patient adherence to therapy and dietary recommendations.

DISCUSSION

Based on the analysis of the eight extracted articles, fluid restriction management in patients with Chronic Kidney Disease undergoing hemodialysis is influenced by two main factors: patients' level of knowledge regarding fluid restriction and their ability to control thirst. These factors are interrelated; patients with a better understanding of fluid restriction tend to demonstrate higher adherence to therapy, yet in practice, thirst often becomes the primary barrier to compliance.

The findings indicate that health education plays a crucial role in improving adherence to fluid restriction. Several studies reviewed in this literature show that educational programs for hemodialysis patients enhance understanding of fluid management, dietary control, and the medical consequences of fluid overload. Başer and Başer & Mollaoğlu (2019), reported that patient education delivered through booklets significantly improved adherence to dietary and fluid restrictions. This suggests that structured information delivery helps patients better understand the importance of controlling fluid intake during hemodialysis.

These findings are consistent with Nadri et al. (2020), who demonstrated that patient education contributes to a reduction in interdialytic weight gain (IDWG), an important indicator of adherence to fluid restriction. A decrease in IDWG following educational interventions indicates improved patient control over fluid intake. Furthermore, the mode of educational delivery also affects intervention effectiveness. Arad et al (2021) found that education combined with follow-up via phone calls and text messages significantly improved adherence to hemodialysis therapy, including fluid restriction. This highlights the importance of continuous education in reinforcing patient understanding and motivation.

Other studies emphasize the role of technology in enhancing patient education. Torabikhah et al (2023) showed that education delivered through mHealth applications significantly improved adherence to fluid restriction and reduced IDWG. The use of technology allows patients to access health information more flexibly and continuously, aligning with the concept of blended education, which integrates face-to-face learning with digital media to improve learning effectiveness.

In addition to educational approaches, this review highlights the importance of non-pharmacological interventions in managing thirst. Thirst is one of the most common complaints among CKD patients undergoing hemodialysis due to fluid and electrolyte imbalances, often leading to difficulty in adhering to fluid restrictions (Kara, 2016). Several studies suggest that ice cube sipping is an effective and simple strategy to alleviate thirst.

Armiyati et al. (2019) reported that patients who practiced ice cube sipping were able to tolerate thirst longer compared to those who only rinsed their mouths or used mouthwash. The cooling sensation from ice cubes stimulates saliva production and provides oral comfort, thereby reducing perceived

thirst without increasing fluid intake. This finding is supported by Anggraeni et al. (2023), who demonstrated a significant reduction in thirst levels following the intervention, as indicated by decreased Dialysis Thirst Inventory scores. Moreover, this intervention is simple, cost-effective, and can be easily performed independently at home.

Overall, the synthesis of the reviewed studies indicates that health education and thirst management interventions play complementary roles in supporting fluid restriction among CKD patients. Health education enhances knowledge, awareness, and motivation, while ice cube sipping addresses physiological barriers such as thirst. However, most studies have examined these interventions separately, and research integrating blended education with ice cube sipping within a single intervention program remains limited. Therefore, further studies are needed to evaluate the combined effectiveness of these approaches in improving adherence to fluid restriction and reducing thirst levels. Such integration is expected to provide a more comprehensive strategy for improving the quality of life of CKD patients and optimizing fluid management during hemodialysis therapy.

CONCLUSION

Based on the findings of the literature review of eight analyzed articles, it can be concluded that health education and non-pharmacological interventions play a significant role in supporting fluid restriction management in patients with Chronic Kidney Disease undergoing hemodialysis. Health education, including approaches such as blended education, has been shown to improve patient knowledge and adherence to fluid restriction, as well as help reduce interdialytic weight gain (IDWG).

On the other hand, the ice cube sipping intervention is effective in alleviating thirst, which is often the primary barrier to adherence to fluid restriction among hemodialysis patients. Therefore, the integration of effective health education with simple interventions such as ice cube sipping has the potential to serve as a more comprehensive approach to improving adherence to fluid restriction and enhancing the quality of life of patients with CKD.

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